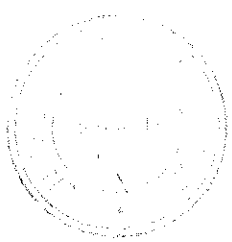
ПРИЛОЖЕНИЕ № 6

КЪМ ДОГОВОР С ПРЕДМЕТ: „ПОДМЯНА НА МАСЛОНАПЪЛНЕНА КАБЕЛНА ЕЛЕКТРОПРОВОДНА ЛИНИЯ 110 KV „ДРАГАЛЕВЦИ“ - ЕЛЕМЕНТ ОТ КРИТИЧНАТА ИНФРАСТРУКТУРА НА РАЗПРЕДЕЛИТЕЛНАТА МРЕЖА 110 KV НА ГРАД СОФИЯ“

Приложение № 1 към Предложение за изпълнение на поръчката – Заверени копия на каталози на предлаганите материали, апаратура, оборудване и съоръжения

ДЗЗД „ЕИК ДРАГАЛЕВЦИ" Пловдив



Приложение № 1.1 Заверено копие на каталог на Ограничител на пренапрежение (вентилни отводи) за нова КЕЛ 110 kV - 1 комплект (за преходен портал „КЕЛ - ВЕЛ“)

ДЗЗД „ЕИК ДРАГАЛЕВ“ Пловдив

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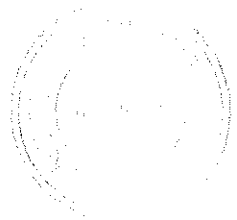


Zinc Oxide Surge Arrester PEXLIM P-X

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

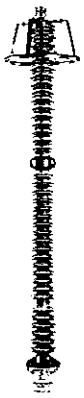
Major component in PEXLINK™ concept for transmission line protection.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 420 kV
Rated voltages (U_r)	42 - 360 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10-15 kA_{peak}
Charge, energy and current withstands:	
Repetitive charge transfer rating, Q_{rs} (IEC)	3.2 C
Thermal energy rating, W_{th} (IEC)	11 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	7.0 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1.600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	G
Single-impulse withstand rating as per IEEE standard	3.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	4.0 C
Short-circuit/Pressure relief capability	65 $kA_{rms\,sym}$
Mechanical strength:	
Specified long-term load (SLL)	2.500 Nm
Specified short-term load (SSL)	4.000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 4

Further data according to the IEEE standard can be supplied on request



PEXLIM P-X
Guaranteed protective data 24 - 145 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
24[3]	24	19.2	19.5	26.5	25.2	45.8	48.5	49.7	51.9	54.5	59.8	65.6
36[3]	30	24.0	24.4	33.1	31.5	56.5	60.7	62.2	64.9	68.3	74.8	81.9
	33	26.4	26.7	36.4	34.6	64.4	66.7	68.4	71.4	75.1	82.3	90.1
	36	28.8	29.0	39.7	37.8	70.2	72.8	74.6	77.9	81.9	89.7	98.3
	39	31.2	31.6	43.0	40.9	76.1	78.8	80.8	84.3	88.8	97.2	107
52	42	34	34.0	46.4	44.1	81.8	84.8	87.0	90.8	95.5	105	115
	48	38	39.0	53.0	50.4	93.6	97.0	99.4	104	110	120	132
	51	41	41.3	56.3	53.5	99.5	104	106	111	117	128	140
	54	43	43.0	59.6	56.7	106	110	112	117	123	135	148
	60	48	48.0	66.3	63.0	117	122	125	130	137	150	164
	72	58	58.0	79.5	75.6	141	145	150	156	164	180	197
72	54	43	43.0	59.6	56.7	106	110	112	117	123	135	148
	60	48	48.0	66.3	63.0	117	122	125	130	137	150	164
	63	50	51.0	69.6	66.1	123	128	131	137	144	157	172
	66	53	53.4	72.9	69.3	129	134	137	143	151	165	181
	72	58	58.0	79.5	75.6	141	145	150	156	164	180	197
	75	60	60.7	82.8	78.7	147	152	156	163	171	187	205
	78	62	63.1	86.1	81.9	153	158	162	169	178	195	213
	81	65	65.8	89.6	85.0	158	164	168	176	185	202	222
	84	67	68.0	92.8	88.2	164	170	174	182	192	210	230
100	72	58	58.0	79.5	75.6	141	145	150	156	164	180	197
	75	60	60.7	82.8	78.7	147	152	156	163	171	187	205
	78	62	63.1	86.1	81.9	153	158	162	169	178	195	213
	81	65	65.8	89.6	85.0	158	164	168	176	185	202	222
	84	67	68.0	92.8	88.2	164	170	174	182	192	210	230
123	90	72	72.0	99.4	94.5	176	182	187	195	205	225	245
	96	77	77.0	106	100	188	194	199	208	219	240	263
	102	78	82.6	112	107	199	207	212	221	233	255	279
	108	78	84.0	119	113	211	219	224	234	246	270	295
	114	78	92.3	125	119	223	231	237	247	260	284	312
	120	78	96.0	132	126	234	243	249	260	273	299	328
	123	78	104	142	135	252	261	268	279	294	322	353
	132	78	106	145	138	258	267	274	286	301	329	361
	138	78	111	152	144	270	279	286	299	314	344	377
	144	78	115	159	151	281	291	299	312	328	359	394
	150	78	121	165	157	293	304	311	325	342	374	410

[1] The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than U_s is indicated.
Any deviation with U_c higher than or equal to the actual system voltage @ MCOT by 1% can be selected.

[2] With one duty cycle at the thermal energy rating of 11 kJ/kV (U_r)

[3] Accepted for system voltages ≥ 15 kV or below can be supplied on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

PEXLIM P-X
Guaranteed protective data 145 - 420 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
145	108	85	85.0	119	113	211	219	224	234	246	270	295
	120	92	93.0	132	126	234	243	249	260	273	299	328
	132	92	105	145	138	258	267	274	286	301	329	361
	135	92	111	152	144	270	279	286	299	314	344	377
	144	92	115	159	151	281	291	299	312	328	359	394
	150	92	121	165	157	293	304	311	325	342	374	410
	162	92	131	179	170	316	328	336	351	369	404	443
	168	92	131	185	176	328	340	348	364	383	419	459
170	132	108	105	145	138	258	267	274	286	301	329	361
	144	108	115	159	151	281	291	299	312	328	359	394
	150	108	121	165	157	293	304	311	325	342	374	410
	162	108	131	179	170	316	328	336	351	369	404	443
	168	108	131	185	176	328	340	348	364	383	419	459
	180	108	144	198	189	351	364	373	390	410	449	492
	192	108	152	212	201	375	388	398	415	437	479	525
245	180	144	144	198	189	351	364	373	390	410	449	492
	192	154	154	212	201	375	388	398	415	437	479	525
	198	156	160	218	207	387	400	410	428	451	494	541
	210	156	170	232	220	410	425	435	454	478	524	574
	214	156	173	237	225	419	434	445	464	488	535	586
	216	156	175	238	226	422	437	448	467	492	539	590
	219	156	177	241	229	427	443	454	474	499	546	598
	222	156	179	245	233	433	449	460	480	505	554	607
	228	156	180	251	239	445	461	473	493	519	569	623
300	215	173	175	238	226	422	437	448	467	492	539	590
	228	182	182	251	239	445	461	473	493	519	569	623
	240	191	191	265	252	468	485	497	519	546	598	655
	255	191	209	265	270	504	522	535	558	587	643	705
	264	191	212	291	277	515	534	547	571	601	658	721
	276	191	220	304	289	539	558	572	597	628	688	754
362	258	206	209	283	270	504	522	535	558	587	643	705
	264	211	212	291	277	515	534	547	571	601	658	721
	276	221	221	304	289	539	558	572	597	628	688	754
	288	230	230	318	302	562	582	597	623	656	718	787
420	330	264	267	364	346	644	667	684	714	751	823	901
	336	267	272	371	352	656	679	695	727	765	838	918
	342	267	277	377	359	667	691	709	740	779	852	934
	360	267	291	397	378	702	726	745	779	819	897	983

[1] The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than U_s is indicated.
Any arrester with U_c higher than or equal to the actual system voltage @ MCOT by 1% can be selected.

[2] With one duty cycle at the thermal energy rating of 11 kJ/kV (U_r)

[3] Accepted for system voltages ≥ 15 kV or below can be supplied on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

PEXLIM P-X
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [1]				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
U_s	U_r			kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
24	24	XV024	1353	263	126	126	235	19	451	-	-	-	1
36	30-36	XV036	1353	263	126	126	235	19	451	-	-	-	1
	39	XV036	2270	403	187	187	330	30	736	-	-	-	1
52	42-72	XV052	2270	403	187	187	330	30	736	-	-	-	1
72	54-72	XV072	2270	403	187	187	330	30	736	-	-	-	1
	75-84	XV072	3625	578	293	293	452	44	1080	-	-	-	1
100	75-96	XV100	3625	578	293	293	452	44	1080	-	-	-	1
123	90-120	XV123	3625	578	293	293	452	43	1080	-	-	-	1
	90-144	XV123	4540	800	374	374	660	54	1397	-	-	-	2
	150	XV123	4938	861	419	419	697	55	1436	-	-	-	2
145	108-120	XV145	3625	578	293	293	452	42	1080	-	-	-	1
	108-144	XV145	4540	800	374	374	660	53	1397	-	-	-	2
	150	XV145	4938	861	419	419	697	55	1436	-	-	-	2
	162-168	XV145	6896	978	450	450	782	66	1741	-	-	-	2
170	132-144	XV170	4540	800	374	374	660	53	1400	400	-	160	3
	150	XV170	4948	861	419	419	697	57	1459	400	-	160	3
	162-192	XV170	6896	978	450	450	782	70	1744	400	-	160	3
245	180-192	XM245	6896	978	450	450	782	66	1741	400	-	160	3
	180-228	XV245	7250	1156	566	566	924	83	2088	400	-	160	3
	180-198	XV245	6613	1433	712	712	1159	101	2647	600	-	600	4
	210-228	XV245	6613	1433	712	712	1159	98	2617	600	-	300	4
300	216-276	XV300	6613	1433	712	712	1159	101	2617	600	-	600	4
	216-276	XV300	9520	1956	773	773	1254	110	2872	600	-	600	4
362	258-288	XV362	9520	1956	773	773	1254	118	2872	1200	1000	600	5
	258-288	XV362	11730	1956	960	960	1564	148	3539	1400	1000	700	6
420	330-360	XV420	10878	1734	879	879	1388	131	3216	1400	1000	700	5
Neutral-ground arresters													
52	30-56	XN052	1353	263	126	126	235	19	451	-	-	-	1
72	42-54	XN072	2270	403	187	187	330	29	736	-	-	-	1
100	60	XN100	2270	403	187	187	330	30	736	-	-	-	1
123	72	XN123	2270	403	187	187	330	28	736	-	-	-	1
	75-120	XN123	3625	578	293	293	452	43	1080	-	-	-	1
145	84-120	XN145	3625	578	293	293	452	42	1080	-	-	-	1
170	96-120	XN170	3625	578	293	293	452	42	1080	-	-	-	1
245	108	XN245	3625	578	293	293	452	43	1080	-	-	-	1
	108-144	XN245	4540	800	374	374	660	60	1397	-	-	-	2

[1] Values for creepage distances for simply units of greater.

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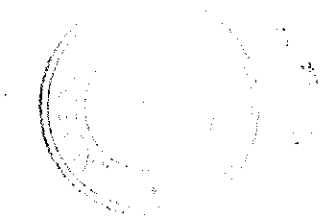


PEXLIM P-X
Technical data for housings

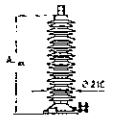


Figure 1

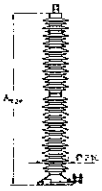


Figure 2


Figure 3

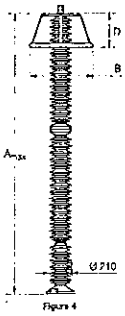


Figure 4

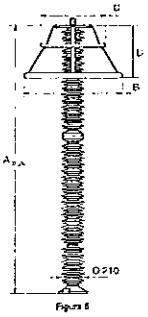


Figure 5

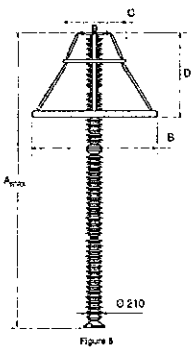
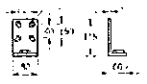
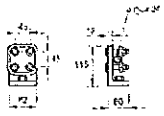


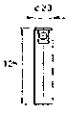
Figure 6

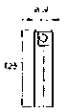
PEXLIM P-X
Accessories

Line terminals

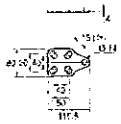

1HSA410 000-L
Aluminium

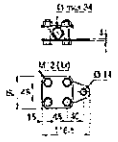

1HSA410 000-M
Aluminium flag with other items in stainless steel


1HSA410 000-N
Aluminium

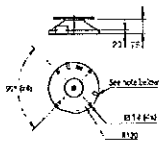

1HSA410 000-P
Stainless steel

Earth terminals

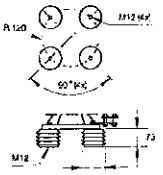

1HSA490 000-A
Stainless steel


1HSA490 000-B
Stainless steel

Drilling plans


NOTE! Alternative drilling plan
3 slotted holes (120°), n14 at R111-127

Without insulating base
Aluminium


Insulating base
1HSA493 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

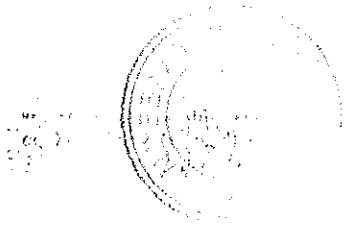
PEXLIM P-X
Shipping data

Rated voltage U_r kV$_{rms}$	Housing	Number of arresters per crate: One Volume m³	One Gross kg	Three Volume m³	Three Gross kg	Six Volume m³	Six Gross kg
	XV024	0.1	42	0.5	82	0.9	152
6	XV036	0.1	42	0.5	86	0.9	152
	XV036	0.5	52	0.5	116	0.9	212
42-72	XV052	0.5	52	0.5	116	0.9	212
54-72	XV072	0.5	52	0.5	116	0.9	212
76-84	XV072	0.7	71	0.7	153	1.2	301
76-96	XV120	0.7	71	0.7	153	1.2	301
90-120	XH123	0.7	71	0.7	153	1.2	301
90-144	XV123	0.9	87	0.9	201	1.5	372
150	XV123	0.9	87	0.9	201	1.5	372
108-120	XH145	0.7	58	0.7	154	1.2	253
108-144	XV145	0.9	87	0.9	201	1.5	372
150	XV145	0.9	87	0.9	201	1.5	372
162-168	XV145	1.1	65	1.1	239	1.9	443
132-144	XH170	0.9	59	0.9	207	1.5	384
150	XH170	0.9	59	0.9	207	1.5	384
162-192	XV173	1.1	102	1.1	251	1.9	443
192	XM245	1.1	68	1.1	249	1.9	443
180-228	XH245	1.1	115	1.1	290	1.9	545
180-156	XV245	0.9	139	1.5	339	-	-
210-226	XV245	0.9	139	1.5	339	-	-
216-264	XH300	1.0	155	1.7	358	-	-
276	XH300	1.0	155	1.7	358	-	-
216-276	XV300	1.0	153	1.7	382	-	-
258-288	XH362	1.6	207	2.3	435	-	-
258	XV362	2.1	242	2.9	497	-	-
324-228	XV362	2.1	258	2.3	545	-	-
330-360	XH420	2.1	242	2.3	497	-	-
30-36	XN052	0.1	42	0.5	85	0.9	152
42-54	XN072	0.5	52	0.5	116	0.9	212
60	XN100	0.5	52	0.5	116	0.9	212
72	XN123	0.5	52	0.5	116	0.9	212
75-120	XN123	0.7	71	0.7	153	1.2	301
84-120	XN145	0.7	71	0.7	153	1.2	301
96-120	XN170	0.7	71	0.7	153	1.2	301
108-120	XN245	0.7	71	0.7	153	1.2	301
132-144	XN245	0.9	87	0.9	201	1.5	372

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be considered an approximation and specific data for deliveries may differ from the values given.



Data Schedule

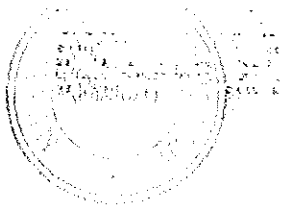
Tender ID: Pos:

ABB High Voltage Products

Data schedule: Surge Arresters

DIMENSION DRAWING: 1HSA134-8664

		PEXLIM P-X P096-XV123
1 General data		
Design		ZnO, Gapless
Manufacturer, country		ABB
Applied standards		IEC
Catalogue		1HSM 9543 12-00en
Maximum system voltage (Us)	kVrms	123
Arrester classification as per IEC 60099-4 Ed 3.0		Station; SH
Nominal discharge current	kApeak	20
Rated voltage (Ur)	kVrms	96
Maximum continuous operating voltage (Uc)	kVrms	77
Frequency	Hz	15-62
TOV capability (after thermal energy rating, Wth)		
1 s	kVrms	106
10 s	kVrms	100
2 Charge, energy and current withstand data		
Repetitive charge transfer rating, Qrs	C	3.2
Thermal energy rating, Wth	kJ/kV (Ur)	11
Discharge current withstand strength		
High current, 4/10 µs	kApeak	100
Low current, 2000 µs	Apeak	1600
Single-impulse withstand rating (IEEE), Repetitive charge transfer test value (IEC) - sample tests on all manufactured block batches	C	4
Energy data as per previous IEC standard IEC 60099-4, Ed 2.2		
Line discharge class	Class	4
Energy capability - thermal energy capability (as per IEC 60099-4 Ed 2.2, clause 8.5.5)	kJ/kV (Ur)	11
3 Guaranteed max. protective data		
Maximum residual/discharge voltage		
with current wave 30/60 µs (slow-front/switching)		
0.5 kA	kVpeak	182
1.0 kA	kVpeak	188
2.0 kA	kVpeak	194
with current wave 8/20 µs (fast-front/lightning)		
5.0 kA	kVpeak	208
10 kA	kVpeak	219
20 kA	kVpeak	240
with current wave 1/(2-20) µs (FOW as per IEEE, steep front as per IEC)		
External inductive effects neglected.		
10 kA	kVpeak	233
4 Technical data for housing		
Short-circuit capability		
High current, 0.2 s	kArms	65
Low current	Arms	600
External insulation		
Requirements as per IEC 60099-4		
LIWL, 1.2/50 µs	kVpeak	312
50 Hz, wet (60 s)	kVrms	146
SIWL, wet (250/2500 µs)	kVpeak	243
Tested values on empty units/modules housings		
LIWL, 1.2/50 µs	kVpeak	800
50 Hz, wet (60 s)	kVrms	374
SIWL, wet (250/2500 µs)	kVpeak	660
Creepage distance (nominal)	mm	4540
	mm/kV (Us)	36.9
Specified long-term load (SLL)	Nm	2500
Specified short-term load (SSL)	Nm	4000
Insulator colour / material		Grey Silicone

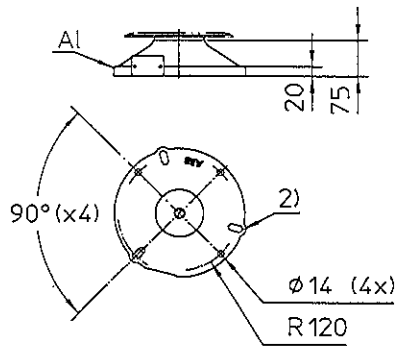


Surge arrester type PEXLIM P-X

System voltage range 12 - 170 kV

Rated voltage kV	System voltage kV		A mm	B mm	C mm	D mm	Creepage distance mm	1) Mass kg	fig.
012-015	XV	012	481				1363	20	1
018-024	XV	024	481				1363	19	1
030-036	XV	036	481				1363	19	1
039			736				2270	30	1
042-072	XV	052	736				2270	30	1
054-072	XV	072	736				2270	29	1
075-084			1080				3625	44	
075-096	XV	100	1080				3625	44	1
090-120	XH	123	1080				3625	43	1
090-144	XV		1397				4540	54	2
150			1486				4988	55	
108-120	XH	145	1080				3625	42	1
108-144	XV		1397				4540	53	2
150			1486				4988	55	
162-168			1741				5895	66	
132-144	XH	170	1417	400		160	4540	53	3
150			1506				4988	57	
132-192	XV		1761				5895	70	

DRILLING PLAN



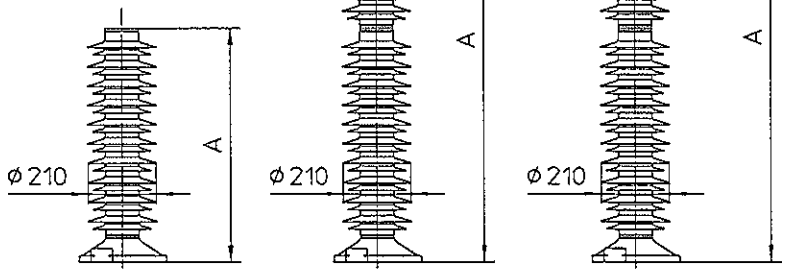


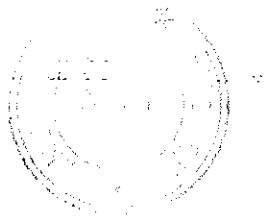
fig. 1 fig. 2 fig. 3

1) Including line terminal, earth terminal and grading ring arrangement.

2) Alternative drilling plan - 3 slotted holes (120°), ø14 at R111-127.

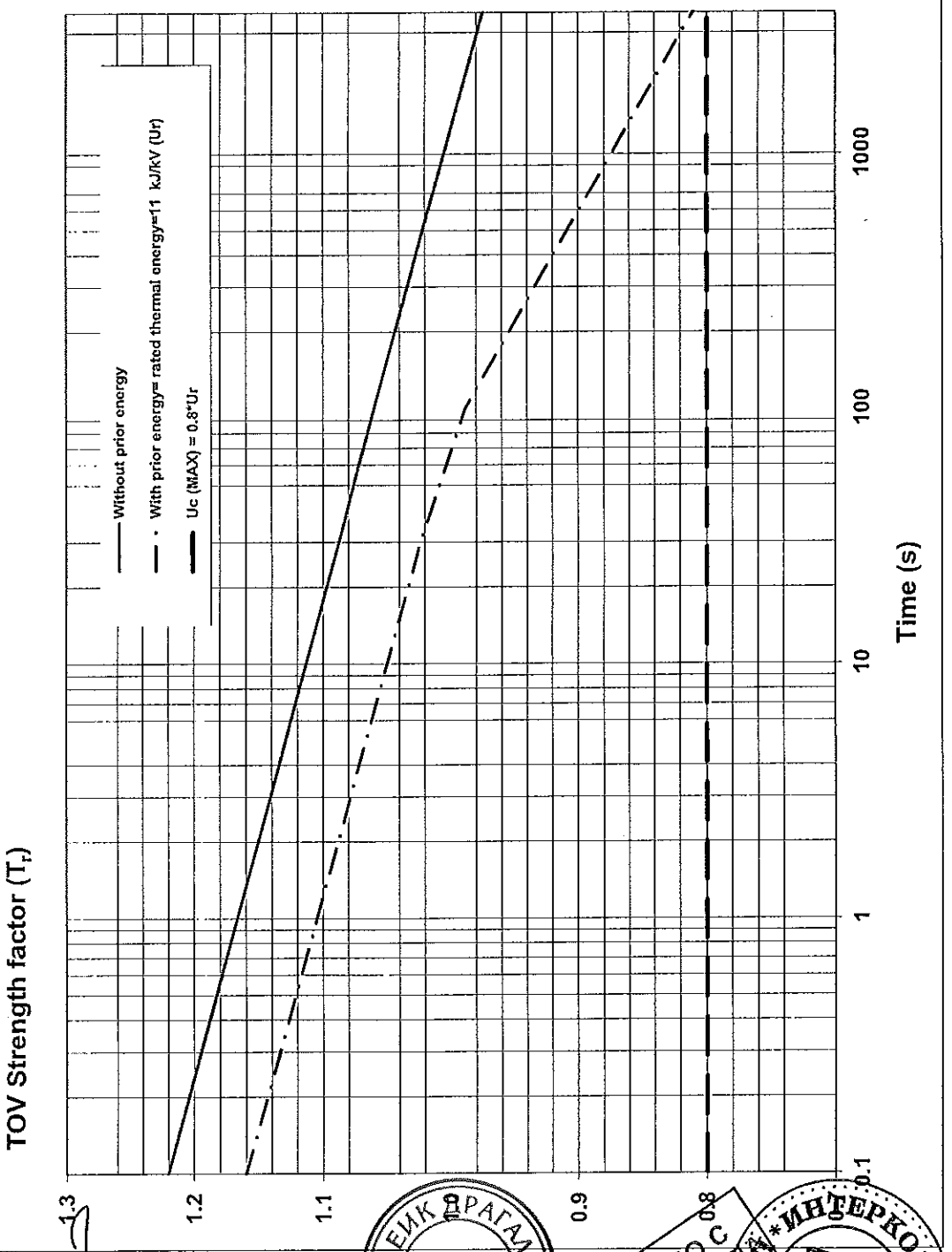
Accessories on drawing 1HSA301 000-D
Surge counter on drawing 1HSA440 000-A
Surge arrester monitor EXCOUNT-II on drawing 1HSA440 000-B

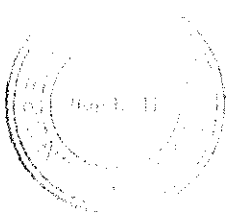
Prepared: P Skyllberg 2002-06-18	Responsible department: PTHVP/AKK	Title: DIMENSION DRAWING SURGE ARRESTER	Language: en
Approved: T Åslund 2002-09-30	Take over department: PTHVP/AF		Sheet: 1
Revision: 2 Base changed.			Cont: -
ABB Power Technology Products		Document no.: 1HSA303 000-CA	



LAK 7992
PPHC/AKB 2014-10-06

TOV CAPABILITY FOR ARRESTERS TYPE PEXLIM P-X and PEXLIM P-Y
Expressed in multiples of the rated voltage U_r, (T_r)





Summary of type tests and documentation for arrester type PEXLIM P-X

Zinc oxide surge arrester with HTV silicone rubber housing.

