Contents

Materials for fibre optic lines

GENERAL

Earth wires are for grounding overhead lines and to protect them against atmospheric discharges and lightning strikes. The conductors used vary widely. To cover the permanent growing demand on data-transmission lines, in recent years, the earth wires of overhead lines include fibre optic elements, which allow a fast and safe transmission of a large quantity of information. In the very beginning optical fibres were used in companies mainly for internal data transmission and remote control. Nowadays these fibres are also used by external organisations for several kinds of transmission. High voltage transmission lines will not only be used for carrying current, they also play an important part in international telecommunications and data-transmission.

Earth wires with optical fibres are called – OPGW– optical ground wires.

Normal types of strain- and supporting-fittings cannot be used here. They would result in radial forces too great for this very sensitive type of conductor. For this reason it is necessary to use helical fittings or specially adapted clamps e.g. cone type strain clamps. These fittings do not stress the conductor with excessive radial forces.

Metal free aerial cables with fibre optics (ADSS), cannot be used as earth cables because of their dielectrical construction. Such types of cables will be installed additionally on overhead lines for data transfer.

Basically the same fittings will be used as for OPGW cables except no grounding is necessary. Metal free cables installed along railways or short distance installations will be supported by suspension rollers. On the one hand this technique guarantees cost-effective installation, because the suspension rollers will also be used for pulling through the cable during installation, and on the other hand they will guarantee safe operation, because the cable can move within the rollers in case of contact from falling parts of trees or if there is heavy icing.

Short circuit capability

The clamps have a good short circuit capability, which is achieved by a secure encasement of the conductor and by a large contact area. The connecting parts such as eyes, bolts etc. are matched to customer requirements.

Standards

Connecting bolts acc. to DIN 48073.
Split pins are made of stainless steel or tinned copper.
Clevis eye connections acc. to DIN 48074 resp. IEC Publication 471.

Hot dip galvanising

Steel hardware is hot dip galvanised in Mosdorfer's own plant.
Galvanising can be done in accordance to national and international standards.

abbreviation for bolts
S = screw bolt
N = rivet bolt

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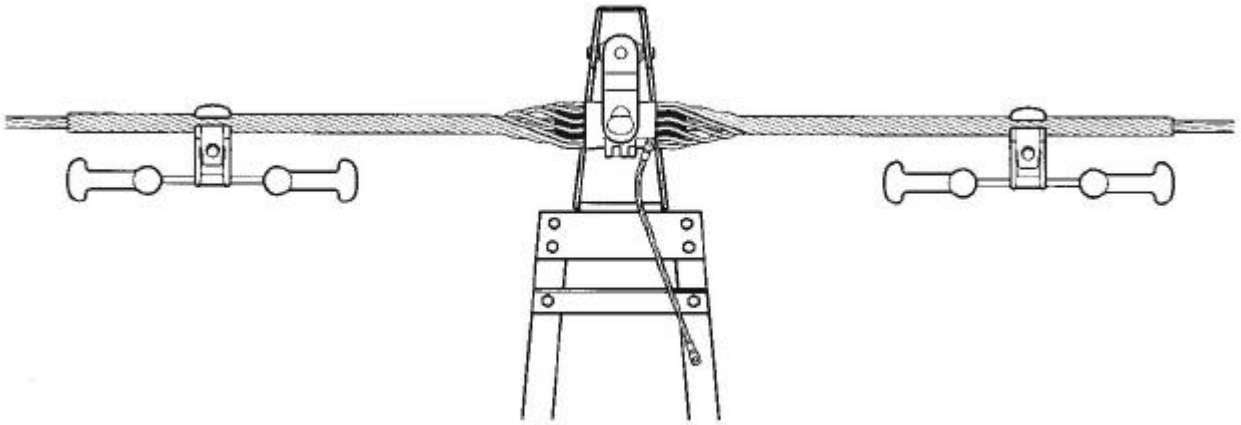
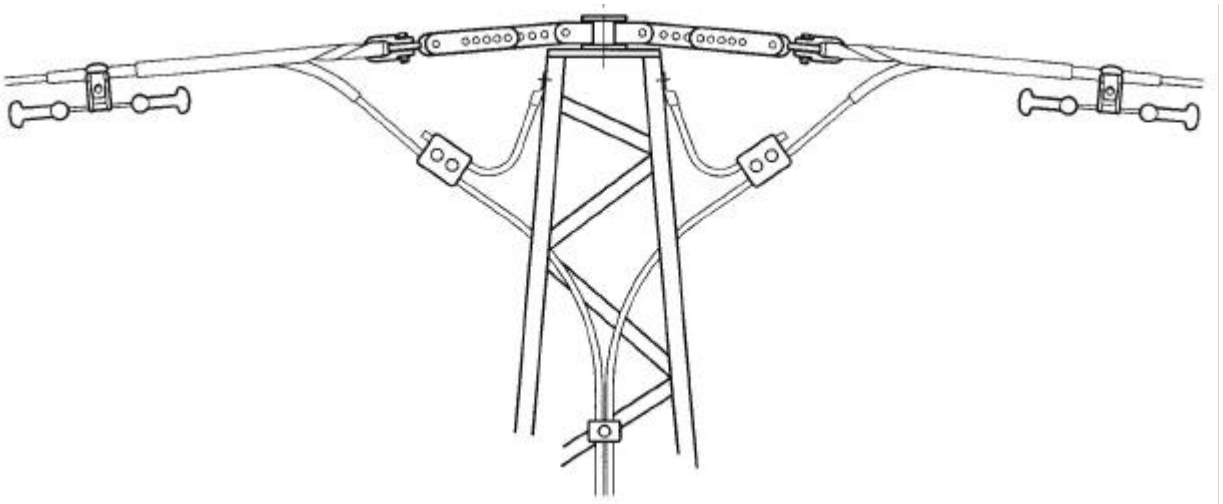
FITTINGS FOR OPGW



View of a suspension point with C-shaped bracket



View of a tension point with down lead clamps

SUSPENSION POINTS

C-brackets welded

This C-shaped suspension bracket, which is „open“ on one side gives excellent accessibility and movement for the attached suspension clamps. They can be equipped with several types of suspension clamps.

Standardtype

Material: Steel, hot dip galvanised								
L.-Nr.	Dimensions in mm		Base plate		max. stat. load		Short circuit current	Weight
	Height	for bolt	Hole centres	for bolts	hor. kN	vert. kN	kA	kg
4654.01	265	19	90 x 90	M 16	15	30	40	13,00
4654.01/2	265	19	90 x 90	M 16	15	30	40	13,00
4654.03	310	19	90 x 90	M 16	15	30	40	18,00
4654.01/H	265	19	90 x 90	M 16	20	30	40	14,50*
4654.04	310	19	90 x 90	M 16	60	30	40	24,00

* Special designs for pulling up.

Other designs of the mounting plate are available upon request. If an insulated design is required, please state this separately on your order. Certain dimensions of bolts are also available on request.

Type for pulling up

For special applications, where summer and winter seasons gives dissimilar loads, it is necessary to use a modified type of the standard C-shaped suspension bracket. As shown on the picture beside, the eye-bearing is designed so that the hinge can move over an angle of >200°. This guarantees, in the pulling up of the conductor, that the suspension clamp can move and adjust vertically and gives no bending stress to the hinge, the suspension eye or in the worst case to the OPGW-cable.

