

AXCLIGHT® H
SUSPENDED CABLE FOR
OVERHEAD LINES
INSTALLATION INSTRUCTIONS





AXCLIGHT® H

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RELIABLE AND COST EFFECTIVE

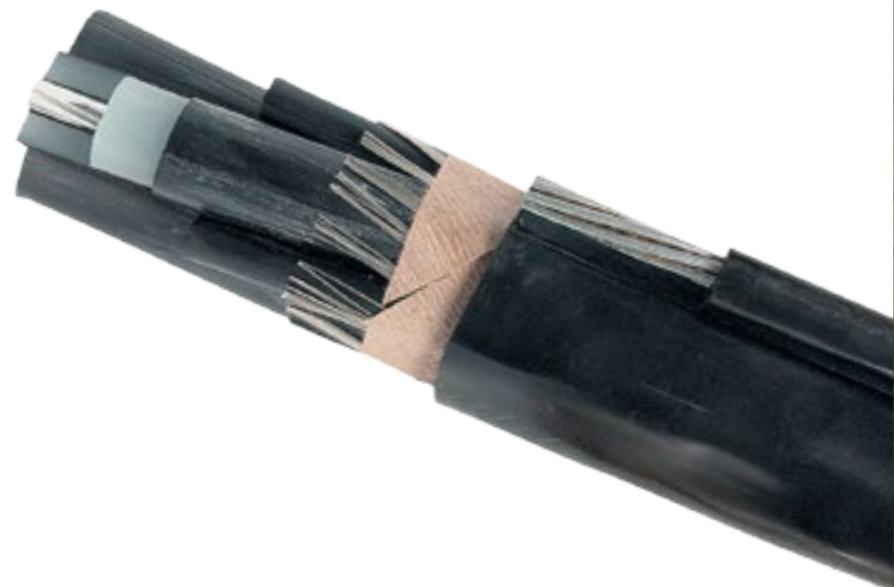
Approximately 80% of customer downtime is the result of faults in the 12–24 kV distribution network. The best way to improve reliability of supply is to move cables underground.

However, for projects in difficult terrain where it would be expensive and time consuming to lay cables underground, Axclight-H offers significant benefits. Launched in 1999, Axclight-H has shown itself to be extremely reliable, coping well with several major storms. For a lower investment cost than conversion to BLL, you can replace the overhead line with our Axclight-H cable.

Its strong supporting line and other structural features mean that the Axclight-H can be used to create systems with low operating, maintenance and repair costs. Other benefits include narrower line clearance widths, the ability also to run low voltage lines and telecommunication lines,

and low sensitivity to lightning surges. Axclight-H can be used over land and water.

Axclight-H is available for 12-24 kV with cross-sections of 25, 50 and 95 mm² Al. All cables have a supporting line of Fe 140, 25 mm². The line breaking load is 33.9 kN.



TECHNICAL DESCRIPTION

MECHANICAL DIMENSIONING

Dimensioning in accordance with the EBR standard K28 relating to suspended cable systems 0.4–24 kV.

TENSIONING AND SPAN

The cable is tensioned in accordance with configuration tables. The tension is calculated so that the sag corresponds to 2% of the span at 0 °C and under the weight of the cable (except for 3x95, 24 kV, which is tensioned to 2.5% of the span). The longest normal span is assumed to be 110 m. If a longer normal span is required, a separation calculation must be carried out. The limitation is that the mechanical stress must not exceed 55% of the breaking load of the supporting line at 0 °C ice, without wind.



INSTALLATION HEIGHT

Cables must be installed 6 m above ground in built-up areas and when crossing public roads.

In other areas, the height is 4.5 m above ground in accordance with ELSÄK-FS 2008:1.

SUSPENSION DEVICES AND TENSIONERS

The recommended suspension device is Ensto SO 220 and wedge bolts are recommended as tensioners minimize.

SPLICING AND SPLITTING

Splices between poles can be carried out with the supporting line relieving the cable sections of mechanical load. The best solution is to splice the supporting line with two tensioners.

Quicktap is the easiest way to split lines.

STAYS

In order to minimise the risk of exposing the installer to two potentials in the pole, you are recommended to fit stay insulators. However, this is not a requirement.