LAK 5873 Rev 8
PPHC/AKB

Type tests performed	Standard	Report No.	Issued	Note/verification
Electrical tests				
Insulation withstand tests	IEC 60099-4,Ed 3.0 cl.10.8.2	Q 12-120	2013-02-28	All module sizes (36, 72 and 120kV)
		HVP/AK 13-21	2013-04-09	Validation of test samples
Residual voltage tests	IEC 60099-4,Ed 3.0 cl.10.8.3	HVP/AK 13-70	2013-12-06	The protection levels
Test to verify the long term stability against continuous operating voltage	IEC 60099-4,Ed 3.0 cl.10.8.4	HVP/AK 10-22	2010-04-29	The long term stability at highest voltage stress (0.98*Uref)
Test to verify the repetitive charge transfer rating	IEC 60099-4,Ed 3.0 cl.10.8.5	HVP/AK 13-28	2013-06-26	Charge rating, Qrs, of 3.2 C
Heat dissipation behaviour of test sample	IEC 60099-4,Ed 3.0 cl.10.8.6	HVP/AK 13-69	2013-12-04	
Operating duty test	IEC 60099-4,Ed 3.0 cl.10.8.7	HVP/AK 14-41	2014-07-01	Thermal energy rating of 11 kJ/kV rated voltage
Power-frequency voltage-versus-time test	IEC 60099-4,Ed 3.0 cl.10.8.8	HVP/AK 14-74	2014-10-20	
Lightning impulse discharge capability test	IEC 60099-4,Ed 3.0 Annex H	HVP/AK 08-06	2008-06-02	Impulse strength for lightning surges
Short-circuit tests	IEC 60099-4, Ed 2.2 cl.10.8.7 Same requirements as in new revision IEC 60099-4 Ed 3.0 cl.10.8.10	HVP/AK 07-45	2007-10-05	All current levels for a rated short-circuit current of 63 kA. (Actual high-current 65 kA)
Mechanical tests				
Bending strength test Bending fatigue test	IEC 60099-4, IEC 37/345/CDV Same requirements as in new revision IEC 60099-4 Ed 3.0 cl.10.8.11	HVP/AK 08-01	2008-06-17	Verifies a specified long-term load, SLL, of 2500 Nm and a specified short-term load, SSL, of 4000 Nm.
Verification of low temperature performance		HVP/AK 02-01	2002-01-07	Test on 120 kV module at 2500 Nm -50°C
Environmental ageing tests				
Weather ageing test (1000 h salt fog)	IEC 60099-4,Ed 3.0 cl.10.8.17	No. 333a E (TUD)	2013-02-15	Test on 120 kV module
Data sheets		**Document No.**	**Issued**	
Protective characteristics		LAK 5882rev 3	2013-11-14	
Temporary overvoltage (TOV) characteristics		LAK 7992	2014-10-06	With and without previous thermal energy of 11 kJ/kV rated voltage

ABB AB

2002-01-25
Rev 8 (Revision date 2015-04-14)

We hereby certify that the tests listed above verify guaranteed data for PEXLIM P-X arresters

Ludvika 2015-04-14
ABB AB

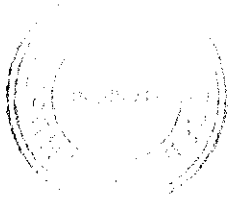
High Voltage Products/Surge Arresters
Quality Department

Kurt Jansson

ABB AB High Voltage Products QA QUALITY

ABB

ВЯРНО С ОРИГИНАЛА ИНТЕРКОМПАЕКС ПЛОВДИВ ООД



SUMMARY OF CUSTOMER WITNESS TESTS

Routine test requirements

The minimum requirements for routine tests on surge arresters are specified by IEC and IEEE. The tests performed by ABB fulfils or exceeds the requirements according to IEC 60099-4 or IEEE C62.11, as applicable for a specific order.

The routine tests performed by ABB comprise the following, as applicable:

- Residual voltage (Discharge voltage) at 10 kA (8/20μs) is individually measured on each MO resistor. The residual voltage of the complete arrester is taken as the sum of the residual voltages of the MO resistors in series.
- Tightness (Seal) check on arresters with hollow insulators having enclosed gas volume and separate sealing system is made on each unit in a pass/no-pass test. Maximum permissible seal leak rate is 0.0001 mbarl/sec at a pressure difference of 0.1 MPa.
- Reference voltage (Power frequency resistive current) is measured on each unit.
- After the application of at least rated voltage on each unit for a minimum of 10 seconds, the test voltage is decreased to 0.9 times rated voltage of the unit (being a higher voltage stress than required by IEC or IEEE) . At this voltage each unit is checked to have a steady partial discharge level less than 5pC.
- Power losses are measured at continuous operating voltage on each unit.
- Grading current is measured at continuous operating voltage on each unit.

Witnessing of routine tests

ABB accepts inspection and witnessing of these routine tests by Final Customer, Consultant or Purchaser, provided this is undertaken at the time of production and in accordance with our planned schedule. However, unless an extended visit is planned, not all tests can usually be witnessed for practical reasons. For example, the Residual Voltage (Discharge Voltage) test is performed during daily production of the MO resistors, which can occur a significant time before their assembly into the arresters.

If no Inspector is available at the time for the tests, we reserve the right to perform the tests according to our planned schedule and present the test report to the Inspector.

Acceptance tests are not considered necessary nor value-adding to secure the performance of ABB surge arresters due to the extensive testing program already undertaken by ABB (type, routine and sample). Consequently, acceptance tests are not performed unless specifically agreed upon in advance. Unless otherwise agreed, **customer witness of tests** on surge arresters from a specific order are hence limited to the following repeated electrical tests from the above list, performed on an agreed number (maximum 10%) of samples from the actual order, with all testing made on individual units of the arrester:

- Reference voltage
- Partial discharge
- Power losses
- Grading current

During customer visits, we welcome the opportunity to provide a tour of our facilities and, if possible, show the production of similar equipment from other customer orders.

ABB AB
High Voltage Products
James Taylor
Technology Support Manager
Principal Specialist / Surge Arresters

ABB Ludvika, Sweden

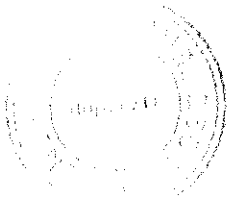
ABB AB High Voltage Products QA QUALITY

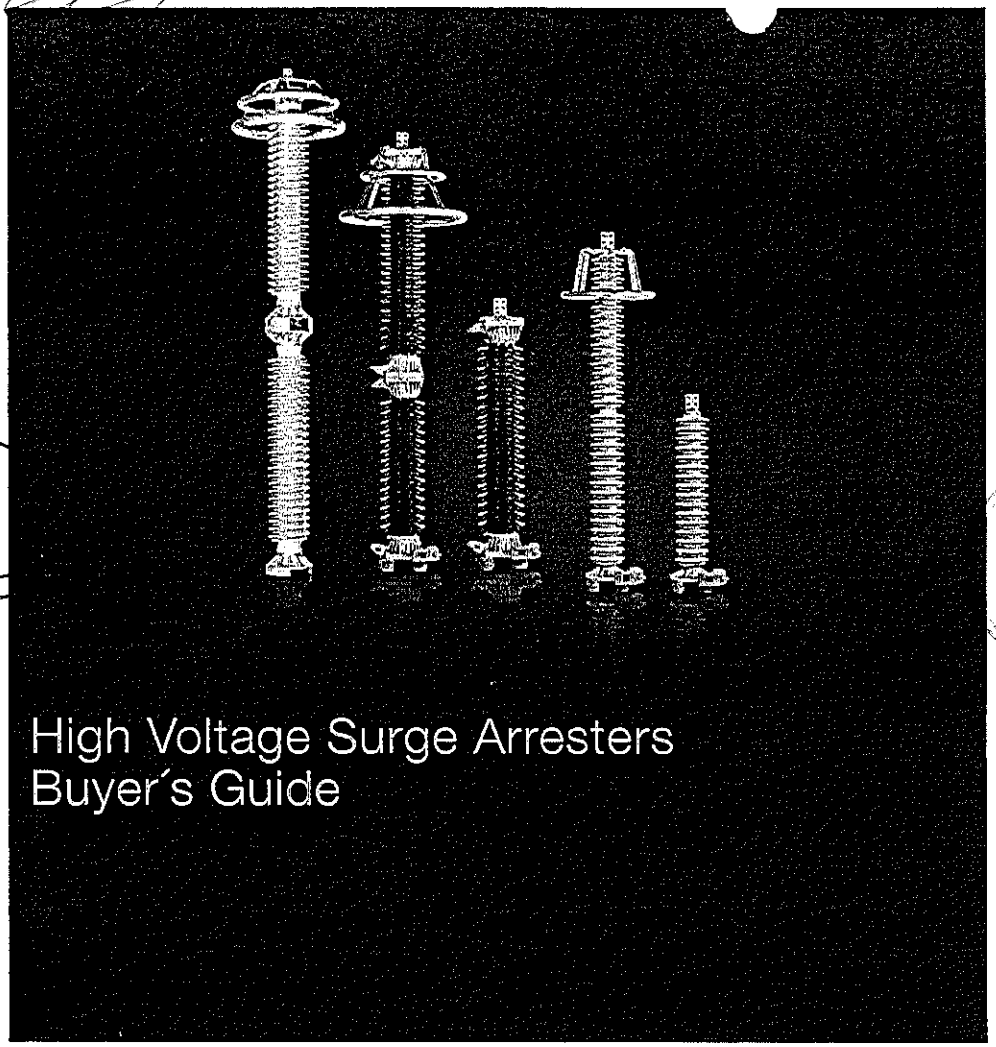
ТЗЗП „ЕИК ДРАГАЛЕВСКИ" Пловдив

ИНТЕРКОМИЕКС ПОО ПЛОВДИВ

ВЯРНО С ОРИГИНАЛА

ABB





High Voltage Surge Arresters
Buyer´s Guide

Table of contents

Safe, secure and economic supply of electricity — with ABB surge arresters

ABB surge arresters are the primary protection against atmospheric and switching overvoltages. They are generally connected in parallel with the equipment to be protected to divert the surge current. The active elements (MO resistors) of ABB surge arresters are manufactured using a highly non-linear ceramic resistor material, composed primarily of zinc oxide mixed with other metal oxides and sintered together.

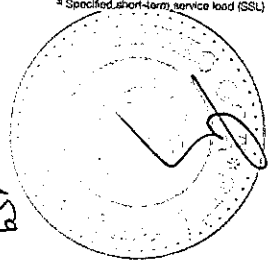
Strong focus on quality at all stages, from raw material through to finished product, ensures that ABB surge arresters survive the designed stresses with ease and with good margins. Different dimensions permit a large variety of standard arresters as well as client-specific solutions with regards protection levels, energy capability and mechanical performance.

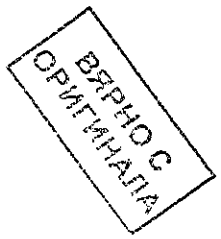
This Buyer's Guide deals with high voltage surge arresters for standard AC applications. For other applications, such as series capacitors protection, shunt capacitor protection or DC applications, contact your ABB sales representative.

Product range

Arrester classification	Type	Max. system voltage [1] kV_{rms}	Rated voltage [2] kV_{rms}	Energy requirement/ Lightning intensity	Mechanical strength [3] Nm
PEXLIM — Silicone polymer-housed arrester					
Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.					
Major component for PEXLINK™ concept for transmission line protection.					
10 kA, IEC station class designation SL	PEXLIM R-Z	72 - 145	75 - 120	Moderate	1 300
10 kA, IEC station class designation SL	PEXLIM R-Y	24 - 170	18 - 144	Moderate	1 600
10 kA, IEC station class designation SM	PEXLIM Q	52 - 420	42 - 396	High	4 000
20 kA, IEC station class designation SH	PEXLIM P-X	52 - 420	42 - 360	Very high	4 000
20 kA, IEC station class designation SH	PEXLIM P-Y	300 - 550	228 - 444	Very high	9 000
TEXLIM — High strength silicone polymer-housed arrester					
Specially suited to extreme seismic zones.					
10 kA, IEC station class designation SM	TEXLIM Q-C	123 - 420	90 - 420	High	40 000
20 kA, IEC station class designation SH	TEXLIM P-C	245 - 550	180 - 444	Very high	40 000
20 kA, IEC station class designation SH	TEXLIM T-C	245 - 800	180 - 624	Very high	40 000
EXLIM — Porcelain-housed arrester					
10 kA, IEC station class designation SL	EXLIM R	52 - 170	42 - 168	Moderate	7 500
10 kA, IEC station class designation SM	EXLIM Q-E	52 - 245	42 - 228	High	7 500
10 kA, IEC station class designation SM	EXLIM Q-D	170 - 420	132 - 420	High	20 000
20 kA, IEC station class designation SH	EXLIM P	52 - 550	42 - 444	Very high	20 000
20 kA, IEC station class designation SH	EXLIM T	245 - 800	180 - 624	Very high	20 000

[1] Arrester classification according to IEC 60099 4.
[2] Arresters with lower or higher voltages may be available on request for special applications.
[3] Specified short-term service load (SSL)





Definitions

NOTE! The standards referred to hereunder are the latest editions of IEC 60099-4 and IEEE C62.11

Maximum system voltage (Us)
The maximum voltage between phases during normal service.

Nominal discharge current (IEC)
The peak value of the lightning current impulse which is used to classify the arrester.

Lightning classifying current (ANSI/IEEE)
The designated lightning current used to perform the classification tests.

Rated voltage (U_r)
An arrester fulfilling the IEC standard must withstand its rated voltage (U_r) for 10 s after being preheated to 60 °C and subjected to energy injection as defined in the standard. Thus, U_r shall equal at least the 10-second TOV capability of an arrester. Additionally, rated voltage is used as a reference parameter.

NOTE! TOV capability of ABB arresters exceeds the IEC requirements.

Duty-cycle voltage rating (IEEE)
The designated maximum permissible voltage between its terminals at which an arrester is designed to perform its duty cycle.

Continuous operating voltage
The maximum permissible r.m.s. power frequency voltage that may be applied continuously between the arrester terminals. This voltage is defined in different ways (verified by different test procedures) in IEC and IEEE.

- IEC (U_c)
  IEC gives the manufacturer the freedom to decide U_c. The value is verified in the operating duty test.
- IEEE (MCOV)
  IEEE lists the maximum continuous operating voltage (MCOV) for all arrester ratings used in a table. The value is used in all tests specified by IEEE.

Temporary overvoltages (TOV)
Temporary overvoltages, as differentiated from surge overvoltages, are oscillatory power frequency overvoltages of relatively long duration (from a few cycles to hours).
The most common form of TOV occurs on the healthy phases of a system during an earth-fault involving one or more phases. Other sources of TOV are load-rejection, energization of unloaded lines, ferroresonance, etc. The TOV capability of the arresters is indicated with prior energy stress in the relevant catalogues.

Residual voltage/Discharge voltage
The peak value of the voltage that appears between the terminals of an arrester during the passage of discharge current through it. Residual voltage depends on both the magnitude and the waveform of the discharge current. The voltage/current characteristics of the arresters are given in the relevant catalogues.

Arrester class
- Distribution class arrester (IEC designations: DL, DM, DH)
  An arrester intended for use on distribution systems, typically of Us ≤ 52 kV, to protect components primarily from the effects of lightning.
- Station class arrester (IEC designations: SL, SM, SH)
  An arrester intended for use in stations to protect the equipment from transient overvoltages, typically but not only intended for use on systems of Us ≥ 72,5 kV.

Energy capability
The energy that a surge arrester can absorb, in one or more impulses, without damage and without loss of thermal stability. The energy capability of a surge arrester is different depending on the type, duration and grouping of applied impulses as well as what occurs afterwards. Arrester standards have historically not explicitly defined the energy capability of an arrester, and the current editions have specifically focused on attempting to resolve this deficiency in the following forms (IEC 60099-4 definitions):

- Repetitive charge transfer rating, Q_{rs}
  The maximum specified charge transfer capability of an arrester, in the form of a single event or group of surges that may be transferred through an arrester without causing mechanical failure or unacceptable electrical degradation to the MO resistors. This applies to both station and distribution class arresters.
- Thermal charge transfer rating, Q_{th}
  The maximum specified charge that may be transferred through an arrester or arrester section within 3 minutes in a thermal recovery test without causing a thermal runaway. This applies only to distribution class arresters.

- Thermal energy rating, W_{th}
  The maximum specified energy, given in kJ/kV of U_r, that may be injected into an arrester or arrester section within 3 minutes in a thermal recovery test without causing a thermal runaway. This applies only to station class arresters.

Short-circuit capability
The ability of an arrester, in the event of an overload due to any reason, to conduct the resulting system short-circuit current without violent shattering which may damage nearby equipment or injure personnel. After such an operation, the arrester must be replaced. The system short-circuit current may be high or low depending on the system impedance and earthing conditions and hence short-circuit capability is verified at different current levels.

External insulation withstand strength
The maximum value of the applied voltage of a specified wave shape which does not cause the flashover of an arrester. Unlike other equipment, arresters are designed to discharge internally and the voltage across the housing can never exceed the protective levels. Thus, the external insulation of arrester housings is self-protected and need not fulfill a certain standardized insulation class provided its insulation withstand strength is higher than the protective levels by a designated safety factor and appropriately corrected for installation altitude.

NOTE! The insulation withstand of ABB surge arresters has been thoroughly considered in the design, and spacings between metal flanges as well as spacings between flanges and grading rings are sufficiently large to withstand overvoltages appearing during current discharges. All ABB arresters are suitable for installations up to at least 1000 m above sea level, often with a large margin.

Pollution performance
IEC 60815 defines five levels of pollution (from very light to very heavy), with the traditional correspondingly required creepage for porcelain housings as indicated in the table below.

Site pollution severity class	Pollution level	Specific creepage in mm/kV (U_s)	Unified specific creepage distance mm/kV (U_s/ √3)
a	Very light	12.7	22.0
b	Light (L)	16	27.8
c	Medium (M)	20	34.7
d	Heavy (H)	25	43.3
e	Very heavy (V)	31	53.7

Polymeric insulators of hydrophobicity transfer material (HTM), e.g. silicone, present advantages including a generally improved pollution withstand behaviour when compared to similar ceramic insulators of equal creepage distance. From a pollution withstand or flashover point of view, a reduced creepage distance may be used on PEXLIM and TEXLIM arresters with such HTM insulators.

The creepage distance is the length measured along the housing's external profile and serves as a measure of the arrester performance in polluted environments with respect to the risk of external flashover. Since the mean diameter for all the standard arresters is less than 300 mm, the specific creepage distance is the same as the nominal creepage distance.

SSL
Specified long-term load allowed to be continuously applied during service without causing any mechanical damage to the arrester.

SLL
Specified short-term load allowed to be applied during service for short periods and for relatively rare events without causing any mechanical damage to the arrester.

MBL
Mean breaking load is the average breaking load for porcelain-housed arresters.

Definitions
Line Surge Arresters (LSA)

Backflashover
Occurs when lightning strikes the tower structure or overhead shield wire. The lightning discharge current, flowing through the tower and tower footing impedance, produces potential differences across the line insulation. If the line insulation strength is exceeded, flashover occurs i.e. a backflashover. Backflashover is most prevalent when tower footing impedance is high.

Compact insulation lines
Transmission lines with reduced clearances between phases and between phase and earth and with lower insulation level withstand than for normal lines for the same system voltage.

Coupling factor
The ratio of included surge voltage on a parallel conductor to that on a struck conductor. This factor is determined from the geometric relationships between phase and ground (or protected phase conductors). A value often used for estimation purposes is 0.25.

Keraunic level
Number of annual thunderstorm days for a given region.

LSA
Line Surge Arresters are intended for installation in overhead lines in parallel to the line insulators in order to prevent flashovers, which may be either:

- non-gapped line arrester (NGLA)
  arrester without internal or external series gap

- externally gapped line arrester (EGLA)
  arrester with series gap used to protect an insulator assembly from lightning-caused fast-front overvoltages only

NOTE! PEXLINK is a NGLA

Shielding
Protection of phase conductors from direct lightning strokes; generally, by means of additional conductor(s) running on the top of the towers and grounded through the tower structures.

Shielding angle
The included angle, usually between 20 to 30 degrees, between shield wire and phase conductor.

Shielding failure
Occurs when lightning strikes a phase conductor of a line protected by overhead shield wires.

Tower footing impedance
The impedance seen by a lightning surge flowing from the tower base to true ground. The risk for backflashover increases with increasing footing impedance.

Travelling waves
Occur when lightning strikes a transmission line span and a high current surge is injected on to the struck conductor. The impulse voltage and current waves divide and propagate in both directions from the stroke terminal at a velocity of approximately 300 meters per microsecond with magnitudes determined by the stroke current and line surge impedance.

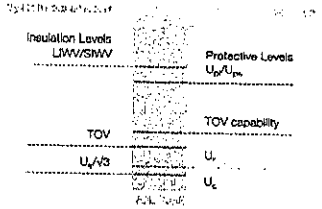
Simplified selection procedure

The selection is carried out in two major steps:

- Matching the electrical characteristics of the arresters to the system's electrical demands
- Matching the mechanical characteristics of the arresters to the system's mechanical and environmental requirements.

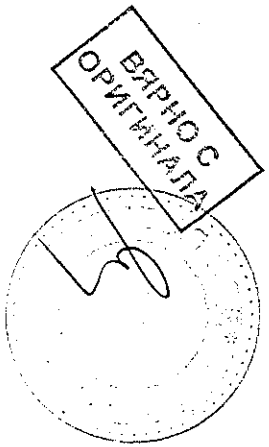
The final selection is reflected in the arrester type designation.