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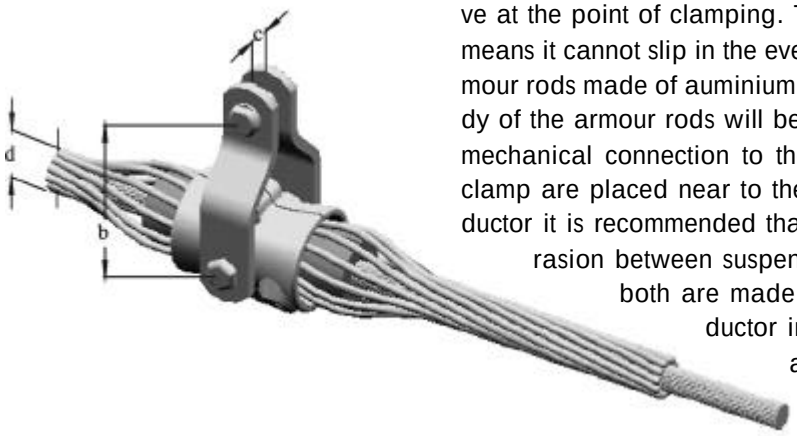
Armour grip suspension clamps

trunnion type
for conductors with aluminium- or aluminium-alloy-outer strands and cables.

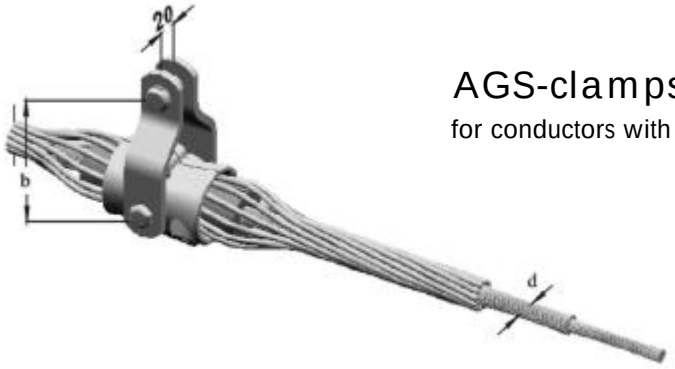


With this suspension clamp the conductor will be protected by a neoprene-sleeve at the point of clamping. The special concave shaped design of the sleeve means it cannot slip in the event of a one sided load through the conductor. Armour rods made of auminium alloy cover the conductor and the sleeve. The body of the armour rods will be fastened by an aluminium clamp. This gives the mechanical connection to the suspension point. The connection bolts of the clamp are placed near to the conductor axis. Depending on the type of conductor it is recommended that reinforcing rods are used. To minimize the abrasion between suspension eye and the connection bolts of the clamp, both are made of steel. AGS-clamps can be used up to a conductor installation angle of 30°. A conductor installation angle of up to 60° can be achieved by using two AGS-clamps.

Material: Clamp: aluminium-alloy, forged
Insert: neoprene
Rods: aluminium-alloy
Trunnion: steel, hot dip galvanised
Straps: steel, hot dip galvanised

L.-Nr.	Conductor Ø	Length of rods	Dimensions in mm b	c	Connecting bolt	d	Breaking strength kN	Short circuit current kA	Weight kg
4361.01/1	9,91–10,28	1800	80	20	S19	17,33–17,62	50	25	1,80
4361.02/1	10,29–10,63	1800	80	20	S19	17,33–18,05	50	25	1,80
4361.03/1	10,64–11,04	1800	80	20	S19	18,06–18,46	50	25	1,80
4361.04/1	11,05–11,45	1800	80	20	S19	18,47–18,87	50	25	1,80
4361.05/1	11,46–11,95	1800	80	20	S19	18,88–19,37	50	25	1,80
4361.06/1	11,96–12,23	1800	80	20	S19	19,38–19,65	50	25	1,80
4361.07/1	12,24–12,69	1800	80	20	S19	20,72–21,17	50	25	1,90
4361.08/1	12,70–13,02	1800	80	20	S19	21,18–21,50	50	25	1,90
4361.09/1	13,03–13,48	1800	80	20	S19	21,51–21,96	50	25	2,00
4361.10/1	13,49–13,78	1800	80	20	S19	21,97–22,26	50	25	2,00
4361.11/1	13,79–14,11	1800	90	20	S19	23,03–23,35	80	32	2,30
4361.12/1	14,12–14,57	1800	90	20	S19	23,36–23,81	80	32	2,30
4361.13/1	14,58–15,10	1800	90	20	S19	23,82–24,34	80	32	2,40
4361.14/1	15,11–15,41	1800	90	20	S19	24,35–24,65	80	32	2,40
4361.15/1	15,42–15,74	1800	90	20	S19	24,66–24,98	80	32	2,40
4361.16/1	15,75–16,40	2000	90	20	S19	24,99–25,64	80	32	2,60
4361.17/1	16,41–17,11	2000	90	20	S19	26,77–27,47	80	32	3,10
4361.18/1	17,12–17,54	2000	90	20	S19	27,48–27,90	80	32	3,10
4361.19/1	17,55–18,05	2000	90	20	S19	27,91–28,41	80	32	3,10
4361.20/1	18,06–18,58	2000	90	20	S19	28,42–28,94	80	32	3,20
4361.21/1	18,59–19,07	2000	90	20	S19	28,95–29,43	80	32	3,20
4361.22/1	19,08–19,52	2000	120	20	S19	31,78–32,22	110	35	4,40
4361.23/1	19,53–20,21	2000	120	20	S19	32,23–32,91	110	35	4,50
4361.24/1	20,22–20,95	2000	120	20	S19	32,92–33,65	110	35	4,50
4361.25/1	20,96–21,48	2000	120	20	S19	33,66–34,18	110	35	4,50
4361.26/1	21,49–22,11	2000	120	20	S19	34,19–34,81	110	35	4,50
4361.27/1	22,12–22,70	2200	120	20	S19	34,82–35,40	110	35	5,00
4361.28/1	22,71–23,05	2200	120	20	S19	35,41–35,75	110	35	5,00
4361.29/1	23,06–23,38	2200	140	20	S19	35,76–36,08	110	35	5,70
4361.30/1	23,39–23,82	2200	140	20	S19	36,09–36,52	110	35	5,70
4361.31/1	23,83–24,45	2200	140	20	S19	36,53–37,15	110	35	5,80

Materials for fibre optic lines



AGS-clamps with reinforcing rods

for conductors with aluminium- or aluminium-alloy outer strands and cables.

Material: Clamp: aluminium-alloy, forged
Insert: neoprene
Rods: aluminium-alloy
Trunnion: steel, hot dip galvanised
Straps: steel, hot dip galvanised

