



## PRODUCT CATALOGUE

LIGHTNING PROTECTION MATERIALS  
EARTHING MATERIALS  
SURGE PROTECTION OBO-BETTERMANN  
EXOTHERMIC WELDING KUMWELL

# catalogue

**LIGHTNING PROTECTION | EARTHING | SURGE PROTECTION | EXOTHERMIC WELDING**

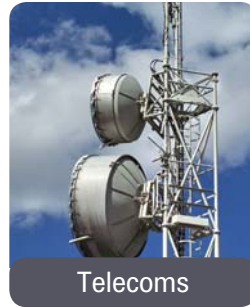
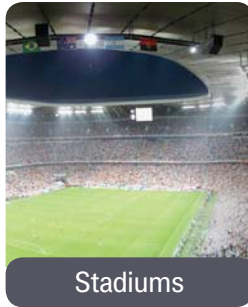
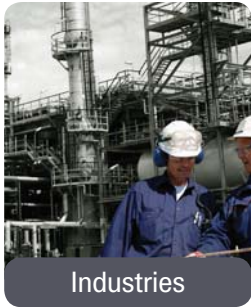


PITTAS-DRAGNIS LTD is a highly specialized Greek company operating for more than 30 years in the field of Lightning - Surge Protection and Grounding Systems.

## SERVICES

- Design - Project implementation in new Lightning Protection and Earthing installations
- Installations from specialized and experienced personnel
- Technical support
- Removals of prohibited Radioactive Lightning Conductors
- Seminars with scope Lightning protection and Earthing systems
- Research for development and design of new materials and arrangements
- Laboratory test services for Lightning Protection - Earthing components & materials

## APPLICATIONS



## CERTIFICATES - TEST REPORTS - SCIENTIFIC REFERENCES

- Laboratory BET Germany
- Laboratory LCOE Spain
- Laboratory ICMET Romania
- National Technical University of Athens
- Greek Atomic Energy Commission
- East London University
- TGMC U.S.A.
- EUROPES Marbella Spain
- IASTED International Conference
- P.P.C. Research Centre
- SGS ISO 9001:2008
- EUROCERT ISO 9001:2008

## LABORATORY TESTS

### LIGHTNING PROTECTION - EARTHING COMPONENTS & MATERIALS

With reference to European standards series **EAOT EN 62561 (EN 50164)**

PITTAS - DRAGNIS is equipped with the latest instruments and modern facilities to ensure reliable procedures and test results in order to fully respond to the specifications that Standards require.

The laboratory tests which the components and materials are subject are the following:

1. Electrical tests
2. Mechanical tests
3. Environmental tests



## STANDARDS




ΕΛΟΤ EN 62305.01	Protection against lightning Part 1: General principles
ΕΛΟΤ EN 62305.02	Protection against lightning Part 2: Risk management
ΕΛΟΤ EN 62305.03	Protection against lightning Part 3: Physical damage to structures and life hazard
ΕΛΟΤ EN 62305.04	Protection against lightning Part 4: Electrical and electronic systems within structures
ΕΛΟΤ EN 62561.01	Lightning protection components (LPC) Part 1: Requirements for connection components
ΕΛΟΤ EN 62561.02	Lightning protection components (LPC) Part 2: Requirements for conductors and earth electrodes
ΕΛΟΤ EN 62561.03	Lightning protection components (LPC) Part 3: Requirements for isolating spark gaps
ΕΛΟΤ EN 62561.04	Lightning protection components (LPC) Part 4: Requirements for conductor fasteners
ΕΛΟΤ EN 62561.05	Lightning protection components (LPC) Part 5: Requirements for earth electrode inspection housings and earth electrode seals
ΕΛΟΤ EN 62561.06	Lightning protection components (LPC) Part 6: Requirements for lightning strike counters
ΕΛΟΤ EN 62561.07	Lightning protection components (LPC) Part 7: Requirements for earthing enhancing compounds
ΕΛΟΤ EN 61643.11	Low-voltage surge protective devices Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods
ΕΛΟΤ TS 61643.12	Low-voltage surge protective devices Part 12: Surge protective devices connected to low-voltage power distribution systems - Selection and application principles
ΕΛΟΤ EN 61643.21	Low voltage surge protective devices Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods
ΕΛΟΤ TS 50539.12	Low-voltage surge protective devices - Surge protective devices for specific application including d.c. - Part 12: Selection and application principles - SPDs connected to photovoltaic installations
ΕΛΟΤ TS 50539.22	Low-voltage surge protective devices - Surge protective devices for specific application including d.c. - Part 12: Selection and application principles - Wind turbine applications
ΕΛΟΤ HD 384 E2	Requirements for electrical installations

## Material abbreviations

MATERIALS		ABBREVIATION
ΧΑΛΥΒΑΣ	STEEL	St
ΧΑΛΥΒΑΣ ΘΕΡΜΑ ΕΠΙΨΕΥΔΑΡΓΥΡΩΜΕΝΟΣ	HOT-DIP GALVANIZED STEEL	St/tZn
ΧΑΛΥΒΑΣ ΕΠΙΨΕΥΔΑΡΓΥΡΩΜΕΝΟΣ	GALVANIZED STEEL	St/galZn
ΧΑΛΥΒΑΣ ΕΠΙΧΑΛΚΩΜΕΝΟΣ	STEEL-COPPER PLATED	St/Cu
ΧΑΛΥΒΑΣ ΘΕΡΜΑ ΕΠΙΨΕΥΔΑΡΓΥΡΩΜΕΝΟΣ ΕΠΕΝΔΕΔΥΜΕΝΟΣ	HOT-DIP GALVANIZED STEEL PVC COATED	St/tZn-PVC
ΧΑΛΚΟΣ ΗΛΕΚΤΡΟΛΥΤΙΚΟΣ	ELECTROLYTIC COPPER	Cu-E
ΧΑΛΚΟΣ ΕΠΙΚΑΣΣΙΤΕΡΩΜΕΝΟΣ	COPPER TIN PLATED	Cu/eSn
ΧΑΛΚΟΣ ΕΠΙΝΙΚΕΛΩΜΕΝΟΣ	COPPER NICKEL PLATED	Cu/eNi
ΧΑΛΚΟΣ ΗΛΕΚΤΡΟΛΥΤΙΚΟΣ ΕΠΕΝΔΕΔΥΜΕΝΟΣ	ELECTROLYTIC COPPER PVC COATED	Cu-E/PVC
ALUMINIUM ALLOY	ALLUMINIUM ALLOY	AlMgSi
ALUMINIUM	ALUMINIUM	Al
STAINLESS STEEL	STAINLESS STEEL	INOX
STAINLESS STEEL ΕΠΙΧΑΛΚΩΜΕΝΟΣ	STAINLESS STEEL-COPPER PLATED	INOX/eCu
ΧΑΛΚΟΣ - ALUMINIUM ΔΙΜΕΤΑΛΛΙΚΟ	CU-AL BIMETALLIC	Cu/Al
ΚΡΑΜΑ ΧΑΛΚΟΥ	COPPER ALLOY	Ms-Cu
ΚΡΑΜΑ ΧΑΛΚΟΥ ΕΠΙΚΑΣΣΙΤΕΡΩΜΕΝΟ	COPPER ALLOY TIN PLATED	Ms-Cu/eSn
ΟΡΕΙΧΑΛΚΟΣ	BRASS	Ms-Cu/Zn
ΟΡΕΙΧΑΛΚΟΣ ΕΠΙΧΑΛΚΩΜΕΝΟΣ	BRASS COPPER PLATED	Ms/eCu
ΟΡΕΙΧΑΛΚΟΣ ΕΠΙΚΑΣΣΙΤΕΡΩΜΕΝΟΣ	BRASS TIN PLATED	Ms/eSn
ΟΡΕΙCOPPER ΕΠΙΝΙΚΕΛΩΜΕΝΟΣ	BRASS NICKEL PLATED	Ms/eNi
ΟΡΕΙΧΑΛΚΟΣ ΕΠΙΧΡΩΜΙΩΜΕΝΟΣ	BRASS CHROMIUM PLATED	Ms/eChr
ZINC ALLOY	ZINC ALLOY	ZAMAK
ZINC ALLOY COPPER PLATED	ZINC ALLOY COPPER PLATED	ZAMAK/eCu
POLYVINYLCHLORIDE	POLYVINYLCHLORIDE	PVC
ΠΟΛΥΑΜΙΔΙΟ	POLYAMIDE	PA
ΠΟΛΥΠΡΟΠΥΛΕΝΙΟ	POLYPROPYLENE	PP
ΝΕΟΠΡΕΝΕ Ή ΠΟΛΥΧΛΩΡΟΠΡΕΝΙΟ	NEOPRENE OR POLYCHLOROPRENE	PCR
ΥΑΛΟΝΗΜΑ	FIBRE-GLASS REINFORCED	GFK

# Material combination

	Steel (St), Hot dip galvanized steel (St/tZn)	Aluminium (Al)	Copper (Cu)	Stainless Steel (INOX)	Tin (Tin)
Steel (St), Hot dip galvanized steel (St/tZn)					
Aluminium (Al)					
Copper (Cu)					
Stainless Steel (INOX)					
Tin (Tin)					

-  Recommended
-  Not Recommended
-  Feasible



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Lightning Protection Materials  
Earthing Materials  
Surge Protection **OBO-BETTERMANN**  
Exothermic welding **KUMWELL**

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[continuation]

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Earthing  
Materials

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# 1

## Lightning Protection Materials



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- 1.2 E.S.E. Lightning Rod TESLA-S®
- 1.3 Air terminal rods
- 1.4 Fasteners
- 1.5 Connectors
- 1.6 Pipe clamps
- 1.7 Accessory components

# 1.1 1

## Solid round conductors



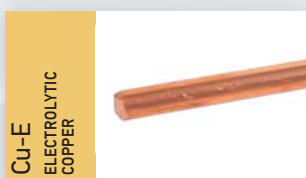
Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
St/tZn	Ø 8	50	400	EN 62561-2	111111-001
	Ø 10	78,5	620		111111-002

• Zinc coating 350 gr/m<sup>2</sup>

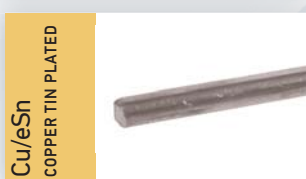


Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
St/Cu	Ø 8	50	410	EN 62561-2	111112-001
	Ø 10	78,5	630		111112-002

• Copper coating 70 µm • High resistant in corrosive environment



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
Cu-E	Ø 8	50	450	EN 62561-2	111113-002
	Ø 10	78,5	700		111113-003



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
Cu/eSn	Ø 8	50	450	EN 62561-2	111114-001



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
AlMgSi	Ø 8	50	135	EN 62561-2	111115-001
	Ø 9	63,6	170		111115-002
	Ø 10	78,5	210		111115-003

• Above ground



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
INOX V2A	Ø 8	50	395	EN 62561-2	111116-001
	Ø 10	78,5	617		111116-003
INOX V4A	Ø 8	50	395		111116-002
	Ø 10	78,5	617		111116-004

• High resistant in corrosive environment

# 1.1 2

## Conductor isCon®

Surface discharge-free and high voltage-resistant insulated arrester to maintain the separation distance  $s \leq 1$  m.



Material	Cross section (mm <sup>2</sup> )	Diameter (mm)	Item No.
Cu-E/PVC	35	Ø 23	111211-001

# 1.1 3

## Stranded conductors



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Number of strands	Weight ~ gr/m	Standard	Item No.
Cu-E	Ø 5,3	16	7 x 1,70	135	EN 62561-2	111313-001
	Ø 6,6	25	7 x 2,14	213		111313-002
	Ø 7,9	35	7 x 2,52	295		111313-003
	Ø 9,1	50	7 x 3,00	405		111313-004
	Ø 11,0	70	19 x 2,14	588		111313-005
	Ø 12,9	95	19 x 2,52	814		111313-006
	Ø 14,5	120	19 x 2,80	1.035		111313-008
	Ø 16,2	150	37 x 2,25	1.271		111313-009
	Ø 18,0	185	37 x 2,50	1.589		111313-010
Ø 20,6	240	61 x 2,25	2.102	111313-011		

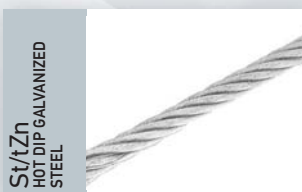


Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Number of strands	Weight ~ gr/m	Standard	Item No.
Cu/eSn	Ø 5,3	16	7 x 1,70	135	EN 62561-2	111314-001
	Ø 6,6	25	7 x 2,14	213		111314-002
	Ø 7,9	35	7 x 2,52	295		111314-003
	Ø 9,1	50	7 x 3,00	405		111314-004
	Ø 11,0	70	19 x 2,14	588		111314-005
	Ø 12,9	95	19 x 2,52	814		111314-006
	Ø 14,5	120	19 x 2,80	1.035		111314-007

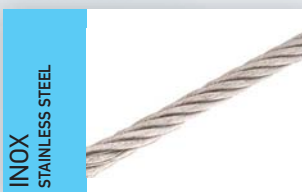


Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Number of strands	Weight ~ gr/m	Item No.
Cu-E/PVC	6,7	10	7 x 1,35	110	111317-002
	7,8	16	7 x 1,70	165	111317-003
	9,7	25	7 x 2,14	260	111317-004
	10,9	35	7 x 2,52	350	111317-005
	12,8	50	19 x 1,78	480	111317-006
	14,6	70	19 x 2,14	675	111317-007
	17,1	95	19 x 2,52	930	111317-008
	18,8	120	37 x 2,03	1.150	111317-009
	20,9	150	37 x 2,25	1.420	111317-011
	23,3	185	37 x 2,52	1.790	111317-012
	26,6	240	61 x 2,25	2.350	111317-013

• G/Y insulation



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Number of strands	Weight ~ gr/m	Standard	Item No.
St/tZn	Ø 6	28,26	6 x 19	131	EN 62561-2	111311-001
	Ø 8	50,24		209		111311-002
	Ø 10	78,50		346		111311-003



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Number of strands	Weight ~ gr/m	Standard	Item No.
INOX	Ø 8	50,24	7 x 19	258	EN 62561-2	111316-001
	Ø 10	78,50		375		111316-002



# 1.1 4

## Flexible stranded conductors

Cu-E  
ELECTROLYTIC COPPER



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Item No.
Cu-E	Ø 6	16	111413-001
	Ø 8	25	111413-002
	Ø 9	35	111413-003
	Ø 11	50	111413-004
	Ø 13	70	111413-005
	Ø 16	95	111413-006

Cu/eSn  
COPPER TIN PLATED



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Item No.
Cu/eSn	Ø 6	16	111414-001
	Ø 8	25	111414-002
	Ø 9	35	111414-003
	Ø 11	50	111414-004
	Ø 13	70	111414-005
	Ø 16	95	111414-006

Cu-E/PVC (H07V-K NYAF)  
ELECTROLYTIC COPPER  
PVC COATED



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight (gr/m)	Item No.
Cu-E/PVC	Ø 8	16	175	111417-005
	Ø 9,9	25	270	111417-006
	Ø 11,1	35	370	111417-007
	Ø 13,3	50	500	111417-008
	Ø 15,2	70	700	111417-009
	Ø 16,9	95	955	111417-010
	Ø 20	120	1.180	111417-011

# 1.1 5

## Preformed flexible stranded conductors

Preformed flexible stranded conductors with PVC insulation, used for equipotential bonding of metallic surfaces. The terminals are tin plated copper.

Cu-E/PVC  
ELECTROLYTIC COPPER  
PVC COATED



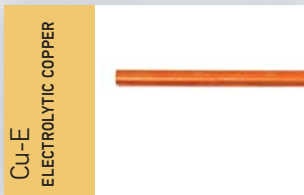
Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Item No.
Cu-E/PVC	16	200	111511-004
	25	200	111511-005
	35	200	111511-006
	16	300	111511-009
	25	300	111511-010
	35	300	111511-011
	16	400	111511-013
	25	400	111511-014
	35	400	111511-015

# 1.1

# 6

## Straight round conductors

Straight round conductors diameter  $\varnothing$  16 mm used for lightning protection - earthing.



Material	Diameter (mm)	Μήκος (mm)	Standard	Item No.
St/tZn	$\varnothing$ 16	4.000	EN 62561-2	111611-003
	$\varnothing$ 16	6.000		111611-004

Material	Diameter (mm)	Μήκος (mm)	Standard	Item No.
Cu-E	$\varnothing$ 16	4.000	EN 62561-2	111613-002

# 1.1

# 7

## Earth lead-in rods

Earth lead-in rods diameter  $\varnothing$  16 mm, which connect the lightning protection system down conductors and the earthing system, so as to protect the down conductor system from mechanical stresses at the lowest heights above the ground.



SINGLE POINT

DOUBLE POINT

SINGLE POINT

DOUBLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
St/tZn	$\varnothing$ 16	1.500	EN 62561-1 & 2	111711-001
	$\varnothing$ 16	2.000		111711-002
	$\varnothing$ 16	2.500		111711-003

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
St/tZn	$\varnothing$ 16	1.500	EN 62561-1 & 2	111711-004
	$\varnothing$ 16	2.000		111711-005
	$\varnothing$ 16	2.500		111711-006

- Connection with the down conductor is accomplished by Item No. 163111-004

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu-E	$\varnothing$ 16	1.500	EN 62561-1 & 2	111713-001
	$\varnothing$ 16	2.000		111713-002
	$\varnothing$ 16	2.500		111713-003

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu-E	$\varnothing$ 16	1.500	EN 62561-1 & 2	111713-004
	$\varnothing$ 16	2.000		111713-005
	$\varnothing$ 16	2.500		111713-006

- Connection with the down conductor is accomplished by Item No. 163111-007

# 1.1 8

## Tape conductors

Tape conductors (strips) used in earthing systems. They are also used in lightning protection systems for equipotential bonding.



### ZINC COATING 500gr/m<sup>2</sup>

Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
St/tZn	30	3	90	710	EN 62561-2	121111-001
	30	3,5	105	830		121111-005
	40	4	160	1.260		121111-006



### COPPER COATING 70 μm

Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
St/Cu	30	3,5	105	900	EN 62561-2	121112-001
	40	4	160	1.320		121112-002

- High resistant in corrosive environment



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
Cu-E	20	2,5	50	440	EN 62561-2	121113-002
	25	3	75	670		121113-003
	30	2	60	530		121113-005
	30	3	90	800		121113-006
	40	3	120	1.060		121113-009
	40	4	160	1.420		121113-010

- Available in other dimensions as well



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
Cu/eSn	20	2,5	50	440	EN 62561-2	121114-001
	25	3	75	670		121114-002
	30	2	60	530		121114-005
	30	3	90	800		121114-006
	40	3	120	1.060		121114-007
	40	4	160	1.420		121114-008



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
INOX V2A	30	3,5	105	825	EN 62561-2	121116-001
INOX V4A						121116-003

- High resistant in corrosive environment

# 1.1

# 9

## Flexible stranded tapes

Flexible stranded copper tapes constructed by strands with diameter 0.2mm used for equipotential bonding of metallic surfaces.



Cu-E  
ELECTROLYTIC COPPER

Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Item No.
Cu-E	17	2,0	16	121311-001
	20	2,5	25	121311-002
	22	3,0	35	121311-003
	30	4,0	50	121311-004
	45	3,5	70	121311-005



Cu/eSn  
COPPER TIN PLATED

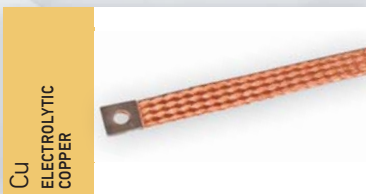
Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Item No.
Cu/eSn	17	2,0	16	121312-001
	20	2,5	25	121312-002
	22	3,0	35	121312-003
	30	4,0	50	121312-004
	45	3,5	70	121312-005

# 1.1

# 10

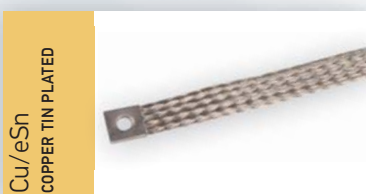
## Preformed flexible stranded tapes

Preformed flexible stranded tapes, in length 300 - 500 mm used for equipotential bonding of metallic surfaces. The terminals are tin plated copper.



Cu  
ELECTROLYTIC COPPER

Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Length (mm)	Hole (mm)	Item No.
Cu	30	3,0	35	300	Ø 12	121411-001
				500		121411-002



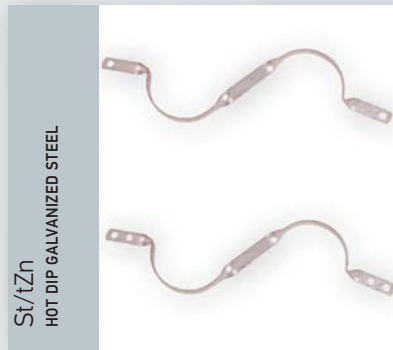
Cu/eSn  
COPPER TIN PLATED

Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Length (mm)	Hole (mm)	Item No.
Cu/eSn	30	3,0	35	300	Ø 12	121412-001
				500		121412-002

# 1.1 11

## Contraction-expansion absorbing conductor

Contraction-expansion absorbing component which is installed at intervals of approximately 20 meters of straight or crossing air termination system conductors Ø 8-10 mm to absorb the contraction-expansion due to temperature changes.



### SINGLE POINT

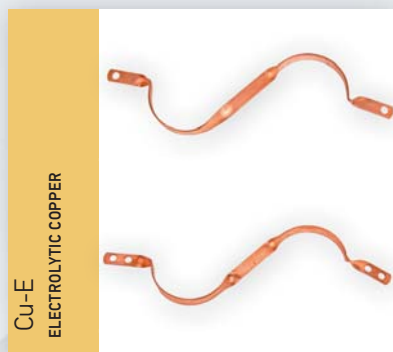
Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
St/tZn	Ø 8-10	400	EN 62561-1 & 2	131111-002

- Connection with the conductor is accomplished by Item No. 163011-001

### DOUBLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
St/tZn	Ø 8-10	400	EN 62561-1 & 2	131111-001

- Connection with the conductor is accomplished by Item No. 163111-004



### SINGLE POINT

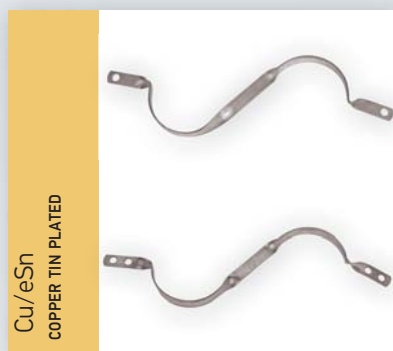
Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu-E	Ø 8-10	400	EN 62561-1 & 2	131112-002

- Connection with the conductor is accomplished by Item No. 163011-005

### DOUBLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu-E	Ø 8-10	400	EN 62561-1 & 2	131112-001

- Connection with the conductor is accomplished by Item No. 163111-007



### SINGLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu/eSn	Ø 8-10	400	EN 62561-1 & 2	131113-002

- Connection with the conductor is accomplished by Item No. 163011-008

### DOUBLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu/eSn	Ø 8-10	400	EN 62561-1 & 2	131113-001

- Connection with the conductor is accomplished by Item No. 163111-008



Material	Diameter (mm)	Length (mm)	Standard	Item No.
AlMgSi	Ø 9	400	EN 62561-1 & 2	131114-001

- Connection with the conductor is accomplished by Item No. 162211-005 or Item No. 161511-005

# 1.1 12

## Contraction-expansion absorbing conductor cross

Contraction-expansion absorbing conductor cross which is installed in the junction of crossing conductors  $\varnothing$  8-10 mm.

St/tZn  
HOT DIP GALVANIZED STEEL



### SINGLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
St/tZn	$\varnothing$ 8-10	400	EN 62561-1 & 2	131211-002

- Connection with the conductor is accomplished by Item No. 163011-001
- Cross connector Item No. 161611-001

### DOUBLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
St/tZn	$\varnothing$ 8-10	400	EN 62561-1 & 2	131211-001

- Connection with the conductor is accomplished by Item No. 163111-004
- Cross connector Item No. 161611-001

Cu-E  
ELECTROLYTIC COPPER



### SINGLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu-E	$\varnothing$ 8-10	400	EN 62561-1 & 2	131212-002

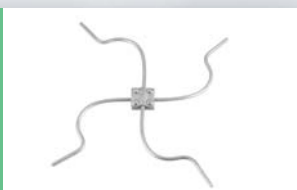
- Connection with the conductor is accomplished by Item No. 163011-005
- Cross connector Item No. 161611-006

### DOUBLE POINT

Material	Diameter Round (mm)	Length (mm)	Standard	Item No.
Cu-E	$\varnothing$ 8-10	400	EN 62561-1 & 2	131212-001

- Connection with the conductor is accomplished by Item No. 163111-007
- Cross connector Item No. 161611-006

AlMgSi  
ALUMINIUM ALLOY



Material	Diameter (mm)	Length (mm)	Standard	Item No.
AlMgSi	$\varnothing$ 9	400	EN 62561-1 & 2	131213-001

- Connection with the conductor is accomplished by Item No. 162211-005 or Item No. 161511-005
- Cross connector Item No. 161511-005

# 1.2

## E.S.E. Lightning Rod TESLA-S®



New Generation pulsed excitation Lightning head with enhanced ionization system in compliance with the French Standard NFC 17 102

### TESLA-S® lightning conductor - Principle of operation

The TESLA-S lightning head carries a sharp pointed rod, made from special bronze alloy to attract and capture lightning. This rod incorporates a safety arc gap for the main lightning current and is attached to a sphere shape casing. A metal horizontal disc is fitted symmetrically around the casing, making electrical contact with it and the rod. The disc will react to the bad weather electric field and will be charged inductively with the field rise.