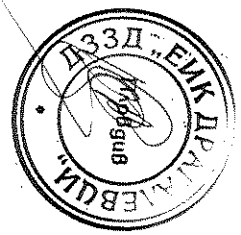
System/arrester parameters



Vocabulary

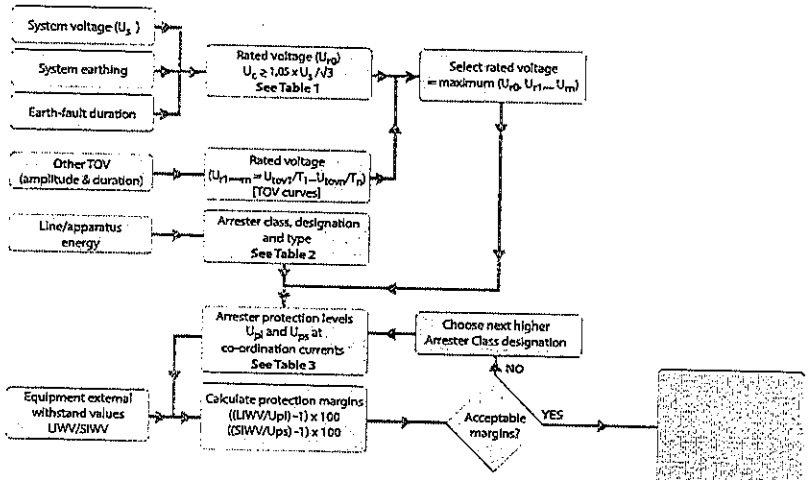
U_s	Maximum system voltage
U_c	Continuous operating voltage
U_r	Rated voltage
TOV	Temporary overvoltage
T	TOV strength factor
k	Earth fault factor
U_{ps}	Switching impulse protective level
U_{pl}	Lightning impulse protective level
U_{ws}	Switching impulse withstand level
U_{wl}	Lightning impulse withstand level
SIWV	Switching impulse withstand voltage
LIWV	Lightning impulse withstand voltage



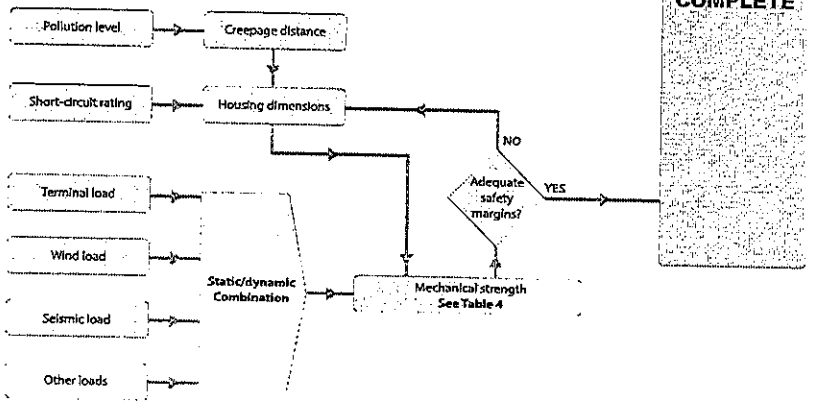


Flowchart for simplified selection of surge arresters

Electrical selection



Mechanical selection



Matching the system characteristics

Arrester rated voltage (U_r)

For each system voltage, the tables "Guaranteed protective data" show a range of U_r and maximum continuous operating voltages U_c, all of which are capable of withstanding the actual continuous operating voltage (U_{ca}) with sufficient margin. Hence, the selection of U_r is only a function of the applied temporary overvoltages, TOV, (U_{tov}), taking into account their amplitudes and duration.

TOV, as differentiated from surge overvoltages, are oscillatory power frequency overvoltages, with or without harmonics, of relatively long duration (from a few cycles to hours or longer) which are generated by system events. The arresters must withstand the heat energy generated by them.

Most commonly, a single or two-phase earth fault leads to a TOV in the healthy phase(s) and also in the neutral of Y-connected transformers. Its amplitude is determined by the system earthing conditions and its duration by the fault-clearance time.

If the earth-fault factor, ($k = U_{tov}/U_{cn}$, is 1.4 or less, the system is considered to be effectively earthed. Generally, this implies a solid connection of the neutral to the earth grid. All other forms of earthing via an impedance or a non-earthing of the neutral is considered as non-effective with, typically, $k = 1.73$

For effectively earthed systems, the fault-clearance time is generally under 1 s but it can vary widely among different systems. The catalogues list the values of TOV capability for 1 and 10 s duration after a prior energy stress (as a conservative approach). For other durations or for specific TOV conditions, follow the procedure hereunder:

- Consider each TOV separately.
- From the TOV curves, read off the TOV strength factor (T_r) for the time corresponding to the fault-clearance time.
- U_{tov}/T_r gives the minimum value of U_r for withstanding this TOV. Choose the next higher standard rating.
- The final choice of U_r will be the highest of the U_r values obtained from the above calculations for each TOV.

System earthing	Fault duration	System voltage U_s (kV)	Min. U_r (kV)
Effective	≤ 10 s	≤ 100	≥ 0.79 x U_s
Effective	≤ 1 s	≥ 123	≥ 0.74 x U_s
Non-effective	≤ 10 s	≤ 170	≥ 0.97 x U_s
Non-effective	≤ 1 h	≤ 170	≥ 1.24 x U_s

Table 1.

The table gives a suggested minimum value of the arrester rated voltage (U_r), based on common parameters. In each case, choose the next higher standard rating as given in the catalogue. This is only intended as a general guide, and actual U_r necessary may depend on the specific parameters of the system and the chosen arrester.

Note: Do not select a lower value of U_r than obtained as above unless the parameters are known more exactly; otherwise the arrester may be over-stressed by TOV.

Energy capability and Arrester Class designation

IEC classifies arresters by their application and nominal discharge current. Station class 10 and 20 kA arresters are further classified by energy capability expressed as a repetitive charge transfer rating and thermal energy rating. These arresters are thereafter designated as either SL, SM, or SH where the letters "L", "M" and "H" in the designation stand for "low", "medium" and "high" duty, respectively.

Matching the system characteristics

Arrester Class designation	Arrester type	Energy capability Wth kJ/kV (U_r)	Qrs(C)	Normal application range (U_s)
SL	EXLIM R	5	1.2	≤ 170 kV
	PEXLIM R-Z	5	1.2	≤ 145 kV
	PEXLIM R-Y	5	1.2	≤ 170 kV
SM	EXLIM Q-E	8	2.0	≤ 245 kV
	EXLIM Q-D	8	2.0	170-420 kV
	PEXLIM Q	8	2.0	≤ 420 kV
	TEXLIM Q-C	8	2.0	123-420 kV
SH	EXLIM P	11	3.2	≤ 550 kV
	PEXLIM P-X	11	3.2	≤ 420 kV
	PEXLIM P-Y	11	3.2	300-550 kV
	TEXLIM P-C	11	3.2	245-550 kV
	EXLIM T	15	5.2	245-800 kV
	TEXLIM T-C	15	5.2	245-800 kV

Table 2.

Energy capability of ABB arresters: The normal application range is only a guide, and depends on the specific parameters.

Though the energy capability is mentioned in a different manner in IEEE, the normal range of application as above applies even for IEEE systems. For specific and special cases, e.g. capacitor banks, it may be necessary to calculate the energy capability differently; for example as shown in the IEC 60099-5 and other guides.

Protection levels (U_{pl} and U_{ps})

For insulation coordination purposes, consider the lightning impulse protection level (U_{pl}) at 10 kA for $U_m \leq 362$ kV and at 20 kA for higher voltages. Similarly, the switching impulse protection levels (U_{ps}) for coordination purposes range from 0.5 kA (for $U_m \leq 170$ kV) to 2 kA (for $U_m \geq 362$ kV). The values can be read-off from the catalogue tables or easily computed from Table 3. In the latter case, they must be rounded upwards.

Arrester type	Nom. Discharge current (I_n)	U_{pl}/U_r at 10 kAp	U_{ps}/U_r at 20 kAp	U_{ps}/U_r
EXLIM R	10	2.590		2.060 at 0.5 kAp
PEXLIM R-Z	10	2.590		2.060 at 0.5 kAp
PEXLIM R-Y	10	2.590		2.060 at 0.5 kAp
EXLIM Q	10	2.350		1.981 at 1.0 kAp
PEXLIM Q	10	2.350		1.981 at 1.0 kAp
TEXLIM Q-C	10	2.350		1.981 at 1.0 kAp
EXLIM P	20	2.275	2.5	2.020 at 2.0 kAp
PEXLIM P-X	20	2.275	2.5	2.020 at 2.0 kAp
PEXLIM P-Y	20	2.275	2.5	2.020 at 2.0 kAp
TEXLIM P-C	20	2.275	2.5	2.020 at 2.0 kAp
EXLIM T	20	2.200	2.4	1.976 at 2.0 kAp
TEXLIM T-C	20	2.200	2.4	1.976 at 2.0 kAp

Table 3.

U_{pl} and U_{ps} ratios for ABB arresters

Matching the system characteristics

Protection margins

Protection margins (in %), calculated at coordinating impulse currents as per Table 3, are defined as follows:

- Margin for lightning impulses = ((LIWV/U_{pl})-1) x 100, where LIWV is the external insulation withstand of the equipment against lightning impulses.
- Margin for switching impulses = ((SIWV/U_{ps})-1) x 100 where SIWV is the external insulation withstand of the equipment for switching impulses.

Note: IEEE standards refer to LIWV as BIL and SIWV as BSL.

Margins are normally excellent due to the low U_{pl}, U_{ps} and also that most equipment at present have high external insulation withstand. However, depending on the electrical distance between the arrester and the protected equipment, the Upl margin is reduced and thus arresters fail to protect equipment that is not in the close vicinity of the arresters, i.e. within their protection zone. The flexible erection alternatives for PEXLIM arresters may be of benefit in reducing the distance effects. Additional line-entrance arresters may help too. For more detailed information, please refer to separate ABB technical publication regarding application guidelines for station protection.

Note! The "distance effect" reduction does not apply to U_{ps} margin since the front-time of a switching surge impulse is longer.

It is recommended that the protection margins (after taking into account the "distance effect") should be of the order of 20% or more to account for uncertainties and possible reduction in the withstand values of the protected equipment with age.

Should the selected arrester type not give the desired protection margins, the selection should be changed to an arrester of a higher designated energy class, which automatically leads to lower U_{pl}.

Note! Do NOT use a lower-than selected U_r to attempt improvement of the margins, as this may lead to unacceptably low TOV capability.

As an additional assistance in selection, please refer to the simplified flow chart at the beginning of this chapter. The MO resistor column must be suitably housed to withstand long-term effects of the system loading and the environmental stresses.

External creepage distance

IEC 60815 defines the minimum creepage distances for different environmental conditions. Select the housing to give the desired creepage — the same as for the other equipment in the same location. If the specific creepage demand exceeds 31 mm/kV, please refer to ABB for a special design.

PEXLIM and TEXLIM arresters, having a highly hydrophobic housing, are better suited for extremely polluted areas than EXLIM arresters and a lower creepage may be justified in many cases.

Matching the system characteristics

Mechanical strength

Surge arresters are an active protective device, which means they are not inherently intended to be permanently mechanically loaded in service. Naturally their design includes consideration to withstanding rarely-occurring and short-term mechanical loads (e.g. external short-circuit, gust winds, earthquake, etc) as well as more likely and long-term mechanical loads (e.g. conductor weight, static wind, etc). However, such loads should always be limited as much as possible though proper installation.

All ABB arrester designs exhibit very high strength under tensile or compression loading; hence it is the cantilever loading that is of interest in defining mechanical strength. To be applicable to different arrester lengths, the loading is given in terms of bending moment in this guide. The line terminal and the insulating base (when supplied) match or exceed the strength of the arrester housing.

Standard arresters are intended for vertical, upright erection on a structure and require no bracing. Pedestal-mounted arresters with mechanical strength higher than listed can be quoted on request. Special arresters for suspension, inverted mounting or other angular erection are also available.

Due to their otherwise advantageous flexible construction, PEXLIM arresters may exhibit a visible deflection at the line-end under maximum terminal loading. Such deflection is nevertheless limited by our specified value for long-term load (SLL) given in Table 4. This maximum recommended continuous loading ensures that the electrical and mechanical functions of the arrester are not impaired in any way, even during long-term cyclic loading. Importantly, the value for specified short-term load (SSL) can be upheld even after such cyclic loading.

If the permissible bending moment for a certain arrester appears insufficient for a given loading, consider one of the following methods to reduce the loading demand.

- Use lighter terminal clamps and/or optimized tee-offs for arresters. In contrast to the current capability (and thus the size of clamps and conductors) required for other substation equipment, the continuous current through an arrester is of the order of only a few mA. Hence, using a lighter terminal clamp and/or connecting the arresters by lighter and more vertical tee-offs can considerably reduce the demand for mechanical strength.
- Use another erection alternative (suspension, underhung, etc). Since PEXLIM arresters are very light compared to equivalent porcelain-housed arresters, they permit innovative erection alternatives, which could reduce the bending moment demands. This in turn can lead to the additional benefit of lighter structures with subsequent reduced costs, or even the complete elimination of the need for a separate structure at all.

EXLIM
Porcelain-housed insulator

Arrester type	Cantilever strength (Nm)	
	SSL	SLL
EXLIM R-C	7 500	3 000
EXLIM Q-D	20 000	8 000
EXLIM Q-E	7 500	3 000
EXLIM T-B	20 000	7 200

PEXLIM
Silicone polymer-housed insulator

Arrester type	Cantilever strength (Nm)	
	SSL	SLL
PEXLIM R-Z	1 300	800
PEXLIM R-Y	1 600	1 000
PEXLIM Q-Y	4 000	2 500
PEXLIM P-Y	9 000	6 000

TEXLIM
High strength silicone polymer-housed insulator

Arrester type	Cantilever strength (Nm)	
	SSL	SLL
TEXLIM Q-C	40 000 Nm	21 000
TEXLIM P-C	40 000 Nm	21 000
TEXLIM T-C	40 000 Nm	21 000

SSL Specified short-term load. | SLL Specified long-term load. (For PEXLIM and TEXLIM arresters this is a declared value based on cyclic loading.)

Table 4. Permissible mechanical loading for ABB arresters

Matching the system characteristics

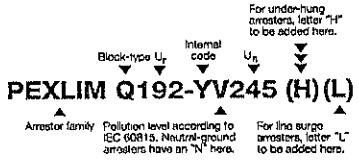
Neutral-ground arresters

For neutral-ground arresters the recommended rated voltage is approximately the maximum system voltage divided by √3. The recommended neutral-ground arresters in the relevant sections are calculated for unearthed systems with relatively long fault duration. The electrical characteristics are identical to standard catalogue arresters with the corresponding rated voltage. For such arresters, U_c is zero since they are not subject to any continuous voltage stress during normal service conditions. The neutral-ground arresters should preferably be of the same type as the phase-ground arresters. For resonant-earthed systems with long radial lines special considerations must be taken and a higher rated voltage (20% to 40%) than listed may be necessary.

Type designation

The type designation itself gives detailed information of the arrester and its application. See the figure below. As standard, the arresters are meant for upright vertical erection. For under-hung erection, when desired, the type designation has the suffix letter "H". For other angular erection, please inform us at order. For non-standard arresters the type designation will have additional suffix letters, for example:

E	Non-standard electrical data
M	Non-standard mechanical data
P	Non-standard metal-oxide columns



Special applications

Please consult your nearest ABB representative for help in selection of arresters for special applications such as protection of shunt or series capacitor banks, cables and cable-aerial junctions, rotating machines, traction systems, overhead lines, HVDC or for non-standard arrester ratings or extreme mechanical demands.

Ordering data for arresters

The following information, at a minimum, is required with your order:

- Quantity and type designation
- Rated voltage
- Type of line terminal
- Type of earth terminal
- Type of surge counter, if any
- Type of insulating base, if any.

(Insulating base is required if surge counter and/or leakage current measurements are desired. One base is required for each arrester.)

Ordering example

Below is a typical example of an order with three PEXLIM arresters and its accessories.

Number	Item
3	PEXLIM Q192-YH245, rated voltage 192 kV
3	Line terminal type 1HSA 410 000-L
3	Earth terminal type 1HSA 420 000-A
3	Insulating base type 1HSA 430 000-A
3	Surge counter type EXCOUNT-C

Note! We recommend that the order form, on page 137, be filled-in and attached to your order to ensure inclusion of all the important parameters and commercial conditions.

Simple selection example

Substation data	
Maximum system voltage	145 kV
Arrester location	Phase-ground
System earthing	Effective
System fault clearance time	1 s
Creepage distance	3625 mm

1. $U_{r0} = 0.74 \times U_s$ (according to table 1) = 0.74x145 = 107.3 kV_{rms}. Select the next higher standard U_r (see "Guaranteed protective data"), i.e. 108 kV_{rms}.

2. According to table 2, a common choice selection for 145 kV_{rms} would be a Arrester Class designation SL arrester, i.e. PEXLIM R. This arrester has a U_{pl}/U_r of 2.59, i.e. U_{pl} of 280 kV_{peak} at 10 kA (according to table 3). With a LIWV of 650 kV_{peak} this would give a protective margin of (650/280-1)x100 = 132%.

3. This margin appears to be excellent but it must be noted that, after considering distance effect and possible insulation ageing, the margin could be reduced to below 20% depending on the impinging impulse steepness and amplitude. Thus, it is very important that the arrester is installed as close as possible to the protected object.

4. If the margin is considered insufficient, choose a higher class designation arrester, e.g. PEXLIM Q, with the same rated voltage 108 kV.

5. With a required creepage distance of 3625 mm, i.e. 25 mm/kV SCD, a H145 housing is suitable from the range.

6. The type designation of the selected arrester will then be:

   PEXLIM R108-YH145 (or PEXLIM Q108-YH145)

Design features
Porcelain-housed arresters EXLIM

The design is based on successful experience of over 75 years, first as gapped SiC arresters, in all climates and conditions all over the world. EXLIM arresters live up to their name: EXcellent voltage LIMiters. The design is robust and well-matched with the other apparatus in substations.

Each arrester is built up of one or more units. Each unit is a porcelain housing containing a single column of MO resistors (blocks), all individually extensively routine-tested during manufacture, dispersed with the necessary spacers as determined by the electrical design for the arrester. It is necessary, therefore, that the units are series-connected at site in the pre-determined order as marked on the units. Consult the installation instructions supplied with each arrester.

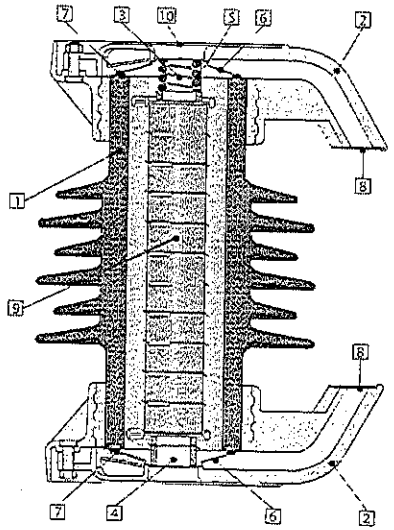
Longer arresters often require (and are supplied with) external grading rings to maintain a uniform and acceptable voltage stress along their length. Operation of such arresters without the grading rings, therefore, may lead to failure and invalidates our guarantees/warranties.

The standard porcelain color is brown but grey porcelain is supplied on request.

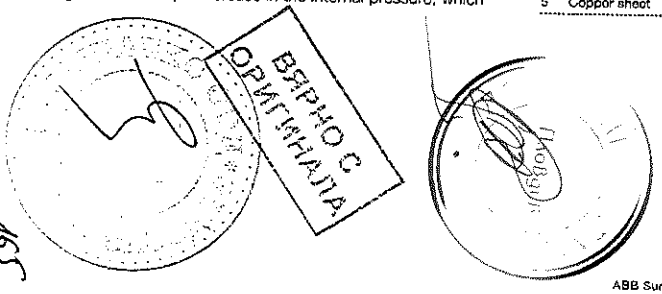
Seaworthy packing of the arresters is standard.

Sealing and pressure-relief function
The flanges are cemented to the porcelain and enclose also the sealing arrangement. Please see the figures herein. For satisfactory performance, it is important that the units are hermetically sealed for the lifetime of the arresters. The sealing arrangement at each end of each unit consists of a pre-stressed stainless steel plate with a rubber gasket. This plate exerts a continuous pressure on the gasket against the surface of the insulator and ensures effective sealing even if the gasket "sets" due to ageing. It also serves to fix the column of the blocks in the longitudinal direction by means of springs. The sealing is verified for each unit after manufacture in routine tests.

The sealing plate is designed to act also as an over-pressure relief system. Should the arrester be stressed in excess of its design capability, an internal arc is established. The ionized gases cause rapid increase in the internal pressure, which in turn causes the sealing plate to flap open and the ionized gases to flow out through the venting ducts. Since the ducts at the two ends are directed towards each other, this results in an external arc; thus relieving the internal pressure and preventing a violent shattering of the insulator.



1	Porcelain insulator	6	Sealing cover
2	Venting duct	7	Sealing ring
3	Spring	8	Indication plates
4	Desiccant bag	9	MO resistors
5	Copper sheet	10	Flange cover



Design features
Porcelain-housed arresters EXLIM

Mechanical Strength
The mechanical strength of the housing is defined in accordance with IEC 60099-4. Thus the guaranteed mean breaking load (MBL) is at least 20% above the specified figure for short-term service load (SSL). The insulating base (when supplied) matches the strength of the housing.

The specified long-term load (SLL) should be limited to 40% of the SSL in accordance with IEC 60099-4.

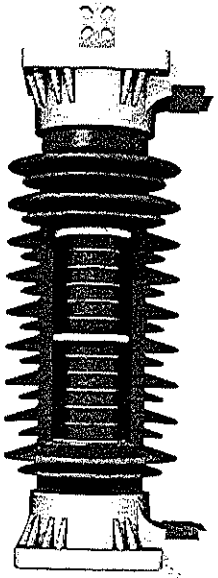
Arresters with mechanical strength higher than listed are quoted on request.

Mechanical loading — Horizontal (cantilever) load
The maximum permissible continuous horizontal load is calculated as the maximum continuous (static) moment divided by the distance between the base of the arrester and the centre of the terminal load.

The continuous current through an arrester is of the order of a few mA. Hence, using a lighter terminal clamp and/or connecting the arrester by a lighter tee-off considerably reduces the demand for mechanical strength.

Installation, maintenance and monitoring
Standard EXLIM arresters are intended for vertical, upright erection on a structure and require no bracing. Special EXLIM arresters for suspension, inverted mounting or other angular erection are available on request.

EXLIM arresters are easy to install following the instructions packed with each arrester. Installation does not need any special tools or instruments. Properly chosen and installed arresters are practically maintenance-free for their lifetime and do not need any monitoring. However, if such monitoring is demanded, it is easily performed online by using the EXCOUNT-II with it's built-in features for correctly measuring the resistive leakage current.

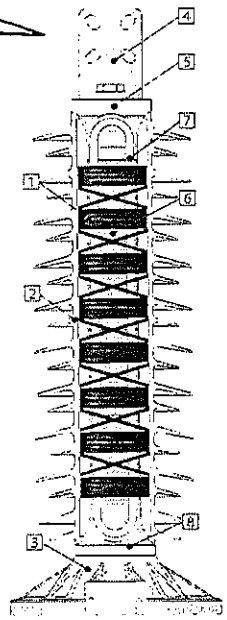


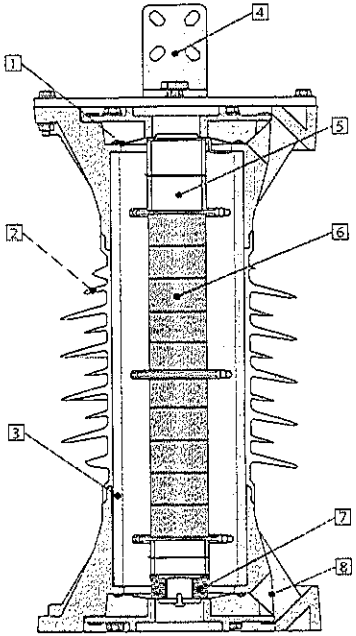
Design features
Polymer-housed arresters PEXLIM and TEXLIM

PEXLIM and TEXLIM arresters use the same MO resistors as the EXLIM arresters and match their electrical performance. Silicone as outer insulation material has been used for over 30 years with good results and has been chosen by ABB for arresters as well. It confers the additional benefits of low weight, improved pollution performance, increased personnel safety and flexibility in erection.