SUSPENSION

Breaking links should be used to reduce the risk of damage to the equipment. Breaking links are designed to fail before mechanical damage occurs to cables, suspension devices and poles.

The breaking load should be between 13 and 15 kN (breaking links must not be used on poles in crossings).

In poles in straight lines or small angles < 30° use spacing hooks (EBR 172).

For angles between 30° and 60° use double yokes SOT 73.

For tension relief and angles > 60° tension relief bracket 1 is recommended.



Angles less than 30 degrees.



Angles between 30 and 60 degrees.



Angles greater than 60 degrees.



EARTHING

The cable screen and supporting line must be connected to earth at all terminations.

Earthing points must be provided for all applications in overhead line systems with protected details, transformer stations, circuit breakers or transitions from overhead line to cable. The earthing point is provided at the same pole if field conditions are acceptable.

It is not possible to use the supporting line as an earth connection from an earthing point along the line to the protected object, which means that a separate line must be installed as the earth connection.

When Axclight-H is used as an earth cable to a substation, the supporting line must be connected to the earth bar.

When splicing Axclight-H and Axclight-TT, the supporting line is left outside the splice and is insulated to the same electrical level as the sheath.

WORKPLACE EARTH

A workplace earth is provided at the connections of the cable. The earth must also include the supporting line.

Alternatively, the work can be carried out as "work involving electricity" as defined in the applicable ESA Arbete instructions.

CROSSINGS

According to Els akerhetsverket (Swedish National Electrical Safety Board) Directive: 30-99-0459, crossings over public roads using Axclight-H must be carried out in accordance with Issue 2 of SS 436 02 80.

MATERIAL KITS

The material kits used in the structures are detailed in the type sheets in EBR publication K28. Contact your wholesaler for product information and pricing.

LINE CLEARANCE WIDTH

The minimum clearance width for woodland is 2 m.

PULLING

To avoid damaging the sheath, drag-free pulling is recommended.

Cable trailers are used for 12 kV, cross-section 25–50 mm² and for ALUS with gauge 76 mm. For other cross-sections, the "Snille" line trailer is used. Observe the minimum permitted bending radius of the cable, using double trailers for angles greater than 30°.

Axclight-H may be pulled to long lengths, but the length should not exceed 1500 m if the section includes many large angles or if the line is cut. Long cable lengths are heavy to pull and difficult to adjust when fitting.

OVERVOLTAGE PROTECTION

Nonlinear resistance arresters are fitted when the cable joins with overhead line.

Nonlinear resistance arresters are also recommended for safety devices and circuit breakers if the cable length is between 50–250 m.

TEMPLATES

Suitable marking templates are given in tables in the calculation program, EBR K28.

INTEGRATION

Integration is carried out in accordance with the applicable assembly instructions issued by Svensk Energi in collaboration with Telia, Trafikverket (Swedish Transport Administration) and the Kommunförbundet (Swedish Association of Local Authorities). See also the high current regulations §B103 section 1 and SS 436 01 12 "Integration of overhead lines for high current and low current. Mechanical dimensioning".



Pole-mounted substation.

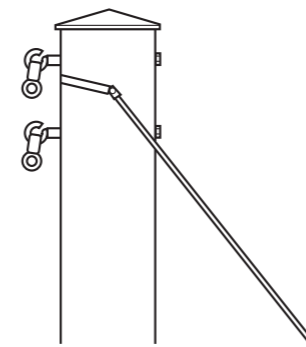
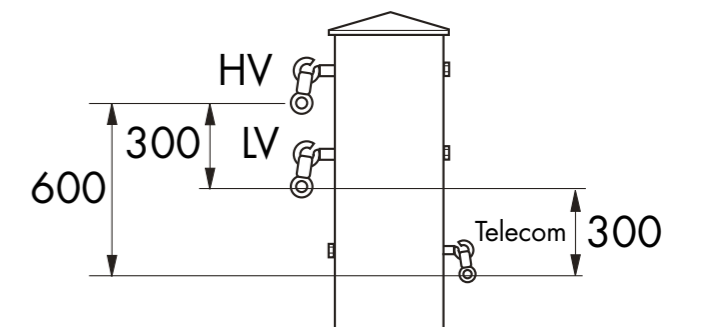


Suspension with breaking link.