A special high-tension converter is located inside the sphere shape casing. High tension is achieved by the natural instability and negative resistance of a plasma arc placed inside a transverse magnetic field produced by a coil. The circuit is characterized by a series connection of an arc's negative resistance to an inductance and capacitance. A very high ionizing tension is produced at the area around the head's rod. The TESLA-S type is powered by the induction of the bad weather thunder field itself, a phenomenon that typically lasts a few to several minutes of an hour.

The head of the TESLA-S is equipped with a safety arrangement to protect its own circuitry during a lightning capture. The internal gap mechanism, the sparking device and the circuitry are placed in a waterproof and enforced sphere shape casing. The sphere shape of the casing allows the lightning current to pass freely through the grounding cathode. Additionally the casing's base acts like an external spark gap between the head and the cathode.

### Technical characteristics

- Inductance: over 20 Henries.
- Capacitance: 200 pF.
- L/R constant: 8-10 msec.
- Gap of leading spark: 0.1 mm.
- Arc gap of main lightning current (internal): 2 mm.
- Arc gap of main lightning current (external): 40 mm.
- Repetition rate of leading spark: 10-20 µsec.
- Operating range in thunder field intensity: 5-200 kV/m (instantly).
- Weight of head: 8.9 kgr.
- Size: 85 cm, 40 cm diameter respectively.
- Junction of lightning head: internal thread 1+1/4" inch.
- Head material: 304 A Stainless Steel
- NO of International Classification:H 02 G 13 / 00.

## Support mast

Telescopic support mast made from steel heavy type with deep infiltration welding (MIG-MAG).

Available in hot dip galvanized steel, stainless steel or in antioxidant painted steel to fit to the appropriate environment.

Depending on the installation requirements the available heights of masts are from 1 to 23 meters. Masts higher than 8 meters have self-supporting tension cables.

HOT DIP GALVANIZED STEEL (ST/TZN)		
Material	Height (m.)	Item No.
St/tZn	2	181212-002
	3	181212-003
	4	181212-004
	5	181212-005
	6	181212-006
	7	181212-007
	8	181212-008
	9	181212-009
	10	181212-010
	11	181212-011
	12	181212-012
	13	181212-013
	14	181212-014
	15	181212-015
	16	181212-016
	17	181212-017
	18	181212-018
	19	181212-019
	20	181212-020
	21	181212-021
	22	181212-022
	23	181212-023

STAINLESS STEEL (INOX)		
Material	Height (m.)	Item No.
INOX	2	181211-001
	3	181211-002
	4	181211-003
	5	181211-004
	6	181211-005

## Down conductor

It is used bare electrolytic copper stranded conductor of cross section 50 mm<sup>2</sup>. The down conductor should be perpendicular so as the lightning current flow as smooth as possible.

## Earthing

Earth rods copper plated with brass clamps are usually installed in triangle arrangement in order to achieve low earth resistance. In case of hard or rocky ground, copper plates along with earthing enhancement compound EARTHPLUS® can be used.

## Accessories

For the installation of down conductor on the mast or the walls appropriate fasteners are used accordingly.

Along the down conductor a test connector for earthing measurements and a magnetic card for recording lightning impulse current are inserted.

Two meters above the ground the down conductor is inserted on a pipe to be protected from mechanical stresses.

For visual inspection and earthing measurement an earth pit 30x30x30 cm with earth sign is installed.

The good operation if the lightning conductor head is tested with TESLA-S TESTER.

## Testing & Certificates

- BET laboratory, GERMANY
- ICMET laboratory, ROMANIA
- NATIONAL TECHNICAL UNIVERSITY OF ATHENS
- Greek Atomic Energy Commission
- East London University
- TGMC U.S.A.
- EUROPE'S Marbella Spain
- IASTED International Conference

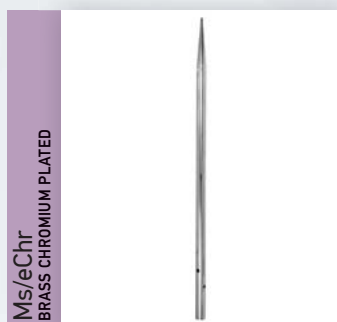
**The Tesla-S® is friendly to the environment.**  
**Laboratory tested according to NFC 17 102 & EN 62561-1**



# 1.3 1

## Air terminal rods Franklin Heavy Type

Air terminal rods Franklin Heavy Type which are installed either independently or in combination with the meshed air termination system (FARADAY cage), to cover protruding points of the building. The connection with the down conductor is accomplished using special connector.



Material	Diameter (mm)	Length (mm)	Standard	Item No.
Ms/eChr	Ø 30	1.000	EN 62561-1 & 2	141311-001

- Franklin connector Item No. 171116-001



Material	Diameter (mm)	Length (mm)	Standard	Item No.
INOX	Ø 30	1.000	EN 62561-1 & 2	141312-001

- Franklin connector Item No. 171116-002

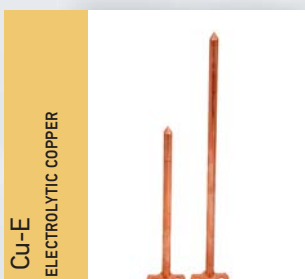
# 1.3 2

## Air terminal rods on fasteners

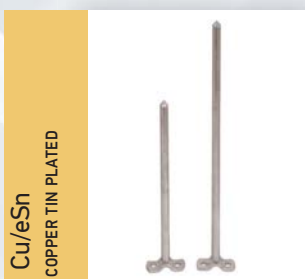
Air terminal rods on wall fasteners. They are mounted on a perpendicular to the ground surface. The fastener provides direct connection to the down conductor.



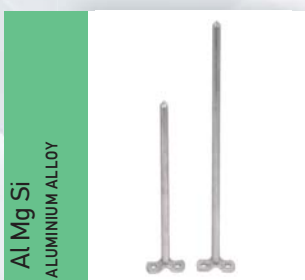
Material	Diameter (mm)	Length (mm)	Standard	Item No.
St/tZn	Ø 10	200	EN 62561-1 & 2	141411-001
		300		141411-002
		500		141411-003



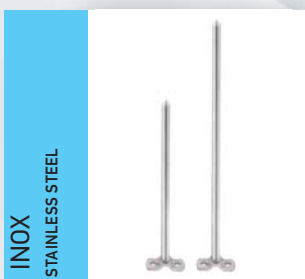
Material	Diameter (mm)	Length (mm)	Standard	Item No.
Cu-E	Ø 10	200	EN 62561-1 & 2	141412-001
		300		141412-002
		500		141412-003



Material	Diameter (mm)	Length (mm)	Standard	Item No.
Cu/eSn	Ø 10	200	EN 62561-1 & 2	141413-001
		300		141413-002
		500		141413-003



Material	Diameter (mm)	Length (mm)	Standard	Item No.
AlMgSi	Ø 10	200	EN 62561-1 & 2	141414-002
		300		141414-003
		500		141414-004



Material	Diameter (mm)	Length (mm)	Standard	Item No.
INOX	Ø 10	200	EN 62561-1 & 2	141415-001
		300		141415-002
		500		141415-003

# 1.3 3

## Air terminal rods on bases

Air terminal rods which are mounted on bases. The base has a protrusive thread M8 on which the rod is screwed. The rods have a special made fastener with notch to connect the down conductor.



St/tZn  
HOT DIP GALVANIZED STEEL

Material	Diameter (mm)	Length (mm)	Standard	Item No.
St/tZn	Ø 16	300	EN 62561-1 & 2	141511-003
	Ø 16	600		141511-004

- Base Item No. 141611-001



Cu-E  
ELECTROLYTIC COPPER

Material	Diameter (mm)	Length (mm)	Standard	Item No.
Cu-E	Ø 16	300	EN 62561-1 & 2	141512-002
	Ø 16	600		141512-003

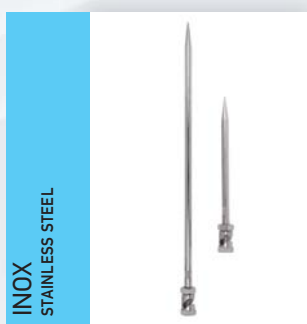
- Base Item No. 141614-001



Ms/eChr  
BRASS CHROMIUM PLATED

Material	Diameter (mm)	Length (mm)	Standard	Item No.
Ms/eChr	Ø 16	300	EN 62561-1 & 2	141513-001
	Ø 16	600		141513-002

- Base Item No. 141611-001



INOX  
STAINLESS STEEL

Material	Diameter (mm)	Length (mm)	Standard	Item No.
INOX	Ø 16	300	EN 62561-1 & 2	141514-001
	Ø 16	600		141514-002

- Base Item No. 141614-001

# 1.3

# 4

## Air terminal rod bases

Air terminal rod bases (round), with protrusive thread M8 for mounting.

St/tZn  
HOT DIP GALVANIZED  
STEEL



Material	Diameter (mm)	Item No.
St/tZn	Ø 100	141611-001

INOX  
STAINLESS STEEL



Material	Diameter (mm)	Item No.
INOX	Ø 100	141614-001

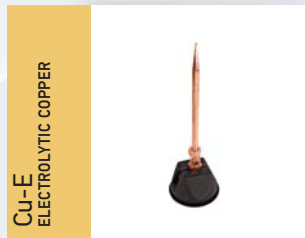
# 1.3 5

## Air terminal rods with PVC base

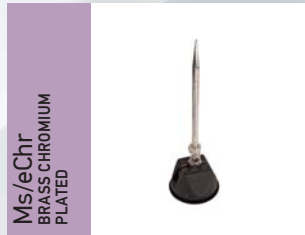
Air terminal rods which are mounted on PVC base filled with concrete. The rods are screwed on a protrusive thread M8. They are used in Lightning protection systems and especially on insulating roofs. The rods have a special made fastener with notch to connect the down conductor.



Terminal Material	Material Base	Terminal Diameter (mm)	Terminal Length (mm)	Standard	Item No.
St/tZn	PVC	Ø 16	300	EN 62561-1 & 2	141711-001
			600		141711-002



Terminal Material	Material Base	Terminal Diameter (mm)	Terminal Length (mm)	Standard	Item No.
Cu-E	PVC	Ø 16	300	EN 62561-1 & 2	141712-001
			600		141712-002



Terminal Material	Material Base	Terminal Diameter (mm)	Terminal Length (mm)	Standard	Item No.
Ms/eChr	PVC	Ø 16	300	EN 62561-1 & 2	141713-002
			600		141713-003



Terminal Material	Material Base	Terminal Diameter (mm)	Terminal Length (mm)	Standard	Item No.
INOX	PVC	Ø 16	300	EN 62561-1 & 2	141714-001
			600		141714-002

# 1.3

# 6

## Air terminal rods lateral support

Air terminal rods for lateral support on perpendicular surfaces and on protrusive parts of the building (as parapets, chimneys and other constructions on the roof) with wall fasteners  $\varnothing$  16 mm. On the lower part end they have receptacle to connect the down conductor using a double point connector.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Diameter (mm)	Length (mm)	Standard	Item No.
St/tZn	$\varnothing$ 16	1.000	EN 62561-1 & 2	141811-001
		1.500		141811-002

- Fastener Item No.151112-001
- Connection with the conductor is accomplished by Item No.163111-004

Cu-E  
ELECTROLYTIC COPPER



Material	Diameter (mm)	Length (mm)	Standard	Item No.
Cu-E	$\varnothing$ 16	1.000	EN 62561-1 & 2	141812-001
		1.500		141812-002

- Fastener Item No.151112-024
- Connection with the conductor is accomplished by Item No. 163111-007

INOX  
STAINLESS STEEL



Material	Diameter (mm)	Length (mm)	Standard	Item No.
INOX	$\varnothing$ 16	1.000	EN 62561-1 & 2	141813-002
		1.500		141813-003

- Fastener Item No.151112-001
- Connection with the conductor is accomplished by Item No.163612-009

# 1.3 7

## Air terminal rod mushroom type

Air terminal rod mushroom type used in flat roofs accessible in public (ex. parking).

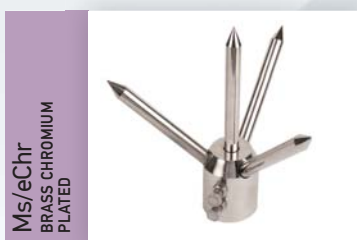


Al  
ALUMINIUM

Material	Diameter (mm)	Height (mm)	Diameter Round (mm)	Standard	Item No.
Al	Ø 80	70	Ø 8-10	EN 62561-1 & 2	141911-001

# 1.3 8

## Multiple air terminal rod



Ms/eChr  
BRASS CHROMIUM  
PLATED

Terminal Material	Terminal Diameter (mm)	Terminal number	Standard	Item No.
Ms/eChr	Ø 14	4	EN 62561-1 & 2	142011-001

# 1.3 9

## Air terminal rods tapered

Air terminal rods made from two parts. The lower part has diameter Ø16mm and the upper part has diameter Ø10mm. Installed on concrete block. For better support an insulated GFK spacer is used.



Al  
ALUMINIUM

Material	Diameter (mm)	Length (mm)	Standard	Item No.
Al	Ø 16 / Ø 10	1.500	EN 62561-1 & 2	142111-001
		2.000		142111-005
		2.500		142111-003
		3.000		142111-004

• Quick connector Ø 16 / Ø 8-10 Item No. 163612-001

# 1.3 10

## Air terminal rods concrete block

Concrete block for the support of air terminal rods  $\varnothing 16\text{mm}$ .

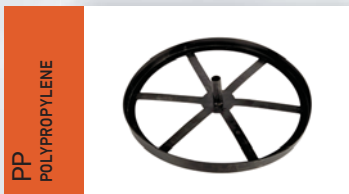


Material	Diameter (mm)	Height (mm)	Weight	Item No.
Beton	$\varnothing 364$	85	16 Kg	141615-001

# 1.3 11

## Concrete block protection base

Edge protection base for the concrete block.

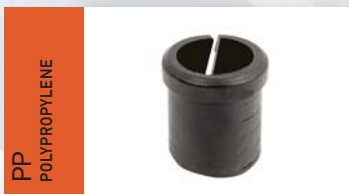


Material	Base Diameter (mm)	Dowel Ext. Diameter (mm)	Item No.
PP	$\varnothing 373$	$\varnothing 19$	141615-002

# 1.3 12

## Air terminal rod - concrete block sleeve

Air terminal rod to concrete base reducing sleeve.

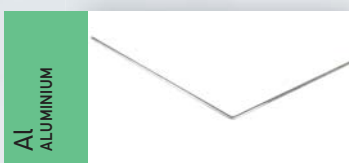


Material	Int. Diameter (mm)	Height (mm)	Item No.
PP	$\varnothing 16$	29	141615-003

# 1.3 13

## Air terminal rods angled

Angular air terminal rods which are installed on the frame of the photovoltaic base with two fasteners.



Material	Diameter (mm)	Length (mm)	Standard	Item No.
Al	$\varnothing 16$	1.500	EN 62561-1 & 2	142112-007

• Air terminal rod fastener - P/V frame. Item No. 151411-002



# 1.4.1 1<sub>A</sub>

## Conductor fasteners Ø 8-10 HILTI type

Fasteners Hilti type of vertical/horizontal Ø 8-10 mm conductors on walls, panels e.t.c. They have internal thread to be supported on threaded drive pin.



Material	Diameter Round (mm)	Fastener Height (mm)	Thread	Standard	Item No.
St/tZn	Ø 8-10	20	M6	EN 62561-4	151111-001
		20	M8		151111-002
		30	M6		151111-004
		30	M8		151111-005
		50	M6		151111-006
		50	M8		151111-007
		60	M6		151111-008
		60	M8		151111-009
		100	M6		151111-011
		100	M8		151111-012



Material	Diameter Round (mm)	Fastener Height (mm)	Thread	Standard	Item No.
Cu-E	Ø 8-10	20	M6	EN 62561-4	151111-025
		20	M8		151111-026
		30	M6		151111-027
		30	M8		151111-028
		50	M6		151111-029
		50	M8		151111-030
		60	M6		151111-031
		60	M8		151111-032
		100	M6		151111-033
		100	M8		151111-034



Material	Diameter Round (mm)	Fastener Height (mm)	Thread	Standard	Item No.
ZAMAK	Ø 8-10	20	M6	EN 62561-4	151111-015
		20	M8		151111-021
		30	M6		151111-016
		30	M8		151111-022
		50	M6		151111-017
		50	M8		151111-023
		60	M6		151111-018
		60	M8		151111-024
		100	M6		151111-014
		100	M8		151111-019

# 1.4.1 1<sub>B</sub>

## Conductor fasteners Ø 16 HILTI type

Fasteners Hilti type of vertical/horizontal Ø 16 mm conductors on walls, panels e.t.c. They have internal thread to be supported on threaded drive pin.

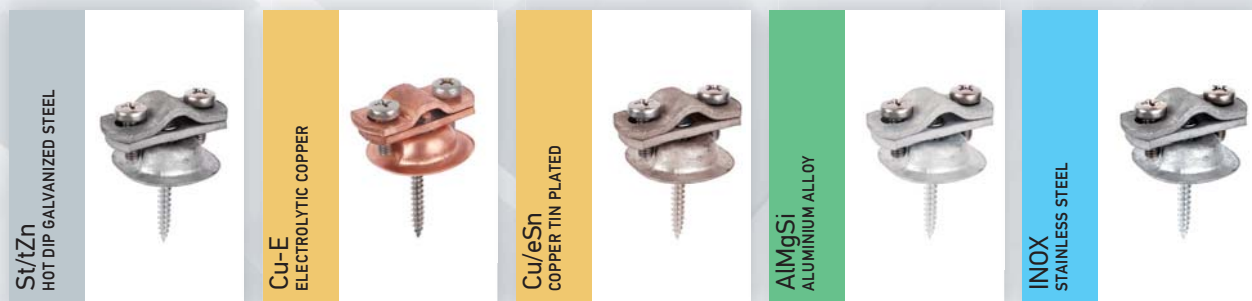


Material	Diameter Round (mm)	Fastener Height (mm)	Thread	Standard	Item No.
St/tZn	Ø 16	20	M8	EN 62561-4	151111-013
Cu-E		20	M8		151111-035
ZAMAK		20	M8		151111-020

# 1.4.1 2<sub>A</sub>

## Conductor fasteners Ø 6 with metallic spacer

Fasteners of vertical/horizontal Ø 6 mm conductors, with metallic spacer, to be supported on walls, with woodscrew and "upat".

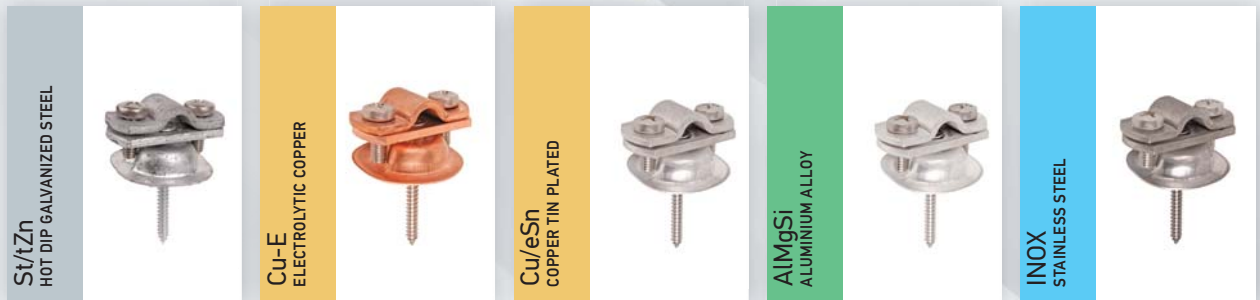


Material	Diameter Round (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	Ø 6	44	20	EN 62561-4	151112-002
Cu-E					151112-029
Cu/eSn					151112-036
AlMgSi					151112-016
INOX					151112-005

# 1.4.1 2<sub>B</sub>

## Conductor fasteners Ø 8-10 with metallic spacer

Fasteners of vertical/horizontal Ø 8-10 mm conductors, with metallic spacer, to be supported on walls, with woodscrew and "upat".

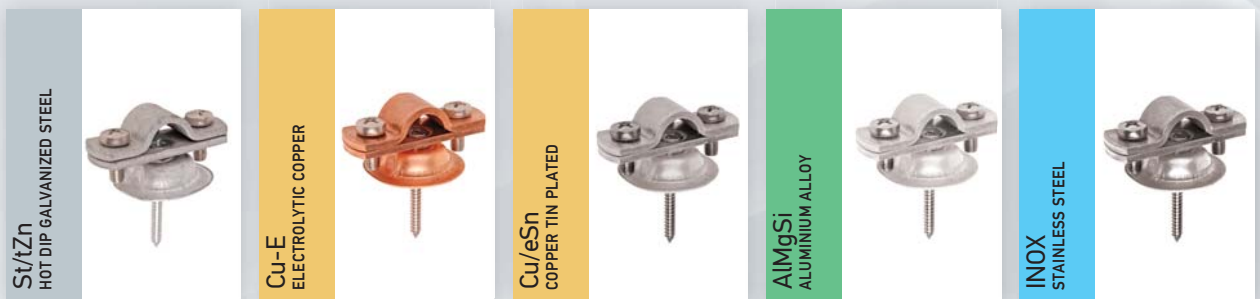


Material	Diameter Round (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	Ø 8-10	44	20	EN 62561-4	151112-003
Cu-E					151112-030
Cu/eSn					151112-037
AlMgSi					151112-017
INOX					151112-006

# 1.4.1 2<sub>C</sub>

## Conductor fasteners Ø 16 with metallic spacer

Fasteners of vertical/horizontal Ø 16 mm conductors, with metallic spacer, to be supported on walls, with woodscrew and "upat".

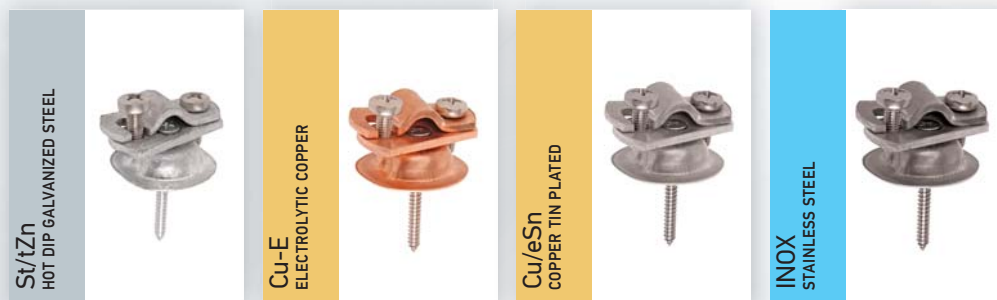


Material	Diameter Round (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	Ø 16	56	20	EN 62561-4	151112-001
Cu-E					151112-024
Cu/eSn					151112-032
AlMgSi					151112-015
INOX					151112-014

# 1.4.1 3<sub>A</sub>

## Conductor fasteners Ø 8-10 with metallic spacer and open slot

Fasteners of vertical/horizontal Ø 8-10 mm conductors, with metallic spacer and open slot, to be supported on walls, with woodscrew and "upat".

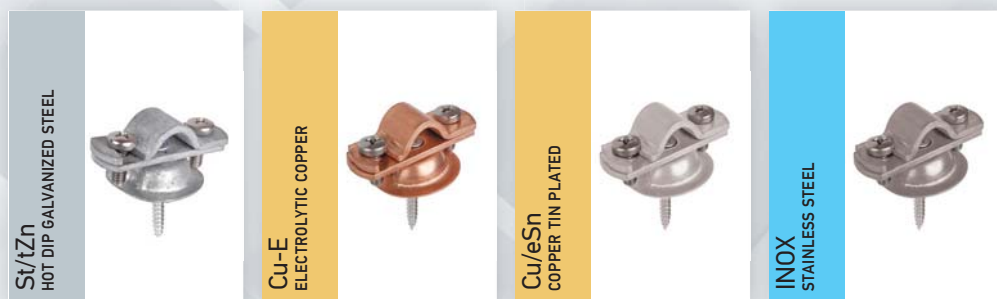


Material	Diameter Round (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	Ø 8-10	44	20	EN 62561-4	151112-007
Cu-E					151112-031
Cu/eSn					151112-035
INOX					151112-009

# 1.4.1 3<sub>B</sub>

## Conductor fasteners Ø 16 with metallic spacer and open slot

Fasteners of vertical/horizontal Ø 16 mm conductors, with metallic spacer and open slot, to be supported on walls, with woodscrew and "upat".