Two basic designs

The ABB polymer-housed arresters comes in two different designs:





Moulded PEXLIM design	
1 Protective winding	2 Silicone rubber insulator
3 Base	4 Line terminal
5 Top yoke	6 MO resistors
7 Fibre glass loop	8 Bottom yoke

TEXLIM tube design	
1 Sealing cover	2 Silicone rubber insulator
3 Fibre glass tube	4 Line terminal
5 Spacers	6 MO resistors
7 Spring	8 Venting duct

Design features
Moulded PEXLIM design

Design Highlights

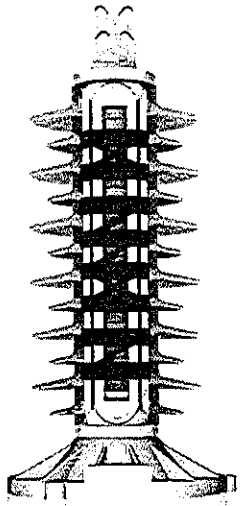
Each arrester is built-up of one or more units, which in turn may be made up of one or more modules. Each module contains a single column of MO resistors (blocks), which are extensively individually routine-tested during manufacture, dispersed with the necessary spacers as determined by the electrical design for the arrester. The modules are standardized into different sizes based on electrical, mechanical and process considerations.

ABB employs a unique patented design to enclose the blocks in each module under axial pre-compression in a cage formed of fibreglass reinforced loops fixed between two yokes which also serve as electrodes. A protective fibre-winding is then wound over the loops resulting in an open cage design for the module. This results in high mechanical strength and excellent short-circuit performance. See the figures hereunder.

Each module is then passed through a computer-controlled cleaning and priming process. The module is then loaded in a highly automated vulcanizing press and silicone injected at a high pressure and temperature (HTV process) to completely bond to the active parts, leaving no internal voids or air spaces. Individual modules are thereafter assembled into units and routine tested before packing and dispatch.

For satisfactory performance, it is important that the units are hermetically sealed for the lifetime of the arresters. The HTV moulding process under vacuum ensures this by bonding along the entire length from electrode to electrode. There is no air or any gas entrapped between the active parts and the housing. Hence, gaskets or sealing rings are not required.

Should the arrester be electrically stressed in excess of its design capability, an internal arc will be established. Due to the open cage design, it will easily burn through the soft silicone material, permitting the resultant gases to escape quickly and directly. At the same time, the fibre-windings prevent the explosive expulsion of the internal components. Hence, special pressure-relief vents are not required for this design; with the fail-safe short-circuit capability well verified by short-circuit tests in accordance with IEC/IEEE.



Cutaway view of a typical PEXLIM module showing the internal arrangements and the open-cage construction designed to improve both mechanical strength and personnel safety.

Design features

High strength TEXLIM tube design

In special cases with very high demands for mechanical strength, the moulded design may not provide the optimal solution — particularly at system voltages above 420 kV. Instead, what is required is a mix between the features of the standard EXLIM and the moulded PEXLIM designs. The TEXLIM tube design provides this by offering comparable mechanical strength to EXLIM arresters, but with much less mass. The seismic and pollution performance is in line with the moulded PEXLIM arresters and thus superior to conventional porcelain designs.

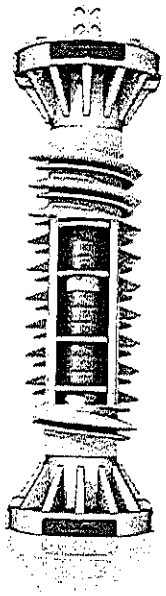
Design highlights

The basic concept is the replacement of the porcelain housing used with EXLIM arresters by a fibreglass tube housing onto which the silicone sheds are vulcanized and metal flanges are integrated. The internal arrangement and the pressure-relief devices are similar to those for EXLIM arresters.

For satisfactory performance, it is important that the units are hermetically sealed for the lifetime of the arresters. The sealing arrangement at each end of each unit is shown in the figure hereunder and consists of a pre-stressed stainless steel plate with a rubber gasket. This plate exerts a continuous pressure on the gasket against the inner surface of the flanges and ensures effective sealing even if the gasket "sets" due to ageing. It also serves to fix the column of the blocks in the longitudinal direction by means of heavy spring washers.

To maintain the interior free of any humidity, the unit is evacuated after the sealing plate and gaskets are fitted and then filled with dry air at low dew point. Additionally, a small bag of a desiccant is placed in each unit during assembly. Sealing is verified for each unit after manufacture during routine tests.

The sealing plate is designed to also act as an over-pressure relief system. Should the arrester be electrically stressed in excess of its design capability, an internal arc is established. The ionized gases cause a rapid increase in the internal pressure, which in turn causes the sealing plate to flap open and the ionized gases to flow out through openings in the flanges. Since the openings at the two ends are directed towards each other this results in an external arc; thus relieving the internal pressure and preventing a violent breaking of the insulator.



Cutaway view of a typical TEXLIM unit showing the internal arrangements.

Silicone as an insulator

All PEXLIM and TEXLIM arresters utilize silicone for the external insulation. Silicone rubber is highly hydrophobic and resistant to UV radiation and has been shown to be the best insulation (compared to both porcelain and other polymers) based on world wide independent laboratory and field tests. ABB uses special fillers to enhance these properties as well as giving it high pollution resistance, tracking resistance and fire-extinguishing features. The silicone housing is available only in grey color. For additional information, please refer to publication 1HSM 9543 01-06en.

In a form-fit-function comparison, PEXLIM is the most optimized and cost-effective of the available polymer designs. A separately defining criteria often becomes the mechanical strength demands. TEXLIM would seemly have the advantage in this regard, and it could be that specific applications do require a very strong composite tube solution. However, mechanical loads should always be limited as much as possible though proper installation using good engineering practices, and by so doing, the PEXLIM design remains the first choice for the vast majority of applications.

Installation, maintenance and monitoring

All ABB arresters are easy to install following the instructions packed with each arrester. Installation does not need any special tools or instruments.

The units of multiple-unit arresters must be series-connected at site in a pre-determined order as marked on the units and explained in the instructions that are packed in each case. An incorrect assembly may lead to failure and invalidates our warranty.

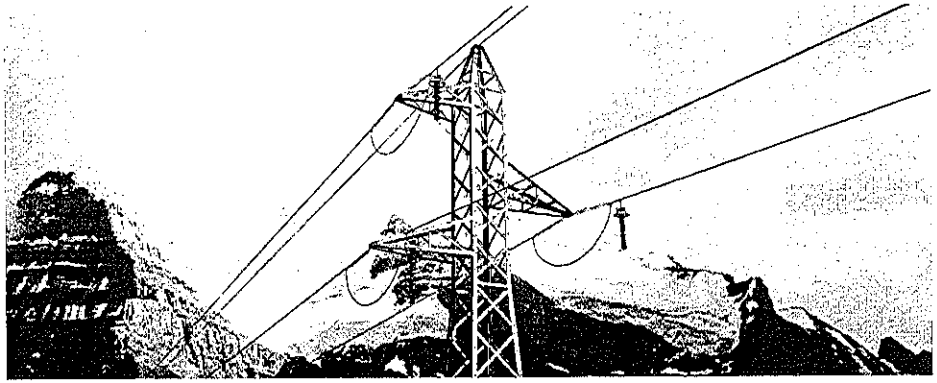
The design of tall arresters often requires external grading rings to maintain a uniform and acceptable voltage stress along their length. Such rings are included in the delivery of arresters. Installation or operation of such arresters without these grading rings may lead to failure and invalidates our warranty.

Properly chosen and installed arresters are practically maintenance-free for their lifetime and do not need any monitoring. However, if such monitoring is desired, it is easily performed online by using EXCOUNT-II with its built-in features for diagnostic analysis of resistive leakage current. More information is available in the chapter dealing with accessories.

Line surge arresters PEXLINK

The concept

Both large and small public/private utility owners of transmission systems face a sharpened competitive situation which demands increased availability and reliability of the systems. Consumers have become more demanding as their processes are dependent on constant and reliable energy supply of good quality.



In many countries, it has also been increasingly difficult to obtain permission to build new lines of normal dimensions. Hence, new lines under construction may mostly be "compact-insulation" lines. This, in turn, requires optimal control of overvoltages caused by lightning or switching events. Surge arresters installed along the line or at a few selected critical towers, in this case, may be an attractive solution or a complement to other means.

Improvement in the reliability and availability of a transmission system can be obtained in one or more of the following ways:

1. Duplication of the system (more than one line)
This is a very expensive method and often impractical.

2. Increased insulation withstand.
It can both be expensive and create other problems such as the need for increased insulation of station equipmont.

3. Improved footing impedance
Often difficult and expensive, especially in hilly terrain.

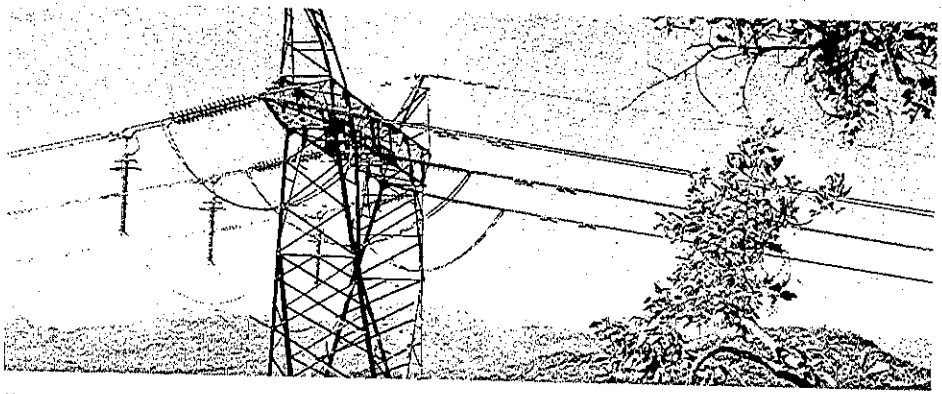
4. Shield wires
If the provision was not in the original tower design, it can be expensive to retrofit such shielding. It helps eliminate a large number of interruptions, but it may not be enough to obtain the now-demanded degree of reliability.

5. Protection of line insulation by surge arresters
Surge arresters connected in parallel with them at selected towers. In this application usually the term line surge arresters (LSA) is used. Protection using polymer-housed arresters (ABB type PEXLIM) along with additional accessories for fixing the arresters across the insulators and providing automatic disconnection of the arresters in the event of their being overstressed is called the PEXLINK concept. This method is simple, cost-effective and, in many cases, an attractive alternative to the methods mentioned above.

More information on Internet
Visit www.abb.com/arrestersonline for viewing the PEXLINK video.

PEXLINK
ABB's protection philosophy

ABB's philosophy is to provide protection for line insulation at selected locations by using standard available components. The main item is the gapless silicone polymer-housed arrester, PEXLIM, with metal-oxide (MO) active elements. Such arresters have been used for many years for protection of equipment in substations and hence their protective performance and reliability is well-known.



Line surge arresters, incorporating PEXLIM Q arresters and disconnecting devices on earth leads, erected on ESKOM 300 kV system in South Africa.

The low weight permits installation on existing structures and the polymer housing gives increased safety of the line equipment as well as people and animals which may be in the vicinity of the lines during overstress conditions.

With regard to lightning energy, line arresters are exposed to more severe conditions than arresters placed in substations. The latter are benefited by the reduction of surge steepness due to line corona effect and reduction in surge amplitude as the lightning current finds parallel paths through shielding wires, flashover and parallel lines. Thus, it is necessary to ensure that the MO resistors of the LSA are not under-dimensioned from an energy and current point-of-view. A computer program is used to determine the optimum number of locations (generally where the footing impedance is high) and to calculate the arrester stresses at each of the chosen locations.

The design permits installation using standard transmission-line hardware normally available locally. The design also permits mounting at different positions based on tower geometry and conductor spacing.

If very high availability is desired, a very large number of locations may have to be protected, mainly due to the unpredictable nature of lightning. In such a case it may not be economically justified to select arresters with "sufficient energy capability" and instead a higher failure rate may be acceptable.

To ensure quick, safe, automatic and controlled disconnection of a failed arrester, ABB uses a special disconnecting device with a suitable link, often in the earthing circuit of the arresters.

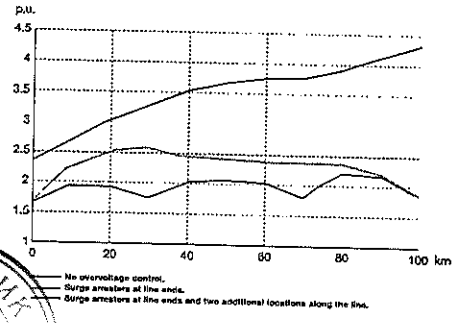
The recommended earth lead is designed to withstand the short-circuit currents and the disconnecting device is tested to ensure no false operations. Thus, at a failure, the tripped line does not have to be locked-out and attended to immediately.

PEXLINK
Application

Increased line availability
By locating the PEXLINK on sections of lines with high footing impedance towers and one additional low footing-impedance tower at each end of the section, PEXLINK protects existing shielded and non-shielded lines from abnormal lightning surges (frequent or high amplitudes) and reduces the outages.

The reduced outages are beneficial also indirectly in that sensitive equipment is not damaged and the circuit breakers overhaul interval can be increased. Thus, total maintenance costs are also reduced.

This protection may be used for all system voltages where the stated abnormal conditions exist. Arresters with moderate energy capability are often sufficient. However, the high-current capability must be large and distribution-type arresters may not be suitable.



The diagram shows overvoltages phase-ground generated by three-phase reclosing of 550 kV, 200 km transmission line with a previous ground fault. For long EHV lines pre-insertion resistors traditionally are used to limit switching overvoltages. Surge arresters, as a robust and efficient alternative, could be located at line ends and along the line at selected points.

Switching overvoltage control
For long EHV lines, surge arresters usually are located at line-ends. In addition, by locating arresters at one or more points along the line e.g. at midpoint or 1/3 and 2/3 line length switching surge overvoltages and thus line insulation requirements could be limited without using preinsertion resistors. Arresters used for this type of application should be designed for high energy capability, especially at the receiving end of the line.

Compact-insulation lines
Arresters placed in parallel with line insulators permit a large degree of compacting of a transmission line with lower right-of-way costs as a result.

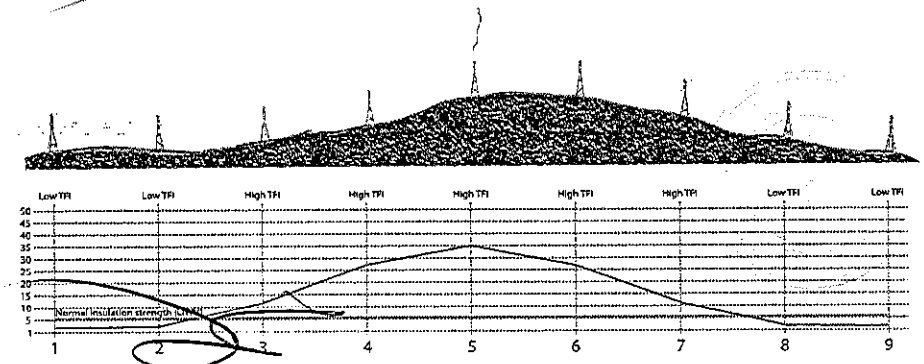
Line upgrading
The existing insulation level of a line, when suitably protected by arresters, may be upgraded for service at a higher system voltage leading to greater power transfer without much additional capital cost.

Extended station protection
By locating arresters on towers near a substation, the risk of backflashovers near the station is eliminated. This results in reduction of steepness and amplitude of incoming travelling waves, thus improving the protection performance of station arresters and eliminating the need for additional expensive metal-enclosed arresters even for large GIS.

Substitute for shield wires
In cases where provision of shield wires is not practical physically or is very expensive, e.g. very long spans, very high towers etc, arresters are a good and economical substitute.

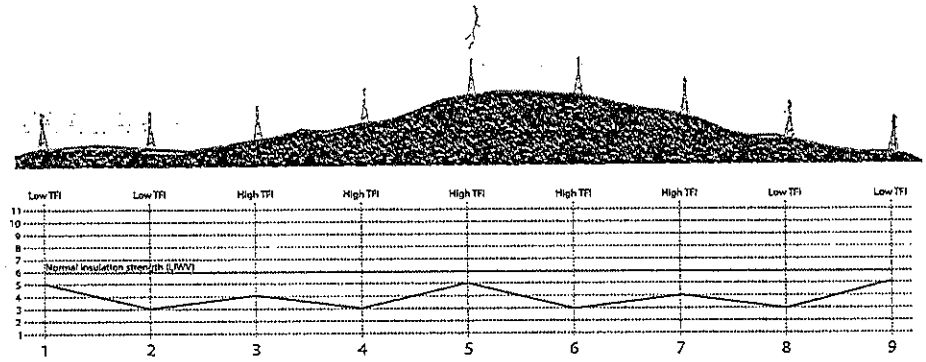
Arresters located in all phases on each tower eliminate the need for both shield wires and good footing impedance and may be economically justified in cases where the cost of reduction in footing impedance and the cost of overhead shield wire are very high.

PEXLINK
Application



No arresters at all. Lightning stroke to tower number 5

Very high risk for flashover due to high TFI (Tower Footing Impedance) with an earth fault followed by a circuit breaker operation as a consequence.



Arresters in all 9 towers. Lightning stroke to tower number 5

The overvoltage profile is well below the LIWV of the system all along the section. An ideal protection is obtained.

PEXLINK
Features

Lightning discharge capability

In general, arresters on lines are subjected to higher energy and current stresses caused by lightning than arresters installed in stations. Furthermore, the associated waveform and durations differ considerably from those specified for station arrester applications. Thus, line arresters are defined in terms of their lightning discharge capability, and PEXLIM arresters perform well in this regard.

Arrester type	Lightning discharge capability as per IEC 60099-4 Annex H	
	Energy	Charge
PEXLIM R	2.5 kJ/kV (U_r)*	1.0 As **
PEXLIM Q	4.0 kJ/kV (U_r)*	1.8 As **
PEXLIM P	7.0 kJ/kV (U_r)*	2.8 As **

* U_r = Rated voltage
** As = Ampere second

Standard components

The suspension of the arresters is simplified and standard clamps and similar hardware normally available may be used for this purpose. This leads to overall economy for the user.

A few examples can be seen in the figures for "Some erection alternatives" on next page.

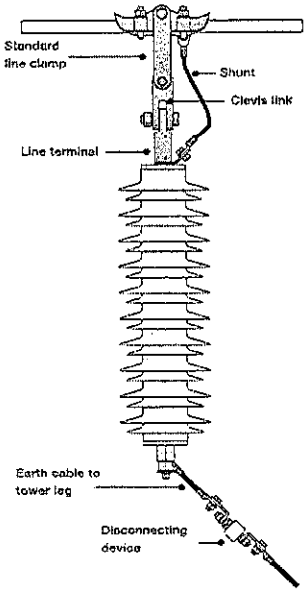
The disconnecting device is carefully chosen to perform its function only at the overload of the arrester.

The separation of the disconnector is quick and effective and the method of connection advised by ABB in each particular case ensures that neither the disconnected conductor nor the damaged arrester cause any interference with other live parts. Thus, after a failure, the line can be re-charged without attending to it immediately.

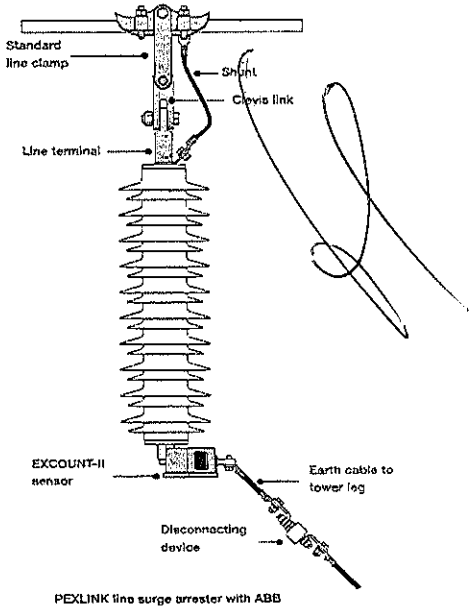
The disconnection is easily visible from the ground and thus locating it is simple for the maintenance crew.

Easy to install

The PEXLIM arresters are built-up of optimum-length modules and hence can be easily designed for use on various voltages. They are light and easily transported up the towers.



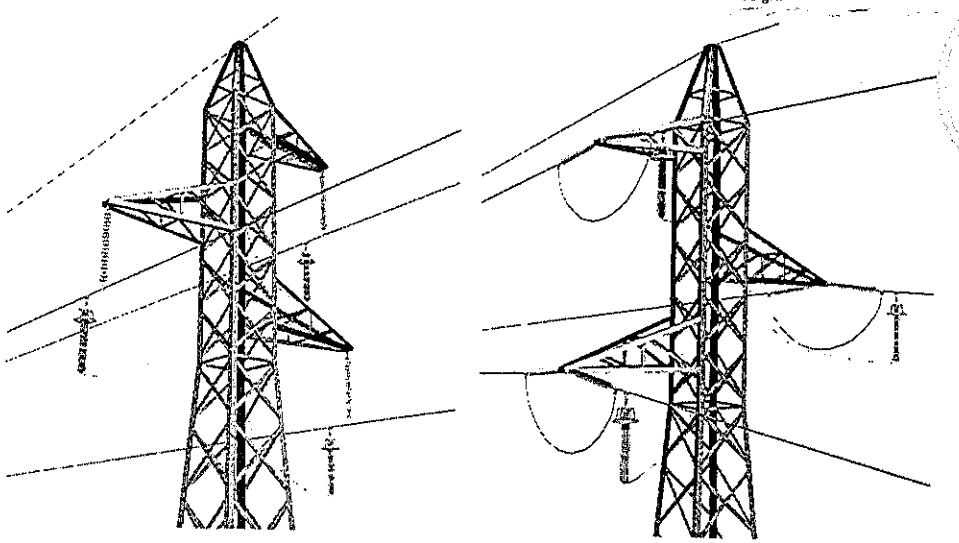
PEXLINK line surge arrester

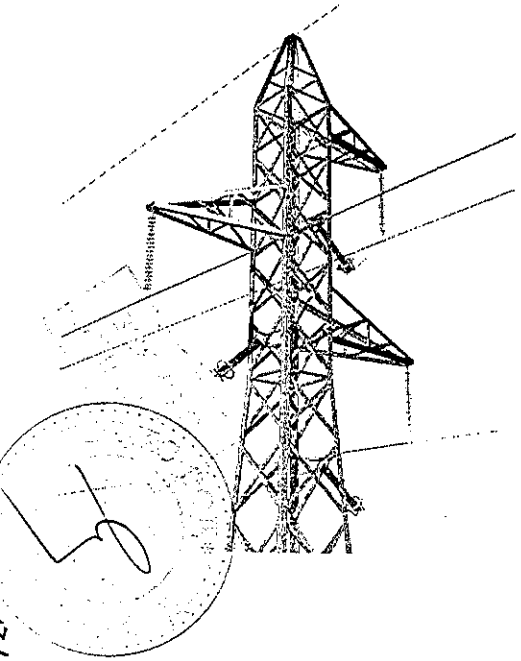


PEXLINK line surge arrester with ABB surge arrester monitor EXCOUNT-II

PEXLINK
Some erection alternatives

Different arrangements showing how easy it is to install the PEXLINK concept in towers of different design.





Quality control and testing

ABB is certified to fulfil the requirements of ISO 9001

Type tests
Type (design) tests have been performed in accordance with IEC 60099-4. Test reports are available on request.

Routine tests
Routine tests are performed on MO resistors as well as on assembled arrester units and accessories. The most important type tests data is verified on all batches of MO resistors, thus verifying catalogue data.

Tests on MO resistors

Energy withstand test on all blocks
Each individual MO resistor passes three energy test cycles with cooling in-between. In each cycle, the injected energy is in excess of the rated energy capability. Blocks with insufficient energy capability are automatically rejected.