L.-Nr.	Dimensions in mm						Breaking strength kN	Short circuit current kA	Weight kg
	Conductor Ø	Length of rods	L. of reinf. rods	b	Connecting bolt	d			
4362.00/09	9,91–10,26	1270	1670	90	S19	16,05–16,40	50	32	2,70
4362.00/08	10,27–10,51	1370	1770	90	S19	16,41–16,65	50	32	2,70
4362.00/07	10,52–10,97	1370	1770	90	S19	16,66–17,11	50	32	2,80
4362.00/06	10,98–11,09	1370	1770	90	S19	17,12–17,23	50	32	2,90
4362.00/1	11,10–11,40	1370	1770	90	S19	17,24–17,54	50	32	2,90
4362.01/1	11,41–11,78	1370	1770	90	S19	17,55–17,92	50	32	3,00
4362.02/2	11,79–11,91	1370	1770	90	S19	17,93–18,05	50	32	3,00
4362.03/1	11,92–12,46	1400	1770	90	S19	18,06–18,60	50	32	3,10
4362.05/1	12,47–12,93	1420	1820	90	S19	18,61–19,07	50	32	3,20
4362.04/1	12,94–13,25	1520	1920	120	S19	19,08–19,39	50	32	4,60
4362.06/1	13,26–13,38	1520	1920	120	S19	19,40–19,52	80	35	4,60
4362.07/1	13,39–14,01	1520	1920	120	S19	19,53–20,15	80	35	4,70
4362.08/1	14,02–14,81	1550	1950	120	S19	20,16–20,95	80	35	4,80
4362.09/1	14,82–14,87	1630	1950	120	S19	20,96–21,01	80	35	4,80
4362.10/1	14,88–15,28	1650	2050	120	S19	22,30–22,70	80	35	4,90
4362.11/1	15,29–15,41	1650	2050	120	S19	22,71–22,83	80	35	5,00
4362.12/1	15,42–15,63	1650	2080	120	S19	22,84–23,05	80	35	5,10
4362.13/1	15,64–15,96	1680	2080	140	S19	23,06–23,38	80	35	6,60
4362.16/1	15,97–16,02	1680	2080	140	S19	23,39–23,44	80	35	6,60
4362.17/1	16,03–16,40	1680	2080	140	S19	23,45–23,82	80	35	6,60
4362.18/1	16,41–16,65	1700	2080	140	S19	23,83–24,07	80	35	6,60
4362.14/1	16,66–17,03	1700	2440	140	S19	24,08–24,45	110	35	6,70
4362.19/2	17,04–17,26	1730	2440	140	S19	24,46–24,68	110	35	6,80
4362.15/1	17,27–17,64	1730	2440	140	S19	24,69–25,06	110	35	6,80
4362.21/1	17,65–17,87	1750	2440	140	S19	25,07–25,29	110	35	6,80
4362.20/1	17,88–18,12	1750	2150	140	S19	25,30–25,54	110	35	6,40
4362.22/1	18,13–18,55	2030	2480	150	S19	25,55–25,97	110	35	10,10
4362.23/1	18,56–18,81	2080	2480	150	S19	25,98–26,23	110	35	10,10
4362.24/1	18,82–19,01	2080	2480	150	S19	26,24–26,43	110	35	10,20
4362.25/1	19,02–19,88	2080	2480	150	S19	26,44–27,30	110	35	10,20
4362.26/1	19,89–20,13	2080	2480	150	S19	27,31–27,55	110	35	10,20
4362.27/1	20,14–20,28	2080	2480	150	S19	27,56–27,70	110	35	10,40
4362.29/1	20,29–20,99	2080	2480	150	S19	27,71–28,41	110	35	10,40
4362.28/1	21,00–21,35	2080	2480	150	S19	28,42–28,77	110	35	10,40
4362.30/1	21,36–21,45	2080	2480	150	S19	28,78–28,87	110	35	10,60
4362.31/1	21,46–21,86	2080	2480	150	S19	28,88–29,28	110	35	10,60
4362.32/1	21,87–22,44	2080	2480	150	S19	29,29–29,86	110	35	10,60
4362.33/1	22,45–22,82	2080	2480	150	S19	29,87–30,24	110	35	10,60
4362.34/1	22,83–23,51	2240	2640	155	S19	31,31–31,99	120	40	12,80
4362.35/1	23,52–24,25	2240	2640	155	S19	32,00–32,73	120	40	12,80
4362.36/1	24,26–25,06	2240	2640	155	S19	33,50–34,30	120	40	12,90
4362.37/1	25,07–25,19	2240	2640	155	S19	34,31–34,43	120	40	13,10

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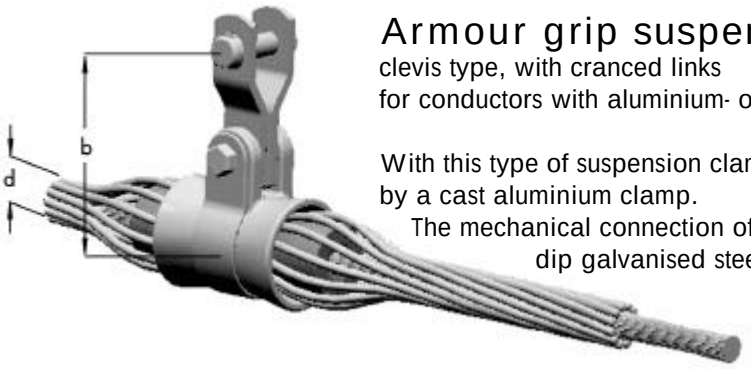

Armour grip suspension clamps

clevis type, with cranced links
for conductors with aluminium- or aluminium-alloy-outer strands and cables.

With this type of suspension clamp the Armour rods and the neoprene insert are enclosed by a cast aluminium clamp.
The mechanical connection of the clamp to the suspension point is provided by a hot dip galvanised steel clevis eye.

Material: Clamp: aluminium-alloy, casted
Insert: neoprene
Rods: aluminium-alloy
Trunnion: steel, hot dip galvanised
Straps: steel, hot dip galvanised

L.-Nr.	Dimensions in mm						Breaking strength kN	Short circuit current kA	Weight kg
	Conductor Ø	Length of rods	Width of clevis	b	Connecting bolt	d			
4361.01/1/A	9,91–10,28	1800	20	145	S19	17,33–17,62		25	1,8
4361.02/1/A	10,29–10,63	1800	20	145	S19	17,33–18,05	41	25	1,8
4361.03/1/A	10,64–11,04	1800	20	145	S19	18,06–18,46	41	25	1,8
4361.04/1/A	11,05–11,45	1800	20	145	S19	18,47–18,87	41	25	1,8
4361.05/1/A	11,46–11,95	1800	20	145	S19	18,88–19,37	41	25	1,9
4361.06/1/A	11,96–12,23	1800	20	145	S19	19,38–19,65	41	25	1,9
4361.07/1/A	12,24–12,69	1800	20	145	S19	20,72–21,17	45	25	2,1
4361.08/1/A	12,70–13,02	1800	20	145	S19	21,18–21,50	45	25	2,1
4361.09/1/A	13,03–13,48	1800	20	145	S19	21,51–21,96	45	25	2,2
4361.10/1/A	13,49–13,78	1800	20	145	S19	21,97–22,26	45	25	2,2
4361.11/1/A	13,79–14,11	1800	20	143	S19	23,03–23,35	45	25	2,4
4361.12/1/A	14,12–14,57	1800	20	143	S19	23,36–23,81	45	25	2,5
4361.13/1/A	14,58–15,10	1800	20	143	S19	23,82–24,34	45	25	2,5
4361.14/1/A	15,11–15,41	1800	20	143	S19	24,35–24,65	45	25	2,5
4361.15/1/A	15,42–15,74	1800	20	143	S19	24,66–24,98	45	25	2,5
4361.16/1/A	15,75–16,40	2000	20	143	S19	24,99–25,64	45	25	2,6

The clevis width is 20 mm. Other dimensions on request.

L.N° refers to right hand lay, for left hand lay please add /L, for example 4361.03/L.
Other dimensions on request.
AGS clamps for conductors with alumoweld-outer strands on request.

AGS-clamps with fixing bracket

Trunnion type
for conductors with aluminium- or aluminium-alloy outer stands.

Dimensions on request.

TENSION POINTS

Tension brackets welded

for bolts M16
for aluminium-, al-alloy-, ACSR-, AACSR- and alumoweld conductors.