Material	Diameter Round (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	Ø 16	56	20	EN 62561-4	151112-008
Cu-E					151112-023
Cu/eSn					151112-041
INOX					151112-013

# 1.4.1 4

## Conductor fasteners Ø 8-10 with plastic body and swelling neoprene

Fasteners of Ø 8-10 mm conductors with plastic body and swelling neoprene. Installation on tiles or panel roofs. The Ø 10 mm opening should be made with a non-impact drill.



Material	Diameter Round (mm)	Fastener Length (mm)	Neoprene Diameter (mm)	Standard	Item No.
St/tZn	Ø 8-10	57	10	EN 62561-4	151113-002
Cu-E					151113-007
INOX					151113-003

# 1.4.1 5

## Conductor fasteners Ø 8-10 with plastic body, swelling neoprene and open slot

Fasteners of Ø 8-10 mm conductors with plastic body, swelling neoprene and open slot. Installation on tiles or panel roofs. The Ø 10 mm opening should be made with a non-impact drill.



Material	Diameter Round (mm)	Fastener Length (mm)	Neoprene Diameter (mm)	Standard	Item No.
St/tZn	Ø 8-10	57	10	EN 62561-4	151113-004
Cu-E					151113-008
INOX					151113-006

# 1.4.1 6

## Conductor fasteners Ø 8-10 «clip» type with swelling neoprene

Fasteners of Ø 8-10 mm conductors "clip" type with swelling neoprene. Installation on tiles or panel roofs. The Ø 10 mm opening should be made with a non-impact drill.



Material	Diameter Round (mm)	Standard	Item No.
INOX	Ø 8-10	EN 62561-4	151113-001
INOX/eCu			151113-005

# 1.4.1 7<sub>A</sub>

## Conductor fasteners Ø 8-10 with stainless steel base

Fasteners of Ø 8-10 mm conductors Hilti type with stainless steel base. Installation on steel roof panels.



Material	Diameter Round (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	Ø 8-10	43	20	EN 62561-4	151118-001
Cu-E					151118-004

# 1.4.1 7<sub>B</sub>

## Conductor fasteners Ø 8-10 «clip» type with stainless steel base

Fasteners of Ø 8-10 mm conductors "clip" type with stainless steel base. Installation on steel roof panels.

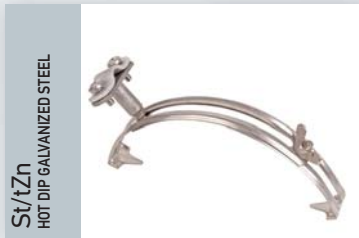


Material	Diameter Round (mm)	Standard	Item No.
INOX	Ø 8-10	EN 62561-4	151118-003
INOX/eCu			151118-005

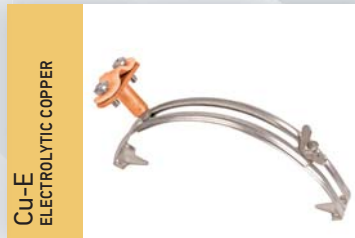
# 1.4.1 8

## Conductor fasteners Ø 8-10 with adjustable base

Fasteners of Ø 8-10 mm conductors with stainless steel adjustable base. Installation on tiles.



St/tZn  
HOT DIP GALVANIZED STEEL



Cu-E  
ELECTROLYTIC COPPER

Material	Diameter Round (mm)	Base opening (mm)	Standard	Item No.
St/tZn	Ø 8-10	210 - 370	EN 62561-4	151115-001
Cu-E				151115-003

# 1.4.1 9<sub>Ai</sub>

## Conductor fasteners Ø 8-10 for water proof flat roofs Type A

Fasteners of Ø 8-10 mm conductors for water proof flat roofs. PVC filled with concrete.



PVC  
POLYVINYLCHLORIDE

Material	Diameter Round (mm)	Weight ~ gr	Standard	Item No.
PVC	Ø 8-10	Filled with concrete	EN 62561-4	151117-001
		Without concrete		60

# 1.4.1 9<sub>Aii</sub>

## Conductor fasteners 30mm adapter for waterproof roofs

Conductor fasteners adapter for water proof flat roofs. It is adjusted to the fastener and is suitable for flat conductors 30mm.



PP  
POLYPROPYLENE

Material	Width Tape (mm)	Item No.
PP	30	151214-001

# 1.4.1 9<sub>B</sub>

## Conductor fasteners Ø 8-10 for water proof flat roofs Type B

Fasteners of Ø 8-10 mm conductors for water proof flat roofs. PVC with concrete block.



PVC/μινετόν  
POLYVINYLCHLORIDE

Material	Diameter Round (mm)	Weight ~ gr	Standard	Item No.
PVC/μινετόν	Ø 8-10	1000	EN 62561-4	151117-003

# 1.4.1 10

## Conductor fasteners Ø 8-10 on panels

Fasteners of Ø 8-10 mm conductors. Installation on steel roof panels or at the edge of structures.



St/tZn  
HOT DIP GALVANIZED  
STEEL



Cu-E  
ELECTROLYTIC COPPER

Material	Round (mm)	Standard	Item No.
St/tZn	Ø 8-10	EN 62561-4	151118-002
Cu-E			151118-007

# 1.4.1 11

## Conductor fasteners Ø 8-10 on gutter

Fasteners of Ø 8-10 mm conductors. Installation on gutter.



St/tZn  
HOT DIP GALVANIZED  
STEEL



Cu-E  
ELECTROLYTIC COPPER

Material	Round (mm)	Standard	Item No.
St/tZn	Ø 8-10	EN 62561-4	151119-001
Cu-E			151119-002



# 1.4.1 12<sub>A</sub>

## Conductor fasteners Ø 8-10 for metallic ridges «H» type

Fasteners of Ø 8-10 mm conductors. Installation on metallic ridges «H» type.



Material	Round (mm)	Ridge Thickness (mm)	Standard	Item No.
St/tZn	Ø 8-10	5 – 18	EN 62561-4	151120-001
St/tZn Cu-E		5 – 18		151120-005
St/tZn		18 – 35		151120-002
St/tZn Cu-E		18– 35		151120-006

# 1.4.1 12<sub>B</sub>

## Conductor fasteners Ø 8-10 for metallic ridges

Fasteners of Ø 8-10 mm conductors. Installation on metallic ridges.



Material	Round (mm)	Ridge Thickness (mm)	Standard	Item No.
St/tZn	Ø 8-10	10	EN 62561-4	151120-003
Cu-E				151120-007

# 1.4.1 12<sub>c</sub>

## Conductor fasteners Ø 8-10 for metallic ridges

Fasteners of Ø 8-10 mm conductors. Installation on metallic ridges.

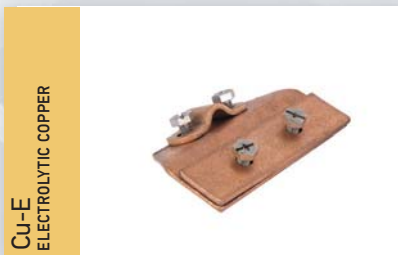
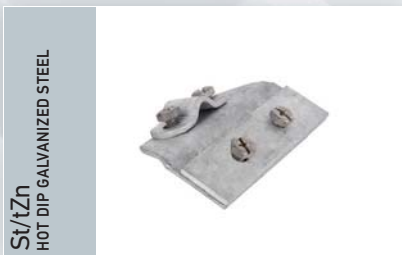


Material	Round (mm)	Ridge Thickness (mm)	Standard	Item No.
St/tZn	Ø 8-10	5	EN 62561-4	151120-004
Cu-E				151120-008

# 1.4.1 13

## Conductor fasteners Ø 8-10 for grates and cable trays

Fasteners of Ø 8-10 mm conductors. Installation on cable trays and grates.

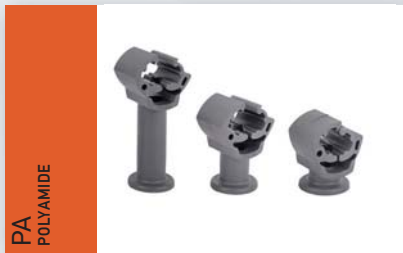


Material	Round (mm)	Standard	Item No.
St/tZn	Ø 8-10	EN 62561-4	151121-001
Cu-E			151121-002

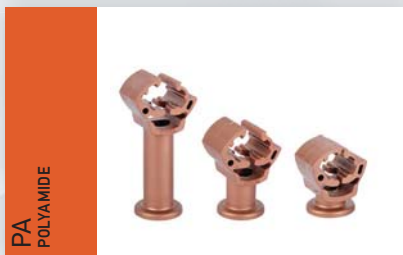
# 1.4.1 14<sub>A</sub>

## Conductor fasteners Ø 8-10 by PA

Fasteners of Ø 8-10 mm conductors, by Polyamide (PA) with internal thread. Installation on walls.



PA  
POLYAMIDE



PA  
POLYAMIDE

Material	Round (mm)	Height (mm)	Thread	Standard	Item No.
PA gray	Ø 8-10	25	M6	EN 62561-4	151122-002
		40			151122-004
		20	M 8		151122-001
		30			151122-003
PA brown		55	M6		151122-005
		25			151122-007
		40	M 8		151122-009
		20			151122-006
	30	151122-008			
	55		151122-010		

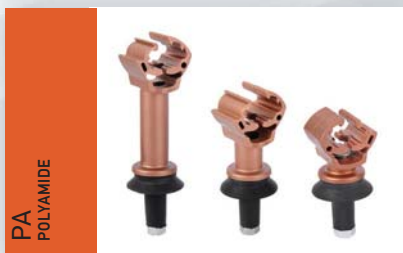
# 1.4.1 14<sub>B</sub>

## Conductor fasteners Ø 8-10 by PA with swelling neoprene

Fasteners of Ø 8-10 mm conductors, by Polyamide (PA) with swelling neoprene. Installation on tiles or panel roofs. The Ø 10 mm opening should be made with a non-impact drill.



PA  
POLYAMIDE



PA  
POLYAMIDE

Material	Round (mm)	Fastener Height (mm)	Neoprene Diameter (mm)	Standard	Item No.
PA gray	Ø 8-10	20	Ø 11,5	EN 62561-4	151122-011
		30			151122-012
		55			151122-013
PA brown		20			151122-014
		30			151122-015
		55			151122-016

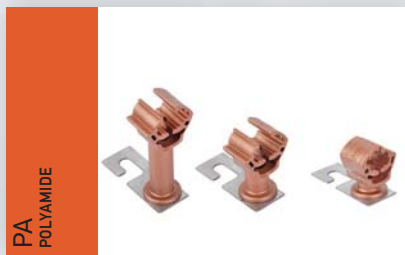
# 1.4.1 14<sub>c</sub>

## Conductor fasteners Ø 8-10 by PA with stainless steel base

Fasteners of Ø 8-10 mm conductors, by Polyamide (PA) with stainless steel base. Installation on steel roof panels.



PA  
POLYAMIDE



PA  
POLYAMIDE

Material	Round (mm)	Fastener Height (mm)	Standard	Item No.
PA gray	Ø 8-10	20	EN 62561-4	151122-017
		30		151122-018
		55		151122-019
PA brown		20		151122-020
		30		151122-021
		55		151122-022

# 1.4.1 15<sub>A</sub>

## Insulating spacer GFK fixed

Insulating spacer for air terminal rods diameter Ø 16 mm, with fixed part for wall or roof structure mounting, made from fiberglass GFK diameter Ø 16 mm.



GFK  
FIBERGLASS

Material	Diameter (mm)	Spacer Length (mm)	Standard	Item No.
GFK	Ø 16	500	EN 62561-4	151411-019
		750		151411-020
		1.000		151411-021

# 1.4.1 15<sub>B</sub>

## Insulating spacer GFK adjustable

Insulating spacer for air terminal rods diameter Ø 16 mm, with adjustable part for wall or roof structure mounting, made from fiberglass GFK diameter Ø 16 mm.

GFK  
FIBERGLASS



Material	Diameter (mm)	Spacer Length (mm)	Standard	Item No.
GFK	Ø 16	500	EN 62561-4	151411-022
		750		151411-023
		1.000		151411-024

# 1.4.1 15<sub>C</sub>

## Insulating spacer GFK pipe

Insulating spacer for air terminal rods diameter Ø 16 mm, with pipe clamp part for wall or roof structure mounting, made from fiberglass GFK diameter Ø 16 mm.

GFK  
FIBERGLASS



Material	Diameter (mm)	Spacer Length (mm)	Standard	Item No.
GFK	Ø 16	500	EN 62561-4	151411-025
		750		151411-026
		1.000		151411-027

# 1.4.2 1

## Tape fasteners 30 HILTI type

Fasteners Hilti type of vertical/horizontal 30 mm tape conductors on walls, panels e.t.c. They have internal thread to be supported on threaded drive pin.



Material	Width Tape (mm)	Fastener Height (mm)	Thread	Standard	Item No.
St/tZn	30	20	M6	EN 62561-4	151211-001
			M8		151211-002



Material	Width Tape (mm)	Fastener Height (mm)	Thread	Standard	Item No.
Cu-E	30	20	M6	EN 62561-4	151211-003
			M8		151211-004

# 1.4.2 2<sub>A</sub>

## Tape fasteners 30 with metallic spacer

Fasteners of vertical/horizontal up to 30 mm tape conductors, with metallic spacer, to be supported on walls, with woodscrew and "upat".



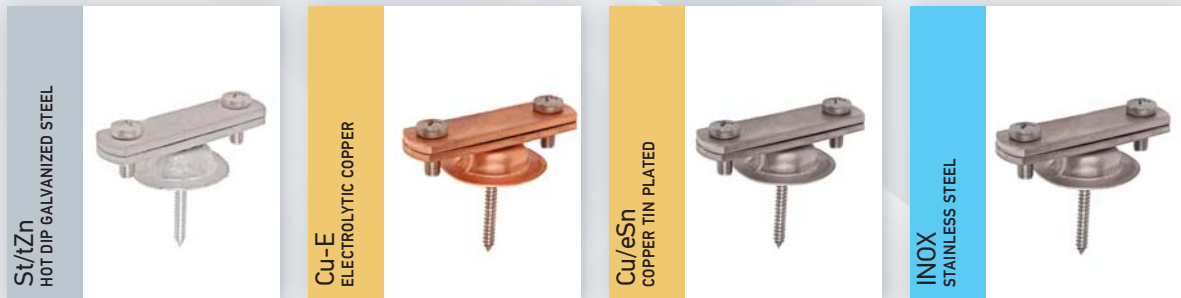
Material	Width Tape (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	30	57	20	EN 62561-4	151212-001
Cu-E					151212-005
Cu/eSn					151212-007
INOX					151212-003

1.4.2

2<sub>B</sub>

## Tape fasteners 40 with metallic spacer

Fasteners of vertical/horizontal up to 40 mm tape conductors, with metallic spacer, to be supported on walls, with woodscrew and "upat".



Material	Width Tape (mm)	Fastener Length (mm)	Fastener Width (mm)	Standard	Item No.
St/tZn	40	67	20	EN 62561-4	151212-002
Cu-E					151212-006
Cu/eSn					151212-008
INOX					151212-004

# 1.5.1 1

## Connectors H. T. round conductors Ø 8-10/Ø 8-10

Connectors Heavy Type for round conductors Ø 8-10/Ø 8-10 mm. Connections "+", "Г", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.

St/tZn  
HOT DIP GALVANIZED STEEL



Cu-E  
ELECTROLYTIC COPPER



Cu/eSn  
COPPER TIN PLATED



INOX  
STAINLESS STEEL



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 8-10/Ø 8-10	EN 62561-1	161411-001
Cu-E				161411-003
Cu/eSn				161411-004
INOX				161411-002

# 1.5.1 2

## Connectors H. T. round conductors Ø 8-10/Ø 16

Connectors Heavy Type for round conductors Ø 8-10/Ø 16 mm. Connections "+", "Г", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.

St/tZn  
HOT DIP GALVANIZED STEEL



Cu-E  
ELECTROLYTIC COPPER



Cu/eSn  
COPPER TIN PLATED



INOX  
STAINLESS STEEL



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 8-10/Ø 16	EN 62561-1	161412-001
Cu-E				161412-004
Cu/eSn				161412-005
INOX				161412-003

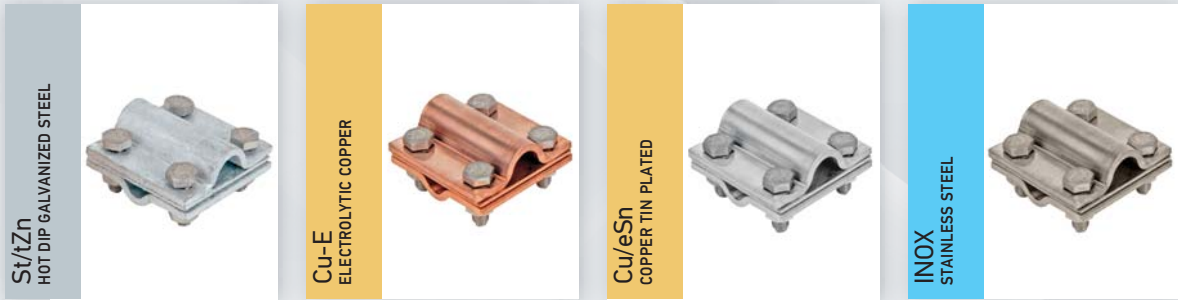


# 1.5.1

# 3

## Connectors H. T. round conductors Ø 8-10/Ø 20

Connectors Heavy Type for round conductors Ø 8-10/Ø 20 mm. Connections "+", "Г", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 8-10/Ø 20	EN 62561-1	161413-001
Cu-E				161413-003
Cu/eSn				161413-004
INOX				161413-002

# 1.5.1

# 4

## Connectors H. T. round conductors Ø 16/Ø 16

Connectors Heavy Type for round conductors Ø 16/Ø 16 mm. Connections "+", "Г", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 16/Ø 16	EN 62561-1	161414-001
Cu-E				161414-003
Cu/eSn				161414-004
INOX				161414-002

# 1.5.1 5

## Connectors H. T. round conductors Ø 16/Ø 20

Connectors Heavy Type for round conductors Ø 16/Ø 20 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 16/Ø 20	EN 62561-1	161415-001
Cu-E				161415-003
Cu/eSn				161415-004
INOX				161415-002

# 1.5.1 6

## Connectors H. T. round conductors Ø 20/Ø 20

Connectors Heavy Type for round conductors Ø 20/Ø 20 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 20/Ø 20	EN 62561-1	161416-001
Cu-E				161416-003
Cu/eSn				161416-004
INOX				161416-002

# 1.5.2

# 1

## Connectors H. T. round/tape conductors Ø 8-10/30

Connectors Heavy Type for round Ø 8-10 mm and tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 8-10/30	EN 62561-1	161811-001
Cu-E				161811-005
Cu/eSn				161811-006
INOX				161811-003

# 1.5.2

# 2

## Connectors H. T. round/tape conductors Ø 16/30

Connectors Heavy Type for round Ø 16 mm and tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 16/30	EN 62561-1	161812-001
Cu-E				161812-003
Cu/eSn				161812-004
INOX				161812-002

# 1.5.2 3

## Connectors H. T. round/tape conductors Ø 20/30

Connectors Heavy Type for round Ø 20 mm and tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	60x60x4	Ø 20/30	EN 62561-1	161813-001
Cu-E				161813-003
Cu/eSn				161813-004
INOX				161813-002

# 1.5.2 4

## Connectors H. T. round/tape conductors Ø 8-10/40

Connectors Heavy Type for round Ø 8-10 mm and tape conductors up to 40 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 70x70x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



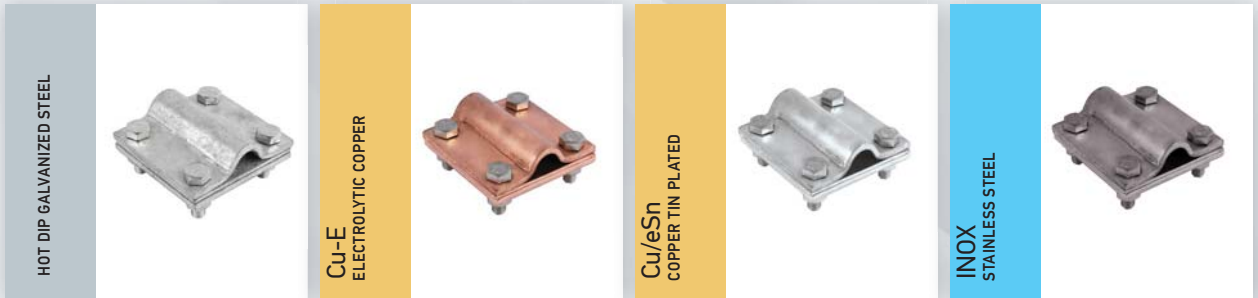
Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	70x70x4	Ø 8-10/40	EN 62561-1	161814-001
Cu-E				161814-003
Cu/eSn				161814-004
INOX				161814-002

# 1.5.2

# 5

## Connectors H. T. round/tape conductors Ø 16/40

Connectors Heavy Type for round Ø 16 mm and tape conductors up to 40 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 70x70x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	70x70x4	Ø 16/40	EN 62561-1	161815-001
Cu-E				161815-003
Cu/eSn				161815-004
INOX				161815-002

# 1.5.2

# 6

## Connectors H. T. round/tape conductors Ø 20/40

Connectors Heavy Type for round Ø 20 mm and tape conductors up to 40 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 70x70x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	70x70x4	Ø 20/40	EN 62561-1	161816-001
Cu-E				161816-004
Cu/eSn				161816-006
INOX				161816-002

# 1.5.3

# 1

## Connectors H. T. tape conductors 30/30

Connectors Heavy Type for tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 60x60x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Tape - Tape (mm)	Standard	Item No.
St/tZn	60x60x4	30/30	EN 62561-1	161611-001
Cu-E				161611-006
Cu/eSn				161611-008
INOX				161611-004

# 1.5.3

# 2

## Connectors H. T. tape conductors 30/30 without intermediate plate

Connectors Heavy Type for tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 2 plates 60x60x4 mm, **(no intermediate plate)**. Usage above and under ground.



Material	Connector dimensions (mm)	Tape - Tape (mm)	Standard	Item No.
St/tZn	60x60x4	30/30	EN 62561-1	161611-003
Cu-E				161611-007
Cu/eSn				161611-009
INOX				161611-005

# 1.5.3 3

## Connectors H. T. tape conductors 40/40

Connectors Heavy Type for tape conductors up to 40 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 70x70x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Connector dimensions (mm)	Tape - Tape (mm)	Standard	Item No.
St/tZn	70x70x4	40/40	EN 62561-1	161612-001
Cu-E				161612-005
Cu/eSn				161612-008
INOX				161612-003

# 1.5.3 4

## Connectors H. T. tape conductors 40/40 without intermediate plate

Connectors Heavy Type for tape conductors up to 40 mm. Connections "+", "Γ", "T", "II". It consists by 2 plates 70x70x4 mm, **(no intermediate plate)**. Usage above and under ground.



Material	Connector dimensions (mm)	Tape - Tape (mm)	Standard	Item No.
St/tZn	70x70x4	40/40	EN 62561-1	161612-002
Cu-E				161612-007
Cu/eSn				161612-009
INOX				161612-004

# 1.5.4

# 1

## Connectors H. T. with two bolts (quickconnectors) round conductors Ø 8-10/Ø 8-10

Connectors Heavy Type with two bolts (quickconnectors) for round conductors Ø 8-10/Ø 8-10 mm. Connections "II". It consists by 3 plates 85x30x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



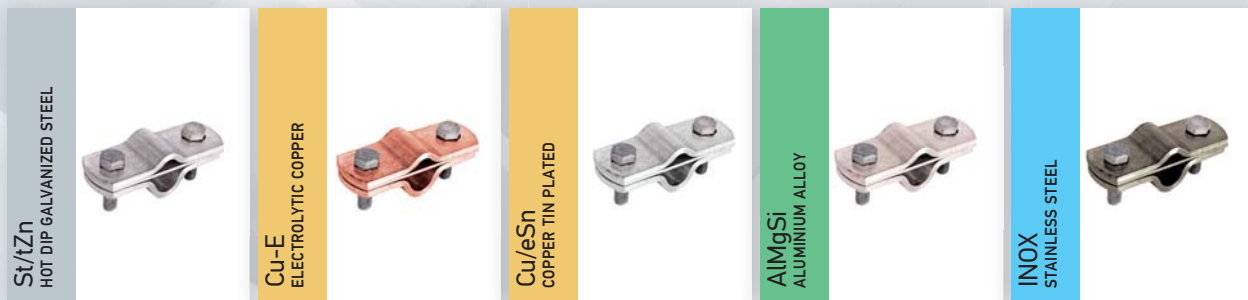
Material	Round - Round (mm)	Standard	Item No.
St/tzn	Ø 8-10/Ø 8-10	EN 62561-1	163611-001
Cu-E			163611-005
Cu/eSn			163611-008
INOX			163611-003

# 1.5.4

# 2

## Connectors H. T. with two bolts (quickconnectors) round conductors Ø 16/Ø 8-10

Connectors Heavy Type with two bolts (quickconnectors) for round conductors Ø 16/Ø 8-10 mm. Connections "II". It consists by 3 plates 85x30x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



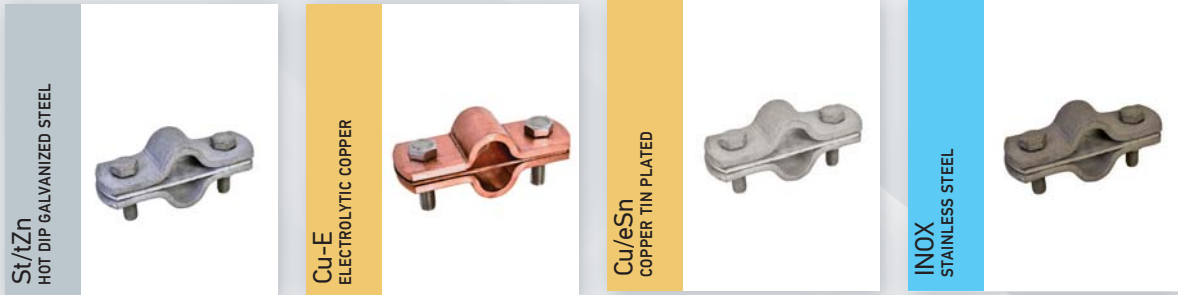
Material	Round - Round (mm)	Standard	Item No.
St/tzn	Ø 16/Ø 8-10	EN 62561-1	163612-002
Cu-E			163612-004
Cu/eSn			163612-008
AlMgSi			163612-001
INOX			163612-009



# 1.5.4 3

## Connectors H. T. with two bolts (quickconnectors) round conductors Ø 16/Ø 16

Connectors Heavy Type with two bolts (quickconnectors) for round conductors Ø 16/Ø 16 mm. Connections "II". It consists by 3 plates 85x30x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Round - Round (mm)	Standard	Item No.
St/tZn	Ø 16/Ø 16	EN 62561-1	163614-001
Cu-E			163614-002
Cu/eSn			163614-003
INOX			163614-005

# 1.5.5 1

## Connectors H. T. with two bolts (quickconnectors) round/tape conductors Ø 8-10/30-40

Connectors Heavy Type with two bolts (quickconnectors) for round Ø 8-10 mm and tape conductors up to 40 mm. Connections "II". It consists by 3 plates 85x30x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.