Classification and inspection
Each individual MO resistor is classified at 1 mA (d.c.) and 10 kA (8/20 µs) and the voltages are printed on each block together with a batch identification. Finally all blocks are visually inspected.

Accelerated life test on samples
Power losses after 1000 hours calculated from a test with shorter duration (approximately 300 hours) at an elevated temperature of 115 °C at 1.05 times U_c shall not exceed the losses at start of the test. Batches in which unapproved blocks appear are rejected.

Energy capability test on samples
Validation of repetitive charge transfer rating (Qrs), based on the same sampling and test procedure and criteria as the IEC 60099-4 type test for station class. The samples are representative of the highest residual voltage of MO resistors from the individual batch in order to verify the statistical quality of each produced batch of all sizes of MO resistors. Batches which do not fulfill the criteria are rejected.

Impulse current test on samples
Selected blocks are subjected to two 100kA current impulses (4/10 µs) at spaced intervals.

Other sample tests
In addition to the above, low current characteristics, protection characteristics, power losses and capacitance are checked to verify the inherent MO resistor parameters.

Tests on assembled mechanical units

Routine tests on units fulfil the demands of both IEC 60099-4 and ANSI/IEEE C62.11. Each arrester has a unique serial number.

Guaranteed residual voltage
The residual voltage at 10 kA, 8/20 µs impulse current of each unit is calculated as the sum of the residual voltages for all blocks connected in series in the unit.

The residual voltage of the complete arrester is the sum of the residual voltages for its units.

Tightness check (only for EXLIM and TEXLIM arresters)
During manufacture, a vacuum is drawn on the internal volume and then dry air is pumped in, together with a small amount of helium tracer gas, before sealing off the unit. A leakage test is performed by placing each unit in a vacuum chamber connected to a He-spectrometer. Maximum permissible leakage rate of Helium is 0.0001 mbarl/s at a pressure difference of 0.1 MPa as a pass/ no pass test.

Power frequency reference voltage
Reference voltage is measured on each arrester unit.

Internal corona
The satisfactory absence of partial discharge is checked on each unit at 0.9 times U_r. A steady internal corona level of not greater than 10 pC is required in a pass/no-pass test.

Grading current
The total leakage current passing through the arrester unit is measured at U_c for information only.

Power losses
Power loss is measured at U_c on each unit verifying that the thermal performance is in compliance with performed type tests.

Test reports
Routine test reports are filed and are available on request.

Tests on accessories

Surge counters and monitors
All such devices are routinely function-tested before leaving the factory.

Zinc Oxide Surge Arrester PEXLIM R-Z

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages. For use when requirements of lightning intensity, energy capability and pollution are moderate.

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.
Major component in PEXLINK™ concept for transmission line protection.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station: SL
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	72 - 145 kV
Rated voltages (U_r)	75 - 120 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	1.2 C
Thermal energy rating, W_{th} (IEC)	5 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	2.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	-
Single-impulse withstand rating as per IEEE standard	1.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	1.5 C
Short-circuit/Pressure relief capability	40 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	800 Nm
Specified short-term load (SSL)	1300 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 2

Further data according to the IEEE standard can be supplied on request

PEXLIM R-Z
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
72	75	60	60.7	82.4	77.4	157	164	171	187	198	222	253
	78	62	63.0	85.7	80.5	161	167	175	191	203	227	259
	84	67	68.0	92.3	86.7	173	180	188	206	218	244	279
	90	72	72.0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77.0	105	99.1	198	206	215	235	249	279	319
100	75	60	60.7	82.4	77.4	155	161	168	184	195	218	249
	84	67	68.0	92.3	86.7	173	180	188	206	218	244	279
	90	72	72.0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77.0	105	99.1	198	206	215	235	249	279	319
123	90	72	72.0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77.0	105	99.1	198	206	215	235	249	279	319
	102	78	82.5	112	105	210	218	229	250	265	296	339
	108	78	84.0	118	111	223	231	242	264	280	314	359
	120	78	98.0	131	123	247	257	269	294	311	349	398
145	108	86	86.0	118	111	223	231	242	264	280	314	359
	120	92	98.0	131	123	247	257	269	294	311	349	398

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 5 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications.

PEXLIM R-Z
Technical data for housings

Max. system voltage U_s	Rated voltage U_r	Housing	Creepage distance	External insulation *) 1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Dimensions Mass	A_{max}	B	C	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	
72	75-96	ZV072	3628	553	278	278	422	24	995	-	-	1
100	75-96	ZV100	3628	553	278	278	422	24	995	-	-	1
123	90-120	ZH123	3628	553	278	278	422	23	995	-	-	1
145	108-120	ZH145	3628	553	278	278	422	23	995	-	-	1

*) Withstand voltages for empty unit of arrester.

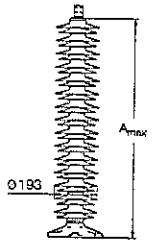
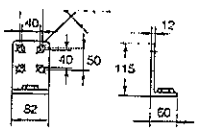


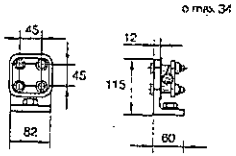
Figure 1

PEXLIM R-Z
Accessories

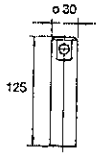
Line terminals



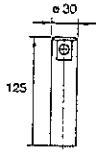
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

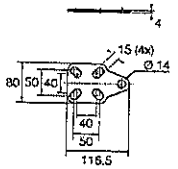


1HSA410 000-N
Aluminium

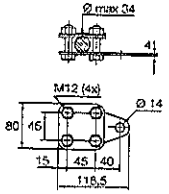


1HSA410 000-P
Stainless steel

Earth terminals

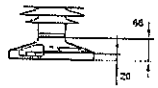


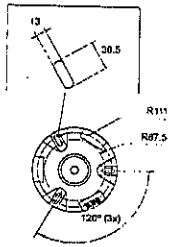
1HSA420 000-A
Stainless steel



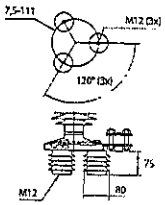
1HSA420 000-B
Stainless steel

Drilling plans





Without insulating base
Aluminium



Insulating base
1HSA430 000-H
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

PEXLIM R-Z

Shipping data

Rated voltage	Housing	Number of arresters per crate					
		One		Three		Six	
U_r		Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg
072-096	ZV072	0,2	39	0,69	96	1,22	167
075-096	ZV100	0,2	39	0,69	96	1,22	167
090-120	ZH123	0,2	38	0,69	95	1,22	136
108-120	Z H145	0,2	38	0,69	95	1,22	136

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

i The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester PEXLIM R-Y

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages. For use when requirements of lightning intensity, energy capability and pollution are moderate.

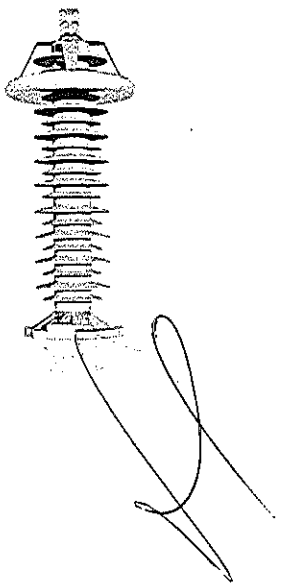
Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.
Major component in PEXLINK™ concept for transmission line protection.

i Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SL
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	24 - 170 kV
Rated voltages (U_r)	18 - 144 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	1.2 C
Thermal energy rating, Wth (IEC)	5 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	2.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	-
Single-impulse withstand rating as per IEEE standard	1.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	1.5 C
Short-circuit/Pressure relief capability	50 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	1000 Nm
Specified short-term load (SSL)	1500 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2	Class 2

Further data according to the IEEE standard can be supplied on request



PEXLIM R-Y

Guaranteed protective data 24 - 100 kV

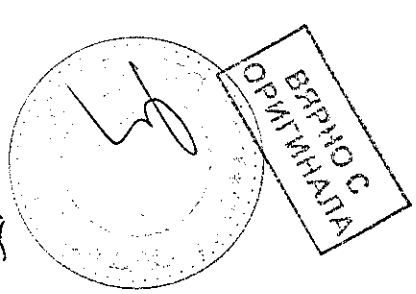
Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
24[3]	18	14.4	15.3	19.7	18.5	37.1	38.5	40.3	44.0	46.7	52.3	59.7
	21	16.8	17.0	23.0	21.6	43.2	44.9	47.0	51.3	54.4	61.0	69.7
	24	19.2	19.5	26.3	24.7	49.4	51.3	53.8	58.7	62.2	69.7	79.6
	27	21.6	22.0	29.6	27.8	55.6	57.7	60.5	66.0	70.0	78.4	89.6
36[3]	30	24.0	24.4	32.9	30.9	61.7	64.2	67.2	73.3	77.7	87.1	100
	33	25.4	26.7	36.2	34.0	67.9	70.6	73.9	80.6	85.5	95.8	110
	36	28.8	29.0	39.5	37.1	74.1	77.0	80.6	88.0	93.3	105	120
	39	31.2	31.5	42.8	40.2	80.3	83.4	87.3	95.3	102	114	130
	42	34	34.0	46.1	43.3	86.4	89.8	94.0	103	109	122	140
	48	38	39.0	52.7	49.5	98.8	103	108	118	125	140	160
52	42	34	34.0	46.1	43.3	86.4	89.8	94.0	103	109	122	140
	48	38	39.0	52.7	49.5	98.8	103	108	118	125	140	160
	51	41	41.3	56.0	52.6	105	109	115	125	133	148	170
	54	43	43.0	59.3	55.7	112	116	121	132	140	157	180
	60	48	48.0	65.9	61.9	124	129	135	147	156	175	199
	66	53	53.4	72.5	68.1	136	142	148	162	171	192	219
72	54	43	43.0	59.3	55.7	112	116	121	132	140	157	180
	60	48	48.0	65.9	61.9	124	129	135	147	156	175	199
	66	53	53.4	72.5	68.1	136	142	148	162	171	192	219
	72	58	58.0	79.1	74.3	149	154	162	176	187	209	239
	75	60	60.7	82.4	77.4	155	161	168	184	195	218	249
	84	67	68.0	92.3	86.7	173	180	188	206	218	244	279
	90	72	72.0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77.0	105	99.1	198	206	215	235	249	279	319
100	75	60	60.7	82.4	77.4	155	161	168	184	195	218	249
	84	67	68.0	92.3	86.7	173	180	188	206	218	244	279
	90	72	72.0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77.0	105	99.1	198	206	215	235	249	279	319

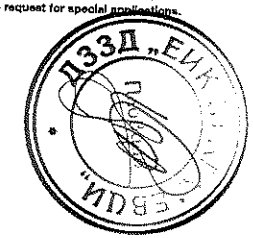
1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 5 kJ/kV (U_r)

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages

Arresters with lower or higher rated voltages may be available on request for special applications.





PEXLIM R-Y

Guaranteed protective data 123 - 170 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
123	90	72	72.0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77.0	105	99.1	198	206	215	235	249	279	319
	102	78	82.6	112	105	210	218	229	250	265	296	339
	108	78	84.0	118	111	223	231	242	264	280	314	359
	120	78	98.0	131	123	247	257	269	294	311	349	398
	132	78	106	145	136	272	283	296	323	342	383	438
	138	78	111	151	142	284	295	309	338	358	401	458
	144	78	115	158	148	297	308	323	352	373	418	478
145	108	85	86.0	118	111	223	231	242	264	280	314	359
	120	92	98.0	131	123	247	257	269	294	311	349	398
	132	92	106	145	136	272	283	296	323	342	383	438
	138	92	111	151	142	284	295	309	338	358	401	458
	144	92	115	158	148	297	308	323	352	373	418	478
170	132	106	106	145	136	272	283	296	323	342	383	438
	138	108	111	151	142	284	295	309	338	358	401	458
	144	108	115	158	148	297	308	323	352	373	418	478

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 5 kJ/kV (U_r)

Arresters with lower or higher rated voltages may be available on request for special applications.

PEXLIM R-Y

Technical data for housings

Max. system voltage U_s kV$_{rms}$	Rated voltage U_r kV$_{rms}$	Housing	Creepage distance mm	External insulation *) 1.2/50 µs dry kV$_{peak}$	50 Hz wet (60s) kV$_{rms}$	60 Hz wet (10s) kV$_{rms}$	250/2500 µs wet kV$_{peak}$	Dimensions Mass kg	A_{max} mm	B mm	C mm	Fig.
24	18-27	YV024	1863	310	150	150	250	16	641	-	-	1
36	30-48	YV036	1863	310	150	150	250	15	641	-	-	1
52	42-60	YV052	1863	310	150	150	250	15	641	-	-	1
	66	YV052	2270	370	180	180	300	17	727	-	-	1
72	54-60	YH072	1863	310	150	150	250	15	641	-	-	1
	54-72	YV072	2270	370	180	180	300	17	727	-	-	1
	75-96	YV072	3726	620	300	300	500	27	1216	-	-	2
100	75-96	YV100	3726	620	300	300	500	27	1216	-	-	2
123	90	YH123	3726	620	300	300	500	29	1219	400	160	3
	96-120	YH123	3726	620	300	300	500	27	1216	-	-	2
	90-96	YV123	4133	680	330	330	550	31	1305	400	160	3
	102-132	YV123	4133	680	330	330	550	29	1302	-	-	2
	138-144	YV123	4540	740	360	360	600	30	1388	-	-	2
145	108	YH145	3726	620	300	300	500	29	1219	400	160	3
	120	YH145	3726	620	300	300	500	26	1216	-	-	2
	108	YV145	4540	740	360	360	600	33	1391	400	160	3
	120-144	YV145	4540	740	360	360	600	30	1388	-	-	2
170	132-144	YH170	4540	740	360	360	600	32	1391	400	160	3
Neutral-ground arresters												
52	30-36	YN052	1863	310	150	150	250	14	641	-	-	1
72	42-54	YN072	1863	310	150	150	250	14	641	-	-	1
100	60	YN100	1863	310	150	150	250	14	641	-	-	1
123	72	YN123	2270	370	180	180	300	16	727	-	-	1
	84-120	YN123	3726	620	300	300	500	25	1216	-	-	2
145	75-120	YN145	3726	620	300	300	500	25	1216	-	-	2
170	75-120	YN170	3726	620	300	300	500	25	1216	-	-	2

*) Sum of withstand voltages for empty units of arrester.

PEXLIM R-Y

Technical data for housings

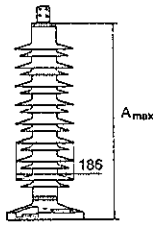


Figure 1

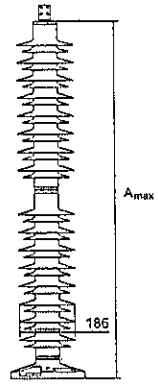


Figure 2

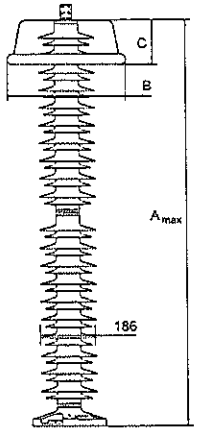
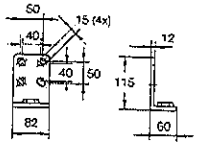


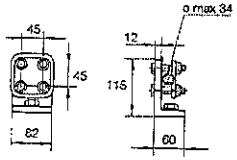
Figure 3

PEXLIM R-Y
Accessories

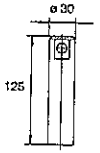
Line terminals



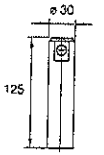
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

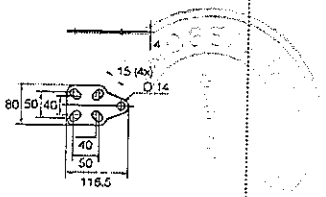


1HSA410 000-N
Aluminium

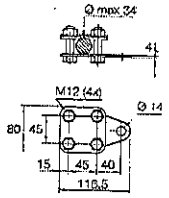


1HSA410 000-P
Stainless steel

Earth terminals

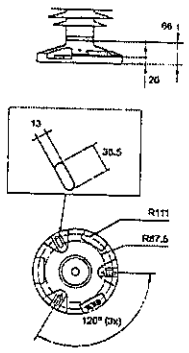


1HSA420 000-A
Stainless steel

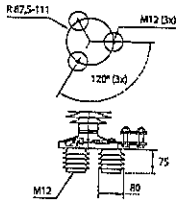


1HSA420 000-B
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430 000-H
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15–20 mm.

PEXLIM R-Y
Shipping data

Rated voltage U_r kV$_{rms}$	Housing	Number of arresters per crate: One Volume m³	One Gross kg	Three Volume m³	Three Gross kg	Six Volume m³	Six Gross kg
18-27	YV024	0.5	35	0.5	65	0.9	110
30-48	YV036	0.5	36	0.5	66	0.9	116
42-60	YV052	0.5	36	0.5	68	0.9	116
66	YV052	0.5	38	0.5	74	0.9	128
54-60	YH072	0.5	36	0.5	68	0.9	116
54-72	YV072	0.5	38	0.5	74	0.9	128
75-96	YV072	0.7	51	0.7	103	1.2	181
75-96	YV100	0.7	51	0.7	103	1.2	181
90	YH123	0.7	53	0.7	109	1.2	193
96-120	YH123	0.7	52	0.7	106	1.2	187
90-96	YV123	0.7	55	0.7	115	1.2	205
102-132	YV123	0.7	54	0.7	112	1.2	199
138-144	YV123	0.9	61	0.9	123	1.5	216
108-120	YH145	0.7	54	0.7	112	1.2	199
108	YV145	0.9	62	0.9	126	1.5	222
120-144	YV145	0.9	61	0.9	123	1.5	216
132-144	YH170	0.9	63	0.9	129	1.5	228
Neutral-ground arresters							
30-36	YN052	0.5	36	0.5	68	0.9	116
42-54	YN072	0.5	36	0.5	68	0.9	116
60	YN100	0.5	36	0.5	68	0.9	116
72	YN123	0.5	38	0.5	74	0.9	128
84-120	YN123	0.7	52	0.7	106	1.2	187
75-120	YN145	0.7	52	0.7	106	1.2	187
75-120	YN170	0.7	52	0.7	106	1.2	187

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester PEXLIM Q-Y

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with high lightning intensity and high energy requirements.
- where grounding or shielding conditions are poor or incomplete.

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.
Major component in PEXLINK™ concept for transmission line protection.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station: SM
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 420 kV
Rated voltages (U_r)	42 - 396 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	2.0 C
Thermal energy rating, W_{th} (IEC)	8 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	4.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1000 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	E
Single-impulse withstand rating as per IEEE standard	2.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	2.7 C
Short-circuit/Pressure relief capability	65 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	2500 Nm
Specified short-term load (SSL)	4000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 3

Further data according to the IEEE standard can be supplied on request

PEXLIM Q-Y

Guaranteed protective data 24 - 145 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
24[3]	24	19.2	19.5	26.4	24.9	46.1	47.6	49.5	53.6	56.4	62.1	69.4
36[3]	30	24.0	24.4	33.0	31.2	57.6	59.5	61.8	67.0	70.5	77.6	86.8
	33	26.4	26.7	36.3	34.3	63.4	65.4	68.0	73.7	77.6	85.4	95.4
	36	28.8	29.0	39.6	37.4	69.2	71.4	74.2	80.4	84.6	93.1	105
52	42	34	34.0	46.2	43.7	80.7	83.3	86.5	93.8	98.7	109	122
	48	38	39.0	52.8	49.9	92.2	95.1	98.9	108	113	125	139
	51	41	41.3	56.1	53.0	98.0	102	105	114	120	132	148
	54	43	43.0	59.4	56.2	104	107	112	121	127	140	157
	60	48	48.0	66.0	62.4	116	119	124	134	141	156	174
	66	53	53.4	72.6	68.7	127	131	136	148	156	171	191
	72	58	58.0	79.2	74.9	139	143	149	161	170	187	209
72	54	43	43.0	59.4	56.2	104	107	112	121	127	140	157
	60	48	48.0	66.0	62.4	116	119	124	134	141	156	174
	66	53	53.4	72.6	68.7	127	131	136	148	156	171	191
	72	58	58.0	79.2	74.9	139	143	149	161	170	187	209
	75	60	60.7	82.5	78.0	144	149	155	168	177	194	217
	78	62	63.1	85.8	81.1	150	155	161	175	184	202	226
	81	65	65.6	89.1	84.3	156	161	167	181	191	210	235
	84	67	68.0	92.4	87.4	162	167	173	188	198	218	243
100	75	60	60.7	82.5	78.0	144	149	155	168	177	194	217
	78	62	63.1	85.8	81.1	150	155	161	175	184	202	226
	81	65	65.6	89.1	84.3	156	161	167	181	191	210	235
	84	67	68.0	92.4	87.4	162	167	173	188	198	218	243
	90	72	72.0	99.0	93.6	173	179	186	201	212	233	261
	96	77	77.0	105	99.9	185	191	198	215	226	249	278
123	90	72	72.0	99.0	93.6	173	179	186	201	212	233	261
	96	77	77.0	105	99.9	185	191	198	215	226	249	278
	102	78	82.6	112	105	196	203	210	228	240	264	296
	108	78	84.0	118	112	208	214	223	242	254	280	313
	120	78	98.0	132	124	231	238	248	268	282	311	347
	129	78	104	141	134	248	256	266	288	304	334	373
	132	78	106	145	137	254	262	272	295	311	342	382
	138	78	111	151	143	265	274	285	309	325	357	399
	144	78	115	158	149	277	286	297	322	339	373	417
	150	78	121	165	156	288	298	309	335	353	388	434
145	108	86	86.0	118	112	208	214	223	242	254	280	313
	114	91	92.3	125	118	219	226	235	255	268	295	330
	120	92	98.0	132	124	231	238	248	268	282	311	347
	132	92	105	145	137	254	262	272	295	311	342	382

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 8 kJ/kV (U_r).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages

Arresters with lower or higher rated voltages may be available on request for special applications

PEXLIM Q-Y

Guaranteed protective data 145 - 420 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
145	138	92	111	151	143	265	274	285	309	325	357	399
	144	92	115	158	149	277	286	297	322	339	373	417
	150	92	121	165	156	288	298	309	335	353	388	434
	162	92	131	178	168	312	321	334	362	381	419	469
	168	92	131	184	174	323	333	346	376	395	435	486
	180	92	144	198	187	346	357	371	402	423	466	521
170	132	106	106	145	137	254	262	272	295	311	342	382
	144	108	115	158	149	277	286	297	322	339	373	417
	150	108	121	165	156	288	298	309	335	353	388	434
	162	108	131	178	168	312	321	334	362	381	419	469
	168	108	131	184	174	323	333	346	376	395	435	486
	180	108	144	198	187	346	357	371	402	423	466	521
	192	108	152	211	199	369	381	396	429	452	497	555
245	180	144	144	198	187	346	357	371	402	423	466	521
	192	154	154	211	199	369	381	396	429	452	497	555
	198	156	160	217	206	381	393	408	443	466	512	573
	210	156	170	231	218	404	417	433	469	494	543	606
	216	156	175	237	224	415	428	445	483	508	559	625
	219	156	177	240	227	421	434	451	489	515	567	634
	222	156	179	244	231	427	440	458	496	522	574	642
	228	156	180	250	237	438	452	470	510	536	590	660
300	216	173	175	237	224	415	428	445	483	508	559	625
	240	191	191	264	249	461	476	495	536	564	621	694
	258	191	209	283	268	496	512	532	576	607	667	746
	264	191	212	290	274	507	523	544	590	621	683	764
	276	191	220	303	287	530	547	569	617	649	714	798
362	258	206	209	283	268	496	512	532	576	607	667	746
	264	211	212	290	274	507	523	544	590	621	683	764
	276	221	221	303	287	530	547	569	617	649	714	798
	288	230	230	316	299	553	571	593	643	677	745	833
420	330	264	267	363	343	634	654	680	737	776	854	954
	336	267	272	369	349	646	666	692	751	790	869	972
	342	267	277	376	356	657	678	705	764	804	885	989
	360	267	291	396	374	692	714	742	804	846	931	1046
	372	267	301	409	387	715	737	766	831	875	962	1080
	378	267	306	415	393	726	749	779	844	889	978	1098
	384	267	308	419	396	732	755	785	851	896	985	1106
	390	267	315	428	405	749	773	803	871	917	1013	1132
	396	267	318	435	412	761	785	816	885	931	1029	1150

[1] The continuous operating voltages (arrester class) as per IEC and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_r has to be considered only when the actual system voltage is higher than the tabulated
Any arrester with U_r higher than or equal to the actual system voltage divided by √3 can be selected.