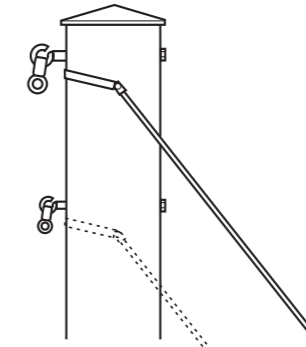
REQUIRED SPACING

Take account of any differences in the sag of the various cables.

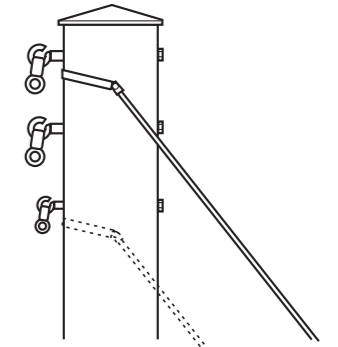
The diagram on the left shows the minimum required distances between pole fixings.



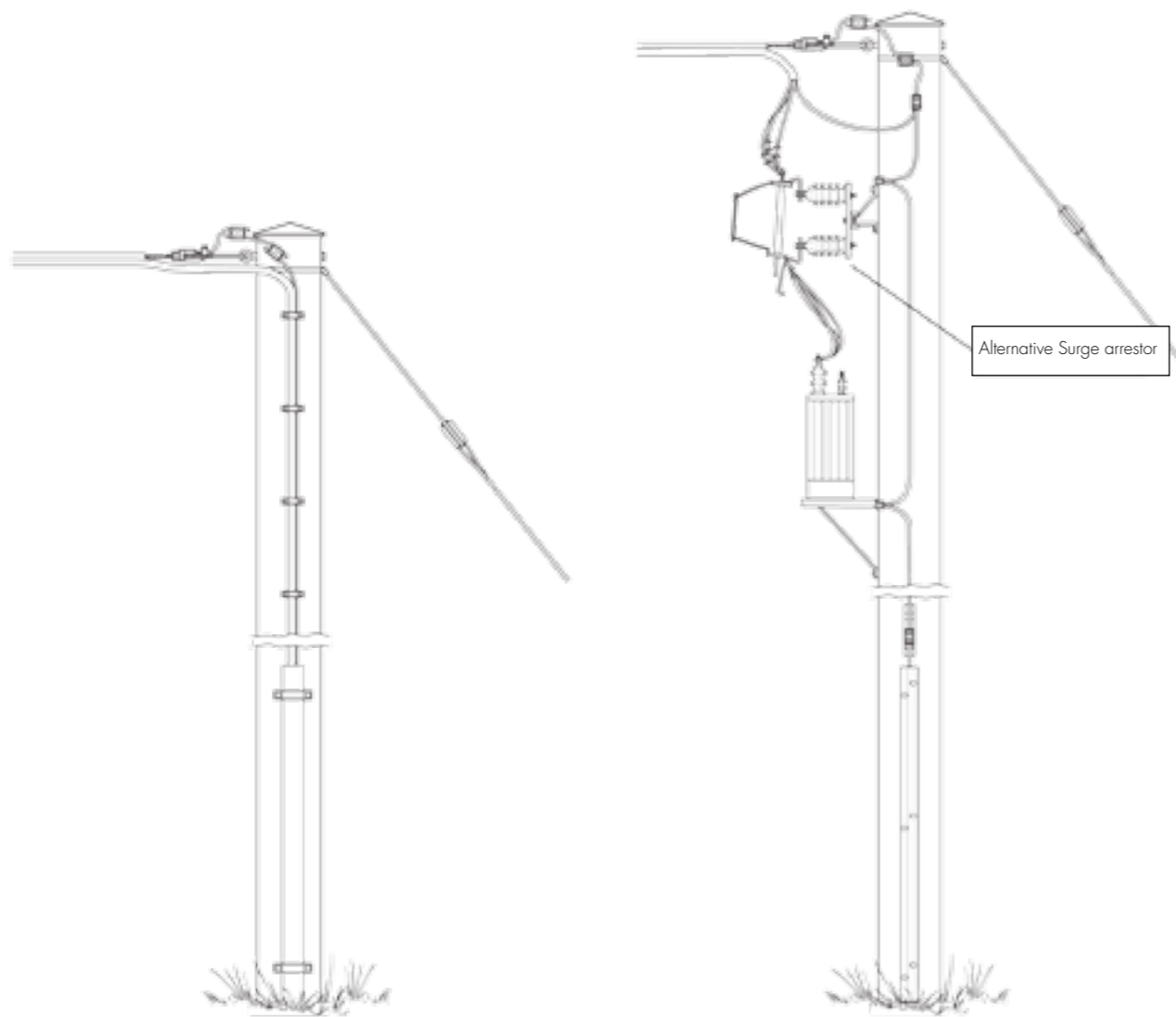
Extra stay not usually required.