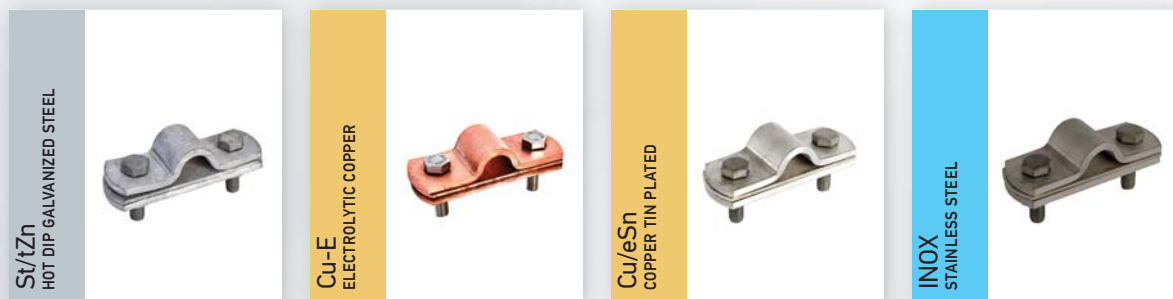


Material	Round - Tape (mm)	Standard	Item No.
St/tZn	Ø 8-10/30-40	EN 62561-1	163811-001
Cu-E			163811-004
Cu/eSn			163811-008
INOX			163811-003

# 1.5.5 2

## Connectors H. T. with two bolts (quickconnectors) round/tape conductors Ø 16/30-40

Connectors Heavy Type with two bolts (quickconnectors) for round Ø 16 mm and tape conductors up to 40 mm. Connections "II". It consists by 3 plates 85x30x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Round - Tape (mm)	Standard	Item No.
St/tzn	Ø 16/30-40	EN 62561-1	163812-001
Cu-E			163812-005
Cu/eSn			163812-008
INOX			163812-009

# 1.5.6 1

## Connectors H. T. with two bolts (quickconnectors) tape conductors 30-40/30-40

Connectors Heavy Type with two bolts (quickconnectors) for tape conductors up to 40 mm. Connections "II". It consists by 3 plates 85x30x4 mm, thickness of intermediate plate 2 mm. Usage above and under ground.



Material	Tape - Tape (mm)	Standard	Item No.
St/tzn	30-40/30-40	EN 62561-1	163711-001
Cu-E			163711-005
Cu/eSn			163711-008
INOX			163711-003

# 1.5.7

# 1

## Connectors L.T. round conductors 16-35/16-35

Connectors Light Type for round conductors 16-35 mm<sup>2</sup>. Connections "+", "Γ", "T", "II". It consists by 3 plates 50x50x3 mm, thickness of intermediate plate 2 mm. Usage above ground.



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	50x50x3	16-35/16-35	EN 62561-1	161512-001
Cu-E				161512-003
Cu/eSn				161512-004
INOX				161512-002

# 1.5.7

# 2

## Connectors L.T. round conductors Ø 8-10/Ø 8-10

Connectors Light Type for round conductors Ø 8-10/Ø 8-10 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 50x50x3 mm, thickness of intermediate plate 2 mm. Usage above ground.



Material	Connector dimensions (mm)	Round - Round (mm)	Standard	Item No.
St/tZn	50x50x3	Ø 8-10/Ø 8-10	EN 62561-1	161511-005
Cu-E				161511-007
Cu/eSn				161511-008
INOX				161511-002

# 1.5.8

# 1

## Connectors L.T. round/tape conductors 16-35/30

Connectors Light Type for round 16-35 mm<sup>2</sup> and tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 50x50x2 mm, thickness of intermediate plate 1,5 mm. Usage above ground.



Material	Connector dimensions (mm)	Round (mm <sup>2</sup> ) - Tape (mm)	Standard	Item No.
St/tZn	50x50x2	16-35/30	EN 62561-1	161912-001
Cu-E				161912-003
Cu/eSn				161912-004
INOX				161912-002

# 1.5.8

# 2

## Connectors L.T. round/tape conductors Ø 8-10/30

Connectors Light Type for round Ø 8-10 mm and tape conductors up to 30 mm. Connections "+", "Γ", "T", "II". It consists by 3 plates 50x50x2 mm, thickness of intermediate plate 1,5 mm. Usage above ground.



Material	Connector dimensions (mm)	Round - Tape (mm)	Standard	Item No.
St/tZn	50x50x2	Ø 8-10 / 30	EN 62561-1	161911-001
Cu-E				161911-004
Cu/eSn				161911-006
INOX				161911-003

# 1.5.9

# 1

## Connectors L.T. tape conductors 30/30

Connectors Light Type for tape conductors up to 30 mm. Connections "+", "Г", "Т", "И". It consists by 3 plates 50x50x2 mm, thickness of intermediate plate 1,5 mm. Usage above ground.



Material	Connector dimensions (mm)	Tape - Tape (mm)	Standard	Item No.
St/tZn	50x50x2	30 /30	EN 62561-1	161711-001
Cu-E				161711-004
Cu/eSn				161711-006
INOX				161711-002

# 1.5.10

# 1

## Parallel connectors for round conductors Ø 8-10

Parallel connectors for round conductors with diameter Ø 8-10 mm.



Material	Diameter conductors (mm)	Standard	Item No.
St/tZn	Ø 8-10/Ø 8-10	EN 62561-1	162011-001
Cu-E			162011-002
Cu/eSn			162011-003

- Usage above ground

# 1.5.10 2

## Extension connectors for round conductors Ø 8-10

Connectors for extension of conductors with diameter Ø 8-10 mm. The connector is suitable for hot dip galvanized steel and aluminum conductors.



Material	Diameter conductors (mm)	Standard	Item No.
ZAMAK	Ø 8	EN 62561-1	162111-001

- Usage above ground

# 1.5.10 3

## "T" connectors for round conductors Ø 8-10

"T" connectors for round conductors with diameter Ø 8-10 mm.



Material	Diameter conductors (mm)	Standard	Item No.
St/tZn	Ø 8 - 10	EN 62561-1	162111-013
Cu-E			162111-014

# 1.5.11

# 1

## Connectors H.T. multipurpose

Heavy type connectors multipurpose for conductors with diameter  $\varnothing$  8 -10 mm or bonding metallic surfaces. For connection type "+", "Γ", "T", "II". Usage above ground.



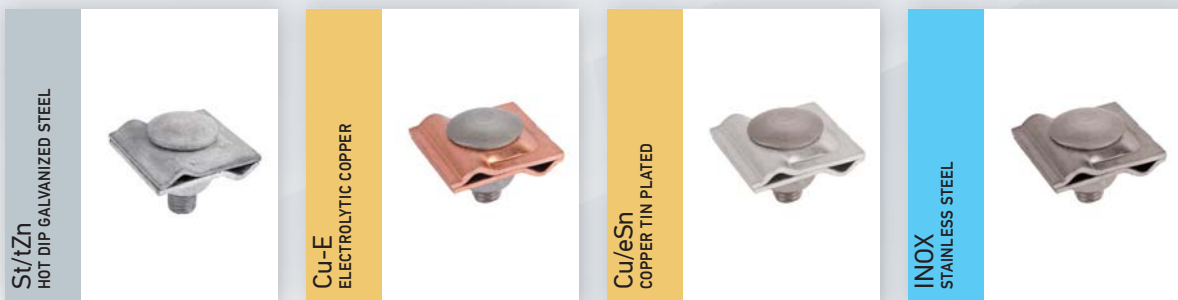
Material	Round - Round (mm)	Standard	Item No.
St/tZn	Ø 8-10/Ø 8-10	EN 62561-1	162211-005
Cu-E			162211-009
Cu/eSn			162211-011
INOX			162211-002

# 1.5.11

# 2

## Connectors L.T. multipurpose

Light type connectors multipurpose for conductors with cross section 16-35 mm<sup>2</sup> or bonding metallic surfaces. For connection type "+", "Γ", "T", "II". Usage above ground.



Material	Round - Round (mm <sup>2</sup> )	Standard	Item No.
St/tZn	16-35/16-35	EN 62561-1	162212-001
Cu-E			162212-003
Cu/eSn			162212-004
INOX			162212-002

# 1.5.12

# 1

## Connectors H.T. round conductors - metallic surface

Heavy type connectors for conductors with diameter  $\varnothing$  8 - 10 mm to metallic surfaces. Usage above ground.



Material	Round (mm <sup>2</sup> )	Standard	Item No.
St/tZn	Ø 8-10	EN 62561-1	162311-001
Cu-E			162311-004
Cu/eSn			162311-005
INOX			162311-003

# 1.5.12

# 2

## Connectors L.T. round conductors - metallic surface

Light type connectors for conductors with cross section 16-35 mm<sup>2</sup> to metallic surfaces. Usage above ground.



Material	Round (mm <sup>2</sup> )	Standard	Item No.
St/tZn	16-35	EN 62561-1	162312-001
Cu-E			162312-003
Cu/eSn			162312-004
INOX			162312-002



# 1.5.12 **3<sub>A</sub>**

## Combination connectors round conductors one bolt

Combination connectors for round conductors. It has one clamping bolt.



Ms-Cu/Zn  
OPEIXAKINOI

Material	Diameter conductors (mm)	Standard	Item No.
Ms-Cu/Zn	Ø 3-5	EN 62561-1	162213-001
	Ø 6-8		162213-002

# 1.5.12 **3<sub>B</sub>**

## Combination connectors round conductors two bolts

Combination connectors for round conductors. It has two clamping bolts.



Ms-Cu/Zn  
OPEIXAKINOI

Material	Diameter conductors (mm)	Standard	Item No.
Ms-Cu/Zn	Ø 3-5	EN 62561-1	162213-003
	Ø 6-8		162213-004
	Ø 9-11		162213-005
	Ø 12-14		162213-009
	Ø 14-16		162213-007
	Ø 18-22		162213-008

# 1.5.13 **1.1**

## Bimetallic connectors H.T. round conductors Ø 8-10/Ø 8-10

Bimetallic connectors H.T. for round conductors Ø 8-10 mm for connection type "+", "T", "T", "II". The connector consists of three plates with dimensions 60x60x4 mm, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.



Cu-E  
ELECTROLYTIC COPPER

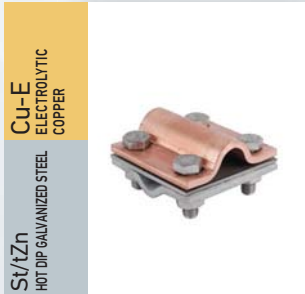
St/tZn  
HOT DIP GALVANIZED STEEL

Material	Round - Round (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn / Ø 8-10 Cu-E	EN 62561-1	162411-002

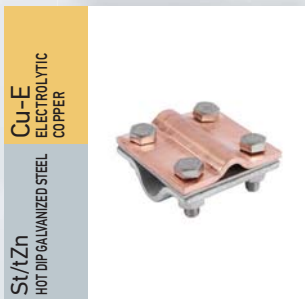
# 1.5.13 1.2

## Bimetallic connectors H.T. round conductors Ø 8-10/Ø 16

Bimetallic connectors H.T. for round Ø 8-10 mm and tape conductors up to 30 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 60x60x4 mm, the intermediate plate is stainless steel with thickness 2mm.



Material	Round - Round (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn / Ø 16 Cu-E	EN 62561-1	162412-001



Material	Round - Round (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 16 St/tZn / Ø 8-10 Cu-E	EN 62561-1	162412-002

Usage above and under ground.

# 1.5.13 1.3

## Bimetallic connectors H.T. round conductors Ø 16/Ø 16

Bimetallic connectors H.T. for round conductors Ø 16 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 60x60x4 mm, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.



Material	Round - Round (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 16 St/tZn / Ø 16 Cu-E	EN 62561-1	162413-001

# 1.5.13 2.1

## Bimetallic connectors H.T. round/tape conductors Ø 8-10/30

Bimetallic connectors H.T. for round Ø 8-10 mm and tape conductors up to 30 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 60x60x4 mm, the intermediate plate is stainless steel with thickness 2mm.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn / 30 Cu-E	EN 62561-1	162611-001

Usage above and under ground.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 Cu-E / 30 St/tZn	EN 62561-1	162611-002

Usage above and under ground.

# 1.5.13 2.2

## Διμεταλλικοί σύνδεσμοι Β.Τ. αγωγών/ταινιών Ø 16/30

Bimetallic connectors H.T. for round Ø 16 mm and tape conductors up to 30 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 60x60x4 mm, the intermediate plate is stainless steel with thickness 2mm.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 16 St/tZn / 30 Cu-E	EN 62561-1	162612-001

Usage above and under ground.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 16 Cu-E / 30 St/tZn	EN 62561-1	162612-002

Usage above and under ground.

# 1.5.13 2.3

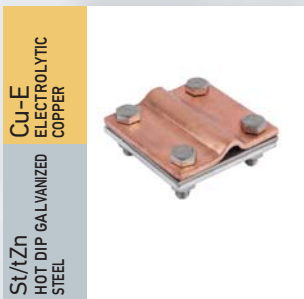
## Bimetallic connectors H.T. round/tape conductors Ø 8-10/40

Bimetallic connectors H.T. for round Ø 8-10 mm and tape conductors up to 40 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 70x70x4 mm, the intermediate plate is stainless steel with thickness 2mm.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn / 40 Cu-E	EN 62561-1	162613-001

Usage above and under ground.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 Cu-E / 40 St/tZn	EN 62561-1	162613-002

Usage above and under ground.

# 1.5.13 2.4

## Bimetallic connectors H.T. round/tape conductors Ø 16/40

Bimetallic connectors H.T. for round Ø 16 mm and tape conductors up to 40 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 70x70x4 mm, the intermediate plate is stainless steel with thickness 2mm.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 16 St/tZn / 40 Cu-E	EN 62561-1	162614-001

Usage above and under ground.



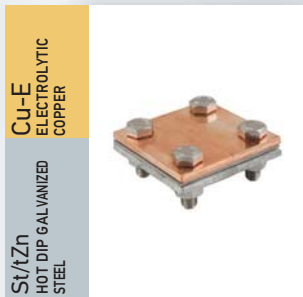
Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 16 Cu-E / 40 St/tZn	EN 62561-1	162614-002

Usage above and under ground.

## 1.5.13 3.1

Bimetallic connectors H.T.  
tape conductors 30/30

Bimetallic connectors H.T. for tape conductors up to 30 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 60x60x4 mm, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.

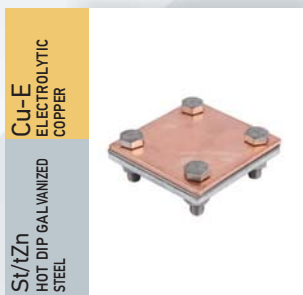


Material	Tape - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	30 St/tZn / 30 Cu-E	EN 62561-1	162511-001

## 1.5.13 3.2

Bimetallic connectors H.T.  
tape conductors 40/40

Bimetallic connectors H.T. for tape conductors up to 40 mm for connection type "+", "Γ", "T", "II". The connector consists of three plates with dimensions 70x70x4 mm, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.

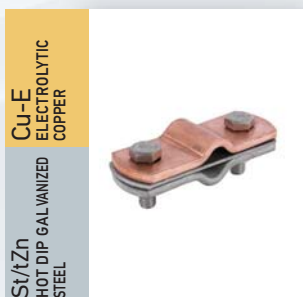


Material	Tape - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	40 St/tZn / 40 Cu-E	EN 62561-1	162512-001

## 1.5.14 1.1

Bimetallic connectors H.T. with two bolts  
(quickconnectors) round conductors  
Ø 8-10/Ø 8-10

Bimetallic connectors H.T. with two bolts (quickconnectors) for round conductors Ø 8-10 mm for connection type "II". The connector consists of three plates, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.

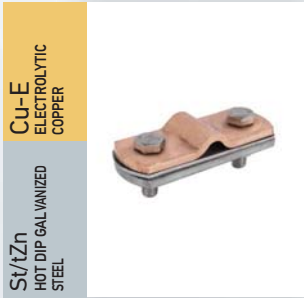


Material	Round - Round (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn / Ø 8-10 Cu-E	EN 62561-1	163611-007

# 1.5.14 2.1

## Bimetallic connectors H.T. with two bolts (quickconnectors) round/tape conductors Ø 8-10/30-40

Bimetallic connectors H.T. with two bolts (quickconnectors) for round Ø 8-10 mm and tape conductors up to 40 mm for connection type "II". The connector consists of three plates, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 Cu-E / 30-40 St/tZn	EN 62561-1	163811-006

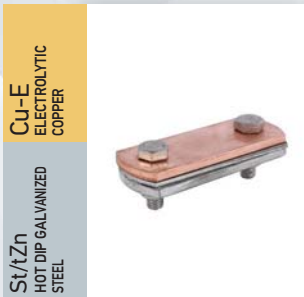


Material	Round - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn / 30-40 Cu-E	EN 62561-1	163811-007

# 1.5.14 3.1

## Bimetallic connectors H.T. with two bolts (quickconnectors) tape conductors 30-40/30-40

Bimetallic connectors H.T. with two bolts (quickconnectors) for tape conductors up to 40 mm for connection type "II". The connector consists of three plates, the intermediate plate is stainless steel with thickness 2mm. Usage above and under ground.



Material	Tape - Tape (mm)	Standard	Item No.
St/tZn   Cu-E	30-40 Cu-E / 30-40 St/tZn	EN 62561-1	163711-007

1.5.15

1

## Test connectors round conductors Ø 8-10/Ø 8-10 Type A

Test connectors for conductors Ø 8-10 mm, which connect the lightning protection system with the earthing system and is suitable for earthing inspection. The connector is installed about 1,5 m above ground level.



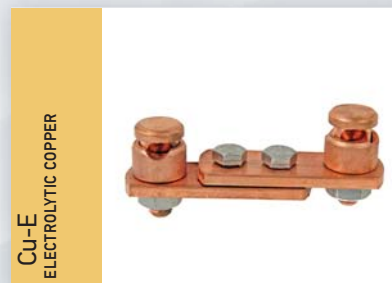
Material	Round - Round (mm)	Standard	Item No.
St/tZn	Ø 8-10/Ø 8-10	EN 62561-1	162711-001
Ms-Cu			162711-007
Ms-Cu/eSn			162711-011

1.5.15

2

## Test connectors round conductors Ø 8-10/Ø 8-10 Type B

Test connectors for conductors Ø 8-10 mm, which connect the lightning protection system with the earthing system and is suitable for earthing inspection. The connector is installed about 1,5 m above ground level.



Material	Round - Round (mm)	Standard	Item No.
St/tZn	Ø 8-10/Ø 8-10	EN 62561-1	162711-003
Cu-E			162711-009

# 1.5.16 1

## Bimetallic test connectors round conductors Ø 8-10/Ø 8-10 Type A

Bimetallic test connectors for conductors Ø 8-10 mm with intermediate stainless steel plate, which connect the lightning protection system with the earthing system and is suitable for earthing inspection. The connector is installed about 1,5 m above ground level.



Material	Round - Round (mm)	Standard	Item No.
St/tZn   Ms-Cu	Ø 8-10 St/tZn   Ø 8-10 Ms-Cu	EN 62561-1	162811-001

# 1.5.16 2

## Bimetallic test connectors round conductors Ø 8-10/Ø 8-10 Type B

Bimetallic test connectors for conductors Ø 8-10 mm with intermediate stainless steel plate, which connect the lightning protection system with the earthing system and is suitable for earthing inspection. The connector is installed about 1,5 m above ground level.

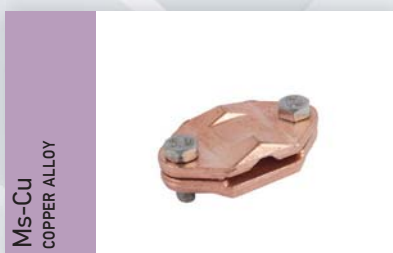


Material	Round - Round (mm)	Standard	Item No.
St/tZn   Cu-E	Ø 8-10 St/tZn   Ø 8-10 Cu-E	EN 62561-1	162811-004

# 1.5.17 1

## Test connectors round/tape conductors Ø 8-10/30

Test connectors for round conductors Ø 8-10 mm and tapes up to 30 mm, which connect the lightning protection system with the earthing system and is suitable for earthing inspection. The connector is installed about 1,5 m above ground level.



Material	Round - Tape (mm)	Standard	Item No.
St/tZn	Ø 8-10/30	EN 62561-1	162911-001
Ms-Cu			162911-004



1.5.18

1

## Single point connectors round conductors multipurpose Type A

Multipurpose single point connectors for conductors  $\varnothing$  8-10 mm. It is used for bonding metallic structures, pipe clamps e.t.c . Usage above ground.



Material	Diameter Round (mm)	Standard	Item No.
ZAMAK	$\varnothing$ 8-10	EN 62561-1	163011-003



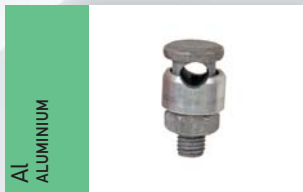
Material	Diameter Round (mm)	Standard	Item No.
ZAMAK/eCu	$\varnothing$ 8-10	EN 62561-1	163011-007

1.5.18

2

## Single point connectors round conductors multipurpose Type B

Multipurpose single point connectors for conductors  $\varnothing$  8-10 mm. It is used for bonding metallic structures, pipe clamps e.t.c . Usage above ground.



Material Básonç	Screw Material	Diameter Round (mm)	Standard	Item No.
Al	St/tZn	$\varnothing$ 8-10	EN 62561-1	163011-002



Material Básonç	Screw Material	Diameter Round (mm)	Standard	Item No.
Ms/eCu	Ms/eCu	$\varnothing$ 8-10	EN 62561-1	163011-006



Material Básonç	Screw Material	Diameter Round (mm)	Standard	Item No.
Ms/eSn	Ms/eSn	$\varnothing$ 8-10	EN 62561-1	163011-008



Material Básonç	Screw Material	Diameter Round (mm)	Standard	Item No.
INOX	INOX	$\varnothing$ 8-10	EN 62561-1	163011-004

1.5.18

3

## Single point connectors round conductors multipurpose Type C

Multipurpose single point connectors for conductors  $\varnothing$  8-10 mm. It is used for bonding metallic structures, pipe clamps e.t.c . Usage above and under ground.



Material	Diameter Round (mm)	Standard	Item No.
St/tZn	$\varnothing$ 8-10	EN 62561-1	163011-001



Material	Diameter Round (mm)	Standard	Item No.
Ms-Cu	$\varnothing$ 8-10	EN 62561-1	163011-005

1.5.18

4

## End connector multipurpose round conductors $\varnothing$ 8-10

End connector for conductors  $\varnothing$  8-10 mm. It is used for bonding metallic structures, pipe clamps e.t.c . Usage above ground.



Material	Diameter Round (mm)	Standard	Item No.
ZAMAK	$\varnothing$ 8-10	EN 62561-1	163211-008

1.5.19

1

## Double point connectors round conductors multipurpose Type A

Multipurpose double point connectors for conductors  $\varnothing$  8-10 mm. It is used for contraction-expansion absorbing conductors , lead-in rods e.t.c . Usage above and under ground.