[2] With prior duty equal to the thermal energy rating of 6 kJ/kV (U_r)

Arresters with lower or higher rated voltages may be available on request for special applications

PEXLIM Q-Y

Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [1]				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
U_m	U_r												
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
24	24	YV024	1363	269	120	120	223	18	483	-	-	-	1
36	30-36	YV036	1363	269	120	120	223	18	483	-	-	-	1
52	42-72	YV052	2889	390	200	200	333	28	743	-	-	-	2
72	54-84	YV072	2889	390	200	200	333	28	743	-	-	-	2
100	75-84	YH100	2889	390	200	200	333	28	743	-	-	-	2
	75-96	YV100	3740	499	238	238	409	35	956	-	-	-	2
123	90-120	YH123	3740	499	238	238	409	35	956	-	-	-	2
	90-150	YV123	4549	580	295	295	461	42	1127	-	-	-	2
145	108-120	YH145	3740	499	238	238	409	34	956	-	-	-	2
	108-150	YV145	4549	580	295	295	461	42	1147	-	-	-	3
	162-168	YV145	5778	780	400	400	666	49	1431	-	-	-	4
	180	YV145	6629	889	438	438	742	57	1644	-	-	-	4
170	132-150	YH170	4549	580	295	295	461	40	1147	-	-	-	3
	132-168	YV170	5778	780	400	400	666	50	1431	-	-	-	4
	180-192	YV170	6629	889	438	438	742	57	1644	-	-	-	4
245	180-198	YH245	6629	889	438	438	742	57	1627	400	-	160	5
	210-228	YH245	7438	970	495	495	794	63	1798	400	-	160	5
	180-198	YV245	8289	1079	533	533	870	76	2028	800	-	400	6
	210-228	YV245	8289	1079	533	533	870	76	2028	600	-	300	5
300	216	YH300	8289	1079	533	533	870	74	2028	800	-	400	6
	240	YH300	8289	1079	533	533	870	73	2028	800	-	200	6
	258-264	YH300	8289	1079	533	533	870	74	2028	800	-	200	7
	276	YH300	9098	1160	590	590	922	81	2306	800	-	200	7
	216-240	YV300	9518	1279	638	638	1075	90	2419	900	800	400	10
	258-276	YV300	9518	1279	638	638	1075	90	2419	900	-	300	9
362	258-276	YH362	9098	1160	590	590	922	91	2306	1400	1000	600	8
	288	YH362	9098	1160	590	590	922	83	2306	900	-	300	7
	258-288	YV362	11220	1497	714	714	1227	111	2845	1400	1000	600	10
420	330-360	YH420	11178	1469	733	733	1203	104	2803	1400		500	9
	330-396	YV420	13647	1740	885	885	1383	109	3358	1400	1000	600	10

Neutral-ground arresters

52	30-36	YN052	1363	269	120	120	223	18	483	-	-	-	1
72	42-54	YN072	2889	390	200	200	333	28	743	-	-	-	2
100	60	YN100	2889	390	200	200	333	28	743	-	-	-	2
123	72-84	YN123	2889	390	200	200	333	27	743	-	-	-	2
	90-120	YN123	3740	499	238	238	409	35	956	-	-	-	2
145	84	YN145	2889	390	200	200	333	27	743	-	-	-	2
	90-120	YN145	3740	499	238	238	409	35	956	-	-	-	2
170	96-120	YN170	3740	499	238	238	409	34	956	-	-	-	2
	132	YN170	4549	580	295	295	461	40	1127	-	-	-	2
245	108-120	YN245	3740	499	238	238	409	34	956	-	-	-	2
	132-144	YN245	4549	580	295	295	461	40	1127	-	-	-	2

[1] Sum of withstand voltages for empty units of arrester.

PEXLIM Q-Y
Technical data for housings

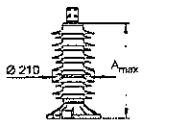


Figure 1

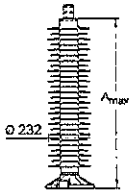


Figure 2

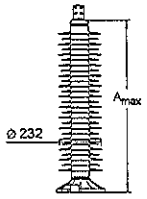


Figure 3

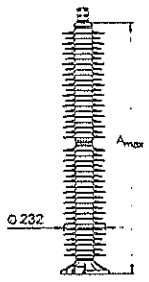


Figure 4

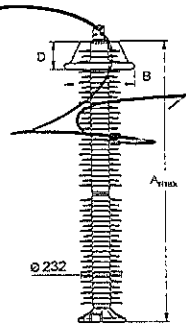


Figure 5

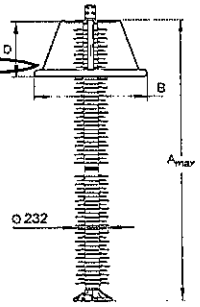


Figure 6

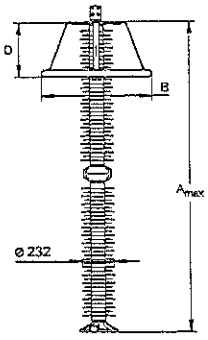


Figure 7

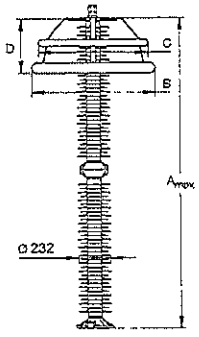


Figure 8

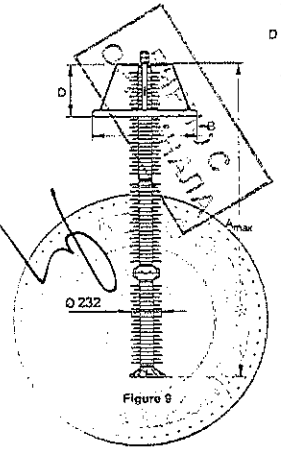


Figure 9

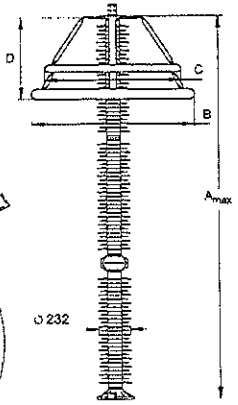
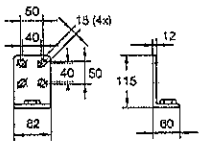


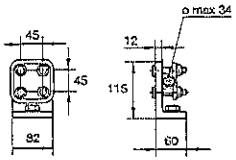
Figure 10

PEXLIM Q-Y
Accessories

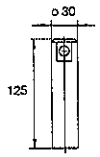
Line terminals



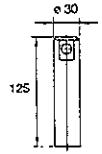
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

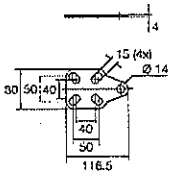


1HSA410 000-N
Aluminium

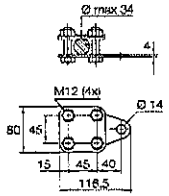


1HSA410 000-P
Stainless steel

Earth terminals

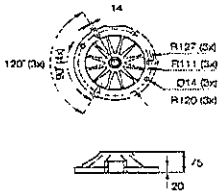


1HSA420 000-A
Stainless steel



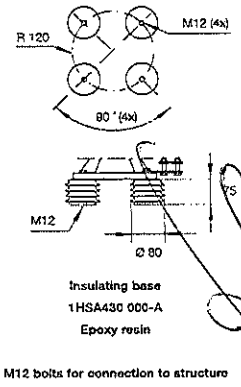
1HSA420 000-B
Stainless steel

Drilling plans



NOTE! Alternative drilling plan
3 slotted holes (120 °), n14 at R111-127

Without insulating base
Aluminium



Insulating base
1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15–20 mm.

PEXLIM Q-Y
Shipping data

Rated voltage	Housing	Number of arresters per crate					
		One		Three		Six	
U_r kV$_{rms}$		Volume m³	Gross kg	Volume m³	Gross kg	Volume m³	Gross kg
24	YV024	0.14	28	0.51	74	0.90	128
30-36	YV036	0.14	28	0.51	74	0.90	128
42-72	YV052	0.14	38	0.51	104	0.90	188
54-84	YV072	0.14	37	0.51	104	0.90	188
75-84	YH100	0.14	37	0.51	101	0.90	182
75-96	YV100	0.20	48	0.69	130	1.22	235
90-120	YH123	0.20	48	0.69	130	1.22	235
90-150	YV123	0.20	55	0.69	151	1.22	277
108-120	YH145	0.20	55	0.69	127	1.22	229
108-150	YV145	0.20	55	0.69	151	1.22	277
162-168	YV145	0.27	64	0.87	177	1.51	324
180	YV145	0.27	72	0.87	201	1.51	372
132-150	YH170	0.20	53	0.69	145	1.22	265
132-166	YV170	0.27	65	0.87	180	1.51	330
180-192	YV170	0.27	70	0.87	225	1.51	420
180-198	YH245	0.87	92	0.87	206	1.51	372
210-228	YH245	1.06	95	1.06	224	1.87	413
180-198	YV245	1.06	111	1.06	263	1.87	491
210-228	YV245	1.06	108	1.06	254	1.87	473
216-240	YH300	1.06	109	1.06	257	1.87	479
258-264	YH300	0.70	100	1.22	250	-	-
276	YH300	0.70	106	1.22	268	-	-
216-240	YV300	1.31	185	1.97	348	-	-
258-276	YV300	1.31	168	1.97	336	-	-
258-276	YH362	1.48	191	2.22	383	-	-
288	YH362	1.14	155	1.66	340	-	-
258-288	YV362	1.84	225	2.87	453	-	-
330-360	YH420	1.65	210	2.53	424	-	-
330-396	YV420	2.0	252	3.16	552	-	-
Neutral-ground arresters							
30-36	YN052	0.14	28	0.51	74	0.90	128
42-54	YN072	0.14	38	0.51	104	0.90	188
60	YN100	0.14	38	0.51	104	0.90	188
72-84	YN123	0.14	37	0.51	101	0.90	182
90-120	YN123	0.20	48	0.69	130	1.22	245
84	YN145	0.14	37	0.51	101	0.90	182
90-120	YN145	0.20	48	0.69	130	1.22	245
96-120	YN170	0.20	47	0.69	127	1.22	229
132	YN170	0.20	53	0.69	145	1.22	265
108-120	YN245	0.20	47	0.69	127	1.22	229
132-144	YN245	0.20	53	0.69	145	1.22	265

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.
Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester PEXLIM P-X

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

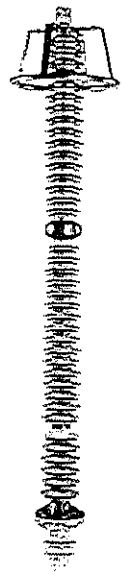
Major component in PEXLINK™ concept for transmission line protection.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 420 kV
Rated voltages (U_r)	42 - 360 kV
Nominal discharge current (IEC)	20 kA$_{peak}$
Lightning impulse classifying current (ANSI/IEEE)	10/15 kA$_{peak}$
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	3.2 C
Thermal energy rating, W_{th} (IEC)	11 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	7.0 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA$_{peak}$
Low current 2000 µs, (based on Q_{rs})	1 600 A$_{peak}$
Energy class as per IEEE standard (switching surge energy rating)	G
Single-impulse withstand rating as per IEEE standard	3.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	4.0 C
Short-circuit/Pressure relief capability	65 kA$_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	2500 Nm
Specified short-term load (SSL)	4000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 4

Further data according to the IEEE standard can be supplied on request



PEXLIM P-X

Guaranteed protective data 24 - 145 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [1]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
24[3]	24	19.2	19.5	26.5	25.2	46.8	48.5	49.7	51.9	54.6	59.8	65.6
36[3]	30	24.0	24.4	33.1	31.5	58.5	60.7	62.2	64.9	68.3	74.8	81.9
	33	26.4	26.7	36.4	34.6	64.4	66.7	68.4	71.4	75.1	82.3	90.1
	36	28.8	29.0	39.7	37.8	70.2	72.8	74.6	77.9	81.9	89.7	98.3
	39	31.2	31.5	43.0	40.9	76.1	78.8	80.8	84.3	88.8	97.2	107
52	42	34	34.0	46.4	44.1	81.9	84.9	87.0	90.8	95.6	105	115
	48	38	38.0	53.0	50.4	93.6	97.0	99.4	104	110	120	132
	51	41	41.3	56.3	53.5	99.5	104	105	111	117	128	140
	54	43	43.0	59.6	56.7	106	110	112	117	123	135	148
	60	48	48.0	66.3	63.0	117	122	125	130	137	150	164
	72	58	58.0	79.5	75.6	141	146	150	156	164	180	197
72	54	43	43.0	59.6	56.7	106	110	112	117	123	135	148
	60	48	48.0	66.3	63.0	117	122	125	130	137	150	164
	63	50	51.0	69.6	66.1	123	128	131	137	144	157	172
	66	53	53.4	72.9	69.3	129	134	137	143	151	165	181
	72	58	58.0	79.5	75.6	141	146	150	156	164	180	197
	75	60	60.7	82.8	78.7	147	152	156	163	171	187	205
	78	62	63.1	86.1	81.9	153	158	162	169	178	195	213
	81	65	65.6	89.5	85.0	158	164	168	176	185	202	222
	84	67	68.0	92.8	88.2	164	170	174	182	192	210	230
100	72	58	58.0	79.5	75.6	141	146	150	156	164	180	197
	75	60	60.7	82.8	78.7	147	152	156	163	171	187	205
	78	62	63.1	86.1	81.9	153	158	162	169	178	195	213
	81	65	65.6	89.5	85.0	158	164	168	176	185	202	222
	84	67	68.0	92.8	88.2	164	170	174	182	192	210	230
123	90	72	72.0	99.4	94.5	176	182	187	195	205	225	246
	96	77	77.0	106	100	188	194	199	208	219	240	263
	102	82	82.6	112	107	199	207	212	221	233	255	279
	108	78	84.0	119	113	211	219	224	234	246	270	295
	114	78	92.3	125	119	223	231	237	247	260	284	312
	120	78	98.0	132	126	234	243	249	260	273	299	328
	129	78	104	142	135	252	261	268	279	294	322	353
	132	78	106	145	138	258	267	274	286	301	329	361
	138	78	111	152	144	270	279	286	299	314	344	377
	144	78	115	159	151	281	291	299	312	328	359	394
	150	78	121	165	157	293	304	311	325	342	374	410

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r)

3) Arresters for system voltages 36 kV or below can be supplied on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications

PEXLIM P-X

Guaranteed protective data 145 - 420 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [1]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
145	108	86	86.0	119	113	211	219	224	234	246	270	295
	120	92	98.0	132	126	234	243	249	260	273	299	328
	132	92	106	145	138	258	267	274	286	301	329	361
	138	92	111	152	144	270	279	286	299	314	344	377
	144	92	115	159	151	281	291	299	312	328	359	394
	150	92	121	165	157	293	304	311	325	342	374	410
	162	92	131	179	170	316	328	336	351	369	404	443
	168	92	131	185	176	328	340	348	364	383	419	459
170	132	106	106	145	138	258	267	274	286	301	329	361
	144	108	115	159	151	281	291	299	312	328	359	394
	150	108	121	165	157	293	304	311	325	342	374	410
	162	108	131	179	170	316	328	336	351	369	404	443
	168	108	131	185	176	328	340	348	364	383	419	459
	180	108	144	198	189	351	364	373	390	410	449	492
	192	108	152	212	201	375	388	398	415	437	479	525
245	180	144	144	198	189	351	364	373	390	410	449	492
	192	154	154	212	201	375	388	398	415	437	479	525
	198	158	160	218	207	387	400	410	428	451	494	541
	210	156	170	232	220	410	425	435	454	478	524	574
	214	156	173	237	225	419	434	445	464	488	535	586
	216	156	175	238	226	422	437	448	467	492	539	590
	219	156	177	241	229	427	443	454	474	499	546	598
	222	156	179	245	233	433	449	460	480	506	554	607
	228	156	180	251	239	445	461	473	493	519	568	623
300	216	173	175	238	226	422	437	448	467	492	539	590
	228	182	182	251	239	445	461	473	493	519	568	623
	240	191	191	265	252	468	485	497	519	546	598	656
	258	191	209	285	270	504	522	535	558	587	643	705
	264	191	212	291	277	515	534	547	571	601	658	721
	276	191	220	304	289	539	558	572	597	628	688	754
362	258	206	209	285	270	504	522	535	558	587	643	705
	264	211	212	291	277	515	534	547	571	601	658	721
	276	221	221	304	289	539	558	572	597	628	688	754
	288	230	230	318	302	562	582	597	623	656	718	787
420	330	264	267	364	346	644	667	684	714	751	823	901
	336	267	272	371	352	656	679	696	727	765	838	918
	342	267	277	377	359	667	691	709	740	779	852	934
	360	267	291	397	378	702	728	746	779	819	897	983

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r)

Arresters with lower or higher rated voltages may be available on request for special applications

PEXLIM P-X
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation *)				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
24	24	XV024	1363	283	126	126	235	19	481	-	-	-	1
36	30-36	XV036	1363	283	126	126	235	19	481	-	-	-	1
	39	XV036	2270	400	187	187	330	30	736	-	-	-	1
52	42-72	XV052	2270	400	187	187	330	30	736	-	-	-	1
72	54-72	XV072	2270	400	187	187	330	29	736	-	-	-	1
	75-84	XV072	3625	578	293	293	462	44	1080	-	-	-	1
100	75-96	XV100	3625	578	293	293	462	44	1080	-	-	-	1
123	90-120	XH123	3625	578	293	293	462	43	1080	-	-	-	1
	90-144	XV123	4540	800	374	374	660	54	1397	-	-	-	2
	150	XV123	4988	861	419	419	697	55	1485	-	-	-	2
145	108-120	XH145	3625	578	293	293	462	42	1080	-	-	-	1
	108-144	XV145	4540	800	374	374	660	53	1397	-	-	-	2
	150	XV145	4988	861	419	419	697	55	1485	-	-	-	2
	162-168	XV145	5885	978	480	480	792	66	1741	-	-	-	2
170	132-144	XH170	4540	800	374	374	660	53	1400	400	-	160	3
	150	XV170	4988	861	419	419	697	57	1489	400	-	160	3
	132-192	XV170	5895	978	480	480	792	70	1744	400	-	160	3
245	180-192	XM245	5885	978	480	480	792	66	1744	400	-	160	3
	180-228	XH245	7250	1156	586	586	924	83	2088	400	-	160	3
	180-198	XV245	8613	1439	712	712	1159	101	2847	800	-	500	4
	210-228	XV245	8613	1439	712	712	1159	98	2617	600	-	300	4
300	216-276	XH300	8613	1439	712	712	1159	101	2617	800	-	500	4
	216-275	XV300	9520	1556	773	773	1254	110	2872	800	-	500	4
362	258-288	XH362	9520	1556	773	773	1254	118	2872	1200	1000	600	5
	258-288	XV362	11790	1956	960	960	1584	148	3533	1400	1000	700	6
420	330-360	XH420	10875	1734	879	879	1386	131	3215	1400	1000	700	5
Neutral-ground arresters													
52	30-36	XN052	1363	283	126	126	235	19	481	-	-	-	1
72	42-54	XN072	2270	400	187	187	330	29	736	-	-	-	1
100	60	XN100	2270	400	187	187	330	30	736	-	-	-	1
123	72	XN123	2270	400	187	187	330	28	736	-	-	-	1
	75-120	XN123	3625	578	293	293	462	43	1080	-	-	-	1
145	84-120	XN145	3625	578	293	293	462	42	1080	-	-	-	1
170	96-120	XN170	3625	578	293	293	462	42	1080	-	-	-	1
245	108	XN245	3625	578	293	293	462	41	1080	-	-	-	1
	132-144	XN245	4540	800	374	374	660	50	1397	-	-	-	2

*) Sum of withstand voltages for empty units of arrester.

PEXLIM P-X
Technical data for housings

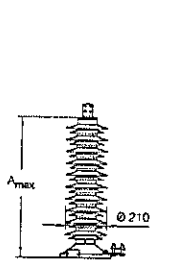


Figure 1

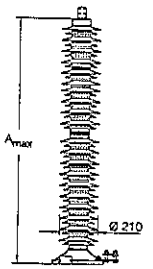


Figure 2

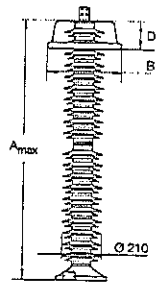


Figure 3

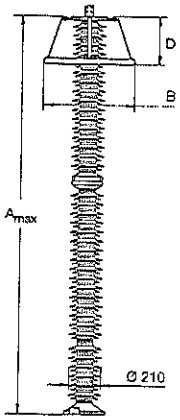


Figure 4

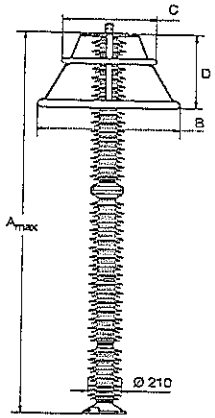


Figure 5

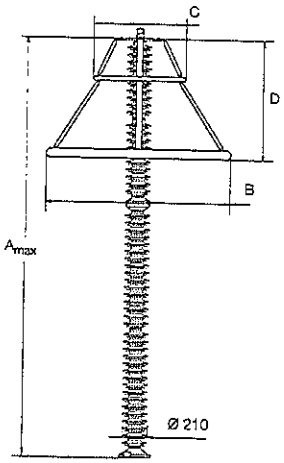
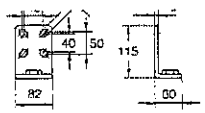


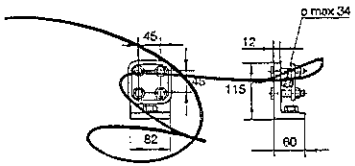
Figure 6

PEXLIM P-X
Accessories

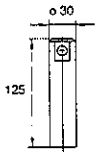
Line terminals



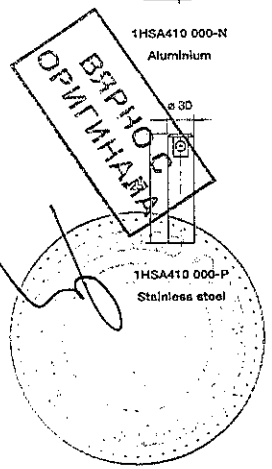
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

