

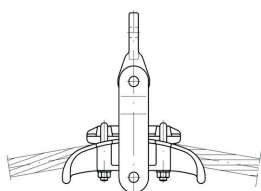
Earth wire fittings

General	120
Material	122
Note about this part of the catalogue	122
C-bracket	123
Suspension clamp with bolt, with straps for steel and copper conductors	123
Hängeklemme with bolt, with shackle for steel and copper conductors	124
Suspension clamp with bracket, casted for aluminium based conductors	124
Suspension clamp with bracket, forged for aluminium based conductors	125
Suspension clamp with bracket for steel and copper conductors	125
Earthwire bracket with parallel groove clamp, double for aluminium based conductors	126
Earthwire bracket with parallel groove clamp, triple for aluminium based conductors	126
Earthwire bracket with parallel groove clamp, quad for aluminium based conductors	127
Shunt copper, insulated	127
Shunt aluminium	128
Earthing clamp aluminium	128
Earthing clamp steel	129
Aircraft Warning Marker Aurora	130

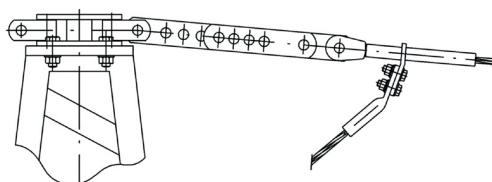


General

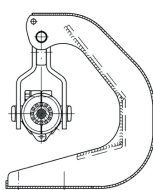
Ground wires provide earth protection for overhead power lines and protecting from lightning strikes. They grounded system releases high energy safely, providing minimum disruption to the power delivery system. Earth wires should be mounted at the highest positions of support structures to provide highest levels of protection. Earthwires are mainly steel coated wires, eg ACS. ACSR conductors are also commonly used.



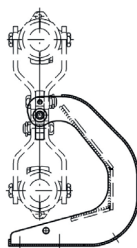
Example for the suspension of an earthwire suspension clamp



Example for a tension point



Earthwire C-bracket with suspension clamp



C-bracket with higher degree of movement



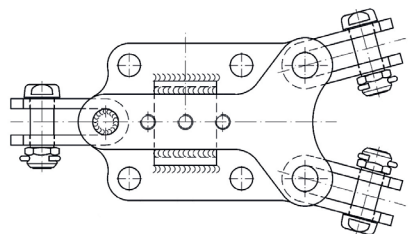
C-bracket with a central plate

At suspension points, oscillating suspension clamps are mostly used allowing controlled movement, and typically mounted onto C- brackets providing protection from vibration. This system offers significant vibration protection advantages over rigid fastening, by allowing controlled freedom of movement preventing damage.

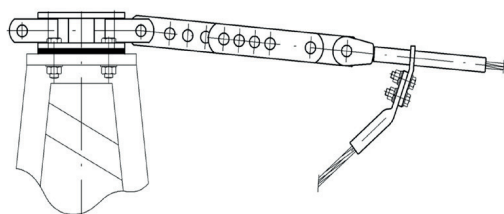
C-brackets

C-bracket supports offered in the table provide special type options, e.g. higher degrees of movement at the hinge connection, providing movement $>200^\circ$ for the suspension clamp. Full vertical orientation of the clamp is also possible. C-bracket mounting base plates can also be adapted to suit specific tower mounting plates.

A type with a central plate is also available.



Earthwire bracket



Groundwire bracket with insulating accessories

Earthwire suspension and tension brackets

There are many options available, both with and without earth clamps. If only one conductor is to be clamped, the opposite groove can be fitted with a filler piece. Bracket attachments are not supplied with screws as standard. These can be provided separately once attachment details are confirmed. Different clamp bore sizes and spacing are also available, complete with corresponding screw lengths and sizes. Tension brackets can also be adapted to suit specific applications.

Groundwires tension clamps fittings are commonly wedge, compression or helical types, all described in part [Arcing devices](#) and part [Material for fibre optic lines](#). To facilitate measurement of the earthing resistance insulating accessories are available for suspension and tension sets, which must then be earthed to the support structure by means of flexible connections.