Material	Diameter Round (mm)	Standard	Item No.
ZAMAK	$\varnothing$ 8-10	EN 62561-1	163111-002



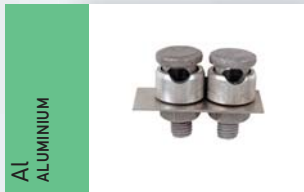
Material	Diameter Round (mm)	Standard	Item No.
ZAMAK/eCu	$\varnothing$ 8-10	EN 62561-1	163111-005

1.5.19

2

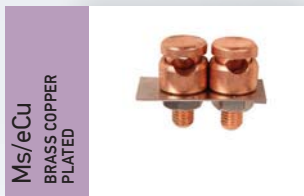
## Double point connectors round conductors multipurpose Type B

Multipurpose double point connectors with stainless steel plate for conductors  $\varnothing$  8-10 mm. It is used for contraction-expansion absorbing conductors, lead-in rods e.t.c. Usage above ground.



Al  
ALUMINIUM

Material Βάσης	Screw Material	Diameter Round (mm)	Standard	Item No.
Al	St/tZn	$\varnothing$ 8-10	EN 62561-1	163111-003



Ms/eCu  
BRASS COPPER  
PLATED

Material Βάσης	Screw Material	Diameter Round (mm)	Standard	Item No.
Ms/eCu	Cu-E	$\varnothing$ 8-10	EN 62561-1	163111-006



Ms/eSn  
BRASS TIN PLATED

Material Βάσης	Screw Material	Diameter Round (mm)	Standard	Item No.
Ms/eSn	Ms/eSn	$\varnothing$ 8-10	EN 62561-1	163111-008



INOX  
STAINLESS STEEL

Material Βάσης	Screw Material	Diameter Round (mm)	Standard	Item No.
INOX	INOX	$\varnothing$ 8-10	EN 62561-1	163111-001

1.5.19

3

## Double point connectors round conductors multipurpose Type C

Multipurpose double point connectors for conductors  $\varnothing$  8-10 mm. It is used for contraction-expansion absorbing conductors, lead-in rods e.t.c. Usage above and under ground.



St/tZn  
ΧΑΛΥΒΑΙΝΟΣ  
ΕΠΙΧΡΩΜΗΘΗΣ ΜΕ ΝΙΚΕΛΟ  
EN 62561-1

Material	Diameter Round (mm)	Standard	Item No.
St/tZn	$\varnothing$ 8-10	EN 62561-1	163111-004



Ms-Cu  
COPPER ALLOY

Material	Diameter Round (mm)	Standard	Item No.
Ms-Cu	$\varnothing$ 8-10	EN 62561-1	163111-007

# 1.5.20

# 1

## Connectors / clamps straight Type A

Connectors / clamps straight for conductors Ø 8-10 mm, used for bonding metallic structures.



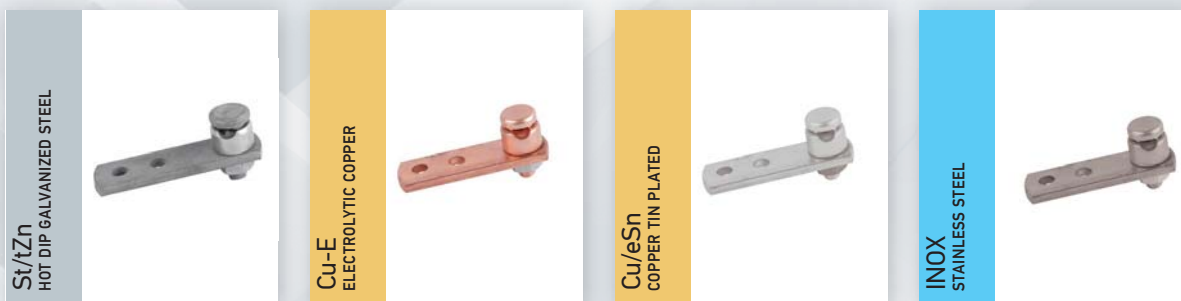
Material	Diameter Round (mm)	Standard	Item No.
St/tZn	Ø 8-10	EN 62561-1	163211-001
Ms-Cu			163211-004
Ms-Cu/eSn			163211-006

# 1.5.20

# 2

## Connectors / clamps straight Type B

Connectors / clamps straight for conductors Ø 8-10 mm, used for bonding metallic structures.



Material	Diameter Round (mm)	Standard	Item No.
St/tZn	Ø 8-10	EN 62561-1	163211-002
Cu-E			163211-005
Cu/eSn			163211-007
INOX			163211-003

# 1.5.20 3

## Connectors / clamps angled Type A

Connectors / clamps angled for conductors  $\varnothing$  8-10 mm, used for bonding metallic structures.



Material	Diameter Round (mm)	Standard	Item No.
St/tZn	$\varnothing$ 8-10	EN 62561-1	163212-001
Ms-Cu			163212-007
Ms-Cu/eSn			163212-009

# 1.5.20 4

## Connectors / clamps angled Type B

Connectors / clamps angled for conductors  $\varnothing$  8-10 mm, used for bonding metallic structures.

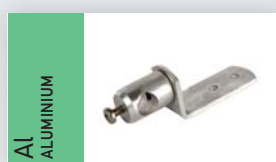


Material	Diameter Round (mm)	Standard	Item No.
St/tZn	$\varnothing$ 8-10	EN 62561-1	163212-004
Cu-E			163212-008
Cu/eSn			163212-010
INOX			163212-005

# 1.5.20 5

## Connectors / clamps angled $\varnothing$ 16

Connectors / clamps angled for conductors, insulation spacers  $\varnothing$  16 mm, used for bonding metallic structures or support.



Material	Diameter Round (mm)	Standard	Item No.
Al	$\varnothing$ 16	EN 62561-1	163212-012

1.6

1<sub>A</sub>

## Pipe clamps single point

Pipe clamps with one point of connection. It is made by hot dip galvanized steel bar with dimensions 40 x 3 mm.

St/tZn  
HOT DIP GALVANIZED STEEL

Material	Pipe Diameter (inch)	Standard	Item No.
St/tZn	½"	EN62561-1	171111-007
	¾"		171111-008
	1"		171111-001
	1 ¼"		171111-010
	1 ½"		171111-009
	2"		171111-002
	2 ½"		171111-011
	3"		171111-003
	3 ½"		171111-012
	4"		171111-004
	5"		171111-005
	6"		171111-006

Lightning Protection Materials

1.6

1<sub>B</sub>

## Pipe clamps double point

Pipe clamps with two points of connection. It is made by hot dip galvanized steel bar with dimensions 40 x 3 mm.

St/tZn  
HOT DIP GALVANIZED STEEL

Material	Pipe Diameter (inch)	Standard	Item No.
St/tZn	½"	EN62561-1	171112-007
	¾"		171112-008
	1"		171112-001
	1 ¼"		171112-010
	1 ½"		171112-009
	2"		171112-002
	2 ½"		171112-011
	3"		171112-003
	3 ½"		171112-012
	4"		171112-004
	5"		171112-005
	6"		171112-006

# 1.6 2

## Pipe clamps Type 925

Galvanized steel pipe clamps, single point connection, pipe diameter 1/4 - 1 1/2" or Ø 11,5 - 48,3 mm. Conductor up to 16 mm<sup>2</sup>.



St/galZn  
GALVANIZED STEEL

Material	Pipe Diameter (mm)	Pipe Diameter (inch)	Item No.
St/galZn	11,5 - 13,5	1/4	171113-001
	15,2 - 17,2	3/8	171113-002
	19,3 - 21,3	1/2	171113-004
	24,9 - 26,9	3/4	171113-006
	31,7 - 33,7	1	171113-003
	40,4 - 42,4	1 1/4	171113-005
	46,3 - 48,3	1 1/2	171113-007

# 1.6 3

## Pipe clamps Type 942

Copper nickel plated pipe clamps, single point connection, pipe diameter 1/8 - 1 1/2" or Ø 8 - 49 mm. Conductor up to 16 mm<sup>2</sup>.



Cu/eNi  
COPPER NICKEL PLATED

Material	Pipe Diameter (mm)	Pipe Diameter (inch)	Item No.
Cu/eNi	8 - 11	1/8	171114-001
	13 - 15	1/4	171114-002
	16 - 18	3/8	171114-003
	19 - 22	1/2	171114-004
	24 - 28	3/4	171114-005
	30 - 35	1	171114-006
	39 - 43	1 1/4	171114-007
	44 - 49	1 1/2	171114-008

# 1.6 4

## Pipe clamps Type 950

Zinc alloy pipe clamps, single point connection, pipe diameter 1/4 - 2" or Ø 12 - 61,5 mm. Conductor up to 35 mm<sup>2</sup>.



ZAMAK  
ZINC ALLOY

Material	Pipe Diameter Ø (mm)	Pipe Diameter (inch)	Item No.
ZAMAK	12 - 14	1/4	171115-001
	15,5 - 17,5	3/8	171115-002
	20 - 22,5	1/2	171115-003
	25 - 28	3/4	171115-004
	31,5 - 34,5	1	171115-005
	40,5 - 43,5	1 1/4	171115-006
	46,5 - 49,5	1 1/2	171115-007
	51 - 54	1 3/4	171115-008
	58,5 - 61,5	2	171115-009

# 1.6 5

## Clamp for Franklin air terminal rods

Franklin air terminal rod clamp with single point connector.

Cu/eSn  
COPPER TIN PLATED



INOX  
STAINLESS STEEL



Material	Pipe Diameter Ø (mm)	Conductor Diameter (mm)	Standard	Item No.
Cu/eSn	30	Ø 8-10	EN 62561-1	171116-001
INOX				171116-002

# 1.6 6

## Adjustable pipe clamps

Adjustable pipe clamps with one point connection which are used for bonding pipes. Suitable for 2 x 16 mm<sup>2</sup> conductors.

INOX  
STAINLESS STEEL



Ms/eNi  
BRASS NICKEL PLATED



Material	Pipe Diameter "	Pipe Diameter Ø (mm)	Standard	Item No.
Ms/eNi	3/8" - 1"	14 - 38	EN 62561-1	171117-005
	3/8" - 1 1/2"	14 - 52		171117-006
	3/8" - 4"	14 - 114		171117-007
	3/8" - 6"	14 - 168		171117-008
INOX	1/8" - 1"	10 - 38		171117-001
	1/8" - 1 1/2"	10 - 52		171117-002
	1/8" - 4"	10 - 114		171117-003
	1/8" - 6"	10 - 168		171117-004



# 1.6 7

## Pipe Strip

Pipe strip used for equipotential bonding.



Material	Width (mm)	Thickness (mm)	Standard	Item No.
INOX	22	0,4	EN 62561-1	171117-011

# 1.6 8

## Pipe Strip clamp

Pipe strip clamp used for equipotential bonding.



Material	Cable Cross Section (mm <sup>2</sup> )	Standard	Item No.
INOX	2 x 16	EN 62561-1	171117-012

# 1.6 9

## Pipe Strip clamp Ø 8-10

Pipe strip clamp for conductors Ø 8-10 mm used for equipotential bonding.



Material	Diameter Round (mm)	Standard	Item No.
INOX	Ø 8-10	EN 62561-1	171117-009

# 1.7 1

## Bimetallic contact

Bimetallic tape (copper-aluminum) CUPAL, which is inserted between copper and steel surface, to avoid electrochemical corrosion.



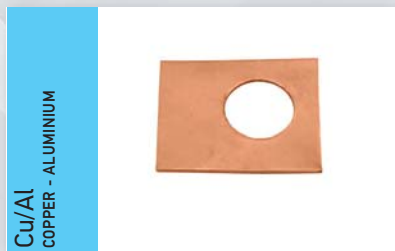
Material	Width Tape (mm)	Thickness Tape (mm)	Length Tape (mm)	Item No.
Cu – Al	40	0,5	500	121211-001

- για χρήση εκτός εδαφους & μπετόν

# 1.7 1<sub>A</sub>

## Bimetallic contact single point

Bimetallic or stainless steel contact single point which are inserted between surfaces to avoid electrochemical corrosion.



Material	Width (mm)	Thickness (mm)	Length (mm)	Pin Hole (mm)	Item No.
Cu – Al	25	1	30	1 x Ø 14	171211-001
INOX					171211-003

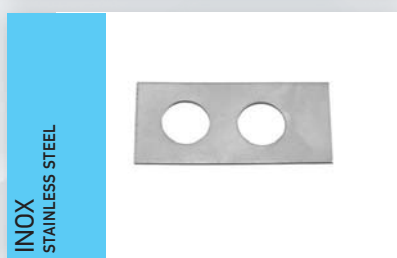
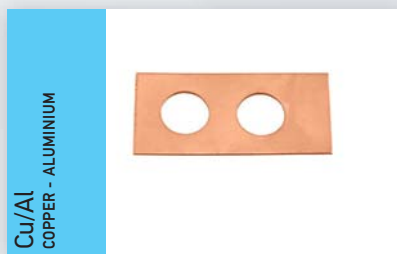


1.7

1<sub>B</sub>

## Bimetallic contact double point

Bimetallic or stainless steel contact double point which are inserted between surfaces to avoid electrochemical corrosion.



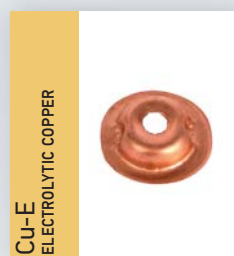
Material	Width (mm)	Thickness (mm)	Length (mm)	Pin Hole (mm)	Item No.
Cu - Al	28	1	52	2 x Ø 14	171211-002
INOX					171211-004

1.7

2.1

## Metallic spacers

They are used with wall conductor fasteners to maintain a distance between the conductor and surface.

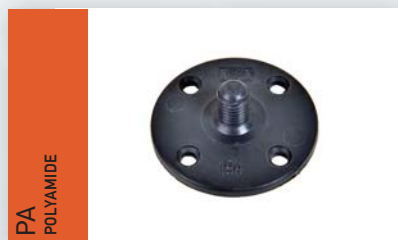


Material	Diameter (mm)	Item No.
St/tZn	Ø 40	171212-004
Cu		171212-005
Cu/eSn		171212-006
AlMgSi		171212-007
INOX		171212-008

# 1.7 2.2

## Bonding base PA

Bonding base with threaded stem. An adhesive sealant is used to bond the base on surfaces for fasteners where drilling is not permitted.

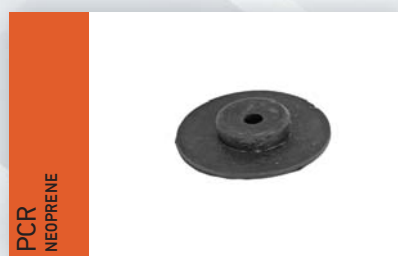


Material	Diameter (mm)	Thread	Item No.
PA	Ø 40	M 8	151122-023

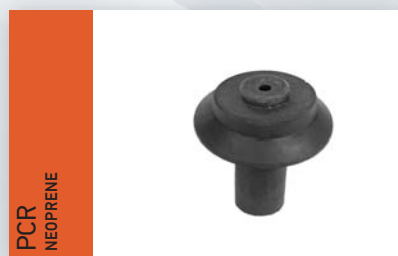
# 1.7 3

## Sealing washers for metallic spacers

Sealing washers made by neoprene. They are used for sealing of drilled surfaces (fastener installation) and are placed inside the metallic spacer.



Material	Diameter (mm)	Item No.
PCR	Ø 40	171212-002

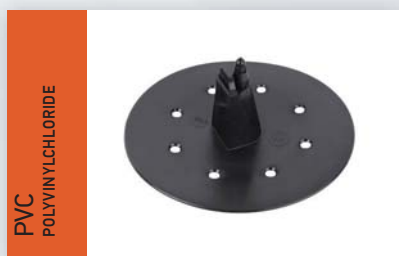


Material	Diameter (mm)	Height (mm)	Item No.
PCR	Ø 30	30	171212-003

# 1.7 4

## Roof penetration

Roof penetration for conductors and tapes. It is installed where the conductor or tape should pass through roof tiles.



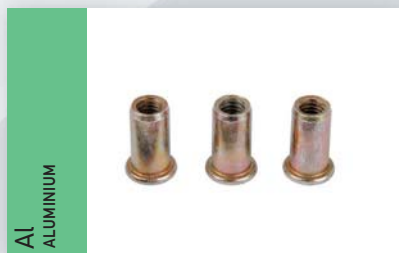
PVC  
POLYVINYLCHLORIDE

Material	Diameter (mm)	Diameter conductor (mm)	Dimensions tape (mm)	Item No.
PVC	Ø 250	Ø 8 - 16	20 - 30	171299-003

# 1.7 5

## Blind rivet nuts

Aluminum Blind rivet nuts with inner thread for metal surfaces.



Al  
ALUMINIUM

Material	Thread	Surface Thickness (mm)	Item No.
Al	M5	0,5 - 3	171213-001
	M6	0,7 - 3	171213-002

# 1.7 6

## Threaded screws

Threaded screw for HILTI fastener.



St/tZn  
HOT DIP GALVANIZED STEEL

Material	Thread	Drive Length (mm)	Thread Length (mm)	Item No.
St/tZn	M6	25	8	171214-001
	M6	35	8	171214-002
	M8	35	10	171214-003

1.7

7

## Magnetic card PCS

Installed on the down conductor, recording the lightning current in kA.



Material	Dimensions (mm)	Item No.
Magnetic card	85x53	171299-005
Sealable holder	105x70	171299-006

1.7

8.1

## Lightning strike counter

The strike counter is inserted on the down conductor and records the number of lightning currents which have passed along. Analogue type.



Type	Dimensions (mm)	Item No.
Lightning strike counter	60x185x60	171299-007

1.7

8.2

## Lightning strike counter LSC I+II

The strike counter is inserted on the down conductor and records the number of lightning currents which have passed along. Digital type.



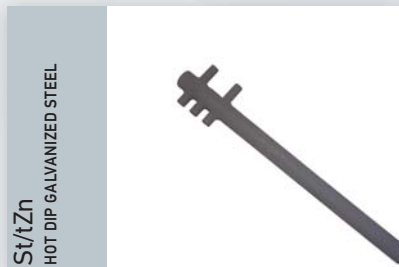
Type	Dimensions (mm)	Item No.
Lightning strike counter	100x89x43	171299-028

- LCD screen
- Lithium battery
- Protection Level IP65

1.7 9

## Straightener round/tape conductors

Tool of shaping and straightening conductors and tapes.



Material	Diameter (mm)	Length (mm)	Item No.
St/tZn	Ø 34	500	171299-010

1.7 10

## Zinc Spray

Zinc spray for repairing exposed surfaces.



Type	Content (ml)	Item No.
zsf	400	171299-011

1.7 11<sub>A</sub>

## Spark gap closed type

Closed spark gap capable to carry lightning current used for equipotential bonding or for corrosion protection.



Type	Impulse current (10/350) kA	Nom. Discharge Impulse current (8/20) kA	Protection level kV	Contact voltage kV	Item No.
481	50	100	< 5	2,5	171299-008

1.7

11<sub>B</sub>

## Protective spark gap

Protective spark gap for bridging a proximity point between roof standard of low-voltage system and components of outer lightning protection system.



Type	Protection level kV	Contact voltage kV	Item No.
482	< 5	10	171299-009

1.7

11<sub>C</sub>

## Ex-proof closed spark gap

Spark gap closed Ex-proof for indirect by-passing of insulating flanges and insulating glands. Used in ATEX environments.



Type	Protection level kV	Contact voltage kV	Impulse current 10/350 kA	Nominal current 8/20 kA	Item No.
480	< 3	1	100	100	171299-013





# 2

## Earthing Materials



- 2.1 Round - Tape conductors - Plates
- 2.2 Earth Rods
- 2.3 Fasteners
- 2.4 Connectors
- 2.5 Equipotential bonding bars
- 2.6 Accessory components
- 2.7 Test Instruments

# 2.1 1

## Solid round conductors



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
St/tZn	Ø 10	78,5	620	EN 62561-2	111111-002

- Zinc coating 350 gr/m<sup>2</sup>



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Πάχος Επιχάλκωσης (µm)	Standard	Item No.
St/Cu	Ø 8	50	410	250	EN 62561-2	111112-003
	Ø 10	78,5	630	70		111112-002



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
Cu-E	Ø 8	50	450	EN 62561-2	111113-002
	Ø 10	78,5	700		111113-003



Material	Diameter (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
INOX V2A	Ø 8	50	395	EN 62561-2	111116-001
	Ø 10	78,5	617		111116-003
INOX V4A	Ø 8	50	395		111116-002
	Ø 10	78,5	617		111116-004

- High resistant in corrosive environments
- Connection with galvanized steel or copper elements

# 2.1

# 2

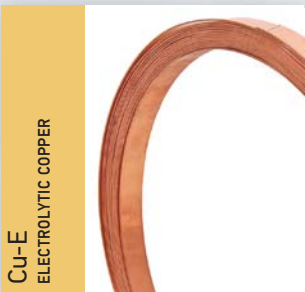
## Tape conductors

Tape conductors used in earthing systems (foundation - perimetric), equipotential bonding.



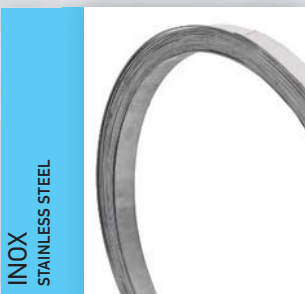
Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
St/tZn	30	3,5	105	830	EN 62561-2	121111-005
	40	4	160	1.260		121111-006

- Zinc coating 500gr/m<sup>2</sup>



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
Cu-E	25	3	75	670	EN 62561-2	121113-003
	30	2	60	530		121113-005
	30	3	90	800		121113-006
	40	3	120	1.060		121113-009
	40	4	160	1.420		121113-010

- Available in various other dimensions according to specifications



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Weight ~ gr/m	Standard	Item No.
INOX V2A	30	3,5	105	825	EN 62561-2	121116-001
INOX V4A	30	3,5	105	825		121116-003

- High resistant in corrosive environment

# 2.1 3

## Flexible stranded tapes

Flexible stranded tapes with small diameter strands (high conductivity) for equipotential bonding of metallic structures.



Material	Width (mm)	Thickness (mm)	Cross secti <sup>o</sup> n (mm <sup>2</sup> )	Item No.
Cu-E	17	2	16	121311-001
	20	2,5	25	121311-002
	28	2,5	35	121311-003
	30	3,6	50	121311-004
	45	3,5	70	121311-005

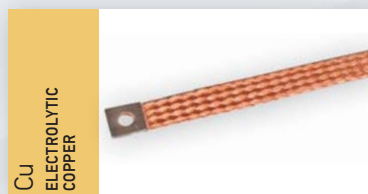


Material	Width (mm)	Thickness (mm)	Cross secti <sup>o</sup> n (mm <sup>2</sup> )	Item No.
Cu/eSn	17	2	16	121312-001
	20	2,5	25	121312-002
	28	2,5	35	121312-003
	30	3,6	50	121312-004
	45	3,5	70	121312-005

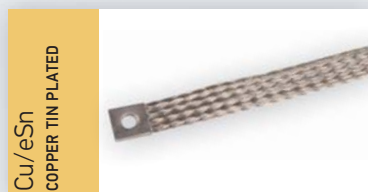
# 2.1 4

## Preformed flexible stranded tapes

Preformed flexible stranded tapes in lengths of 300 mm and 500 mm for equipotential bonding of metallic structures.



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Length (mm)	Hole (mm)	Item No.
Cu	30	3	35	300	Ø 12	121411-001
				500		121411-002



Material	Width (mm)	Thickness (mm)	Cross section (mm <sup>2</sup> )	Length (mm)	Hole (mm)	Item No.
Cu/eSn	30	3	35	300	Ø 12	121412-001
				500		121412-002

# 2.1

# 5

## Plates

Earth plates in various dimensions with single point connector for round conductors.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Length (mm)	Width (mm)	Thickness (mm)	Standard	Item No.
St/tZn	500	500	3	EN 62561-2	191211-009
	500	500	5		191211-011
	500	1.000	3		191211-006
	500	1.000	5		191211-008
	1.000	1.000	3		191211-001
	1.000	1.000	5		191211-002

Cu-E  
ELECTROLYTIC COPPER



Material	Length (mm)	Width (mm)	Thickness (mm)	Standard	Item No.
Cu-E	500	500	2	EN 62561-2	191212-009
	500	500	3		191212-010
	500	500	5		191212-012
	500	1.000	3		191212-006
	500	1.000	5		191212-008
	1.000	1.000	3		191212-001
	1.000	1.000	5		191212-002

# 2.2

# 1

## Earth rod cross

Earth rod cross profile (50 x 50 x 3 mm) hot dip galvanized steel with welded receptacle for single or double connector.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Dimensions (mm)	Thickness (mm)	Length (mm)	Standard	Item No.
St/tZn	50 x 50	3	1.500	EN 62561-1 & 2	191311-001
			2.000		191311-002
			2.500		191311-003
			3.000		191311-004

# 2.2

# 2

## Earth rods

Solid round earth rods.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Diameter (mm)	Length (mm)	Thread	Standard	Item No.
St/tZn	16	1.500	M 16	EN 62561-1 & 2	191411-012
	20	1.500	M 20		191411-007
	20	2.000	M 20		191411-008

St/Cu  
STEEL COPPER PLATED



Material	Diameter (mm)	Length (mm)	Copper plating (µm)	Thread	Item No.
St/Cu	Ø 14	1.500	50	M 16	191412-004

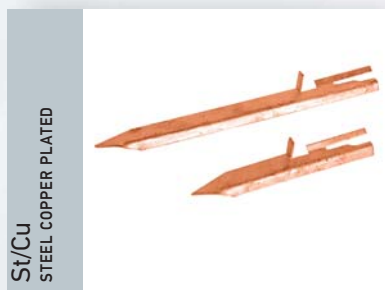
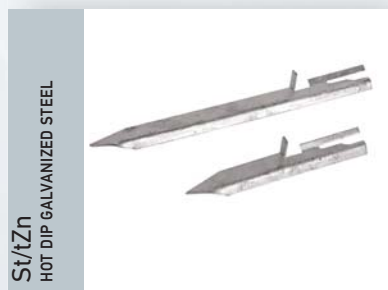
Material	Diameter (mm)	Length (mm)	Copper plating (µm)	Thread	Standard	Item No.
St/Cu	Ø 14,2	1.500	250	5/8"	EN 62561-1 & 2	191412-003
	Ø 17,2	1.500		3/4"		191412-005
	Ø 17,2	2.000		3/4"		191412-006
	Ø 17,2	3.000		3/4"		191412-007
	Ø 20	1.500		M20		191412-011

# 2.3

# 1

## Vertical installation round/tape conductor fasteners

Fasteners for vertical installation of tapes up to 40 mm and round conductors Ø 8-10 mm.