Extra stay recommended when integrating with low current cable.

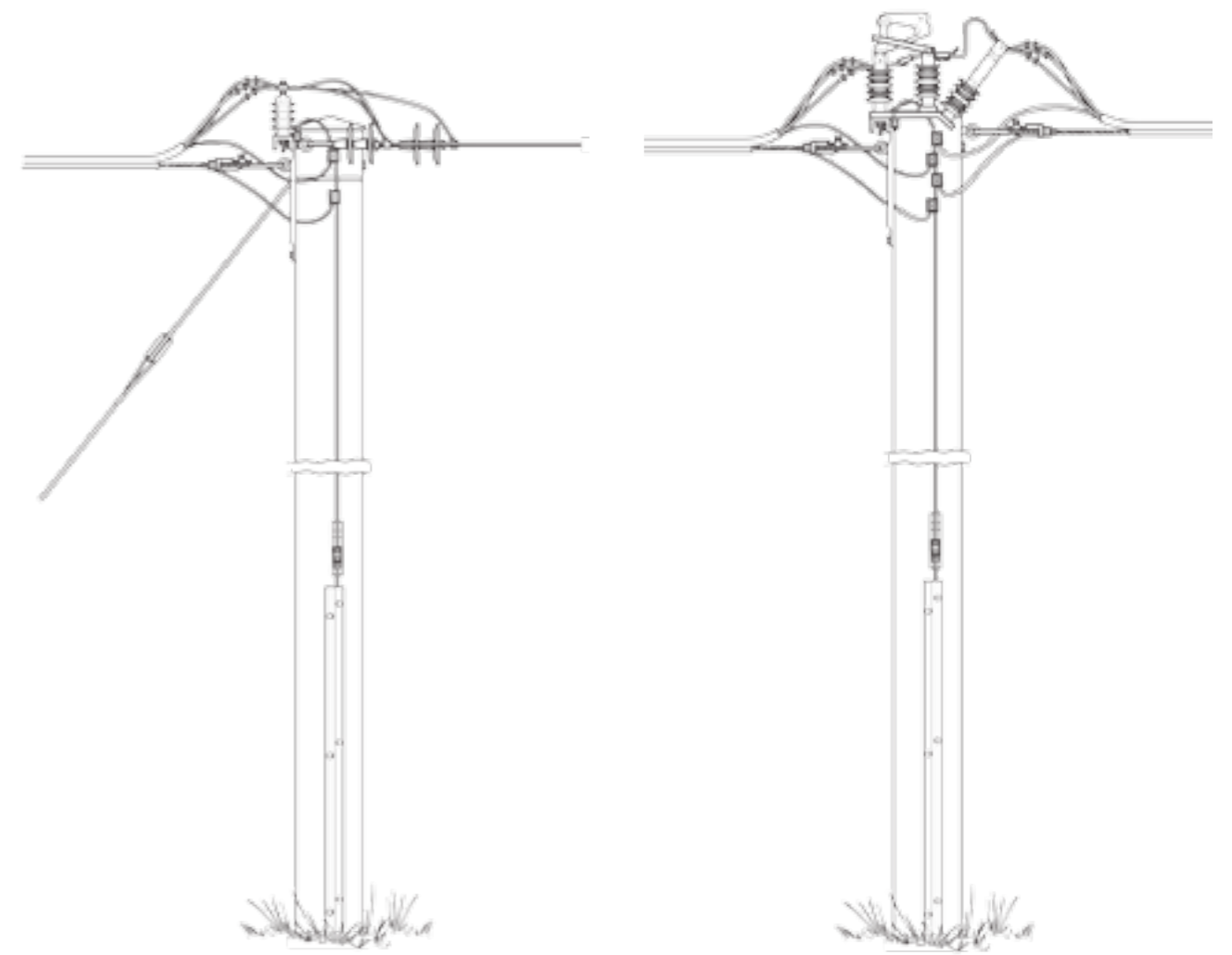


INSTALLATION EXAMPLE



Terminating pole HKÄ 12 and HKÄ 22

Transformer station T1



Transition from overhead line to cable

Disconnectors

GENERAL DATA

EXCLIGHT-H OCH AXCLIGHT®-H 12 KV

Name	Exclight-H 3x10 Cu	Axclight-H 3x25 Al	Axclight-H 3x50 Al	Axclight-H 3x95 Al
Conductor diameter mm	3,6	5,8	8,0	11,3
Screen cross-section mm ²	10	16	16	16
Insulating wall mm	3,4	3,4	3,4	3,4
Diam. over semic. mm	13,3	15,0	17,4	20,7
External diameter mm	35	39	44	51
Height mm	50	53	58	66
Net weight kg/m	1,40	1,50	1,85	2,50
Cross-section of steel line mm ²	24,7	24,7	24,7	24,7
Load capacity, A 90 °C conductor temp. in air 25 °C	81	110	160	230
Load capacity, A 90 °C conductor temp. in air 50 °C	60	82	120	172
load capacity, A 90 °C conductor temp. in ground 15 °C	90	115	170	240
Conductor resistance Ω/km	1,83	1,20	0,641	0,320
Inductance mH/km	0,37	0,39	0,35	0,32
Capacitance µF/km	0,14	0,20	0,24	0,32
Max short circuit current 1 sec, kA 90 °C - 250 °C	1,53	2,50	4,90	9,24
Cap. of earth current A/km	0,90	1,09	1,31	1,74
E. modulus of supporting line, MPa	180000	180000	180000	180000