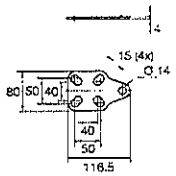


1HSA410 000-N
Aluminium

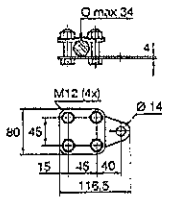


1HSA410 000-P
Stainless steel

Earth terminals

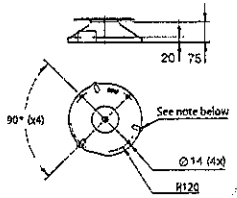


1HSA420 000-A
Stainless steel



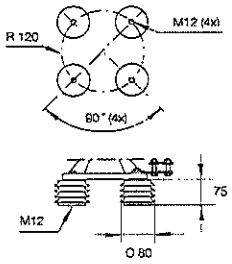
1HSA420 000-B
Stainless steel

Drilling plans



NOTE! Alternative drilling plan
3 slotted holes (120 °), ø14 at R111-127

Without insulating base
Aluminium



Insulating base
1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

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PEXLIM P-X
Shipping data

Rated voltage U_r	Housing	Number of arresters per crate: One Volume	One Gross	Three Volume	Three Gross	Six Volume	Six Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg
24	XV024	0.1	42	0.5	86	0.9	152
30-36	XV036	0.1	42	0.5	86	0.9	152
39	XV036	0.5	52	0.5	116	0.9	212
42-72	XV052	0.5	52	0.5	116	0.9	212
54-72	XV072	0.5	52	0.5	116	0.9	212
75-84	XV072	0.7	71	0.7	163	1.2	301
75-96	XV100	0.7	71	0.7	163	1.2	301
90-120	XH123	0.7	71	0.7	163	1.2	301
90-144	XV123	0.9	87	0.9	201	1.5	372
150	XV123	0.9	87	0.9	201	1.5	372
108-120	XH145	0.7	68	0.7	154	1.2	283
108-144	XV145	0.9	87	0.9	201	1.5	372
150	XV145	0.9	87	0.9	201	1.5	372
162-168	XV145	1.1	98	1.1	239	1.9	443
132-144	XH170	0.9	89	0.9	207	1.5	384
150	XH170	0.9	89	0.9	207	1.5	384
132-192	XV170	1.1	102	1.1	251	1.9	443
192	XM245	1.1	98	1.1	238	1.9	443
180-228	XH245	1.1	115	1.1	290	1.9	545
180-198	XV245	0.9	133	1.5	339	-	-
210-228	XV245	0.9	133	1.5	339	-	-
216-264	XH300	1.0	155	1.7	358	-	-
276	XH300	1.0	155	1.7	358	-	-
216-276	XV300	1.0	163	1.7	382	-	-
258-288	XH362	1.6	207	2.3	435	-	-
258	XV362	2.1	242	2.9	497	-	-
264-288	XV362	2.1	258	2.3	545	-	-
330-360	XH420	2.1	242	2.3	497	-	-
30-36	XN052	0.1	42	0.5	86	0.9	152
42-54	XN072	0.5	52	0.5	116	0.9	212
60	XN100	0.5	52	0.5	116	0.9	212
72	XN123	0.5	52	0.5	116	0.9	212
75-120	XN123	0.7	71	0.7	163	1.2	301
84-120	XN145	0.7	71	0.7	163	1.2	301
96-120	XN170	0.7	71	0.7	163	1.2	301
108-120	XN245	0.7	71	0.7	163	1.2	301
132-144	XN245	0.9	87	0.9	201	1.5	372

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester PEXLIM P-Y

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

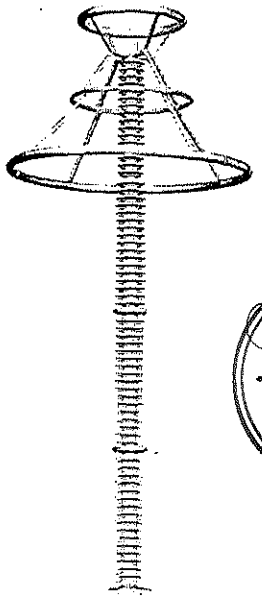
Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	300 - 550 kV
Rated voltages (U_r)	228 - 444 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10/15 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	3.2 C
Thermal energy rating, W_{th} (IEC)	11 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	7.0 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1 600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	G
Single-impulse withstand rating as per IEEE standard	3.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	4.0 C
Short-circuit/Pressure relief capability	65 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	6000 Nm
Specified short-term load (SSL)	9000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC 60099-4 Ed. 2.2)	Class 4

Further data according to the IEEE standard can be supplied on request



PEXLIM P-Y
Guranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
300	228	182	182	251	239	445	461	473	493	519	568	623
	240	191	191	265	252	468	485	497	519	546	598	656
	258	191	209	285	270	504	522	535	558	587	643	705
	264	191	212	291	277	515	534	547	571	601	658	721
	276	191	220	304	289	539	558	572	597	628	688	754
362	258	206	209	285	270	504	522	535	558	587	643	705
	264	211	212	291	277	515	534	547	571	601	658	721
	276	221	221	304	289	539	558	572	597	628	688	754
	288	230	230	318	302	562	582	597	623	656	718	787
420	330	264	267	364	346	644	667	684	714	751	823	901
	336	267	272	371	352	656	679	696	727	765	838	918
	342	267	277	377	359	667	691	709	740	779	852	934
	360	267	291	397	378	702	728	746	779	819	897	983
	378	267	305	417	396	737	764	783	817	860	942	1037
	390	267	315	430	409	761	788	808	843	888	972	1070
	396	267	318	437	415	773	800	820	856	901	987	1086
550	396	317	318	437	415	773	800	820	856	901	987	1086
	420	336	336	464	441	819	849	870	908	956	1051	1152
	444	349	353	490	466	866	897	920	960	1015	1111	1217

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_s higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r)

Arresters with lower or higher rated voltages may be available on request for special applications.

PEXLIM P-Y
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External Insulation*)				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
300	228-240	YH300	7500	1155	586	586	924	112	2220	800	-	400	1
	258-276	YH300	8863	1439	712	712	1159	126	2625	800	-	500	2
	228-276	YV300	9770	1556	773	773	1254	139	2880	800	-	500	2
362	258-276	YM362	8863	1439	712	712	1159	134	2625	1200	1000	600	3
	258-288	YH362	9770	1556	773	773	1254	145	2880	1200	1000	600	3
	258-288	YV362	11250	1734	879	879	1386	160	3330	1400	1000	700	4
420	330-360	YH420	11125	1734	879	879	1386	170	3225	1400	1000	700	3
	378-396	YH420	12613	2017	1005	1005	1621	188	3740	1400	1000	700	5
	330-396	YV420	13520	2134	1068	1068	1718	202	3995	1400	1000	700	5
550	396-444	YH550	14875	2312	1172	1172	1648	226	4335	2000	1000	1000	6

*) Sum of withstand voltages for empty units of arrester.

PEXLIM P-Y
Technical data for housings

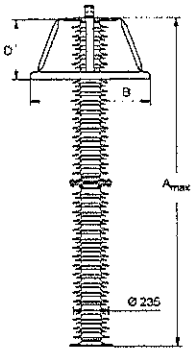


Figure 1

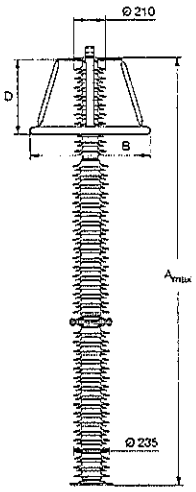


Figure 2

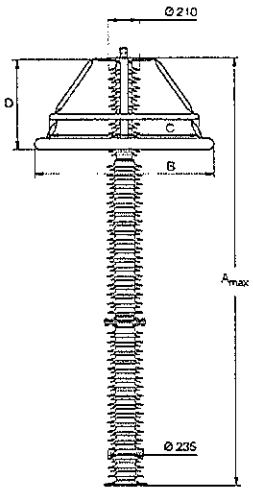


Figure 3

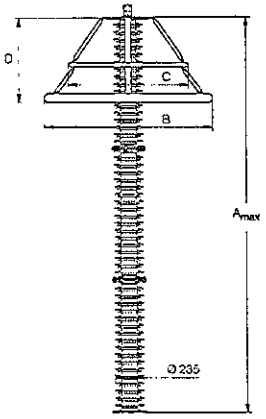


Figure 4

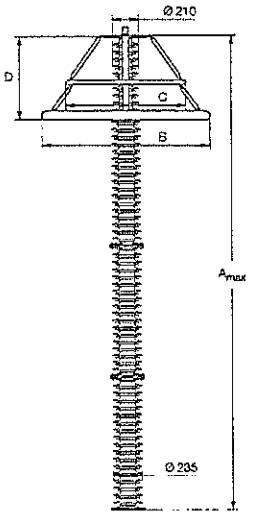


Figure 5

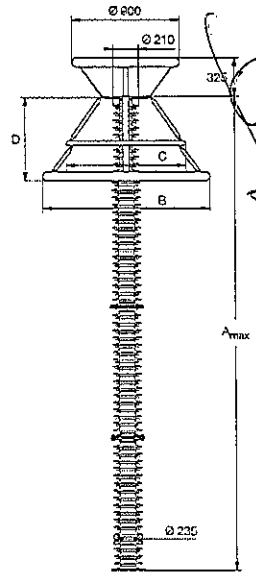
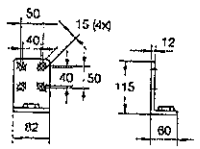


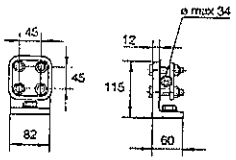
Figure 6

PEXLIM P-Y
Accessories

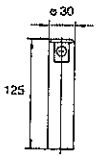
Line terminals



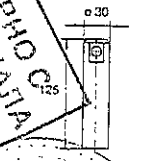
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

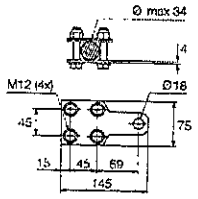


1HSA410 000-N
Aluminium

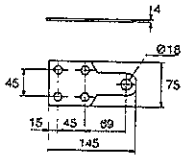


1HSA410 000-P
Stainless steel

Earth terminals

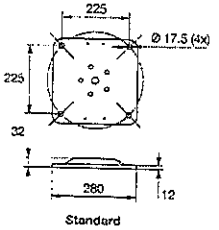


1HSA420 000-U
Stainless steel

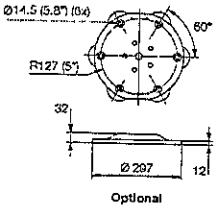


1HSA420 000-V
Stainless steel

Drilling plans without insulating base

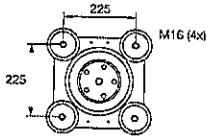


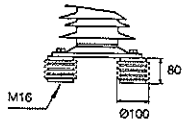
Standard



Optional

Drilling plan with insulating base





Insulating base
1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

PEXLIM P-Y
Shipping data

Rated voltage U_r kV_{rms}	Housing	Number of arresters per crate: One Volume m^3	One Gross kg	Three Volume m^3	Three Gross kg
288-240	YH300	1.18	162	1.18	386
258-276	YH300	1.18	176	1.18	429
228-276	YV300	1.18	188	1.18	467
258-276	YM362	1.69	230	1.94	499
258-288	YH382	1.69	240	1.94	531
330-360	YH420	1.85	280	2.19	621
258-288	YV362	1.85	290	2.19	652
378-396	YH420	1.85	298	2.19	675
330-396	YV420	1.85	312	2.19	716
396-444	YH550	3.38	425	3.38	879

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc-Oxide Surge Arrester TEXLIM Q-C

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).
- Specially suited to extreme seismic zones.

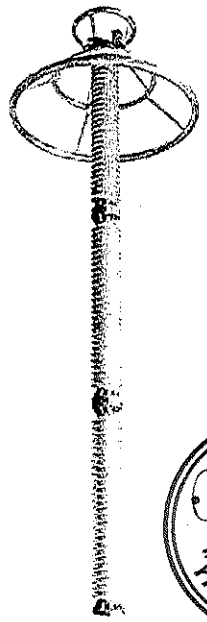
Superior where low weight, non-fragility and additional personnel safety is required.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SM
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	123 - 420 kV
Rated voltages (U_r)	90 - 420 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	2.0 C
Thermal energy rating, W_{th} (IEC)	8 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	4.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1 600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	E
Single-impulse withstand rating as per IEEE standard	2.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	2.7 C
Short-circuit/Pressure relief capability	80 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	21000 Nm
Specified short-term load (SSL)	40000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 3

Further data according to the IEEE standard can be supplied on request



TEXLIM Q-C
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	Ur	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
123	090	72	72.0	98.5	92.7	173	178	185	201	212	233	261
	096	77	77.0	105	98.9	185	190	197	215	226	249	278
	102	78	82.0	111	105	196	202	210	228	240	264	295
	108	78	84.0	118	111	208	214	222	242	254	280	313
	120	78	98.0	131	123	231	237	247	268	282	311	347
	129	78	104	141	132	248	255	265	288	304	334	373
	132	78	106	144	136	254	261	271	295	311	342	382
	138	78	111	151	142	265	273	284	309	325	357	399
	144	78	115	157	148	277	285	296	322	339	373	417
	150	78	121	164	154	288	297	308	335	353	388	434
145	108	86	86.0	118	111	208	214	222	242	254	280	313
	120	92	96.0	131	123	231	237	247	268	282	311	347
	132	92	106	144	136	254	261	271	295	311	342	382
	138	92	111	151	142	265	273	284	309	325	357	399
	144	92	115	157	148	277	285	296	322	339	373	417
	150	92	121	164	154	288	297	308	335	353	388	434
	162	92	131	177	167	312	320	333	362	381	419	469
	168	92	131	183	173	323	332	345	376	395	435	486
170	132	106	106	144	136	254	261	271	295	311	342	382
	144	108	115	157	148	277	285	296	322	339	373	417
	150	108	121	164	154	288	297	308	335	353	388	434
	162	108	131	177	167	312	320	333	362	381	419	469
	168	108	131	183	173	323	332	345	376	395	435	486
	180	108	144	197	185	346	356	370	402	423	466	521
	192	108	152	210	197	369	380	394	429	452	497	555
245	180	144	144	197	185	346	356	370	402	423	466	521
	192	154	154	210	197	369	380	394	429	452	497	555
	198	156	160	216	204	381	391	407	443	466	512	573
	210	156	170	229	216	404	415	431	469	494	543	608
	216	156	174	236	222	415	427	444	483	508	559	625
	219	156	177	239	225	421	433	450	489	515	567	634
	222	156	179	243	228	427	439	456	496	522	574	642
	228	156	180	249	235	438	451	468	510	536	590	660

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_r higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications.

TEXLIM Q-C
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
300	216	173	174	236	222	415	427	444	483	508	559	625
	228	182	182	249	235	438	451	468	510	536	590	660
	240	191	191	252	247	461	474	493	536	564	621	694
	258	191	209	282	265	496	510	530	576	607	667	746
	264	191	212	289	272	507	522	542	590	621	683	764
	276	191	220	302	284	530	545	567	617	649	714	798
362	258	206	209	282	265	496	510	530	576	607	667	746
	264	211	212	289	272	507	522	542	590	621	683	764
	276	221	221	302	284	530	545	567	617	649	714	798
	288	230	230	315	296	553	569	591	643	677	745	833
420	330	264	267	361	340	634	652	678	737	776	854	954
	336	267	272	367	346	645	664	690	751	790	869	972
	342	267	277	374	352	657	676	702	764	804	885	989
	360	267	291	394	371	692	711	739	804	846	931	1045
	372	267	301	407	383	715	735	764	831	875	962	1080
	378	267	306	413	389	726	747	776	844	889	978	1098
	381	267	308	417	392	732	753	782	851	896	985	1106
	390	267	315	427	402	749	770	801	871	917	1013	1132
	396	267	318	433	408	761	782	813	885	931	1029	1150
	420	267	335	459	433	807	830	862	938	987	1091	1219

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_r higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications.

TEXLIM Q-C
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [1]				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
123	90-150	CV123	4800	620	270	270	440	95	1562	-	-	-	1
145	108-168	CV145	4800	620	270	270	440	97	1562	-	-	-	1
170	132-180	CH170	4800	620	270	270	440	98	1562	-	-	-	1
	132-150	CV170	7700	980	430	430	690	125	2282	600	-	300	2
	162-192	CV170	7700	980	430	430	690	128	2282	-	-	-	1
245	180-198	CV245	7700	980	430	430	690	132	2282	800	-	400	2
	210-228	CV245	7700	980	430	430	690	133	2282	500	-	300	2
300	216-240	CH300	7700	980	430	430	690	136	2282	900	-	400	2
	258	CH300	7700	980	430	430	690	137	2282	800	-	200	2
	216-228	CV300	9600	1240	540	540	880	190	3109	1200	1000	800	3
	240-258	CV300	12500	1600	700	700	1130	195	3109	1200	1000	600	3
	264-276	CV300	12500	1600	700	700	1130	190	3109	900	800	400	3
362	258-264	CH362	9600	1240	540	540	880	194	3109	1400	1000	600	3
	276-288	CH362	9600	1240	540	540	880	195	3109	1200	1000	600	3
	258-264	CV362	12500	1600	700	700	1130	226	3829	1600	1000	1200	3
	276-288	CV362	12500	1600	700	700	1130	225	3829	1400	1000	700	3
420	330-360	CH420	12500	1600	700	700	1130	232	3829	1200	1000	800	3
	372-420	CH420	12500	1600	700	700	1130	237	3829	1200	1000	600	3
	330-420	CV420	15400	1960	860	860	1380	267	4549	1200	1000	800	3

Neutral-ground arresters

123	72-120	CN123	4800	620	270	270	440	92	1562	-	-	-	1
145	84-120	CN145	4800	620	270	270	440	92	1562	-	-	-	1
170	96-132	CN170	4800	620	270	270	440	93	1562	-	-	-	1
245	108-144	CN245	4800	620	270	270	440	94	1562	-	-	-	1

[1] Sum of withstand voltages for empty units of arrester.

TEXLIM Q-C
Technical data for housings

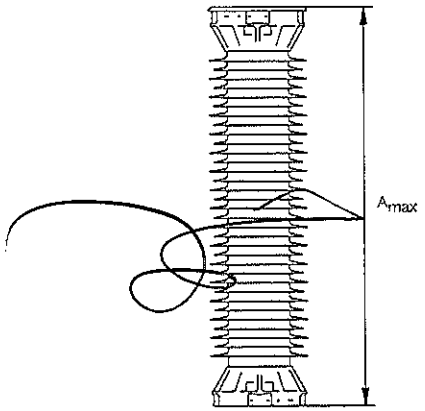


Figure 1

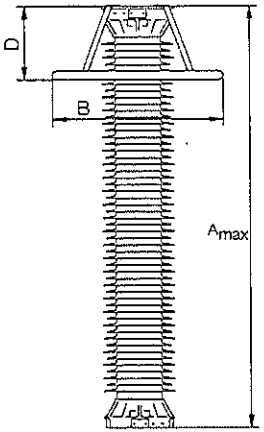


Figure 2

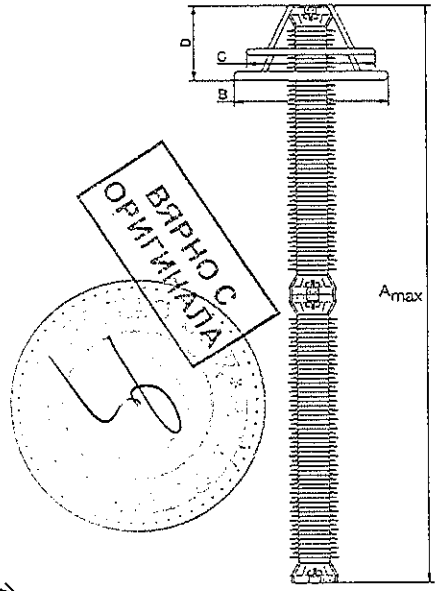
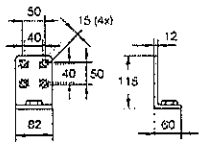


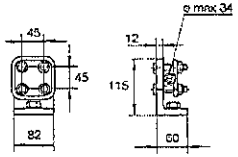
Figure 3

TEXLIM Q-C
Accessories

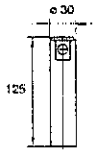
Line terminals



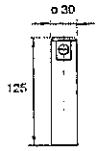
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

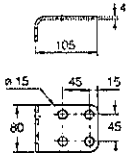


1HSA410 000-C
Aluminium

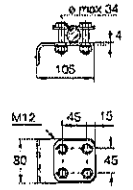


1HSA410 000-D
Stainless steel

Earth terminals

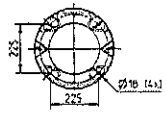


1HSA420 000-C
Stainless steel

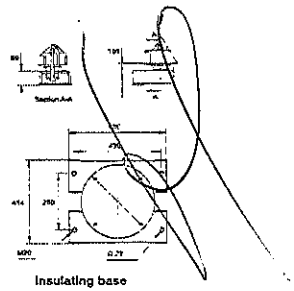


1HSA420 000-D
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430000-V

M20 bolts for connection to structure are not supplied by ABB.

TEXLIM Q-C
Shipping data

Rated voltage	Housing	Without insulating base						With insulating base					
		Number of arresters per crate						Number of arresters per crate					
		One		Two		Three		One		Two		Three	
U_r		Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg
90-150	CV123	2.96	170	2.96	265	2.96	360	2.96	197	2.96	319	2.96	441
108-168	CV145	2.96	172	2.96	269	2.96	366	2.96	199	2.96	323	2.96	447
132-180	CH170	2.96	173	2.96	271	2.96	369	2.96	200	2.96	325	2.96	450
132-150	CV170	4.16	200	4.16	325	4.16	450	4.16	227	4.16	379	4.16	531
162-192	CV170	4.16	203	4.16	331	4.16	459	4.16	230	4.16	385	4.16	540
180-198	CV245	4.16	207	4.16	338	4.16	471	4.16	234	4.16	393	4.16	552
210-228	CV245	4.16	208	4.16	341	4.16	474	4.16	235	4.16	395	4.16	555
216-240	CH300	4.16	211	4.16	347	4.16	483	4.16	238	4.16	401	4.16	564
258	CH300	4.16	212	4.16	349	4.16	486	4.16	239	4.16	403	4.16	567
216-228	CV300	2.96	265	5.54	500	5.54	690	2.96	292	5.54	554	5.54	726
240-258	CV300	2.96	270	5.54	510	5.54	705	2.96	297	5.54	564	5.54	741
264-276	CV300	2.96	265	5.54	500	5.54	690	2.96	292	5.54	554	5.54	726
258-264	CH362	3.74	344	5.54	508	5.54	702	3.74	371	5.54	562	5.54	738
276-288	CH362	2.96	270	5.54	510	5.54	705	2.96	297	5.54	564	5.54	741
258-264	CV362	5.76	426	5.54	572	5.54	798	5.76	453	5.54	626	5.54	834
276-288	CV362	4.94	380	5.54	570	5.54	795	4.94	402	5.54	624	5.54	831
330-360	CH420	4.16	307	5.54	584	5.54	816	4.16	334	5.54	638	5.54	852
372-420	CH420	4.16	312	5.54	594	5.54	831	4.16	339	5.54	648	5.54	867
330-360	CV420	4.16	337	5.54	644	5.54	906	4.16	364	5.54	698	5.54	942
372-420	CV420	4.16	342	5.54	654	5.54	921	4.16	369	5.54	708	5.54	957

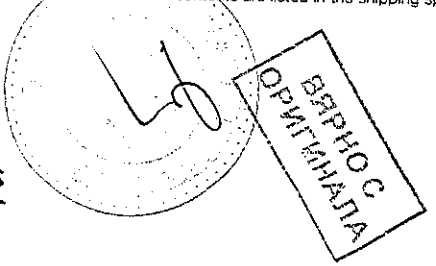
Neutral-ground arresters

Rated voltage	Housing	Without insulating base						With insulating base					
		Number of arresters per crate						Number of arresters per crate					
		One		Two		Three		One		Two		Three	
U_r		Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg
72-120	CN123	2.96	157	2.96	259	2.96	351	2.96	194	2.96	313	2.96	432
84-120	CN145	2.96	157	2.96	259	2.96	351	2.96	194	2.96	313	2.96	432
96-132	CN170	2.96	158	2.96	261	2.96	354	2.96	195	2.96	315	2.96	435
108-144	CN245	2.96	159	2.96	263	2.96	357	2.96	196	2.96	317	2.96	438

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.



Zinc-Oxide Surge Arrester TEXLIM P-C

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).
- Specially suited to extreme seismic zones.