Material	Fastener Length (mm)	Item No.
St/tZn	250	151311-001
	400	151311-002
St/Cu	250	151311-003
	400	151311-004
Cu-E	250	151311-005
	400	151311-006

# 2.3

# 2

## Tape fasteners (Equipotential ring)

Wall fasteners for tapes which are used mainly for indoor equipotential ring in substations.



Material	Width Tape (mm)	Thickness Tape (mm)	Standard	Item No.
St/tZn	up to 40	up to 6	EN 62561-4	151213-001
Cu-E				151213-002
Cu/eSn				151213-003



# 2.3 3

## Conductor fasteners (Brass)

Brass conductor fasteners with internal thread. It is suitable to fasten round conductors on flat metallic surface.



Ms-Cu/Zn  
BRASS

Material	Cross section Round mm <sup>2</sup>	External fastener diameter (mm)	Thread	Standard	Item No.
Ms-Cu/Zn	16-35	Ø 20	M6	EN 62561-4	151123-001
	16-35	Ø 20	M8		151123-005
	50-70	Ø 22	M6		151123-003
	50-70	Ø 22	M8		151123-008
	95-120	Ø 25	M8		151123-009
	120-185	Ø 32	M8		151123-004
	185-240	Ø 35	M8		151123-006

# 2.4 1

## Earth rod clamps

Clamps which connect the earth rod with stranded round conductors.



Ms-Cu/Zn  
BRASS



Ms/eCu  
BRASS COPPER PLATED

Material	Earth rod Diameter (mm)	Standard	Item No.
Ms-Cu/Zn	Ø 14	EN 62561-1	163311-002
	Ø 17		163311-006
	Ø 20		163311-008
Ms/eCu	Ø 16		163311-004

# 2.4

# 2

## Earth rod coupler

Couplers for earth rods made by brass with internal thread. Used for extension or driving.

Ms-Cu/Zn  
BRASS



Material	Earth rod Diameter (mm)	Standard	Item No.
Ms-Cu/Zn	Ø 14	EN 62561-1	191511-001
	Ø 16		191511-002
	Ø 17		191511-003
	Ø 20		191511-004

# 2.4

# 3

## Rebar connector

Reinforcement rebar's connector, for reinforcement steel up to Ø 25 mm, with round conductor Ø 8-10 or Tape up to 40x4 mm.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Conductor (mm)	Rebar (mm)	Tape (mm)	Standard	Item No.
St/tZn	Ø 8-10	Ø 25	40 x 4	EN 62561-1	163411-001

Single reinforcement rebar's connector, for reinforcement steel up to Ø 25 mm, with round conductor Ø 8-10 or Tape up to 40x4 mm.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Conductor (mm)	Rebar (mm)	Tape (mm)	Standard	Item No.
St/tZn	Ø 8-10	Ø 25	40 x 4	EN 62561-1	163411-003

Reinforcement rebar's connector (quickconnector), for reinforcement steel up to Ø 24 mm and Tape 30x3,5 or up to 40x4 mm.

St/tZn  
HOT DIP GALVANIZED STEEL



Material	Rebar (mm)	Tape (mm)	Standard	Item No.
St/tZn	Ø 24	40 x 4	EN 62561-1	163411-002

# 2.4 4

## Connector «C» type

Compression connector "C" type.



Cu-E  
ELECTROLYTIC COPPER



Cu/eSn  
ELECTROLYTIC COPPER

Material	Cross section Round A (mm <sup>2</sup> )	Cross section Round B (mm <sup>2</sup> )	Item No.
Cu-E	16	16	163511-014
	25	25	163511-016
	35	16	163511-017
	35	35	163511-019
	50	25	163511-020
	50	50	163511-021
	70	50	163511-022
	70	70	163511-023
	95	70	163511-025
	95	95	163511-026
	120	95	163511-007
	120	120	163511-002
	150	150	163511-003
	185	185	163511-005
240	240	163511-006	
Cu/eSn	16	16	163512-006
	25	25	163512-008
	35	16	163512-009
	35	35	163512-011
	50	25	163512-012
	50	50	163512-013
	70	50	163512-014
	70	70	163512-015
	95	70	163512-017
	95	95	163512-019
	120	95	163512-001
	120	120	163512-002
	150	150	163512-020
	185	185	163512-022
240	240	163512-003	

# 2.5 1

## Equipotential bonding rail (standard)

Equipotential bonding rail, dimensions 170x50x50 mm (PVC base and cover).

1 Tape 30 x 3,5 mm / 1 Round conductor Ø 8-10 mm / 7 Conductors 2,5 – 25 mm<sup>2</sup>



PVC - Ms-Cu/Zn  
POLYVINYLCHLORIDE -  
BRASS



PVC - Inox  
POLYVINYLCHLORIDE -  
BRASS

Material	Slots	Standard	Item No.
PVC - Ms-Cu/Zn	(9)	EN 62561-1	201111-001
PVC - Inox			201112-001

# 2.5 2

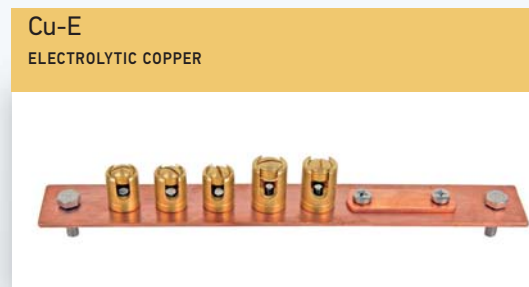
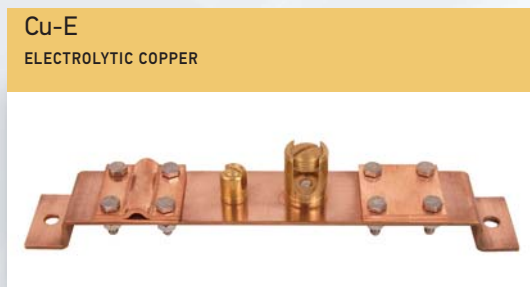
## Equipotential bonding rail (custom)

Equipotential bonding rails are available on various materials and in various dimensions according to the installation requirements.

### Selection

- Material (Hot dip galvanized steel, Copper, Tin plated copper, Stainless Steel)
- Length, Width, Thickness
- Connection elements (round conductors or tape)
- Fixation (Straight with insulators, Prefixed)

### Equipotential bonding rail examples



# 2.5 3

## Equipotential bonding rail insulator

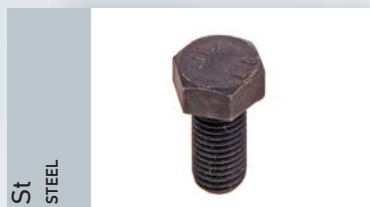


External Diameter (mm)	Height (mm)	Thread	Item No.
Ø 40	40	M 8	171299-004

# 2.6 1.1

## Driving studs

Steel driving stud, which is screwed onto earth rod coupler and is used to drive the earth rod.



Material	Earth rod Diameter (mm)	Item No.
St	Ø 14	171215-001
	Ø 16	171215-002
	Ø 17	171215-003

## 2.6 1.2 Driving point

Steel driving point, which is screwed onto earth rod coupler and is used to drive the earth rod.



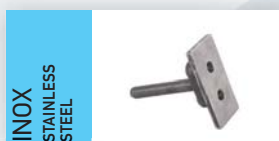
Material	Earth rod Diameter (mm)	Item No.
St	Ø 14	171215-005
	Ø 16	171215-006
	Ø 17	171215-007

## 2.6 2 Earthing fixed point

Wall earthing receptacles which provide fixed earthing point. The connection with the earthing conductors is succeeded either by connector or by exothermic welding.



Material	Diameter (mm)	Length (mm)	Thread	Standard	Item No.
INOX	Ø 70	180	1 x M 10	EN 62561-1	171220-004



Material	Length (mm)	Thread	Standard	Item No.
INOX	60	2 x M 8	EN 62561-1	171216-002
		2 x M 10		171216-001
2 x M 8		171216-006		
2 x M 10		171216-003		
2 x M 8		171216-005		
2 x M 10		171216-004		
2 x M 8		171216-008		
2 x M 10		171216-007		

## 2.6 3 Earthing optimizer EarthPlus®

High quality earthing compound which improves the resistivity of the ground. It also protects the ground rods from corrosion. It is available in plastic container of 18lt. Weight 19kg



Material	Standard	Item No.
Earthing optimizer EarthPlus®	EN 62561-7	191612-001

2.6

4

## EARTHULTRA® earthing enhancing compound

EARTHULTRA® earthing enhancing compound. Ideal for applications where the subsoil has high resistivity. It contributes to the reduction of the ground resistance and provides protection against corrosion. It is available in plastic container of 10 kg.



Material	Standard	Item No.
EARTHULTRA® earthing enhancing compound	EN 62561-7	191612-004

2.6

5

## Press terminals (cable lugs)



Material	Cross section mm <sup>2</sup>	Hole Diameter mm	Item No.
Cu/eSn	6	5	231612-002
		6	231612-003
		8	231612-004
	10	6	231612-005
		8	231612-006
		10	231612-007
	12	10	231612-008
		6	231612-017
		8	231612-018
	16	10	231612-019
		12	231612-020
		6	231612-029
	25	8	231612-030
		10	231612-031
		12	231612-032
	35	6	231612-034
		8	231612-035
		10	231612-036
		12	231612-037
			14

Material	Cross section mm <sup>2</sup>	Hole Diameter mm	Item No.
Cu/eSn	50	8	231612-040
		10	231612-041
		12	231612-042
		14	231612-043
	70	8	231612-046
		10	231612-047
		12	231612-048
		14	231612-049
	95	10	231612-051
		12	231612-052
		14	231612-053
		16	231612-054
	120	10	231612-009
		12	231612-010
		14	231612-011
		16	231612-012
	150	12	231612-013
		14	231612-014
		16	231612-015
		20	231612-016
	185	12	231612-021
		14	231612-022
		16	231612-023
		20	231612-024
240	12	231612-025	
	14	231612-026	
	16	231612-027	
	20	231612-028	

## 2.6 6

### Earth sign

Earthing sign which indicates the position of earth electrodes.



Material	Dimensions (mm)	Item No.
Al	140 x 200	191613-001

## 2.6 7

### Earth pit

The earth pit is used for the inspection of grounding rods and their connection points (tightening of earth ground clamp) and enables the measuring of earth resistance. With earthing symbol indication.



Material	Dimensions (mm)	Standard	Item No.
PVC	200 x 200	EN 62561-5	171218-001
PVC	300 x 300		171218-005

## 2.6 8

### Anti corrosion tapes

Anti corrosion tapes used for protection of underground connections but also for conductors or tapes which are exited from concrete or soil in the air.



Material	Width (mm)	Roll Length (m.)	Thickness (mm)	Item No.
PVC	19	20	0,18	171219-003
	19	20	0,20	171219-004
	50	33	0,18	171219-006
	50	20	0,20	171219-005
PETROLATUM	50	10	1,1	171219-001

# 2.7

# 1

## Earth resistance tester SEAWARD ERT 1557

High Specification Earth Resistance Tester



### TESTS:

#### Earth resistance 2,3 and 4 wire method

Display Range	0.00ohm – 50.0kohm
Measuring Frequency	125 Hz +/- 1 Hz
Measuring current	<20mA
Measuring voltage	<50V effective sine wave

#### Earth resistance using current clamp

Display Range	0.00ohm – 2.00kohm
Measuring Frequency	125 Hz +/- 1 Hz
Measuring current	<20mA
Measuring voltage	<50V effective sine wave

#### Specific earth resistance (ρ)

Display Range	0.00ohm – 1999kohm
Measuring Frequency	125 Hz +/- 1 Hz
Measuring current	<20mA
Measuring voltage	<50V effective sine wave

### ADDITIONAL INFORMATION:

Weight & Dimensions 0.8kg / 26cm x 10cm x 55 mm  
 Power supply 6 Batteries AA 1.5V  
 Communication USB  
 Store up to 500 records  
 Compliance EN 61557-1, -5, IEC61010-1, 300V CAT II

The unit is supplied with four earth spikes and full test lead set, batteries, manual.

Item No.

221111-001

# 2.7

# 2

## Installation Tester TESTBOY TV 455

Installation tester TESTBOY TV 455 can test the safety of electrical installation in household, commercial and industrial applications. It can assure that the wiring is safe and properly installed in order to comply with the requirements of standard HD 60364 Part 6: Verification



### Technical data

- Display: Dot Matrix LCD 128x64 pixel with backlighting and integrated GOD/BAD indication
- Supply: 9VDC (6x1,5V AA, LR06) Rechargeable batteries NiMH or Alkaline
- Environmental conditions: Temperature: 0 to 40 °C, Altitude: 0 to 2000m
- Degree of protection: IP 40
- Over range protection: CAT III 600 V / CAT IV 300 V
- Automatic shut down after 5 minutes
- Memory: 1.700 records
- Interface: USB or RS 232
- Standards: EAOT HD 384, EN 61326, EN 61010-1, EN 61010-031, EN 61008, EN 61009, EN 60364, EN 61557

### Tests

- Voltage: 0 – 550 V AC, - Frequency: 0,14– 500 Hz
- Earth resistance: 0,01 – 19,99 Ω, 20,00 – 199,9 Ω
- Insulation resistance: 0,01 – 19,99 Ω, 20,00 – 199,9 MΩ
- RCD analysis, Tripping time: 0 – 2.500 ms, Contact voltage: 0 – 100V, Tripping current: 10 – 30 – 100 – 300 – 500 and 1.000 mA

### Supplied with:

Operation manual | Carry bag and strap | Test tips (3x - blue, black and green) | Crocodile clips (3x - blue, black and green) | Test cable Schuko | Test cable 3 x 1,5μ. | Calibration certificate | Earth resistance kit | PC Software | Cable USB & RS 232 | Rechargeable NiMH batteries 6x1,5V AA, LR06 and charger

Item No.

221111-003





# 3

## Surge Protection

**OBO**  
BETTERMANN



- 3.1 Power Supply Low Voltage (230/400V)
- 3.2 Telecommunication Systems
- 3.3 MSR (controllers, automation) systems
- 3.4 Data Technology
- 3.5 TV, VIDEO, SAT, RADIO etc.
- 3.6 Photovoltaic systems

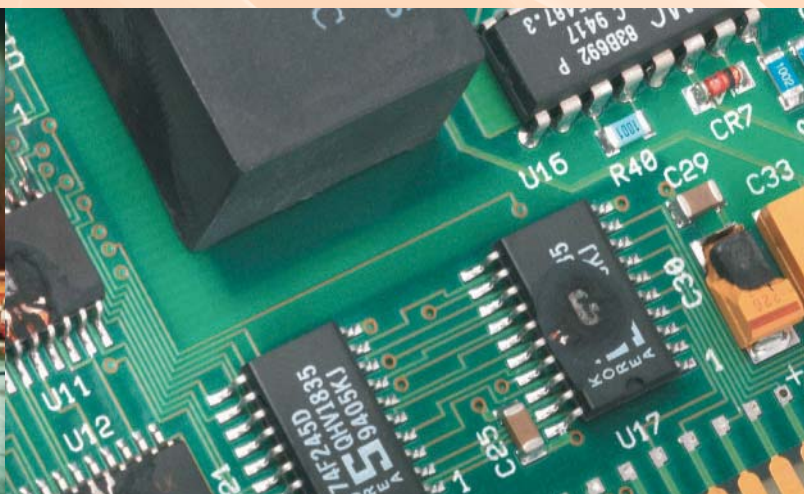


## Damage caused by surges

Our dependency on electrical and electronic equipment continues to increase, in both our professional and private lives.

Data networks in companies, for auxiliary equipment in hospitals and fire departments for example, are vital for the real-time transfer of information that has long since been indispensable. Sensitive databases, e.g. in banks or media publishers, need reliable transmission paths.

It is not only lightning strikes that pose a latent threat to these systems. More and more frequently, today's electronic aids are damaged by surges caused by remote lightning discharges or switching operations in large electrical systems. During thunderstorms, too, high volumes of energy are instantaneously released. These voltage peaks can penetrate a building through all manner of conductive connections and cause enormous damage.



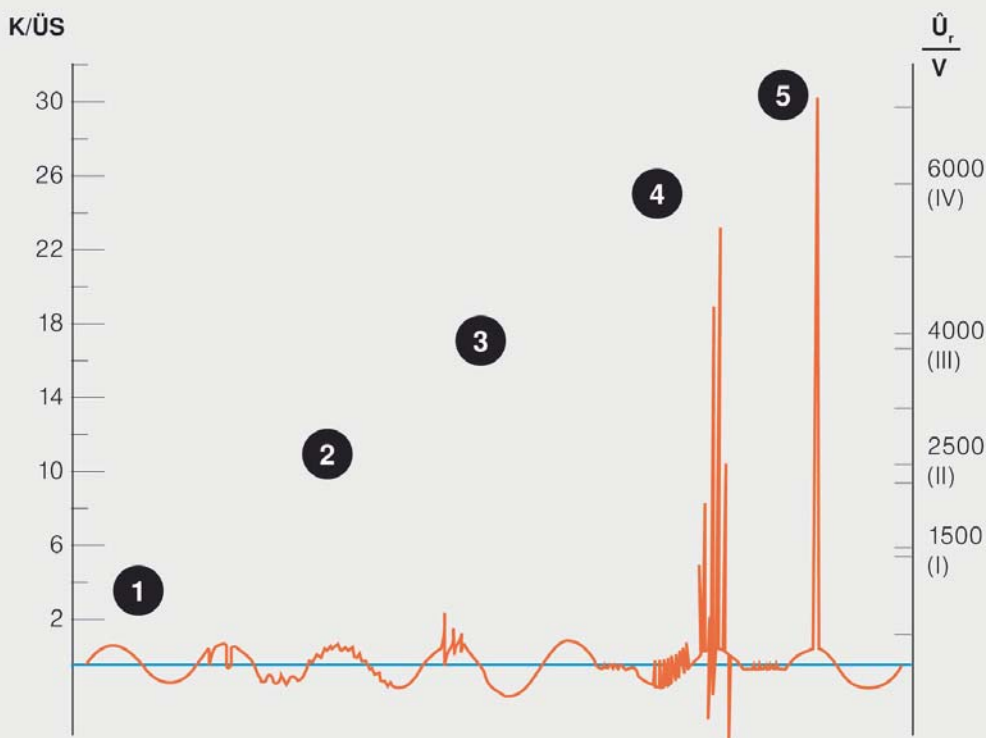
## Damage caused by surges in our daily lives.

The most obvious one is the destruction of electrical equipment. In private households, these are specifically:

- TV / Home cinema
- Telephone systems
- Computer systems, hifi systems
- Kitchen equipment
- Monitoring systems
- Fire alarm systems

A "vital" topic perhaps, particularly in office buildings. Can your company continue to operate smoothly without a host computer or server? Have all important data been backed-up in good time?

Current statistics and estimates of property insurers reveals: damage levels caused by surges – excluding consequential or outage costs – long since reached drastic levels due to the growing dependency on electronic "aids". It's no surprise, then, that property insurers are checking more and more claims and stipulating the use of devices to protect against surges.



#### Transient surge voltages

- 1 = Voltage drops/brief interruptions
- 2 = Harmonic waves through slow and rapid voltage changes
- 3 = Temporary voltage increases
- 4 = Switching surges (SEMP)
- 5 = Lightning surge voltages (LEMP)

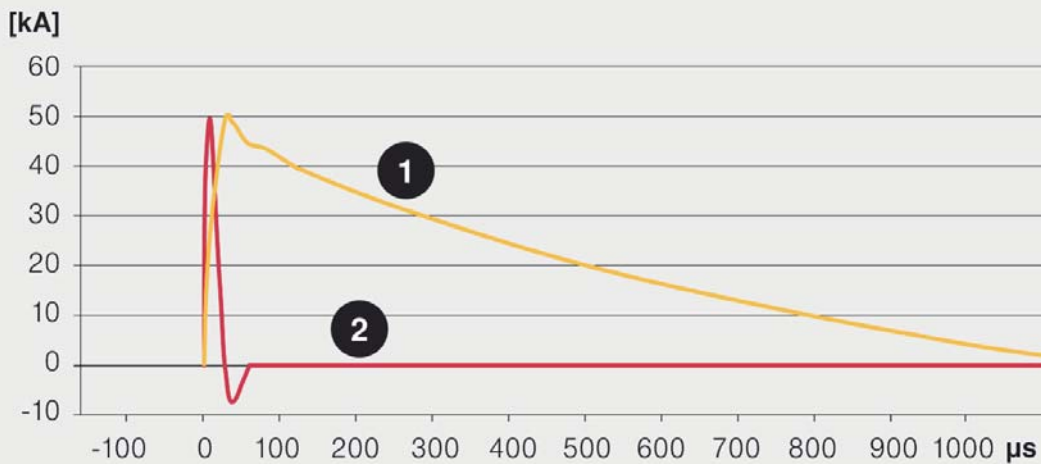
## What are transient surges?

Transient surge voltages are brief voltage peaks lasting microseconds, which may be a multiple of the attached mains nominal voltage.

The largest voltage peaks in the low-voltage consumer network are caused by lightning discharges. The high energy content of lightning surges when a direct strike hits the external lightning protection system or a low-voltage openwire line usually causes – without internal lightning and surge protection – total outage of the connected consumers and damage to the insulation.

Yet induced voltage peaks in building installations and energy or data line supply cables can also reach many times the nominal operating voltage. Switching surges too, which in fact do not cause such high voltage peaks as lightning discharges but occur much more frequently, can result in immediate system failure. As a rule, switching surges amount to twice to three times the operating voltage, lightning surges on the other hand can sometimes reach 20 times the nominal voltage value and transport a high energy content.

Often, failures occur only after a time delay as the aging process of electronic components in the affected devices triggered by smaller transients causes insidious damage. A number of different protection measures are required. These depend on the exact cause and/or impact point of the lightning discharge.



## What pulse forms are there?

Pulse types and their characteristics:

Yellow = pulse shape 1, direct lightning strike, 10/350  $\mu\text{s}$  simulated lightning pulse

Red = pulse shape 2, remote lightning strike or switching operation, 8/20  $\mu\text{s}$  simulated lightning pulse (Surge)

High lightning currents can flow to the ground during a storm. If a building with external lightning protection receives a direct hit, a voltage drop occurs on the earthing resistor of the lightning protection equipotential bonding system, which represents a surge voltage against the distant environment.

This rise in potential poses a threat to the electrical systems (e.g. voltage supply, telephone systems, cable TV, control cables, etc.) that are routed into the building.

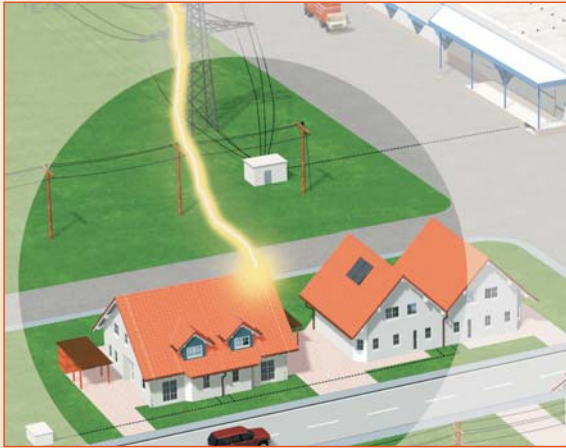
Suitable test currents for testing different lightning and surge protectors have been defined in national and international standards.

### Direct lightning strike: Pulse shape 1

Lightning currents that can occur during a direct lightning strike can be imitated with the surge current of wave form 10/350  $\mu\text{s}$ . The lightning test current imitates both the fast rise and the high energy content of natural lightning. Lightning current arrester type 1 and external lightning protection components are tested using this current.