Ground wire brackets are designed so that movement in all directions is guaranteed. The conductor will be directed safely by the clamp. The clamps are adjusted to suit the actual conductor diameter.

Material: Bracket: steel, hot dip galvanised
PG-clamp: aluminium-alloy

L.-Nr.	Dimensions in mm						Breaking strength kN	Short circuit current kA	Weight kg
	Conductor Ø	Hole-centers	for bolts	Link height	Link width	Bolt			
4652.02/0	without clamp	90 x 90	M16	40	21	S19	100	40	3,60
4652.06/01	without clamp	90 x 90	M16	60	21	S19	230	40	7,00
4652.02	8,2–11,7	90 x 90	M16	40	21	S19	100	40	4,10
4652.03/2	11,8–13,0	90 x 90	M16	40	21	S19	100	40	4,10
4652.02/2	13,1–14,4	90 x 90	M16	40	21	S19	100	40	4,10
4652.03/3	14,5–16,0	90 x 90	M16	40	21	S19	100	40	4,10
4652.03/1	15,9–17,4	90 x 90	M16	40	21	S19	100	40	4,10
4652.03/10	15,9–17,4	90 x 90	M16	60	21	S22	310	50	8,20
4652.04	17,5–19,2	90 x 90	M16	40	21	S19	100	40	4,10
4652.06/1	19,1–21,0	90 x 90	M16	60	21	S19	230	40	7,80
4652.06	21,1–23,4	90 x 90	M16	60	21	S22	230	50	7,20

Other types on request.
In case isolation is needed please state in the order.
Insulation bolts to be delivered on request.

Earth wire brackets

with 3- or 4-hinges

Earth wire brackets with 3 hinges
Serial-Nr. 4653…

Earth wire brackets with 4 hinges
Serial-Nr. 4653…

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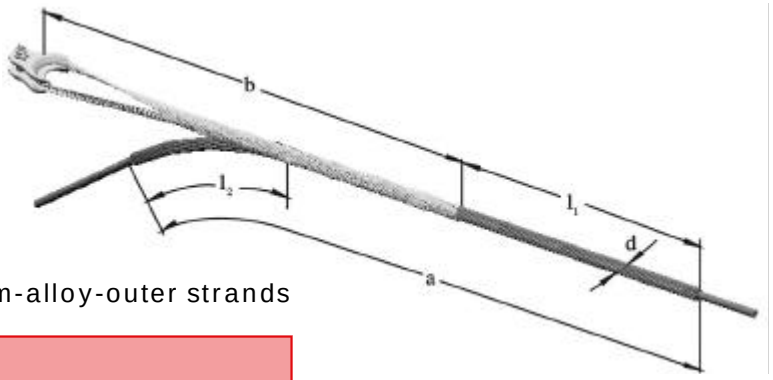
Heliformed dead ends

The strain-equipment for metal-clad cables consists of reinforcing rods and heliformed dead ends with strain thimbles, which provide the link between the string hardware and the dead end sets.
The major advantage of this assembly is:

- Low tension-stress on the end of the conductor.
- Dissemination of the occurring radial forces to a wider surface.
- Upgrade of the torsion-factor, thus lower stresses for the sensitive optical fibres.

This strain-equipment is in accordance to VDE 0210, ÖVE L11 and complies with many other specifications.

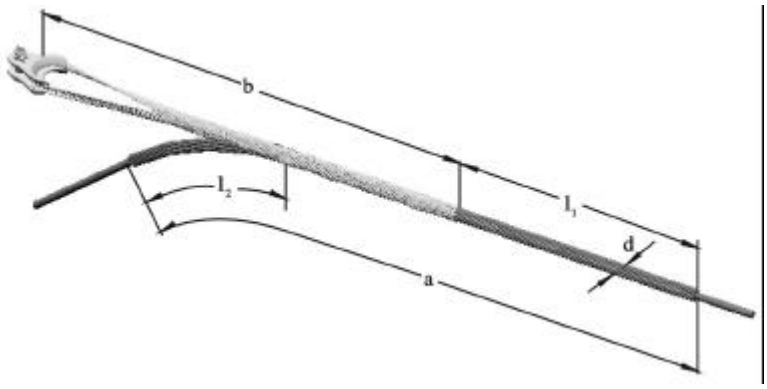


For conductors with aluminium or aluminium-alloy-outer strands

Material:	Dead end: alumoweld Reinforcing rods: aluminium-alloy Thimble: malleable or ductile iron hot dip galvanised								
L.-Nr.	Conductor Ø	Thimble L-Nr.	Dimensions in mm					Weight kg
			a	b	l1	l2	d	
4480.03	8,54–10,46	4410.15/1	1800	900	430	705	14,68–16,60	2,00
4480.00	10,47–11,50	4410.15/1	2000	1000	475	780	16,61–17,64	2,40
4480.01	11,51–12,50	4410.15/1	2200	1200	407	866	17,65–18,64	2,80
4480.02	12,51–13,26	4410.15/1	2500	1200	573	1000	18,65–19,40	3,00
4480.04	13,27–14,50	4410.15/1	2500	1500	435	845	20,17–21,40	4,80
4480.05	14,51–15,50	4410.15/1	2900	1500	533	1160	21,41–22,40	5,10
4480.07	15,51–16,80	4410.15/1	3000	1600	514	1190	22,41–23,70	5,90
4480.08	16,81–17,80	4410.15/1	3000	1600	550	1180	23,71–24,70	5,90
4480.09	17,81–18,50	4410.15/1	3000	1700	464	1160	24,71–25,40	6,20
4480.10	18,51–19,70	4410.15/1	3000	1900	550	960	26,99–28,18	7,70
4480.11	19,71–21,28	4410.15/1	3300	2000	650	1080	28,19–29,76	8,80
4480.12	21,29–22,00	4410.15/1	3300	2200	513	1040	30,53–31,24	9,80
4480.13	22,01–23,00	4410.16	3500	2200	645	1120	31,25–32,24	10,90
4480.14	23,01–23,60	4410.16	3500	2200	675	1100	32,25–32,84	10,90
4480.15	23,61–24,40	4410.16	3500	2400	574	1080	32,85–33,64	12,20
4480.16	24,41–25,30	4410.16	3500	2400	608	1060	33,65–34,54	12,40
4480.17	25,31–26,20	4410.16	3500	2400	640	1040	34,55–35,44	12,60
4480.18	26,21–27,20	4410.16	3500	2400	670	1020	35,45–36,44	12,60

L.N° refers to right hand lay, for left hand lay please add/L, for example 4480.03/L.
Other dimensions on request.
The dimension l1 can be elongated in case 2 stockbridge dampers are used.
Lay direction: Reinforcing rod – against outer lay of conductor
Dead end – as outer lay of conductor

Materials for fibre optic lines



for conductors with alumoweld-outer strands

Material:	Dead end: alumoweld Reinforcing rods: aluminium-alloy Thimble: malleable or ductile iron dip galvanised