To ensure low electrical resistance of the earth

grounding system, **earth bonding accessories** are used to bond tension and suspension brackets to the tower structure. A range of flexible earth bonds are used and available.



Warning Marker

Warning Markers

Warning Markers are installed on groundwires to warn low flying aircraft of the elevated obstacles. These are generally positioned on routes near airports and elevated spans on the uppermost earthwire cable. The warning device consists of two hemispheres attached to the groundwire by two bolted clamps. The Markers are 600 mm diameter; all other details available on request. The Warning Markers can be delivered in three different Types of UV and ozone resistant colours - red, orange and white or alternating - white/orange or white/red.



Reflecting Aircraft Warning Marker

Reflecting Aircraft Warning Markers ,AURORA'

The Aircraft Warning Marker is provided with a reflecting special foil that helps to guarantee that its visibility is increased significantly, especially at dawn and at night. Clamping systems that enable easy installation guarantee rapid and safe assembly from a cable trolley as well as from a helicopter. The Aircraft Warning Marker is designed to withstand the most severe environmental conditions and is equipped with clamps that are suitable for all conductor types with elastomere inserts that will help to protect the conductor. A key feature is the UV resistance of the plastic body that ensures the colour is maintained for many years.

Material

- All materials used are fully compatible with the conductor application. For example, clamps attached to aluminium based conductors are manufactured from high strength corrosion resistant aluminium alloys.
- Unless otherwise specified, all ferrous components are hot dipped galvanized acc. to *EN 61284* or *ISO EN 1461*; Overhead lines requirements and tests for fittings. Where stainless steel fasteners are used, *ISO EN 3506*; Mechanical properties of corrosion resistant stainless steel fasteners - Part 1: Bolts, screws and studs are specified.
- For special cases where big dynamic loads may occur at low temperatures, fittings made of low-temperature (cryogenic) steels are available.
- For lines constructed in higher corrosive atmospheres and environments, the minimum zinc thickness of fittings can be increased from 85 µ to 110 µ or 130 µ Microns.
- All fitting assemblies supplied have **identification marking** according to *EN 61284*; this includes manufactures mark and date code, specified minimum mechanical failure load, and 1 second short circuit current withstand rating.
- Eye-clevis connections are designed acc. to *IEC 61471* and *DIN 48074* - Eyes and clevises; connecting dimensions, Bolts acc. to *DIN 48073* - Connecting bolts for overhead power lines. Bolt security split pins are manufactured in stainless steel. Copper tinplated types can be also be supplied.

Note about this part of the catalogue

Fittings for **fibre optic cables** can be found in Part [material for fibre optic lines](#) of the catalogue.

Suspension clamps, tension clamps, and conductor attachment parallel groove clamps are described in Parts [suspension clamps](#), [tension clamps and joints](#) and [parallel groove clamps](#).

Other accessories, shackles, links, turnbuckles and materials used can be found in Part [string hardware](#).

Heliformed products according to Part [suspension clamps](#), [tension clamps and joints](#).

For **Vibration control devices**, please refer to Part [vibration dampers](#).

C-bracket



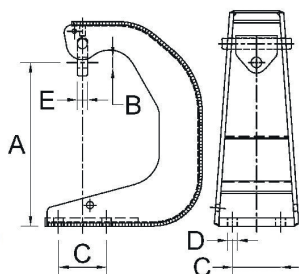
material: steel, **welded**, hot dip galvanized

L.-Nr.	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	max.vertical load kN	max.horizontal load kN	kg
4654.01S	265	20	90	18	20	30	15	13,65
4654.03	310	20	90	18	20	30	15	18,40
4654.04	310	20	90	18	20	40	70	23,20
4654.01	265	20	90	18	20	45	20	12,80

C-brackets for conductor uplift and with other hole centres or equipped with insulating accessories are available upon request.

Fastening screws can be delivered upon request.

Other types are available upon request.