### Remote lightning strikes or switching operations: Pulse shape 2

The surges created by remote lightning strikes and switching operations are imitated with test impulse 8/20  $\mu\text{s}$ . The energy content of this impulse is significantly lower than the lightning test current of surge current wave 10/350  $\mu\text{s}$ . Surge arrester type 2 and type 3 are impacted with this test impulse.



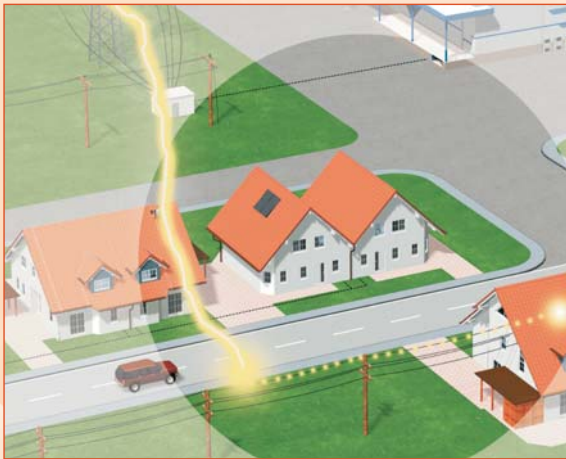
## Direct lightning strike into a building

If a lightning strike hits the external lightning protection system or earthed roof structures capable of carrying lightning current (e.g. roof aerial), then the lightning energy can be arrested to the ground in advance.

However, a lightning protection system on its own is not enough: Due to its impedance, the building's entire earthing system is raised to a high potential.

This potential increase causes the lightning current to spilt over the building's earthing system and also over the power supply systems and data cables to the adjacent earthing systems (adjacent building, low-voltage transformer).

Risk: Lightning impulse (10/350)



## Direct lightning strike into a low-voltage open-wire line

A direct lightning strike into a low voltage open wire line or data cable can couple high partial lightning currents in an adjacent building. Electrical equipment in buildings at the end of the low-voltage openwire line are at particular risk of damage caused by surges.

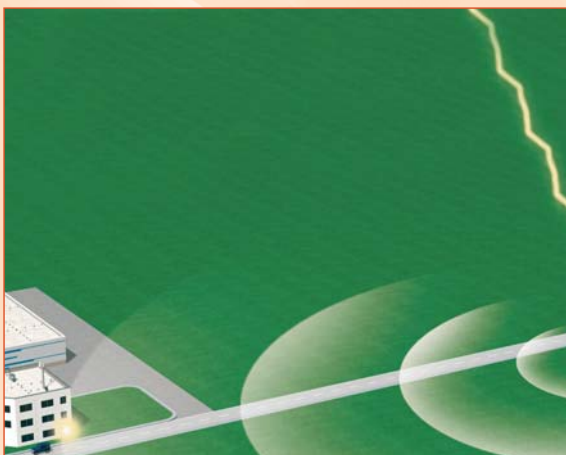
Risk: Lightning impulse (10/350)



## Switching surges in the low-voltage system

Switching surges are caused by switch-on and switch-off operations, by switching inductive and capacitive loads and by interrupting short-circuit currents. Particularly when production plants, lighting systems or transformers are switched off, electrical equipment located in close proximity can be damaged.

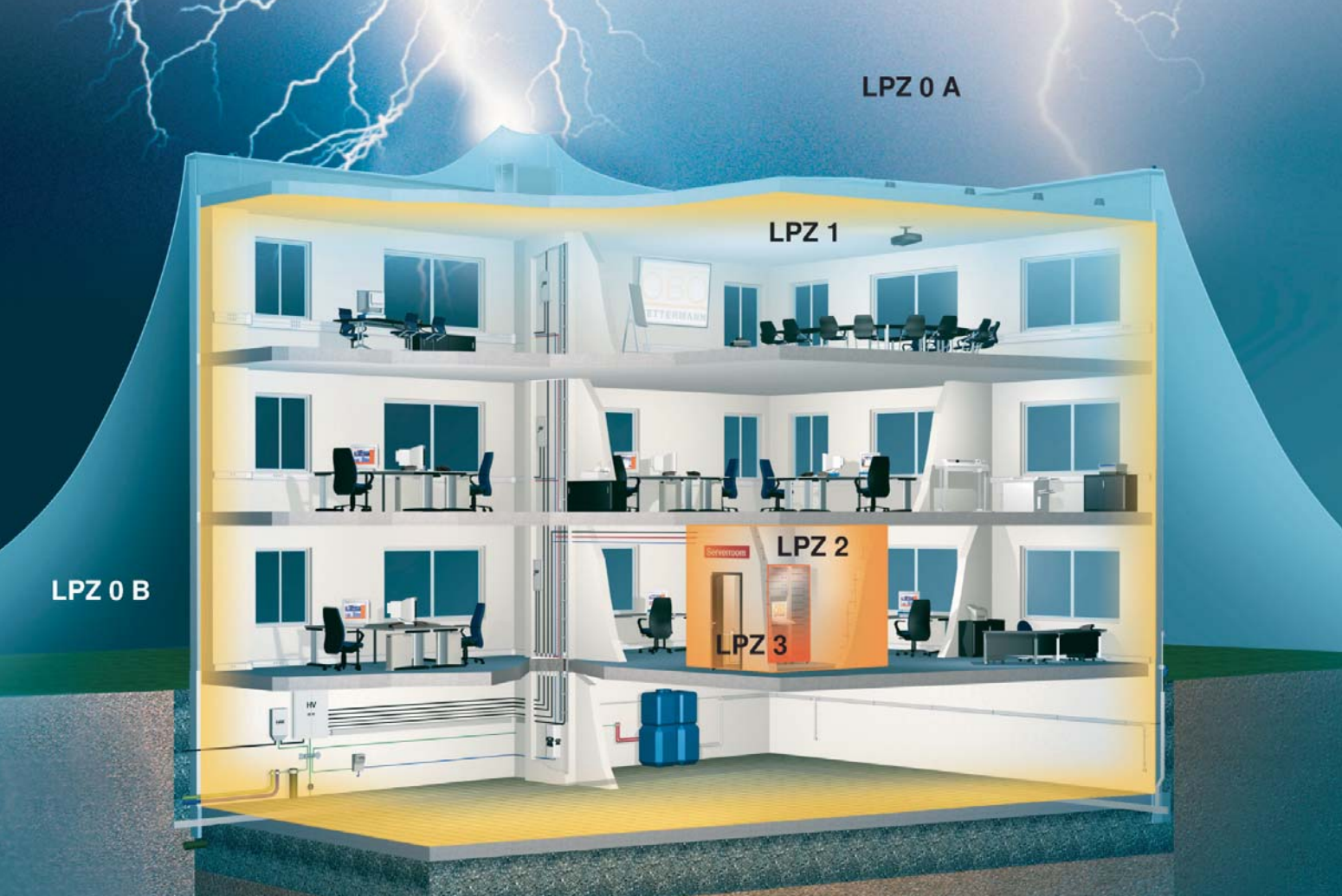
Risk: Surge impulse (8/20)



## Coupling of surges through local or remote lightning strike

Even if lightning protection and surge protection measures are already installed: A local lightning strike creates additional high magnetic fields, which in turn induce high voltage peaks in line systems. Inductive or galvanic coupling can cause damage within a radius of up to 2 km around the lightning impact point.

Risk: Surge impulse (8/20)



## Gradual surge reduction with lightning protection zones.

The lightning protection zone concept described in international standard IEC 62305-4 (DIN VDE 0185 Part 4) has proved to be practical and efficient.

This concept is based on the principle of gradually reducing surges to a safe level before they reach the terminal device and cause damage.

In order to achieve this situation, a building's entire energy network is split into lightning protection zones (LPZ = Lightning Protection Zone).

Installed at each transition from one zone to another is a surge arrester for equipotential bonding. These arresters correspond to the requirement class in question.

## Lightning protection zones

<b>LPZ 0 A</b>	Unprotected zone outside the building. Direct lightning impacts, no shielding against electromagnetic interference pulses LEMP (Lightning Electromagnetic Pulse)
<b>LPZ 0 B</b>	Zone protected by external lightning protection system. No shielding against LEMP.
<b>LPZ 1</b>	Zone inside the building. Low partial lightning energies possible.
<b>LPZ 2</b>	Zone inside the building. Low surges possible.
<b>LPZ 3</b>	Zone inside the building (can also be the metal housing of a consumer). No interference pulses through LEMP or surges present.

## Benefits of the lightning protection zone concept

- Minimisation of the couplings into other cable systems through arresting the energy-rich, dangerous lightning currents directly at the point the cables enter the building.
- Malfunction prevention with magnetic fields.
- Economic, well-plannable individual protection concept for new and old buildings and reconstructions.

## Type classes of the surge protection devices

OBO surge protection devices are classified in accordance with DIN EN 61643-11 into three type classes

Type 1, Type 2 and Type 3

These standards contain building regulations, requirements and tests for surge arrestors used in AC networks with nominal voltages of up to 1,000 V and nominal frequencies of between 50 and 60 Hz. This classification enables arrestors to be matched to different requirements with regard to location, protection level and current-carrying capacity.

The table on this page shows how the devices are classified with regard to the valid IEC, EN and VDE test standards. It also shows which OBO surge protectors are to be installed in the energy supply network and their respective function.

## Zone transitions

<p><b>Zone transition LPZ 0 to LPZ 1</b></p>	<p>Protection device for lightning protection equipotential bonding in accordance with DIN VDE 0185-3 for direct or close lightning strikes.</p> <ul style="list-style-type: none"> <li>• Devices: Type 1 (Class I, Requirement Class B), e. g. MC50-B VDE</li> <li>• Max. protection level according to standard: 4 kV</li> <li>• Installation e.g. in the main distributor/at building entry</li> </ul>
<p><b>Zone transition LPZ 1 to LPZ 2</b></p>	<p>Protection device for surge protection to DIN VDE 0100-443 for surge voltages arriving through the supply network due to remote strikes or switching operations.</p> <ul style="list-style-type: none"> <li>• Devices: Type 2 (Class II, requirements class C), e.g. V20-C</li> <li>• Max. protection level according to standard: 2.5 kV</li> <li>• Installation e.g. in the power distributor, subdistributor</li> </ul>
<p><b>Zone transition LPZ 2 to LPZ 3</b></p>	<p>Protection device, intended for surge protection of portable consumers at sockets and power supplies.</p> <ul style="list-style-type: none"> <li>• Devices: Type 3 (Class III, requirements class D), e.g. FC-D</li> <li>• Max. protection level according to standard: 1.5 kV</li> <li>• Installation e.g. on end consumer</li> </ul>



# Step by step to effective surge protection

Surge protection is a complex subject.

Power supply (230/400V)

Telecommunication systems

Measurement and control systems

Data technology

TV, Video, Radio

Photovoltaic systems

*Example of application:  
Private house with external lightning protection installation*



Where 1, 2, 3 is the 1o, 2o and 3o protection step correspondingly

All surge protection products:

- are VDE tested
- have 5 years warranty



Ask for the analytical product catalogue and technical datasheet.

*Example of application:  
Office building with lightning protection installation*



Surge Protection OBO - BETTERMANN

Where 1, 2, 3 is the 1o, 2o and 3o protection step correspondingly

# 3 1

## Power supply (230/400V)

### Situation

Select type of building

### 1o STEP

Basic line protection / Protection class T1 + T2  
Installation in main distribution board,  
before meter or in shared distribution board



No external lightning protection installation

No overhead line connection

Private buildings  
Distance between main distributor box and sub-distributor box and/or combined distributor is less than 10m

TN

**V10 Compact**  
63 A  
Art.-Nr. 5093 38 0



Typ 2, Typ 3  
After meter

Private buildings/residential buildings, industry/commerce  
Distance between main distributor box and sub-distributor box and/or combined distributor is greater than 10m

TN

**V20-C/3+NPE**  
125 A  
Art.-Nr. 5094 65 6



Typ 2  
After meter

Private buildings/residential buildings, industry/commerce  
Distance between main distributor box and sub-distributor box and/or combined distributor is less than 10m

TN

**V20-C/3+NPE**  
125 A  
Art.-Nr. 5094 65 6



Typ 2  
After meter



External lightning protection installation present

Private building  
Distance between main distributor box and subdistributor box and/or combined distributor is greater than 10m

TN

TT

**V 50-B+C/3+NPE**  
125 A  
Art.-Nr. 5093 65 4



Typ 1+2  
After meter

Private building  
Distance between main distributor box and subdistributor box and/or combined distributor is less than 10m

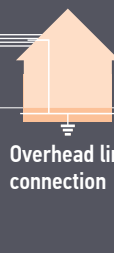
TN

TT

**V 50-B+C/3+NPE**  
125 A  
Art.-Nr. 5093 65 4



Typ 1+2  
After meter



Overhead line connection

Industry/commerce/residential building  
Distance between main distributor box and subdistributor box is greater than 5m

TN-C

IT

**MC 50-B/3**  
500 A  
Typ 1,  
Before or after meter  
Art.-Nr. 5096 87 6



TN-S

TT

**MC 50-B/3+1**  
500 A  
Typ 1,  
Before or after meter  
Art.-Nr. 5096 87 8



Industry/commerce/residential building  
Distance between main distributor box and subdistributor box is less than 10m

TN-C

IT

**MCD 50-B/3**  
500 A  
Typ 1,  
Before or after meter  
Art.-Nr. 5096 87 7



TN-S

TT

**MCD 50-B/3+1**  
500 A  
Typ 1,  
Before or after meter  
Art.-Nr. 5096 87 9



Recommendation:  
Earthed roof-mounted structures (antenna, etc.)

Industry/commerce/residential building  
Distance between main distributor box and subdistributor box is greater than 10m

TN-C

IT

**MCD 50-B/3**  
500 A  
Typ 1,  
Before or after meter  
Art.-Nr. 5096 87 7



TN-S

TT

**MCD 50-B/3+1**  
500 A  
Typ 1,  
Before or after meter  
Art.-Nr. 5096 87 9



## 2o STEP

Medium protection / Protection class T2  
Installation in the/each sub-distribution board

Not necessary

TN  
TT



**V20-C/3+NPE**  
125 A  
Art.-Nr. 5094 65 6



Not necessary

TN  
TT



**V20-C/3+NPE**  
125 A  
Art.-Nr. 5094 65 6



Not necessary

TN  
TT



**V20-C/3+NPE**  
125 A  
Art.-Nr. 5094 65 6



Not necessary

TN  
TT



**V20-C/3+NPE**  
125 A  
Art.-Nr. 5094 65 6



## 3o STEP

Precision line protection / Protection class T3  
Installation before terminal device



**FineController FC-D**  
16 A



Art.-Nr. 5092 80 0



**CNS-3-D**  
F16 A\*  
Art.-Nr. 5092 70 1



**FineController FC-TV-D**  
16 A



Art.-Nr. 5092 80 8



**SNS-D**  
16 A  
Art.-Nr. 5095 03 4



**FineController FC-SAT-D**  
16 A



Art.-Nr. 5092 81 6



**KNS-D**  
16 A\*  
Art.-Nr. 5092 50 7



**FineController FC-TAE-D**  
F 16 A



Art.-Nr. 5092 82 4



**ÜSM-A und ÜSM-A-2**  
16 A\*

Art.-Nr. 5092 45 1  
Art.-Nr. 5092 46 0



**FineController FC-ISDN-D**  
16 A\*



Art.-Nr. 5092 81 2



**ÜSS 45-0 und ÜSS 45-A**  
16 A  
With optical function check:  
ÜSS 45-0: Art.-Nr. 6117 47 3  
With acoustic function check:  
ÜSS 45-A: Art.-Nr. 6117 46 5



**V 10 Compact**  
Typ 2, Typ 3  
63 A

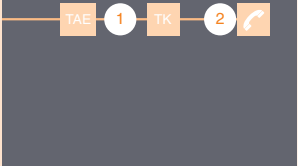






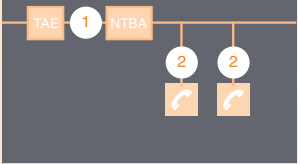






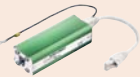
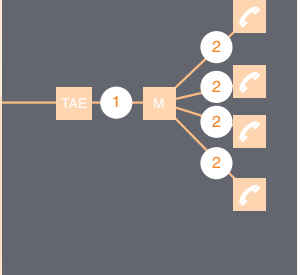






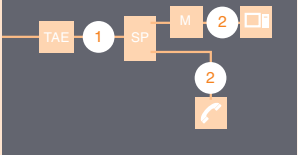



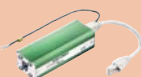
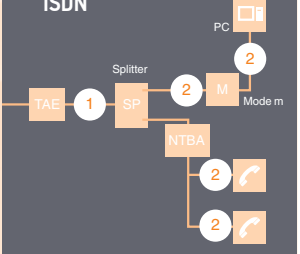




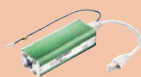
Art.-Nr. 5093 38 0



**VF 230-AC/DC**  
20 A  
Art.-Nr. 5097 64 9











# 3 2

## Telecommunication systems

<b>Situation</b> Connection type	<b>1o STEP</b> Behind the TK transfer point/building entry point Basic protection device or combined protection device	<b>2o STEP</b> At TK terminal device/modem/PC Fine protection device
Analogue connection up to two double wires, e.g. with private connection  	 <b>SC-Tele/4-C-G</b> Art.-Nr. 5081 68 8  Alternative   <b>FineController FC-TAE-D</b> Art.-Nr. 5092 82 4	Alternative   <b>TKS-B</b> Art.-Nr. 5097 97 5   <b>RJ11-Tele/4-C</b> Art.-Nr. 5081 92 0   <b>RJ11-Tele/4-F</b> Art.-Nr. 5081 93 9  Alternative   <b>FineController FC-TAE-D</b> Art.-Nr. 5092 82 4
ISDN connection  	 <b>SC-Tele/4-C-G</b> Art.-Nr. 5081 68 8  Alternative   <b>FineController FC-TAE-D</b> Art.-Nr. 5092 82 4	Alternative   <b>TKS-B</b> Art.-Nr. 5097 97 5   <b>RJ45-ISDN/4-C-G</b> Art.-Nr. 5081 54 8   <b>RJ45-ISDN/4-C</b> Art.-Nr. 5081 83 1   <b>RJ45S-ISDN/4-F</b> Art.-Nr. 5081 85 8   <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3  Alternative
ISDN multiplex  	 <b>LSA-B-MAG</b> ten double wires Art.-Nr. 5084 02 0   <b>LSA-T-LEI</b> ten double wires Art.-Nr. 5084 01 2	Alternative or in combination   <b>LSA-BF-180 180 V</b> Art.-Nr. 5084 02 4   <b>LSA-T-LEI</b> Art.-Nr. 5084 01 2   <b>LSA-E</b> Art.-Nr. 5084 03 2   <b>FineController FC-ISDN-D</b> Art.-Nr. 5092 81 2
DSL connection + analogue telephone  	 <b>SC-Tele/4-C-G</b> Art.-Nr. 5081 68 8	Alternative   <b>TKS-B</b> Art.-Nr. 5097 97 5   <b>RJ11-Tele/4-F</b> Art.-Nr. 5081 93 9   <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3
DSL connection + ISDN  	 <b>SC-Tele/4-C-G</b> Art.-Nr. 5081 68 8	Alternative   <b>TKS-B</b> Art.-Nr. 5097 97 5   <b>RJ45-ISDN/4-C-G</b> Art.-Nr. 5081 54 8   <b>RJ45S-ISDN/4-F</b> Art.-Nr. 5081 85 8   <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3

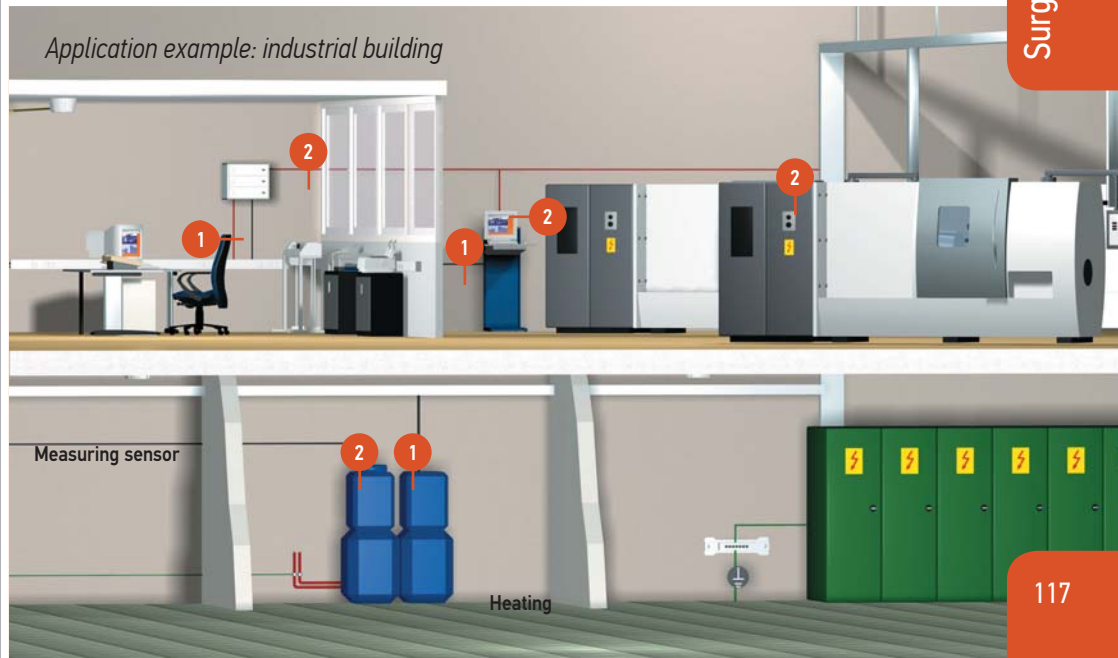
# 3 3

## Measurement and control systems

<b>Situation</b> Select application	<b>1o STEP</b> Before the controller Power supply	<b>2o STEP</b> Behind the control unit and before the receiver/transmitter Data line/measuring sensor supply line
Heating control	 <p><b>VF 230-AC/DC</b>                      AC system, 230 V                      Art.-Nr. 5097 64 9</p>	 <p><b>FLD 24</b>                      24 V                      Art.-Nr. 5098 61 0</p>
PLC control	 <p><b>VF 24-AC/DC</b>                      DC system, 24 V                      Art.-Nr. 5097 60 6</p>	 <p><b>MDP-2/D-24-T</b>                      24 V                      Art.-Nr. 5098 42 2</p>
4–20 mA current loop, PT 100 (measuring sensor), PT 1000 (measuring sensor)	 <p><b>VF 230-AC/DC</b>                      AC system, 230 V                      Art.-Nr. 5097 64 9</p>	 <p><b>MDP-4/D-24-T</b>                      24 V                      Art.-Nr. 5098 43 1</p>
EIB (European Installation Bus)	 <p><b>VF 230-AC/DC</b>                      AC system, 230 V                      Art.-Nr. 5097 64 9</p>	 <p><b>TKS-B</b>                      Art.-Nr. 5097 97 5</p>
Bus systems OBO Bus, Interbus and Profibus	 <p><b>VF 230-AC/DC</b>                      AC system, 230 V                      Art.-Nr. 5097 64 9</p>	 <p><b>TKS-B</b>                      Art.-Nr. 5097 97 5</p>






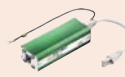








Surge Protection OBO - BETTERMANN

Application example: industrial building

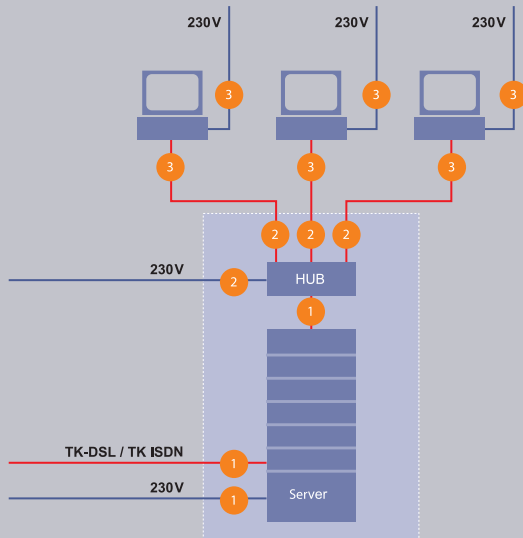


# 3 4

## Data technology

Situation Network system	1o STEP On server with external communication line	2o STEP On hub/switch	3o STEP Installation before terminal device (terminal/PC)
CAT 5/6 cable	 <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3	 <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3	 <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3
Connection DSL	 <b>SC-Tele/4C-G</b> Art.-Nr. 5081 68 8 Alternative  <b>FC-TAE-D</b> Art.-Nr. 5092 82 4	not applicable	 <b>RJ45S-ATM/8-F</b> Art.-Nr. 5081 79 3
Connection ISDN	 <b>SC-Tele/4C-G</b> Art.-Nr. 5081 68 8 Alternative  <b>FC-TAE-D</b> Art.-Nr. 5092 82 4	not applicable	 <b>RJ45S-ISDN/4-F</b> Art.-Nr. 5081 85 8 Alternative  <b>FC-ISDN-D</b> Art.-Nr. 5092 81 2
Power supply 230 V	 <b>CNS-3-D</b> Art.-Nr. 5092 70 1	 <b>CNS-3-D</b> Art.-Nr. 5092 70 1	 <b>CNS-3-D</b> Art.-Nr. 5092 70 1 Alternative  <b>FineController FC-D</b> Art.-Nr. 5092 80 0