Stretch	11*10 ⁻⁶ /°C	11*10 ⁻⁶ /°C	11*10 ⁻⁶ /°C	11*10 ⁻⁶ /°C
Min breaking load, kN	33,9	33,9	33,9	33,9
Max permitted load, kN,55%	18,6	18,6	18,6	18,6

EXCLIGHT-H OCH AXCLIGHT®-H 24 KV

Name	Exclight-H 3x10 Cu	Axclight-H 3x25 Al	Axclight-H 3x50 Al	Axclight-H 3x95 Al
Conductor diameter mm	3,6	5,8	8,0	11,3
Screen cross-section mm ²	10	16	16	16
Insulating wall mm	5,5	5,5	5,5	5,5
Diam. over semic. mm	17,3	19,4	21,6	24,9
External diameter mm	44	50	54	61
Height mm	58	64	68	76
Net weight kg/m	1,80	2,0	2,35	3,05
Cross-section of steel line mm ²	24,7	24,7	24,7	24,7
Load capacity, A 90 °C conductor temp. in air 25 °C	81	110	160	230
Load capacity, A 90 °C conductor temp. in air 50 °C	60	82	120	172
load capacity, A 90 °C conductor temp. in ground 15 °C	90	115	170	240
Conductor resistance Ω/km	1,83	1,20	0,641	0,320
Inductance mH/km	0,42	0,44	0,40	0,36
Capacitance µF/km	0,13	0,15	0,17	0,22
Max short circuit current 1 sec, kA 90 °C - 250 °C	1,53	2,50	4,90	9,24
Cap. of earth current A/km	1,70	1,63	1,85	2,39
E. modulus of supporting line, MPa	180000	180000	180000	180000
Stretch	11*10 ⁻⁶ /°C	11*10 ⁻⁶ /°C	11*10 ⁻⁶ /°C	11*10 ⁻⁶ /°C
Min breaking load, kN	33,9	33,9	33,9	33,9
Max permitted load, kN,55%	18,6	18,6	18,6	18,6