L.-Nr.	Conductor Ø	Thimble L-Nr.	Dimensions in mm					Weight kg
			a	b	l1	l2	d	
4480.19	8,25–10,69	4410.02	1500	890	200	508	14,77–17,21	2,50
4480.20	10,70–11,47	4410.02	1520	980	300	530	17,22–17,99	3,00
4480.21	11,48–12,45	4410.02	1580	1270	200	397	18,82–19,79	3,90
4480.22	12,46–13,06	4410.02	1640	1270	200	457	19,80–20,40	4,10
4480.23	13,07–13,77	4410.02	1700	1390	200	463	21,29–21,99	5,10
4480.24	13,78–14,49	4410.02	1750	1390	200	513	22,00–22,71	5,40
4480.25	14,50–14,79	4410.02	1800	1390	200	583	22,72–23,01	5,40
4480.26	14,80–15,30	4410.02	1850	1390	200	613	23,02–23,52	5,50
4480.27	15,31–15,85	4410.02	1850	1390	200	619	23,53–24,07	5,70
4480.28	15,86–16,80	4410.15/1	1900	1570	250	430	24,08–25,02	6,90
4480.29	16,81–18,24	4410.15/1	2000	1570	250	530	25,03–26,46	7,20
4480.30	18,25–19,00	4410.15/1	2080	1570	250	610	26,47–27,22	7,60
4480.31	19,01–19,70	4410.15/1	2080	1790	250	512	27,23–27,92	8,00
4480.32	19,71–21,28	4410.15/1	2160	1790	250	592	27,93–29,50	8,10
4480.33	21,29–22,56	4410.15/1	2240	1790	250	672	29,51–30,78	8,50

L.N° refers to right hand lay, for left hand lay please add/L, for example 4480.03/L.
Other dimensions on request.
The dimension l1 can be elongated in case 2 stockbridge dampers are used.
Lay direction: Reinforcing rod – against outer lay of conductor
Dead end – as outer lay of conductor

Strain thimbles


Type 1


Type 2

Material:	Thimbles: malleable or ductile iron, hot dip galvanised Bolts: steel, hot dip galvanised

L.-Nr.	Dimensions in mm			Thimble width	Breaking strength kN	Short circuit current kA	Weight kg
	Type	Bolts	Clevis width				
4410.02	1	S19	20	16	100	28	0,80
4410.15/1	1	S19	22	32	230	40	1,20
4410.15	1	S22	22	32	230	40	1,20
4410.16	1	S19	20	45	230	40	1,50
4410.16/1	1	S22	20	45	230	40	1,50
4410.9001	2	S22	20	45	310	42	4,60*

*steel, hot dip galvanised.

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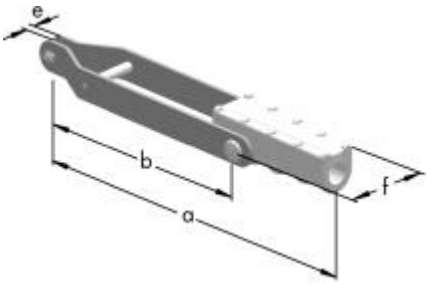
Open cone type tension clamps cast aluminium

L.-Nr. without cones

Material:	Clamp: aluminium-alloy Straps: steel, hot dip galvanised Bolts: steel, 8.8., hot dip galvanised

L.-Nr.	Dimensions in mm						Short circuit current kA	Rated strength kN	Weight kg
	Cond. Ø	a	b	Bolts	e	f			
135–264–101	14,9 – 33,8	1000	800	S19	20	104	35	120	9,70
135–264–102	14,9 – 33,8	1000	800	*	104	104	35	120	9,20

*for strain hinges.



Open cone type tension clamps malleable iron

L.-Nr. without cones

Material:	Clamp: malleable iron, hot dip galvanised Counter piece: aluminium-alloy Straps: steel, hot dip galvanised Bolts: steel, 8.8., hot dip galvanised

L.-Nr.	Dimensions in mm						Short circuit current kA	Rated strength kN	Weight kg
	Cond. Ø	a	b	Bolts	e	f			
135–264–042	10–37,5	750	550	S19	20	94	50	180	12,80
135–264–043	10–37,5	950	750	S22	20	94	50	180	15,00

Open cone type tension clamps ductile iron

L.-Nr. without cones

Material:	Clamp: ductile iron, hot dip galvanised Counter-piece: aluminium-alloy Straps: steel, hot dip galvanised Bolts: steel, 8.8., hot dip galvanised

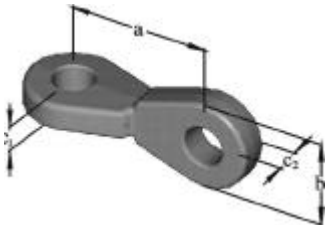
L.-Nr.	Dimensions in mm						Short circuit current kA	Rated strength kN	Weight kg
	Cond. Ø	a	b	Bolts	e	f			
135–264–110	10–37,5	1075	875	S22	20	110	50	280	18,00

Cone for open cone type tension clamps

Cones to be ordered seperately. Cone diameters will be calculated according to the conductor dimensions. Cones are available with or without jumper connection. Depending upon the construction of the OPGW it can be necessary to use reinforcing rods, especially by using only one layer above the tube which contains the optical fibres, or if the diameters of the individual wires are smaller than 3 mm.
Reinforcing rods shall be used on dielectric cables.

Materials for fibre optic lines

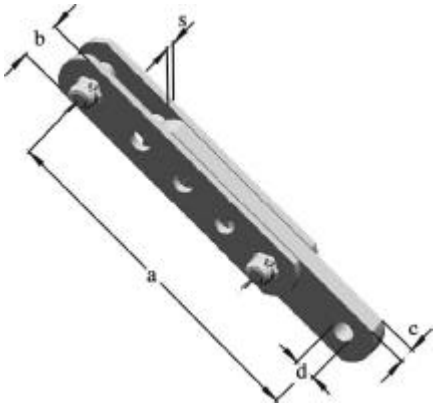
Twisted eye links



Material: Steel, forged, hot dip galvanised								
L.-Nr.	Dimensions in mm for bolts	a	b	c1	c2	Breaking strength kN	Short circuit current kA	Weight kg
4261.08/10	19	70	50	19	19	200	30	0,53
4261.08	19	80	55	19	19	200	40	0,60
4261.10	19	90	60	19	19	240	40	0,85
4261.11	22	90	60	19	19	240	40	0,85
4261.12	22	100	65	19	19	320	50	0,97

Other types see cat. part 3

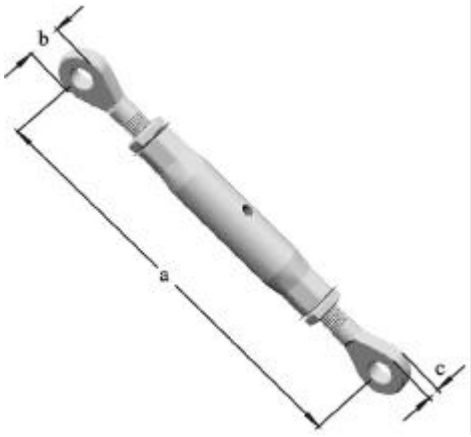
Adjustable extension links straight



Material: Steel, hot dip galvanised								
L.-Nr.	Dimensions in mm Bolts	b x s	a	c	d	Breaking strength kN	Short circuit current kA	Weight kg
4266.30	S 19	50 x 8	265–405	19	20	160	30	3,20
4266.33	S 19	50 x 8	350–490	19	20	160	32	3,80
4266.38	S 19	50 x 8	455–775	19	20	160	32	5,20
4266.53	S 22	60 x 8	309–441	19	24	230	40	4,48

Other types see cat. part 3

Turnbuckles eye-eye



Material: Steel, forged, hot dip galvanised								
L.-Nr.	Type	Dimensions in mm for bolts	a	b	c	Breaking strength kN	Short circuit current kA	Weight kg
4268.32	M20	19	300–420	50	19	160	18	1,90
4268.31	M20	19	440–690	50	19	160	18	2,90
4268.02/10	M24	19	380–505	55	19	240	25	3,10
4268.02	M24	22	380–505	55	19	240	25	3,10
4268.02/2	M24	19	520–770	55	19	240	25	4,50

Other types see cat. part 3

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ACCESSORIES

Flexible copper-earthbonds

They are used for additional earthing between the clamp-body of the suspension-clamp and the earthwire suspension equipment or to the tower.
Cu-shunts are regularly equipped with a bent cable lug with a bolt M12 x 20 and a straight cable lug with a fixing consisting of a bolt M12 x 35 with washer and nut.