### Network






















### Application example: industrial building



# 3 5

## TV, VIDEO, SAT, RADIO etc.

<b>Situation</b> Application	1o STEP Installation between BC transition point and booster	2o STEP Installation before each terminal device (TV/video/HiFi)
Broadband (Cable TV)	 DS-F m/w Art.-Nr. 5093 27 5  DS-F w/w Art.-Nr. 5093 27 2	 FineController FC-TV-D Art.-Nr. 5092 80 8 
	Installation between LNB and receiver/multiswitch, direct on device to be protected	Installation before each terminal device (receiver and/or TV/video/HiFi)
SAT receiver unit with receiver (e.g. in single family house)	 DS-F m/w Art.-Nr. 5093 27 5  DS-F w/w Art.-Nr. 5093 27 2  TV 4+1 Kompaktschutzgerät (4x SAT, 1x terrestrisch) Art.-Nr. 5083 40 0	 FineController FC-SAT-D Art.-Nr. 5092 81 6 
SAT receiver unit with multiswitch and multiway LNB (e.g. in multiple family house)	 DS-F m/w Art.-Nr. 5093 27 5  DS-F w/w Art.-Nr. 5093 27 2  TV 4+1 Art.-Nr. 5083 40 0	 FineController FC-SAT-D Art.-Nr. 5092 81 6 
	Installation between antenna and booster	Installation before each terminal device (TV/video/HiFi)
Terrestrial receiver unit (antenna) analogue TV	 DS-F m/w Art.-Nr. 5093 27 5  DS-F w/w Art.-Nr. 5093 27 2  TV 4+1 Art.-Nr. 5083 40 0	 FineController FC-TV-D Art.-Nr. 5092 80 8 

Surge Protection OB0 - BETTERMANN

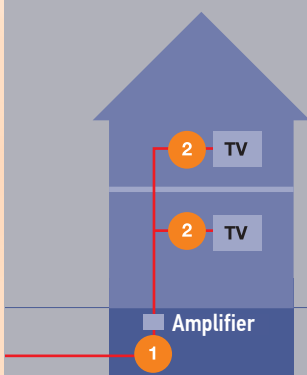
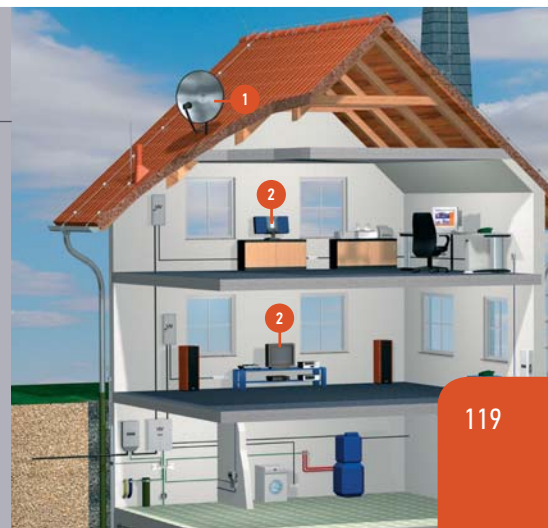


Diagramm of cable TV system

Application example:  
Private house

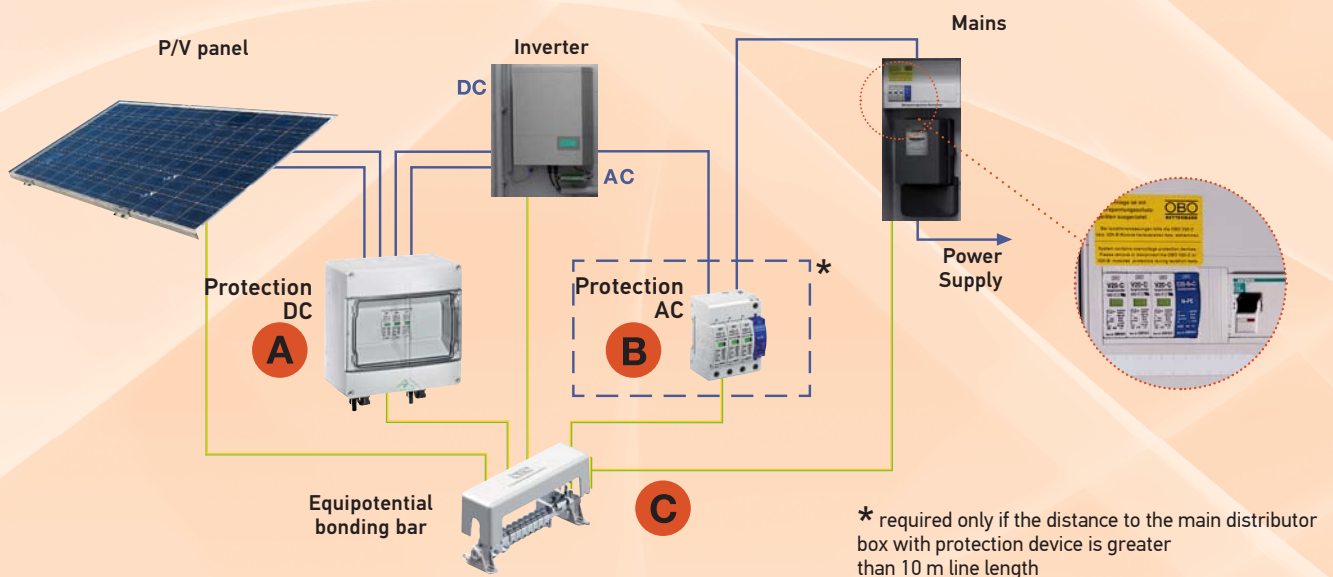




### BUILDINGS WITHOUT EXTERNAL LIGHTNING PROTECTION

Surge protection for the current inverter – the heart of the system – is particularly important on buildings without external lightning protection. A protection system should cover all at-risk lines that are connected to the current inverter. The DC surge arrester (protection circuits up to 1,000 V DC available) must be matched to the maximum no-load voltage of the solar module. The maximum no-load voltage is typically up to 20% above the indicated no-load voltage (UOC STC ).

External lightning protection is not necessary or required.  
A type 2 surge protection is sufficient.



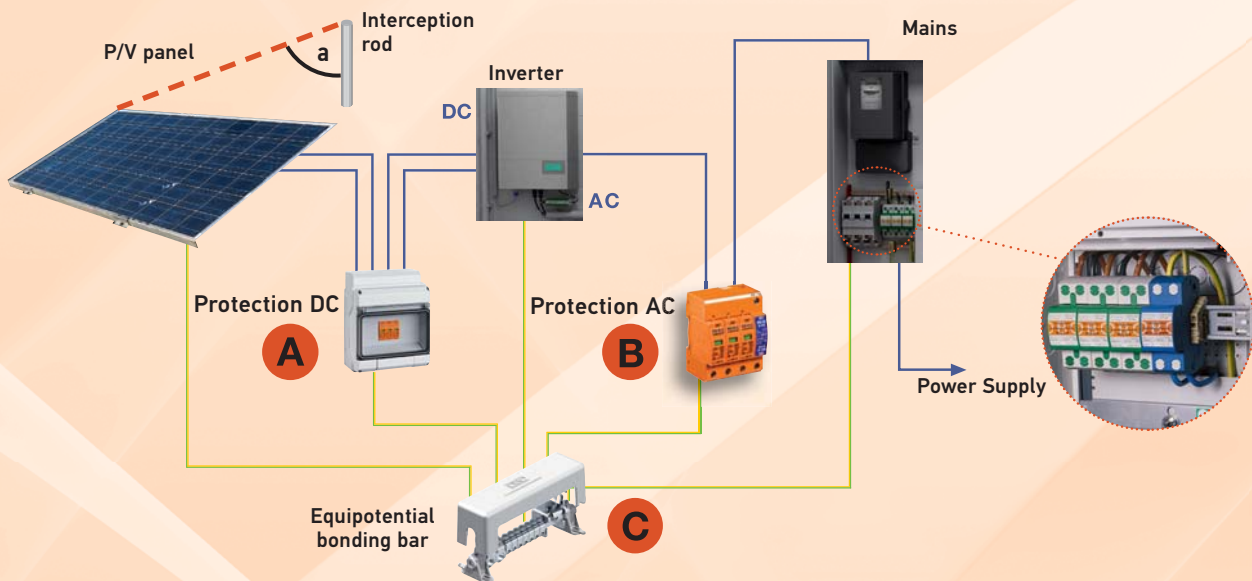
Point	Description	UDC max	Type	Item No.	Picture
A	3-pin complete unit	1,000 V	V20-C/3-PH-1000	5094 608	
	2-pin complete unit	1,000 V	V20-C/2-PH-1000	5094 617	
	System solution in housing	1,000 V	VG-C/DC-PH-MS 1000	5088 691	
	System solution in housing with MC 4 connector	745 V	VG-C/DC-PH 550	5088 690	
B	230 V (L, N, PE)		V20-C/1+NPE-280	5094 650	
	230/400 V (L1, L2, L3, N, PE)		V20-C/3+NPE-280	5094 656	
C	Equipotential bonding bar		1801 VDE	5015 650	

Note: An equipotential bonding between the metallic PV framework and the main equipotential bonding should be created.

## BUILDINGS WITH EXTERNAL LIGHTNING PROTECTION

In buildings with external lightning protection, a direct lightning strike into the PV module must be prevented by the lightning protection system. The high lightning current creates a strong magnetic field, which induces overvoltage in the electrical components. Lightning and surge protection for the current inverter – the heart of the system – is particularly important in this application. A protection system should cover all at-risk lines that are connected to the current inverter.

The distance between the lightning protection and the photovoltaic system (normally 0.5 m–1 m) cannot be maintained (e.g. metal roof).



Point	Description	UDC max	Type	Item No.	Picture
A	3-pin complete unit	900 V	V25-B+C/3-PH900	5097 44 7	
	2-pin complete unit	900 V	V25-B+C/2-PH900	5097 45 7	
	3-pin complete unit	600 V	V50-B+C/3-PH600	5093 62 3	
	2-pin complete unit	600 V	V50-B+C/2-PH600	5093 62 8	
	System solution in housing	900 V	VG-BC/DC PH-MS 900	5088 69 2	
	System solution in housing	600 V	VG-BC/DC PH-MS 600	5088 69 3	
B	230 V (L, N, PE)		V 25-B+C/1+NPE	5094 45 7	
	230/400 V (L1, L2, L3, N, PE)		V 50-B+C/3+NPE	5093 65 4	
C	Equipotential bonding bar		1801 VDE	5015 65 0	

Note: Should it be possible to maintain the distance between the lightning protection and the photovoltaic system, then the surge protection measures on page 5 should be sufficient.

**Kumwell®**

# 4

## Exothermic Welding Kumwell®



- 4.1 Cable to Cable
- 4.2 Cable to Ground Rod
- 4.3 Cable to Surface
- 4.4 Cable to Rebar
- 4.5 Cable to Tape
- 4.6 Tape to Tape
- 4.7 Tape to Ground Rod
- 4.8 Tape to Surface
- 4.9 Tools & Accessories
- 4.10 Instructions for exothermic welding

## EXOTHERMIC WELDING

The grounding system must comply with the latest standards in order to provide first of all personnel safety, followed by equipment protection, return path for fault and surges, static dissipation-proper function of E/M installations.

In order to meet these objectives, grounding connections must maintain a low contact resistance under adverse conditions, for the expected lifetime of the grounding system. Connections in grounding networks are subject to severe corrosion, high mechanical stress and thermal heating.

The best solution for those connections is exothermic welding.

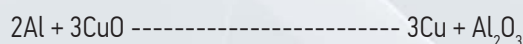
## PROCESS

Our company uses the exothermic welding of Kumwell. The process is simple and autonomous. Kumwell welding is suitable for bonding, on a molecular level, copper/copper, copper/iron and iron/iron. The final bond is of the highest quality. The process can be completed without external source of power or heat.

The electrical connection is accomplished with a superheated molten copper alloy above and all around the parts to be joined.

The molten copper is contained and controlled within a semi-permanent graphite mould and causes melting of the joining parts. The bond is completed when all the parts have naturally cooled down.

The process uses divided aluminum particles as the reducing agent with copper oxide to produce the following chemical reaction:



This molecular chemical reaction generates a tremendous superheat -exothermic- with molten metals reaching approximate temperatures of 2.204 °C (4.000 °F).

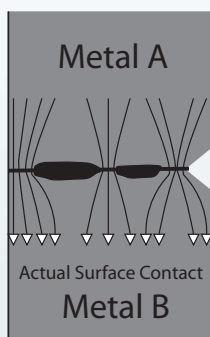
Material	CAS number	Chemical formula
Copper oxide	CAS 1317-39-1	Cu <sub>2</sub> O
Copper oxide	CAS 1317-38-0	CuO
Aluminium	CAS 7429-90-5	Al
Copper	CAS 7440-50-8	Cu

Kumwell exothermic welding have in their majority at least double the surface compared to the surface of the parts they connect.

Unlike compression and bolt clamp, exothermic welded joint become homogenous metal providing high conductivity (more than 90%) and excellent resistance to corrosion.

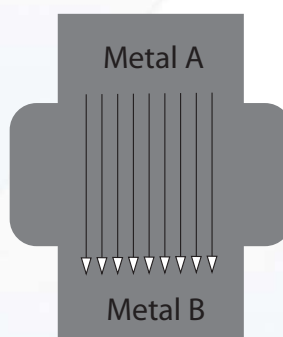
## Clamp

Compression - Bolt connection



## Exothermic welding

molecular connection



### Standards:

- UL 467 (Grounding and bonding equipment)
- IEEE std 837-2002 (IEEE standard for qualifying permanent connections used in substation grounding)

## WELD METAL POWDER KW-KB-KR

There are three different types of powder for different applications.

**KW:** is suitable for grounding and lightning protection connections between copper to copper, copper to steel, copper to stainless steel, stainless steel to stainless steel.

The range of applications includes: power plant substations, transmission lines, refinery industrial plants, telecommunication towers, industrial – commercial buildings ,etc

**KB:** is designed for cathodic protection. The mould and the powder are in compliance with ANSI/ASME B31.4-1998 standard.

**KR:** is designed for railway signaling applications. The mould and the powder are in compliance with ASTM ES-94a.

Kumwell weld metal powder is contained in a moisture-resistance plastic cartridge, packed in a paper box. Ignition powder is on the bottom of the tube below the powder and it can be released by scratching the bottom and tapping the tube.

The retaining weld metal powder metal disk is contained in a separate package.

## KUMWELL MOULD

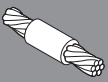
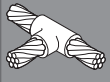


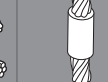
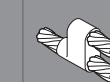


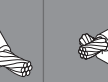

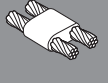


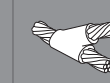

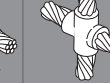
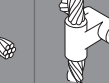









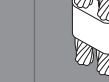



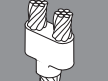
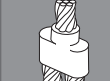
KUMWELL Graphite Mould is made from high quality raw material, accurate production and expert engineering. Each mould has label giving information regarding the type, conductor size and metal powder that needs to be used.

Ask for the analytical product catalogue and technical datasheet.

4.

1

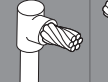

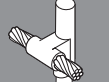
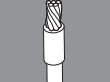
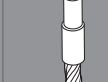
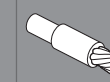

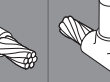

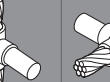
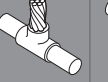

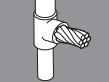
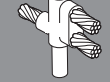
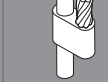
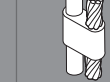
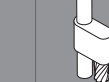

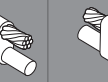
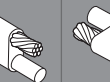
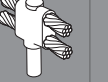

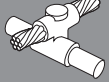
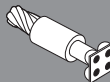

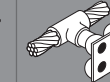



## Cable to Cable

									
CC-1	CC-2	CC-3	CC-4	CC-5	CC-6	CC-7	CC-8	CC-11	CC-13
									
CC-14	CC-17	CC-18	CC-19	CC-20	CC-22	CC-23	CC-24	CC-25	CC-26
									
CC-27	CC-28	CC-29	CC-30	CC-31	CC-33	CC-34	CC-35	CC-36	CC-37
									
CC-38	CC-39								

4.

2

## Cable to Ground Rod

									
CR-1	CR-2	CR-3	CR-5	CR-6	CR-7	CR-8	CR-9	CR-12	CR-13
									
CR-14	CR-15	CR-16	CR-17	CR-18	CR-19	CR-20	CR-21	CR-22	CR-23
									
CR-24	CR-25	CR-26	CR-27	CR-29	CR-30	CR-31	CR-32	CR-33	

4.

3

## Cable to Surface

CS-1F	CS-2F	CS-3F	CS-4F	CS-5NC	CS-6F	CS-7N	CS-8N	CS-9N	CS-11NC
CS-12N	CS-13N	CS-14N	CS-15N	CS-16	CS-18N	CS-21NC	CS-22	CS-23F	CS-24F
CS-25N	CS-26N	CS-27N	CS-28FC	CS-29NC	CS-30NC	CS-31F	CS-42FC	CS-43FC	CS-45FC

4.

4

## Cable to Rebar

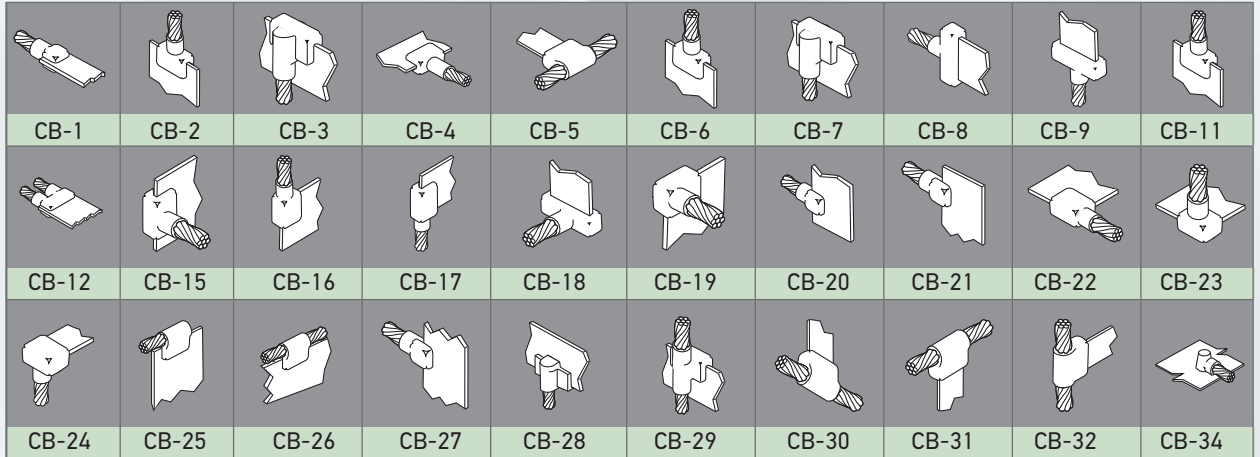
CRE-1P	CRE-3P	CRE-4P	CRE-5P	CRE-6P	CRE-17P	CRE-18P	CRE-19P	CRE-20P	CRE-2
CRE-6	CRE-7	CRE-8	CRE-9	CRE-11	CRE-12	CRE-13	CRE-14	CRE-15	CRE-16
CRE-17	CRE-18	CRE-19	CRE-20						



4.

5

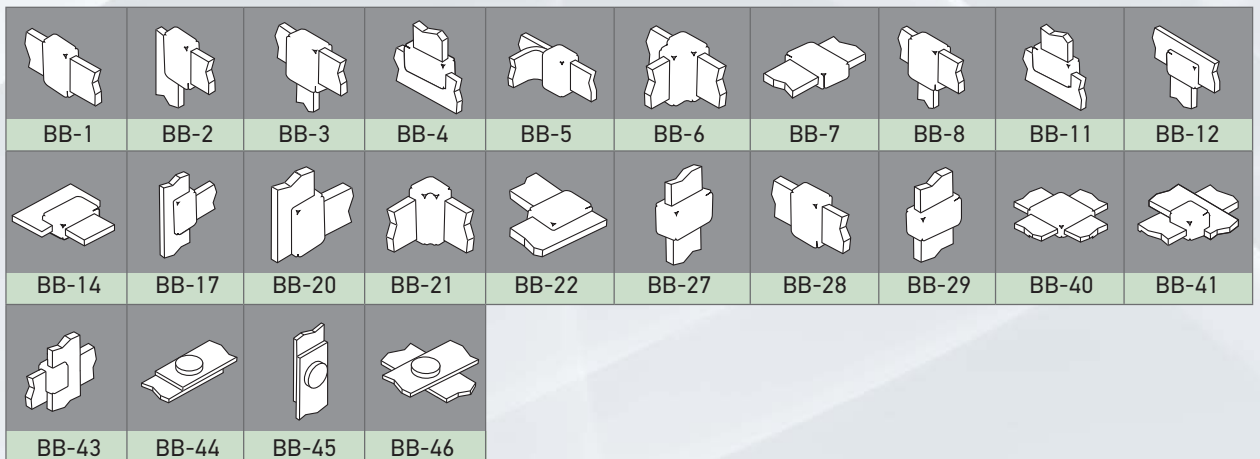
## Cable to Tape



4.

6

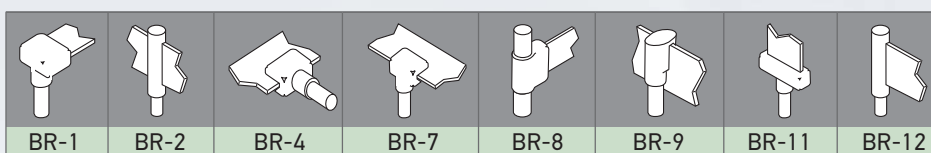
## Tape to Tape



4.

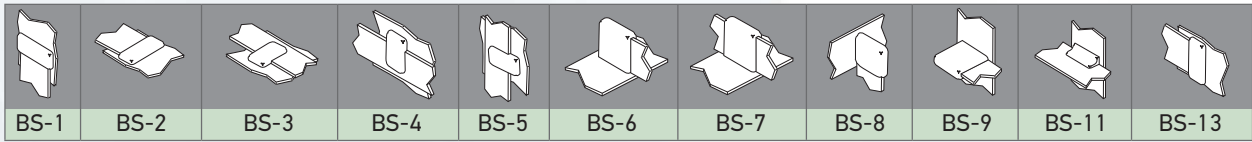
7

## Tape to Ground Rod



# 4. 8

## Tape to Surface



# 4. 9

## Tools & Accessories

mould	 [TYPE-C]	handle clamp	 [HCC00]	mould brush	 [KTA007]
scraper	 [KTA008-011]	flint igniter	 [KTA014]	tool box	 [KTA001]
metal powder					

Item No.	Size
KW15	15 gr
KW25	25 gr
KW32	32 gr
KW45	45 gr
KW65	65 gr
KW90	90 gr
KW115	115 gr
KW150	150 gr
KW200	200 gr
KW250	250 gr

# 4.

# 10

## Instructions for exothermic welding

### 1.

**STEP 1:** Assemble mould with handle clamp.



### 2.

**STEP 2:** Fit conductors snugly into the mould and lock the handle clamp.



### 3.

**STEP 3:** Heat by butane torch to ensure the mould is totally dry before every joint.

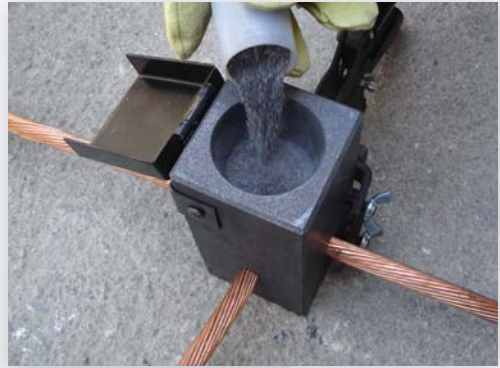


### 4.

**STEP 4:** Place retaining disk ensuring the disk sits well at the base of the weld metal cavity.



**5.** **STEP 5:** Pour a recommended size of weld metal powder into the mould crucible. Check for leaks of weld metal powder.



**6.** **STEP 6:** Loosen starting powder from the bottom of tube. Pour 2/3 of it on top of the weld metal and 1/3 on the mouth of mould.



**7.** **STEP 7:** Ignite the starting powder at the lid opening by flint gun. The process takes 30 - 60 second.



**8.** **STEP 8:** Complete Connection



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 Earthing Materials  
 Surge Protection **OBO-BETTERMANN**  
 Exothermic welding **KUMWELL**

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