Suspension clamp

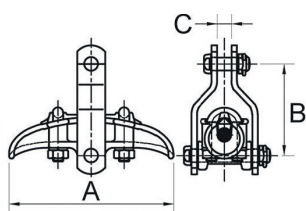
with bolt, with straps for steel and copper conductors



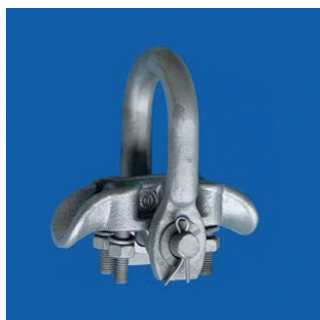
material: malleable or ductile iron, hot dip galvanized; steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	bolt	kN	kA 1s	kg
4337.02/5	6,0 - 12,7	130	100	20	19	55	15	1,80
4337.00	9,0 - 16,5	210	150	20	19	120	32	3,10

Other dimensions are available upon request.



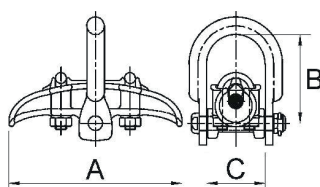
Hängeklemme with bolt, with shackle for steel and copper conductors



material: malleable or ductile iron, hot dip galvanized; steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	bolt	kN	kA 1s	kg
4337.02/4	6,0 - 12,7	130	100	52	16	120	18	1,50
4337.00/1	9,0 - 16,5	210	100	52	19	80	16	2,51

Other dimensions are available upon request.



Suspension clamp with bracket, casted for aluminium based conductors



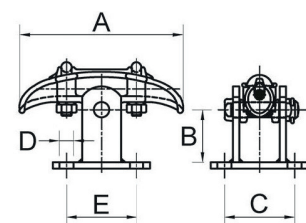
material: aluminium, casted; steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	kN	kA 1s	kg
4616.04	9,0 - 16,5	210	35	90	18	90	100	22	2,60
4616.05	16,5 - 22,1	230	45	90	18	90	120	30	3,10
4616.07	25,0 - 32,0	250	50	90	18	90	130	32	3,40

Suspension clamps with brackets having other hole centres and with insulating accessories are available upon request.

Fastening screws can be delivered upon request.

Other types are available upon request.



Suspension clamp with bracket, forged for aluminium based conductors



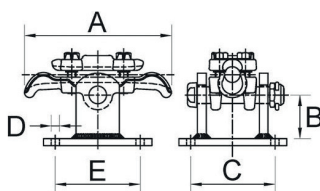
material: aluminium, **forged** steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	kN	kA 1s	kg
4616.10	13,5 - 17,5	170	35	90	18	90	100	32	3,10
4616.12	18,5 - 23,0	190	50	90	18	90	80	32	2,26

Suspension clamps with brackets having other hole centres and with insulating accessories are available upon request.

Fastening screws can be delivered upon request.

Other types are available upon request.



Suspension clamp with bracket for steel and copper conductors



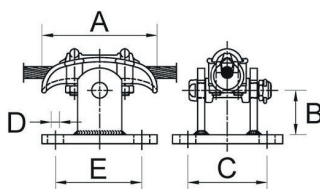
material: malleable or ductile iron, hot dip galvanised

L.-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	kN	kA 1s	kg
4615.01	6,0 - 12,7	130	50	90	18	90	100	16	2,64
4615.02	9,0 - 16,5	210	60	90	18	90	50	22	3,37

Suspension clamps with brackets having other hole centres and with insulating accessories are available upon request.

Fastening screws can be delivered upon request.

Other types are available upon request.