Material: Flexible copper Cable lug: copper, tinned				
L.-Nr.	Cross section mm²	Length mm	Short circuit current kA	Weight kg
4664.03	70	500	14	0,60
4664.03/1	70	1000	14	1,00
4664.31/1	95	500	19	0,80
4664.40/20	120	500	24	0,90

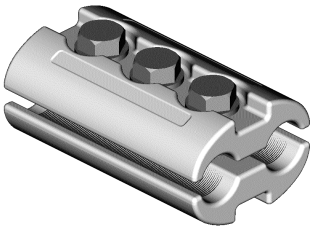
Other lengths on request.
Special types: with shrink tubes (connecting the compressed part of the cable lug to the flexible earthbond)
L-Nr. + S, f. e.: 4664.03 S

Aluminium-shunts

for additional earthing between OPGW-cable and tower.

Material: Aluminium-conductor Cable lug: aluminium					
L.-Nr.	Cross section mm²	Length	Bolts	Short circuit current kA	Weight kg
4664.35	70	500	M12x35	8	0,20
4664.35/1	70	1000	M12x35	8	0,30
4664.35/2	70	1000	M16x35	8	0,40
4664.36	95	1000	M12x35	11	0,40
4664.45	120	1000	M12x35	14	0,50
4664.50	150	1000	M12x35	18	0,60

Other lengths on request.
Special types: with shrinkable tubes (connecting the compressed part of the cable lug to the flexible earthbond)
L-Nr. + S, f. e.: 4664.03 S



Parallel groove clamps, acc. DIN 48075 with serrated grooves.

for aluminium-, al-alloy-, ACSR-, AACSR- and alumoweld conductors.

Material:	Body: aluminium-alloy, forged Bolts: steel, 8.8, hot dip galvanised			
L.-Nr.	Dimensions in mm		Bolts	Weight kg
	Conductor Ø	Length		
1PA100-020LW	9,0– 9,9	70	2 x M10	0,30
1PA100-025LW	10,0–10,7	70	2 x M10	0,30
1PA100-040LW	10,8-11,7	70	2 x M10	0,30
1PA100-055LW	11,8–12,6	70	2 x M10	0,30
1PA100-060LW	12,7–13,6	65	2 x M12	0,30
1PA100-070LW	13,7–14,9	90	3 x M10	0,50
1PA100-095LW	15,0–16,2	90	3 x M10	0 50
1PA100-100LW	16,3–17,1	90	3 x M10	0,50
1PA100-115LW	17,2–18,1	100	3 x M12	0,60
1PA100-140LW	18,2–19,0	100	3 x M12	0,60
1PA100-155LW	19,1–20,0	100	3 x M12	0,60
1PA100-160LW	20,1–21,1	100	3 x M12	0,60
1PA100-165LW	21,2–22,2	120	3 x M12	0,80
1PA100-200LW	22,3–23,4	120	3 x M12	0,80
1PA100-225LW	23,5–24,5	120	3 x M12	0,80
1PA100-230LW	24,6–25,7	120	3 x M12	0,80
1PA100-250LW	25,8–26,7	130	3 x M12	0,90
1PA100-260LW	26,8–27,8	130	3 x M12	0,90

Reductions- and bimetallic tubes on request.

Parallel groove clamps are used at the strain-point of metal-clad OPGW-conductors / earth-wires, to connect the earth wire with the tower through a flexible Al-shunt. The Al-shunt provides an additional earthing-bridge, in order to protect the OPGW-earth wire in the event of a short circuit.
To eliminate stressing of the sensitive fibre optics by radial forces, there are several inner diameters of the clamps available, this means the clamps can be adjusted to the OPGW-conductor diameter.
This ensures that, with proper installation of the clamps, the attenuation will be maintained.

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Down lead clamps

The down lead clamp is used to attach the OPGW-conductor to the tower and to route the conductor down the tower in a defined way. The down lead clamp is designed for installation in a 90° or 0° position. Therefore these clamps can be used for many applications and can be adjusted quickly and easily to the stipulated requirements, by linesmen.

Material:	Clamp: extruded aluminium-alloy Threaded parts: steel, hot dip galvanised Fixing bracket: steel, hot dip galvanised				
L.-Nr.	Dimensions in mm			Fixing bolts	Weight kg
	Conductor Ø	Length	Width of bracket		
4680.27	8,2–11,7	40	22	M8	0,40
4680.27/01	11,8–13,0	40	22	M8	0,40
4680.27/04	13,1–14,4	40	22	M8	0,65
4680.27/1	14,5–15,8	40	22	M8	0,65
4680.27/1/1	15,9–17,4	40	22	M8	0,65
4680.27/2	17,5–19,2	40	22	M8	0,70
4680.27/2/1	19,3–21,2	40	22	M8	0,70
4680.27/2/3	21,3–22,8	40	22	M8	0,70
4680.27/2/2	22,9–24,6	40	22	M8	0,75

On ordering please state exact conductor diameter.

Special types:

- one side with packing piece L. Nr. .../F
  f. e.: 4680.27/6F

With elongated bolt

Type for angles

For inside fixing on a tower structure

Stockbridge dampers with forged clamps

for aluminium-, al-alloy-, ACSR-, AACSR- and alumoweld conductors.

Weights are cast onto the messenger cable.

Material: Weights: cast iron, hot dip galvanised
Messenger cable: steel, hot dip galvanised
Clamp: aluminium-alloy, forged
Bolt: stainless steel

L.-Nr.	Dimensions in mm			Torque Nm	Weight kg
	Conductor Ø	Length	Bolt		
9301.000/EA1	7,00– 9,00	380	M10	30	1,60
9301.010/EA1	9,01–11,00	380	M10	30	1,60
9301.020/EA1	11,01–14,50	380	M10	30	1,60
9301.030/EA1	14,51–17,00	380	M10	35	1,60
9301.040/EA1	17,01–19,50	380	M10	35	1,60
9301.050/EA1	19,51–22,00	385	M12	35	1,65
9301.060/EA1	22,01–24,50	385	M12	35	1,65
9301.070/EA1	24,51–28,00	395	M12	40	1,90
9301.080/EA1	28,01–31,00	395	M12	40	1,90
9301.090/EA1	31,01–33,00	395	M12	45	1,90
9301.100/EA1	33,01–35,00	395	M12	45	1,90
9301.110/EA1	35,01–38,00	395	M12	45	2,00
9301.120/EA1	38,01–42,00	395	M12	45	2,00
9301.130/EA1	42,01–46,00	395	M12	45	2,00
9303.000/EA1	7,00– 9,00	420	M10	30	2,10
9303.010/EA1	9,01–11,00	420	M10	30	2,10
9303.020/EA1	11,01–14,50	420	M10	30	2,10
9303.030/EA1	14,51–17,00	420	M10	35	2,10
9303.040/EA1	17,01–19,50	420	M10	35	2,10
9303.050/EA1	19,51–22,00	425	M12	35	2,20
9303.060/EA1	22,01–24,50	425	M12	35	2,20
9303.070/EA1	24,51–28,00	440	M12	40	2,40
9303.080/EA1	28,01–31,00	440	M12	40	2,40
9303.090/EA1	31,01–33,00	440	M12	45	2,40
9303.100/EA1	33,01–35,00	440	M12	45	2,60
9303.110/EA1	35,01–38,00	440	M12	45	2,60
9303.120/EA1	38,01–42,00	440	M12	45	2,60
9303.130/EA1	42,01–46,00	440	M12	45	2,60

Special designs:

- Bolts hot dip galvanized L.-Nr. ... 1/EA1
  f. e. 9304.031/EA1
- Weights fixed with cones L.-Nr. ... /EA (without 1)
  f. e. 9304.030/EA

Other types see cat. part 10.