EXCLIGHT-H 3X10/10 12 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	6125	7000	7875
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	7237	8185	9125
	Sag m	1,18	1,37	1,55
	Template no	963	856	765
0 °C ice, no wind	Tensile force N	10664	11936	13180
	Sag m	1,95	2,28	2,61
	Template no	1591	1424	1288
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	10664	11936	13180
	Sag m	1,95	2,28	2,61
	Template no	1591	1424	1288
+65 °C no wind	Tensile force N	5081	5851	6629
	Sag m	1,69	1,91	2,14
	Template no	1379	1193	1056

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	5760	0,76	1,09	1,49	1,94	2,46
10	5937	0,74	1,06	1,44	1,89	2,39
0	6125	0,71	1,03	1,40	1,83	2,31
-10	6323	0,69	1,00	1,36	1,77	2,24
-20	6533	0,67	0,96	1,31	1,71	2,17

Sag corresponds to 2% of normal span.

EXCLIGHT-H 3X10/10 24 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	7875	9000	10125
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	9125	10323	11512
	Sag m	1,21	1,39	1,58
	Template no	987	868	780
0 °C ice, no wind	Tensile force N	12114	13586	15031
	Sag m	1,92	2,24	2,56
	Template no	1567	1400	1264
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	12114	13586	15031
	Sag m	1,92	2,24	2,56
	Template no	1567	1400	1264
+65 °C no wind	Tensile force N	6629	7641	8663
	Sag m	1,66	1,88	2,10
	Template no	1355	1174	1037

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	7449	0,76	1,09	1,48	1,93	2,45
10	7656	0,73	1,06	1,44	1,88	2,38
0	7875	0,71	1,03	1,40	1,83	2,31
-10	8103	0,69	1,00	1,36	1,78	2,25
-20	8342	0,67	0,97	1,32	1,73	2,18

Sag corresponds to 2% of normal span.

AXCLIGHT®-H 3X25/16 12 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	6562	7500	8437
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	7696	8723	9740
	Sag m	1,19	1,38	1,56
	Template no	971	862	770
0 °C ice, no wind	Tensile force N	11012	12345	13649
	Sag m	1,95	2,27	2,60
	Template no	1591	1418	1283
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	11012	12345	13649
	Sag m	1,95	2,27	2,60
	Template no	1591	1418	1283
+65 °C no wind	Tensile force N	5456	6295	7143
	Sag m	1,68	1,91	2,13
	Template no	1371	1193	1051

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	6181	0,76	1,09	1,49	1,94	2,46
10	6367	0,74	1,06	1,44	1,88	2,39
0	6562	0,71	1,03	1,40	1,83	2,31
-10	6768	0,69	1,00	1,36	1,77	2,24
-20	6987	0,67	0,97	1,31	1,72	2,17

Sag corresponds to 2% of normal span.

AXCLIGHT®-H 3X25/16 24 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	8750	10000	11250
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	10057	11380	12694
	Sag m	1,22	1,41	1,60
	Template no	995	881	790
0 °C ice, no wind	Tensile force N	12851	14425	15973
	Sag m	1,91	2,22	2,54
	Template no	1559	1387	1254
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	12851	14425	15973
	Sag m	1,91	2,22	2,54
	Template no	1559	1387	1254
+65 °C no wind	Tensile force N	7415	8549	9695
	Sag m	1,65	1,87	2,09
	Template no	1346	1168	1032

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	8297	0,75	1,08	1,48	1,93	2,44
10	8518	0,73	1,06	1,44	1,88	2,38
0	8750	0,71	1,03	1,40	1,83	2,31
-10	8990	0,70	1,00	1,36	1,78	2,25
-20	9242	0,68	0,97	1,33	1,73	2,19

Sag corresponds to 2% of normal span.