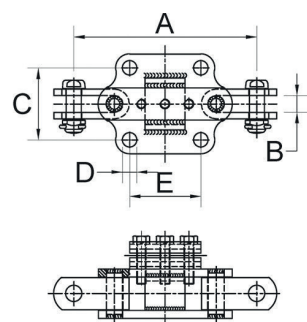


Earthwire bracket with parallel groove clamp, double for aluminium based conductors



material: aluminium; steel, hot dip galvanized

L-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	bolt	kN	kA 1s	kg
4652.02	8,2 - 11,7	230	21	90	18	90	19	100	30	3,89
4652.03	11,8 - 15,8	230	21	90	18	90	19	100	20	3,88
4652.04	15,9 - 19,2	230	21	90	18	90	19	100	20	4,05
4652.06/8	17,3 - 19,2	300	20	90	18	90	19	230	40	7,60
4652.06/1	19,1 - 21,0	300	20	90	18	90	19	230	40	7,80
4652.06/2	21,1 - 23,4	300	20	90	18	90	19	230	40	8,37



Earth wire brackets without parallel groove clamps or with parallel groove clamps that are made of other materials and have other hole centres can be delivered upon request.

Fastening screws can be delivered upon request.

Filling pieces for the clamp groove can be delivered, if necessary.

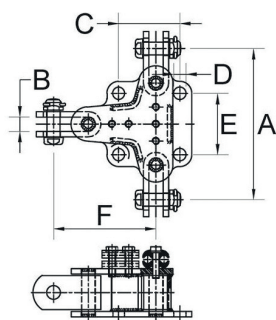
Other types are available upon request.

Earthwire bracket with parallel groove clamp, triple for aluminium based conductors



material: aluminium; steel, hot dip galvanized

L-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	bolt	kN	kA 1s	kg
4653.10/1	8,20 - 11,70	222	21	90	18	90	151	19	160	32	5,67
4653.13	11,80 - 15,80	222	21	90	18	90	151	19	160	32	7,60
4653.09/1	15,80 - 19,20	214	21	90	18	90	148	19	160	32	5,85



Earth wire brackets without parallel groove clamps or with parallel groove clamps that are made of other materials and have other hole centres can be delivered upon request.

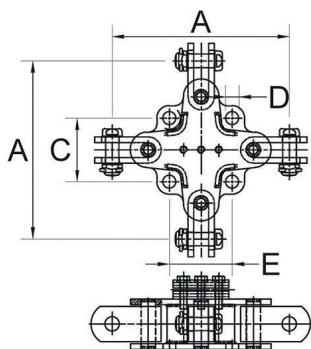
Fastening screws can be delivered upon request.

Filling pieces for the clamp groove can be delivered, if necessary.

Models with only one parallel groove clamp are available upon request.

Other types are available upon request.

Earthwire bracket with parallel groove clamp, quad for aluminium based conductors



material: aluminium; steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	bolt	kN	kA 1s	kg
4653.40/2	8,20 - 11,70	252	21	90	18	90	19	160	32	6,60
4653.40	11,80 - 13,00	252	21	90	18	90	19	160	32	6,62
4653.0001	15,90 - 19,20	252	21	90	18	90	19	160	32	5,80
4653.40/1	19,30 - 24,60	252	21	90	18	90	19	160	32	7,00

Earth wire brackets without parallel groove clamps or with parallel groove clamps that are made of other materials and have other hole centres can be delivered upon request.

Fastening screws can be delivered upon request.

Filling pieces for the clamp groove can be delivered, if necessary.

Other types are available upon request.

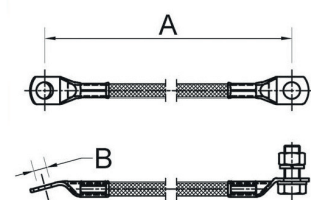
Shunt copper, insulated



material: high flexible copper wire, insulated; copper, tinned; steel, hot dip galvanized

L.-Nr.	A (mm)	B (mm)	cross section (sq mm)	screw	kA 1s	kg
4664.01/3A	500	17	70	M12 x 30	14	0,60
4664.01/5A	1000	17	70	M12 x 30	14	1,00
4664.01/6A	1500	17	70	M12 x 30	14	1,30
4664.31/1A	500	17	95	M12 x 35	19	0,72

Other lengths and connections are available upon request.