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Come along spirals

for conductors with aluminium, aluminium-alloy and alumoweld-outer stands
Come along spirals are used for stringing.

Material: Alumoweld			
L.-Nr.	Dimensions in mm		Weight kg
	Conductor Ø	Length	
4781.60	6,55– 7,36	540	0,16
4781.61	7,37– 8,27	620	0,18
4781.62	8,28– 9,26	670	0,24
4781.63	9,27–10,40	670	0,30
4781.64	10,41–11,70	720	0,33
4781.65	11,71–13,12	820	0,50
4781.66	13,13–14,67	870	0,63
4781.67	14,68–16,60	890	0,85
4781.68	16,61–18,79	980	1,17
4781.69	18,80–21,28	1270	2,00
4781.70	21,29–24,07	1390	2,65
4781.71	24,08–27,22	1570	3,59

L.N° refers to right hand lay, for left hand lay please add /L, for example 4781.60/L.
Other dimensions on request.
Lay direction equal to outer lay of conductors.

Warning spheres

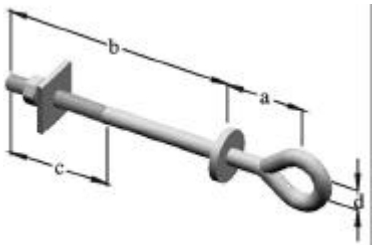
Material: Sphere: glass fibre reinforced polyester Clamps: aluminium-alloy			
L.-Nr.	Maße in mm		Weight kg
	ConductorØ	SphereØ	
9220.10 . .	9,5–12,0	600	5,5
9220.11 . .	12,0–14,5	600	5,5
9220.12 . .	14,5–17,0	600	5,5
9220.13 . .	17,0–19,5	600	5,5
9220.14 . .	19,5–22,0	600	5,5
9220.15 . .	22,0–24,5	600	5,5
9220.16 . .	24,5–28,0	600	5,5
9220.17 . .	28,0–31,5	600	5,5
9220.18 . .	31,5–35,0	600	5,5

Types: L.-Nr. . . . . OR – orange RAL 2005
L.-Nr. . . . . RT – red RAL 3020
L.-Nr. . . . . WE – white RAL 9016
L.-Nr. . . . . RW – one half red, one half white
Other types on request

FITTINGS FOR ADSS

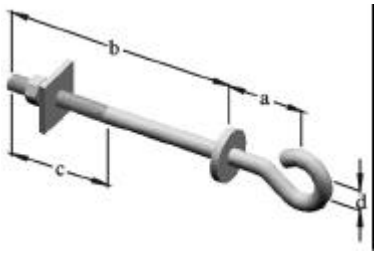
SUSPENSION POINTS FOR LIGHT CABLES WITH SHORT SPANS ON WOODEN OR CONCRETE POLES

The following fixing accessories are designed to allow movement of the clamp in all directions, to prevent any damage.



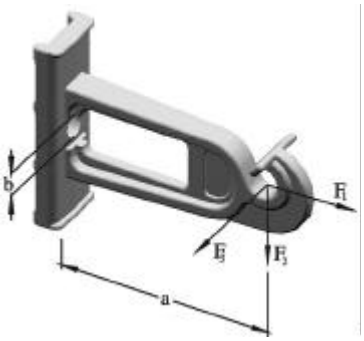
Eye bolt for wooden or concrete poles

Material: Steel, hot dip galvanised							
L.-Nr.	Dimensions in mm					Vertical load kN	Weight kg
	Thread	a	b	c	d		
5050/8/3	M20	115	260	100	35	4,0	1,50



Hook bolt for wooden or concrete poles

Material: Steel, hot dip galvanised							
L.-Nr.	Dimensions in mm					Vertical load kN	Weight kg
	Thread	a	b	c	d		
5060/21	M16	160	240	150	30	4,0	0,90



Hook CS140

for fixing onto wooden or concrete poles by means of a bolt M14 or stainless steel bonds.

Material: Cast aluminium						
L.-Nr.	Dimensions in mm		Breaking strength			Weight kg
	a	b	F1 kN	F2 kN	F3 kN	
5411/1	140	16	12,0	5,0	4,0	0,33

Bolts to be ordered separately.

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Suspension rollers without counter piece
for light cables.

Material:	Straps: steel, hot dip galvanised Bolts: steel, hot dip galvanised Roller: weather resistant plastic

L.-Nr.	Variation	Dimensions in mm				to be fixed on	Weight kg
		Hole	Roller Ø	Straps	Height		
5030/29	Hole	17,5	80	40 x 5	105	Hook bolt M16	0,70
5030/30	Oval hole	20x45	80	40 x 3	140	Hook bolt M16 Hook CS140	0,50
5030/31	Cross slot	22	80	50 x 4	160	Eye bolt M20	0,80
5030/1	Cross slot	22	93	50 x 6	175	Eye bolt M20	1,30
5030/11	slot	–	93	40 x 6	115	Wire upto Ø 6 mm	1,20
5030/12	slot	–	93	40 x 6	225	Wire upto Ø 6mm	1,55

Suspension roller with oval hole

Other variations on request.

Suspension roller with flexible wire and slot

Suspension roller with cross slot

Suspension roller with hole

Suspension roller with slot

Roller suspension clamp
for light cables

Material:	Straps: steel, hot dip galvanised Bolts: steel, hot dip galvanised Roller: glassfibre reinforced plastic Roller insert: neoprene Keeper piece: neoprene

L.-Nr.	Dimensions in mm			to be fixed on	Weight kg
	Cond. Ø	Hole Ø	Roller Ø		
5170.10	10–25	24	80	Hook bolt M20	1,30

Other fixings see cat. part 19

SUSPENSION POINTS FOR ADSS WITH LONG SPANS ON LATICE TOWERS

C-brackets

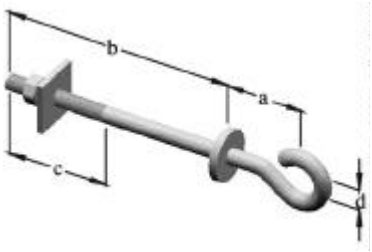
see page 4

AGS clamps

see page 5–7

TENSION POINTS FOR LIGHT CABLES WITH SHORT SPANS ON WOODEN AND CONCRETE POLES

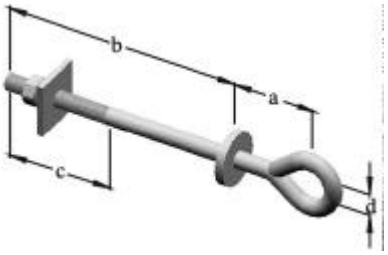
Hook bolts



Material: Steel, hot dip galvanised								
L.-Nr.	Dimensions in mm					Rated strength		Weight kg
	Thread	a	b	c	s	horizontal kN	vertical kN	
5060	M16	30	250	100	15	5,5	5,5	0,75
5061	M16	30	380	100	15	5,5	5,5	0,95
5062	M20	30	250	100	15	13,0	13,0	1,28
5063	M20	30	380	100	15	13,0	13,0	1,60

Other dimensions on request.