AXCLIGHT®-H 3X50/16 12 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	8093	9250	10406
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	9366	10588	11801
	Sag m	1,21	1,40	1,59
	Template no	987	874	785
0 °C ice, no wind	Tensile force N	12303	13795	15260
	Sag m	1,92	2,23	2,55
	Template no	1567	1393	1259
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	12303	13795	15260
	Sag m	1,92	2,23	2,55
	Template no	1567	1393	1259
+65 °C no wind	Tensile force N	6830	7867	8915
	Sag m	1,66	1,88	2,10
	Template no	1355	1174	1037

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	7661	0,75	1,09	1,48	1,93	2,44
10	7872	0,73	1,06	1,44	1,88	2,38
0	8093	0,71	1,03	1,40	1,83	2,31
-10	8325	0,69	1,00	1,36	1,78	2,25
-20	8567	0,67	0,97	1,32	1,73	2,19

Sag corresponds to 2% of normal span.

AXCLIGHT®-H 3X50/16 24 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	10281	11750	13218
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	11669	13218	14756
	Sag m	1,23	1,42	1,61
	Template no	1004	887	795
0 °C ice, no wind	Tensile force N	14150	15914	17652
	Sag m	1,88	2,19	2,50
	Template no	1534	1368	1234
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	14150	15914	17652
	Sag m	1,88	2,19	2,50
	Template no	1534	1368	1234
+65 °C no wind	Tensile force N	8801	10156	11525
	Sag m	1,64	1,85	2,06
	Template no	1338	1156	1017

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	9787	0,75	1,08	1,47	1,92	2,43
10	10029	0,73	1,05	1,44	1,87	2,37
0	10281	0,71	1,03	1,40	1,83	2,31
-10	10541	0,70	1,00	1,37	1,78	2,26
-20	10811	0,68	0,98	1,33	1,74	2,20

Sag corresponds to 2% of normal span.

AXCLIGHT®-H 3X95/16 12 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	10937	12500	14062
	Sag m	1,40	1,60	1,80
	Template no	1142	1000	888
-50 °C no wind	Tensile force N	12381	14000	15611
	Sag m	1,24	1,43	1,62
	Template no	1012	893	800
0 °C ice, no wind	Tensile force N	14732	16560	18362
	Sag m	1,87	2,17	2,48
	Template no	1526	1356	1224
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	14732	16560	18362
	Sag m	1,87	2,17	2,48
	Template no	1526	1356	1224
+65 °C no wind	Tensile force N	9417	10851	12299
	Sag m	1,63	1,84	2,06
	Template no	1330	1150	1017

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	10428	0,75	1,08	1,47	1,92	2,43
10	10678	0,73	1,05	1,43	1,87	2,37
0	10937	0,71	1,03	1,40	1,83	2,31
-10	11205	0,69	1,00	1,37	1,78	2,26
-20	11482	0,68	0,98	1,33	1,74	2,20

Sag corresponds to 2% of normal span.

AXCLIGHT®-H 3X95/16 24 KV

Load case	Normalspan	70 m	80 m	90 m
0 °C no wind	Tensile force N	10675	12200	13725
	Sag m	1,75	2,00	2,25
	Template no	1428	1249	1111
-50 °C no wind	Tensile force N	11794	13395	14988
	Sag m	1,58	1,82	2,06
	Template no	1289	1137	1017
0 °C ice, no wind	Tensile force N	14429	16266	18077
	Sag m	2,14	2,48	2,83
	Template no	1746	1549	1397
After permanent stretching and shrinkage				
0 °C ice, no wind	Tensile force N	14429	16266	18077
	Sag m	2,14	2,48	2,83
	Template no	1746	1549	1397
+65 °C no wind	Tensile force N	9475	10891	12318
	Sag m	1,97	2,24	2,51
	Template no	1608	1400	1239

NORMAL SPAN = 70 M

Line temp	Tensile force N	Sag in m with span of:				
		50 m	60 m	70 m	80 m	90 m
0 °						
20	10276	0,93	1,34	1,82	2,37	3,00
10	10472	0,91	1,31	1,78	2,33	2,95
0	10675	0,89	1,29	1,75	2,29	2,89
-10	10884	0,88	1,26	1,72	2,24	2,84
-20	11100	0,86	1,24	1,68	2,20	2,78

Sag corresponds to 2% of normal span.

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