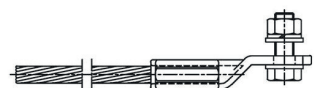
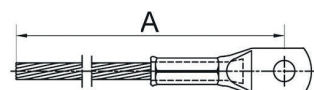
Shunt aluminium



material: aluminium; steel, hot dip galvanized

L.-Nr.	A (mm)	cross section (sq mm)	screw	kA 1s	kg
4664.35	500	70	M12 x 35	8	0,20
4664.35/1	1000	70	M12 x 35	8	0,30
4664.36	1000	95	M12 x 35	11	0,39
4664.0004	1000	95	M12 x 35	11	0,44
4664.36/1	1500	95	M12 x 35	11	0,51
4664.45	1000	120	M12 x 35	14	0,45
4664.45/10	1500	120	M12 x 35	14	0,70

Other lengths and connections are available upon request.



Earthing clamp aluminium

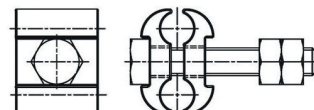


material: aluminium; steel, hot dip galvanized

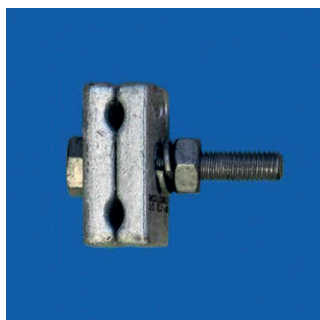
L.-Nr.	cond. Ø (mm)	screw	kA 1s	kg
4680.58/1	8,1 - 11,7	M10 x 60	16	0,10
4680.60/1	11,8 - 15,8	M10 x 70	20	0,14
4680.59	15,9 - 19,2	M12 x 70	28	0,20
4680.61	19,3 - 24,6	M12 x 80	40	0,30

Earthing clamps made of copper are available upon request.

Other types are available upon request.



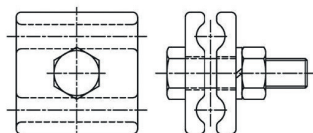
Earthing clamp steel



material: steel, hot dip galvanized

L.-Nr.	cond. Ø (mm)	screw	kA 1s	kg
4680.32	6,0 - 13,0	M10 x 60	8	0,29
4680.30/1	8,0 - 12,0	M12 x 50	8	0,35
4680.33/3	11,7 - 15,7	M12 x 70	12	0,38

Other dimensions are available upon request.



Aircraft Warning Marker Aurora



Reflecting Aircraft Warning Marker

Choose required number of each possible option according to tables below (digit 1 - 11).
Correct No. is for example as follows: 9221.11S107

Digit 1-5	No.	Size of warning marker Ø (mm)
	9221.	600
Digit 6	No.	Colour of main body
	1	RAL 9016 (traffic white)
	2	RAL 3020 (traffic red)
Digit 7	No.	Applied (reflective) foil
	0	no foil applied
	1	4081 fluorescent yellow
Digit 8	No.	Clamp size for conductor Ø (mm)
	S	12,0 - 26,9
	M	27,0 - 36,9
	L	37,0 - 46,9
	X	47,0 - 56,9
Digit 9	No.	Kind of clamping
	1	single clamp (only outside)
	2	double clamp (in- and outside)
Digit 10-11	No.	Rubber for conductor Ø (mm)
	00	no rubbers included
	06	12,0 - 12,9
	07	13,0 - 13,9
	08	14,0 - 14,9
	09	15,0 - 15,9
	10	16,0 - 16,9
	11	17,0 - 17,9
	12	18,0 - 18,9
	13	19,0 - 19,9
	14	20,0 - 20,9
	15	21,0 - 21,9
	16	22,0 - 22,9
	17	23,0 - 23,9
	18	24,0 - 24,9
	19	25,0 - 25,9
	20	26,0 - 26,9

Clamp size "S"

Elastomere inserts for sizes M, L, X on demand.
Warning Markers can only be used with inserts.