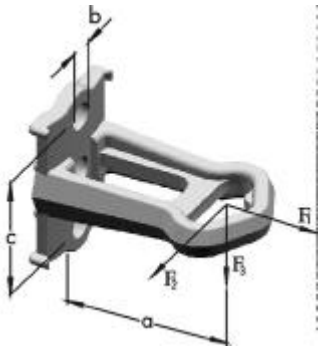
Eye bolts



Material: Steel, hot dip galvanised							
L.-Nr.	Dimensions in mm				Rated strength		Weight kg
	Thread	a	b	c	horizontal kN	vertical kN	
5050	M16	30	250	100	40,0	7,0	0,80
5051/1	M16	30	350	100	40,0	7,0	0,96
5050/11	M20	30	230	120	40,0	15,0	1,23
5050/12	M20	30	350	120	40,0	15,0	1,56

Other dimensions on request. Other types see cat. part 19.

Console CS 100



For fixing on wooden or concrete poles by means of a bolt M14 or stainless steel bonds.

Material: Cast aluminium							
L.-Nr.	Dim. in mm			Breaking strength			Weigth kg
	a	b	c	F1 kN	F2 kN	F3 kN	
5410/1	100	16	70	25,0	8,0	4,0	0,33

Bolts are to be ordered separately.

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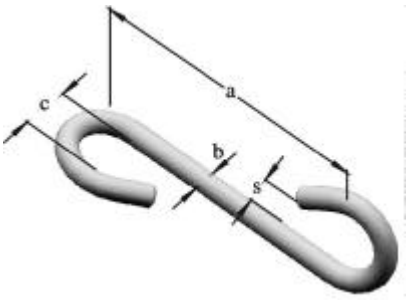
Extension hooks twisted

They will be used to increase the distance between the tower and anchor rod, so that the metal-free aerial cables can be directed around or down the tower with a greater bending radius.

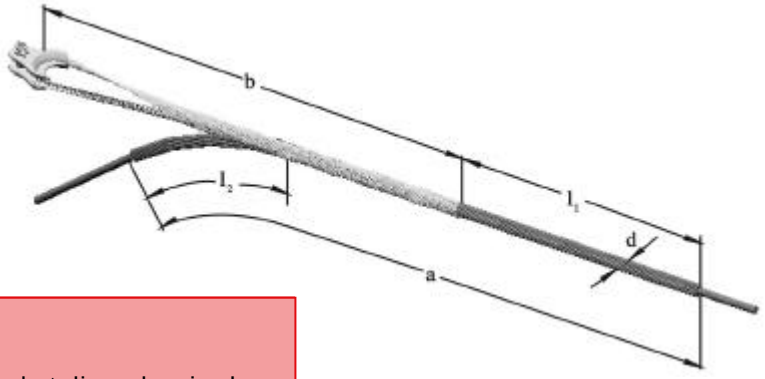


Material: Steel, hot dip galvanised						
L.-Nr.	Dimensions in mm				Breaking strength kN	Weight kg
	a	b	c	s		
2600.65/1	400	16	35	22	13,0	1,10
2600.66/1	400	20	35	22	20,0	1,55

Straight hooks on request.

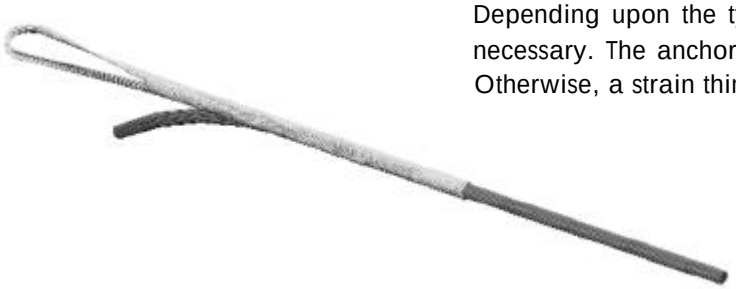
Heliformed dead ends

By using an extension-hook, no strain thimble is necessary. The anchor rods will be directly attached to the extension hook.



Material: Dead end: alumoweld Reinforcing rod: aluminium-alloy Thimble: malleable or ductile iron, hot dip galvanised									
Dea		Thimble	Dimensions in mm					Weight
L.-Nr.	Cond. Ø	L.-Nr.	a	b	l1	l2	d	kg
4481.09	8,25-10,69	4410.02	1500	690	408	425	14,39-16,83	1,80
4481.00	10,70-11,47	4410.02	1900	980	760	450	16,84-17,61	2,50
4481.01	11,48-12,45	4410.15/1	2000	950	920	450	18,38-19,35	2,80
4481.02	12,46-13,06	4410.15/1	2000	950	920	450	19,36-19,96	2,90
4481.03	13,07-13,77	4410.15/1	2150	950	1020	500	19,97-20,67	3,00
4481.04	13,78-14,49	4410.15/1	2150	1300	870	500	21,20-21,91	3,90
4481.05	14,50-15,17	4410.15/1	2300	1300	970	550	21,92-22,59	4,00
4481.06	15,18-15,85	4410.15/1	2300	1300	970	550	22,60-23,27	4,10
4481.07	15,86-16,80	4410.15/1	2300	1500	990	550	23,28-24,22	4,20
4481.08	16,81-18,24	4410.15/1	2450	1500	1095	600	24,23-25,66	4,35

L.N° refers to right hand lay, for left hand lay please add/L, for example 4481.09/L.
Other dimensions on request.
The dimension l1 can be elongated in case 2 stockbridge dampers are used.
Lay direction: Reinforcing rod – against outer lay of conductor
Dead end – as outer lay of conductor



Heliformed dead ends without reinforcing rods

Depending upon the type of the aerial cables reinforcing rods may not be necessary. The anchor rods can be directly connected to an extension-hook. Otherwise, a strain thimble will be used.

Material: Alumoweld			
L.-Nr.	Dimensions in mm		Weight kg
	Conductor Ø	Length	
4781.80	6,55– 7,36	430	0,11
4781.81	7,37– 8,27	450	0,12
4781.82	8,28– 9,26	500	0,14
4781.83	9,27–10,40	570	0,15
4781.84	10,41–11,70	630	0,23
4781.85	11,71–13,12	710	0,26
4781.86	13,13–14,67	730	0,38
4781.87	14,68–16,60	820	0,53
4781.88	16,61–18,79	920	0,72
4781.89	18,80–21,28	1020	1,15
4781.90	21,29–24,07	1050	1,36
4781.91	24,08–27,22	1150	1,48

Extension points for long spans, for lattice towers

- Tension brackets
  see page 8
- Thimbles
  see page 10
- String hardware
  see page 12
- Down lead clamps
  see page 15
- Fixing accessories
  see page 20–21

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Spiral dampers

Function: Contrary to the function of a Stockbridge-damper where energy will be converted, the Spiral vibration damper interrupts the incoming wave and prevents the establishment of a stationary oscillation form.

Material: Weather resistant plastic			
L.-Nr.	Dimensions in mm		Weight kg
	Conductor Ø	Length	
9320.04	6,35– 8,30	1240	0,28
9320.05	8,31–11,72	1300	0,30
9320.06	11,73–14,32	1345	0,32
9320.07	14,33–19,30	1615	0,93