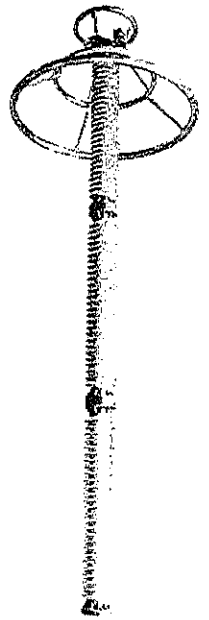
Superior where low weight, non-fragility and additional personnel safety is required.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (Us)	245 - 550 kV
Rated voltages (U_r)	180 - 444 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10/15 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	3.2 C
Thermal energy rating, W_{th} (IEC)	11 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	7 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1 600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	G
Single-impulse withstand rating as per IEEE standard	3.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	4.0 C
Short-circuit/Pressure relief capability	80 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	21 000 Nm
Specified short-term load (SSL)	40 000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 4

Further data according to the IEEE standard can be supplied on request



TEXLIM P-C
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
						30/60 µs			8/20 µs			
		as per IEC	as per ANSI/IEEE									
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
245	180	144	144	196	186	350	362	372	390	410	449	492
	192	154	154	209	199	373	386	397	415	437	479	525
	198	156	160	216	205	385	398	410	428	451	494	541
	210	168	170	229	217	408	422	434	454	478	524	574
	216	156	174	236	223	420	434	447	467	492	539	590
	219	156	177	239	227	425	440	453	474	499	546	598
	222	156	179	242	230	431	446	459	480	506	554	607
	228	156	180	249	236	443	459	471	493	519	568	623
300	216	173	174	236	223	420	434	447	467	492	539	590
	228	182	182	249	236	443	459	471	493	519	568	623
	240	191	191	262	248	466	483	496	519	546	598	656
	258	191	209	281	267	501	519	533	558	587	643	705
	264	191	212	288	273	513	531	546	571	601	658	721
	276	191	221	301	286	536	555	571	597	628	688	754
362	258	206	209	281	267	501	519	533	558	587	643	705
	264	211	212	288	273	513	531	546	571	601	658	721
	276	221	221	301	286	536	555	571	597	628	688	754
	288	230	230	314	298	559	579	595	623	656	718	787
420	330	264	267	360	342	641	663	682	714	751	823	901
	336	267	272	367	348	653	675	695	727	765	838	918
	342	267	277	373	354	664	688	707	740	779	852	934
	360	267	291	393	373	699	724	744	779	819	897	983
	372	267	301	406	385	722	748	769	804	847	927	1021
	378	267	306	413	391	734	760	781	817	860	942	1037
	381	267	308	416	395	740	766	788	824	867	950	1045
	390	267	315	426	404	757	784	806	843	888	972	1070
	396	267	318	432	410	769	796	819	856	901	987	1086
	420	267	336	459	435	816	844	868	908	956	1051	1152
550	396	317	318	432	410	769	796	819	856	901	987	1086
	420	336	336	459	435	816	844	868	908	956	1051	1152
	444	349	353	485	460	862	892	918	960	1015	1111	1217

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_s higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 8 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications

TEXLIM P-C
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [1]				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (60s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
245	180-228	CV245	7700	980	430	430	690	145	2282	600	-	-	2
300	216-240	CH300	7700	980	430	430	690	148	2282	900	-	-	2
	258	CH300	7700	980	430	430	690	150	2282	800			2
	216-240	CV300	9600	1240	540	540	880	202	3109	1200	1000	600	3
	258-276	CV300	9600	1240	540	540	880	203	3109	900	800	400	3
362	258-264	CH362	9600	1240	540	540	880	207	3109	1400	1000	700	3
	276-288	CH362	9600	1240	540	540	880	209	3109	1200	1000	600	3
	258-264	CV362	12500	1600	700	700	1130	236	3829	1400	1000	700	3
	276-288	CV362	12500	1600	700	700	1130	239	3829	1200	1000	800	3
420	330-360	CH420	12500	1600	700	700	1130	248	3829	1200	1000	600	3
	372-420	CH420	12500	1600	700	700	1130	254	3829	900	800	400	3
	330-360	CV420	15400	1960	860	860	1380	278	4549	1200	1000	800	3
	372-420	CV420	15400	1960	860	860	1380	287	4549	1200	1000	600	3
550	396-420	CM550	12500	1600	700	700	1130	267	4162	1800	1000	800	4
	396-444	CH550	15400	1960	860	860	1380	302	4882	2000	1000	1000	4
	396-444	CV550	17300	2220	970	970	1570	348	5709	2000	1000	1000	5
Neutral - ground arresters													
245	108-144	CN245	4800	620	270	270	440	102	1562	-	-	-	1

[1] Sum of withstand voltages for empty units of arrester.

TEXLIM P-C
Technical data for housings

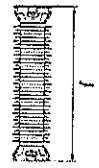


Figure 1

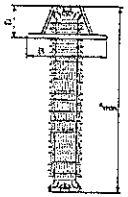


Figure 2

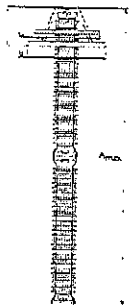


Figure 3

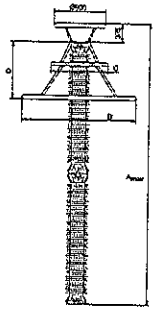


Figure 4

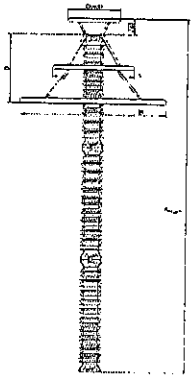
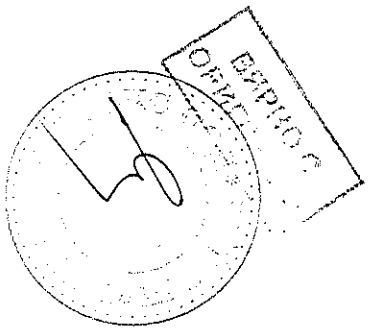
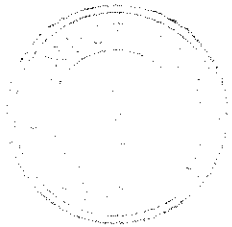


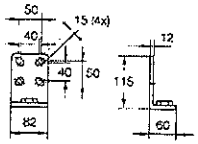
Figure 5



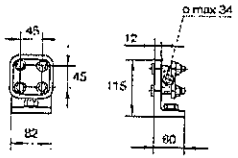
TEXLIM P-C
Accessories



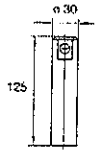
Line terminals



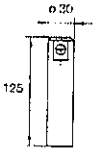
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

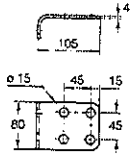


1HSA410 000-C
Aluminium

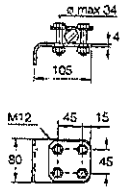


1HSA410 000-D
Stainless steel

Earth terminals

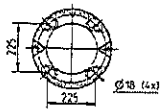


1HSA420 000-C
Stainless steel

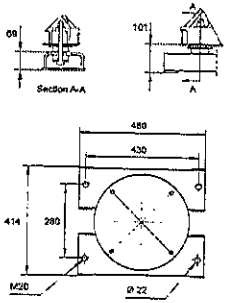


1HSA420 000-D
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430000-V

M20 bolts for connection to structure are not supplied by ABB.

TEXLIM P-C
Shipping data

Rated voltage	Housing	Without insulating base						With insulating base					
		Number of arresters per crate						Number of arresters per crate					
		One		Two		Three		One		Two		Three	
U_r		Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg
180-228	CV245	4.16	220	4.16	365	4.16	510	4.16	247	4.16	419	4.16	591
216-240	CH300	4.16	223	4.16	371	4.16	519	4.16	250	4.16	425	4.16	600
228	CH300	4.16	225	4.16	375	4.16	525	4.16	252	4.16	429	4.16	606
216-240	CV300	2.96	277	5.54	524	5.54	726	2.96	304	5.54	578	5.54	807
258-276	CV300	2.96	278	5.54	526	5.54	729	2.96	305	5.54	580	5.54	810
258-264	CH362	3.74	357	5.54	534	5.54	741	3.74	384	5.54	588	5.54	822
276-288	CH362	2.96	284	5.54	538	5.54	747	2.96	311	5.54	592	5.54	828
258-264	CV362	5.76	386	5.54	592	5.54	828	5.76	413	5.54	646	5.54	909
276-288	CV362	4.16	314	5.54	598	5.54	837	4.16	341	5.54	652	5.54	918
330-360	CH420	4.16	324	5.54	618	5.54	867	4.16	351	5.54	672	5.54	948
372-420	CH420	4.16	329	5.54	628	5.54	882	4.16	356	5.54	682	5.54	963
330-360	CV420	4.16	353	5.54	676	5.54	954	4.16	380	5.54	730	5.54	1035
372-420	CV420	4.16	362	5.54	694	5.54	981	4.16	389	5.54	748	5.54	1062
396-420	CM550	5.76	467	7.14	779	7.14	1046	5.76	494	7.14	833	7.14	1127
396-444	CH550	6.13	527	7.51	874	7.51	1176	6.13	554	7.51	928	7.51	1257
396-444	CV550	6.13	573	7.51	966	7.51	1299	6.13	600	7.51	1020	7.51	1470
Neutral-ground arresters													
108-144	CN245	2.96	177	2.96	279	2.96	381	2.96	204	2.96	333	2.96	462

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc-Oxide Surge Arrester TEXLIM T-C

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).
- Specially suited to extreme seismic zones.

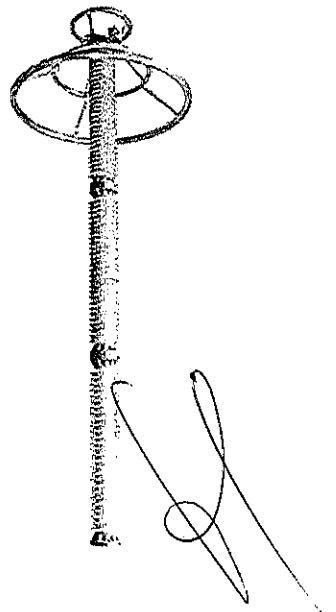
Superior where low weight, non-fragility and additional personnel safety is required.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	245 - 800 kV
Rated voltages (U_r)	180 - 624 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10/15/20kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	5.2 C
Thermal energy rating, W_{th} (IEC)	15 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	11 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	150 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	2 600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	J
Single-impulse withstand rating as per IEEE standard	5.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	6.2 C
Short-circuit/Pressure relief capability	80 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	21000 Nm
Specified short-term load (SSL)	40000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 5

Further data according to the IEEE standard can be supplied on request



TEXLIM T-C
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	Ur	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
245	180	144	144	199	189	346	356	363	381	396	428	466
	192	154	154	212	201	369	380	387	406	423	457	497
	198	156	160	218	208	381	392	399	419	436	471	512
	210	156	170	232	220	404	415	423	444	462	499	543
	216	156	174	238	227	415	427	435	457	476	514	559
	219	156	177	242	230	421	433	441	463	482	521	567
	222	156	179	245	233	427	438	447	469	489	528	574
	228	156	180	252	239	438	451	459	482	502	542	590
300	216	173	174	238	227	415	427	435	457	476	514	559
	228	182	182	252	239	438	451	459	482	502	542	590
	240	191	191	265	252	461	475	484	507	528	571	621
	258	191	209	285	271	496	510	520	545	568	614	667
	264	191	212	291	277	508	522	532	558	581	628	683
	276	191	220	305	290	531	546	556	583	608	656	714
362	258	205	209	285	271	496	510	520	545	568	614	667
	264	211	212	291	277	508	522	532	558	581	628	683
	276	221	221	305	290	531	546	556	583	608	656	714
	288	230	230	318	302	554	569	580	609	634	685	745
420	330	264	267	364	347	634	652	665	697	726	785	854
	336	267	272	371	353	646	664	677	710	740	799	869
	342	267	277	378	359	657	676	689	723	753	813	885
	360	267	291	398	378	692	712	725	761	792	856	931
	372	267	301	411	391	715	735	749	786	819	884	962
	378	267	306	418	397	726	747	761	799	832	899	978
	381	267	308	421	400	732	753	767	805	839	906	985
	390	267	315	431	410	750	771	786	824	858	927	1013
	396	267	318	437	416	761	783	798	837	872	941	1029
	420	267	336	464	441	807	830	846	888	924	998	1091
550	396	317	318	437	416	761	783	798	837	872	941	1029
	420	336	336	464	441	807	830	846	888	924	998	1091
	444	349	353	491	467	853	878	894	938	977	1060	1153
800	588	470	470	650	618	1134	1167	1189	1247	1299	1402	1525
	612	490	490	676	643	1180	1214	1237	1298	1351	1459	1587
	624	499	499	690	656	1203	1238	1261	1323	1378	1488	1618

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_r higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 1.1 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications.

TEXLIM T-C
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [1]				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
U_s	U_r												
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
245	180-228	CV245	7700	980	430	430	690	180	2282	600	-	300	2
300	216-240	CH300	7700	980	430	430	690	185	2282	900	-	400	2
	216-228	CV300	9600	1240	540	540	880	240	3109	1200	1000	600	3
	240-276	CV300	9600	1240	540	540	880	251	3109	900	800	400	3
362	258-264	CH362	9600	1240	540	540	880	256	3109	1400	1000	700	3
	276-288	CH362	9600	1240	540	540	880	257	3109	1200	1000	600	3
	258-264	CV362	12500	1600	700	700	1130	295	3829	1400	1000	700	3
	276-288	CV362	12500	1600	700	700	1130	298	3829	1200	1000	600	3
420	330-360	CH420	12500	1600	700	700	1130	309	3829	1200	1000	600	3
	372-420	CH420	12500	1600	700	700	1130	314	3829	900	800	400	3
	330-360	CV420	15400	1960	860	860	1380	338	4549	1200	1000	600	3
	372-381	CV420	15400	1960	860	860	1380	343	4549	1200	1000	600	3
	390-420	CV420	15400	1960	860	860	1380	350	4549	900	800	400	3
550	396-420	CM550	12500	1600	700	700	1130	329	4152	1800	1000	800	4
	396	CH550	15400	1960	860	860	1380	366	4882	2000	1000	1000	4
	420-444	CH550	15400	1960	860	860	1380	371	4882	1800	1000	800	4
	396-444	CV550	17300	2220	970	970	1570	432	5709	2000	1000	1000	5
800	588	CH800	23100	2940	1290	1290	2070	555	7149	2500	1400	1000	5
	612	CH800	23100	2940	1290	1290	2070	555	7149	2500	1200	1000	5
	624	CH800	23100	2940	1290	1290	2070	555	7149	2500	1000	1000	5
Neutral-ground arresters													
245	108-144	CN245	4800	620	270	270	440	102	1562	-	-	-	1

[1] Sum of withstand voltages for empty units of arrester.

TEXLIM T-C
Technical data for housings

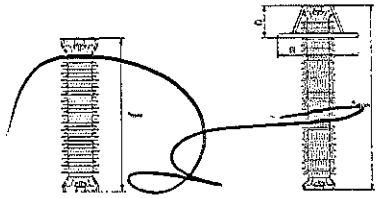


Figure 1

Figure 2

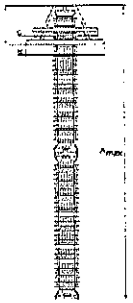


Figure 3

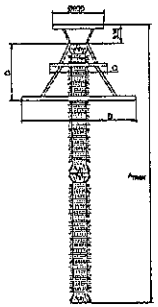


Figure 4

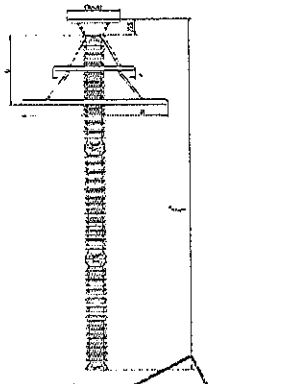
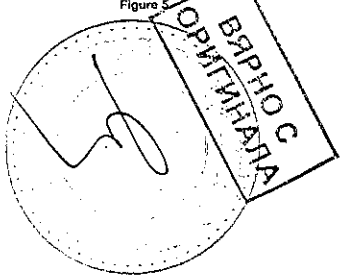
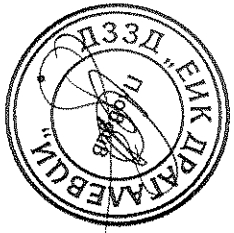


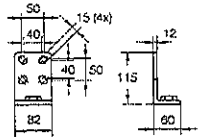
Figure 5



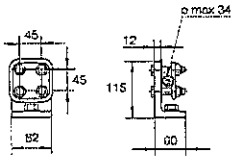


TEXLIM T-C
Accessories

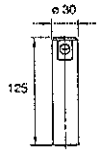
Line terminals



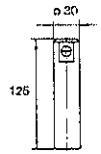
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

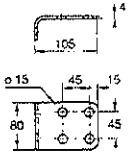


1HSA410 000-C
Aluminium

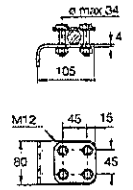


1HSA410 000-D
Stainless steel

Earth terminals

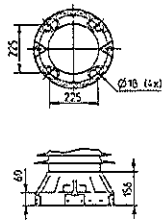


1HSA420 000-C
Stainless steel

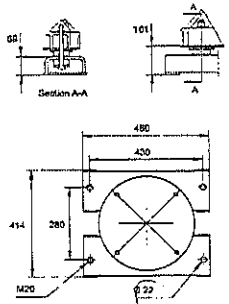


1HSA420 000-D
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430000-V

M20 bolts for connection to structure are not supplied by ABB.

TEXLIM T-C
Shipping data

Rated voltage	Housing	Without insulating base						With insulating base					
		Number of arresters per crate						Number of arresters per crate					
		One		Two		Three		One		Two		Three	
U_r		Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg	m^3	kg
180-228	CV245	4.16	255	4.16	435	4.16	615	4.16	282	4.16	488	4.16	696
216-240	CH300	4.16	260	4.16	445	4.16	630	4.16	287	4.16	499	4.16	711
216-228	CV300	2.96	315	5.54	600	5.54	840	2.96	342	5.54	654	5.54	921
240-276	CV300	2.96	326	5.54	622	5.54	873	2.96	353	5.54	676	5.54	954
258-264	CH362	3.74	406	5.54	632	5.54	888	3.74	433	5.54	686	5.54	969
276-288	CH362	2.96	332	5.54	634	5.54	891	2.96	359	5.54	688	5.54	972
258-264	CV362	5.76	445	5.54	710	5.54	1005	5.76	472	5.54	764	5.54	1085
276-288	CV362	4.16	373	5.54	716	5.54	1014	4.16	400	5.54	770	5.54	1095
330-360	CH420	4.16	384	5.54	738	5.54	1047	4.16	411	5.54	792	5.54	1128
372-420	CH420	4.16	389	5.54	748	5.54	1062	4.16	416	5.54	802	5.54	1143
330-360	CV420	4.16	413	5.54	796	5.54	1134	4.16	440	5.54	850	5.54	1215
372-381	CV420	4.16	418	5.54	806	5.54	1149	4.16	445	5.54	860	5.54	1230
390-420	CV420	4.16	425	5.54	820	5.54	1170	4.16	452	5.54	874	5.54	1251
396-420	CM550	5.76	529	5.76	903	7.14	1232	5.76	556	5.76	957	7.14	1313
396	CH550	6.13	591	6.13	1002	7.51	1368	6.13	618	6.13	1056	7.51	1449
420-444	CH550	5.76	571	5.76	987	7.51	1358	5.76	598	5.76	1041	7.51	1439
396-444	CV550	6.13	657	6.13	1134	11.67	1641	6.13	684	6.13	1188	11.67	1722
588	CH800	9.0	1005	9.0	1605	14.55	2205	9.0	1032	9.0	1659	14.55	2286
612	CH800	9.0	1005	9.0	1605	14.55	2223	9.0	1032	9.0	1659	14.55	2304
624	CH800	9.0	1005	9.0	1605	14.55	2232	9.0	1032	9.0	1659	14.55	2313
Neutral-ground arresters													
108-144	CN245	2.96	200	2.96	325	2.96	450	2.96	227	2.96	379	2.96	531

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester EXLIM R

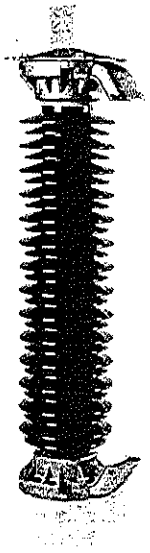
Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages. For use when requirements of lightning intensity, energy capability and pollution are moderate.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SL
Arrestor classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 170 kV
Rated voltages (U_r)	42 - 168 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	1.2 C
Thermal energy rating, W_{th} (IEC)	5 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	2.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	-
Single-impulse withstand rating as per IEEE standard	1.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	1.5 C
Short-circuit/Pressure relief capability	50 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	3000 Nm
Specified short-term load (SSL)	7500 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 2

Further data according to the IEEE standard can be supplied on request



EXLIM R
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
						30/60 µs			8/20 µs			
		as per IEC	as per ANSI/IEEE									
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
36[3]	24	19.2	19.5	26.3	24.7	49.4	51.3	53.8	58.7	62.2	69.7	79.6
	30	24.0	24.4	32.9	30.9	61.7	64.2	67.2	73.3	77.7	87.1	99.5
	33	26.4	26.7	36.2	34.0	67.9	70.6	73.9	80.6	85.5	95.8	110
	36	28.8	29.0	39.5	37.1	74.1	77.0	80.6	88.0	93.3	105	120
	39	31.2	31.5	42.8	40.2	80.3	83.4	87.3	95.3	102	114	130
52	42	34	34.0	46.1	43.3	86.4	89.8	94.0	103	109	122	140
	45	36	36.5	49.4	46.4	92.6	96.2	101	110	117	131	150
	48	38	39.0	52.7	49.5	98.8	103	108	118	125	140	160
	51	41	41.3	56.0	52.6	105	109	115	125	133	148	170
	54	43	43.6	59.3	55.7	112	116	121	132	140	157	180
	60	48	48.0	65.9	61.9	124	129	135	147	156	175	199
72	54	43	43,0	59.3	55.7	112	116	121	132	140	157	180
	60	48	48,0	65.9	61.9	124	129	135	147	156	175	199
	66	53	53,4	72.5	68.1	135	142	148	162	171	192	219
	72	58	58,0	79.1	74.3	149	154	162	176	187	209	239
	75	60	60,7	82.4	77.4	155	161	168	184	195	218	249
	84	67	68,0	92.3	86.7	173	180	188	206	218	244	279
100	75	60	60,7	82.4	77.4	155	161	168	184	195	218	249
	84	67	68,0	92.3	86.7	173	180	188	206	218	244	279
	90	72	72,0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77,0	105	99.1	198	206	215	235	249	279	319
123	90	72	72,0	98.9	92.9	186	193	202	220	234	262	299
	96	77	77,0	105	99.1	198	206	215	235	249	279	319
	108	78	84,0	118	111	223	231	242	264	280	314	359
	120	78	98,0	131	123	247	257	269	294	311	349	398
	132	78	106	145	136	272	283	296	323	342	383	438
	138	78	111	151	142	284	295	309	338	358	401	458
145	108	86	86,0	118	111	223	231	242	264	280	314	359
	120	92	98,0	131	123	247	257	269	294	311	349	398
	132	92	106	145	136	272	283	296	323	342	383	438
	138	92	111	151	142	284	295	309	338	358	401	458
	144	92	115	158	148	297	308	323	352	373	418	478
170	108	106	145	136	272	283	296	323	342	383	438	438
	108	115	158	148	297	308	323	352	373	418	478	478
	108	131	178	167	334	347	363	396	420	470	538	538
	108	131	184	173	346	359	375	411	436	488	557	557

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with Uc higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 5 kJ/kV (U_r).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arrestors with lower or higher rated voltages may be available on request for special applications

EXLIM R
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [4]			Dimensions				
				1.2/50 µs dry	50 Hz wet (60s)	250/2500 µs wet	Mass	A_{max}	B	C	Fig.
U_s	U_r										
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	
52	42-60	CV052	1615	275	129	212	45	725	-	-	1
72	54-75	CM072	1615	275	129	212	46	725	-	-	1
	54-84	CV072	2651	394	221	320	62	997	-	-	1
100	75-96	CH100	2651	394	221	320	63	997	-	-	1
	84-96	CV100	3685	537	287	433	78	1268	-	-	1
123	90-108	CM123	2651	394	221	320	64	997	-	-	1
	90-138	CH123	3685	537	287	433	81	1268	-	-	1
	90-96	CV123	4266	669	350	532	103	1697	600	300	3
	108-138	CV123	4266	669	350	532	103	1697	-	-	2
145	108-144	CH145	3685	537	287	433	82	1269	-	-	1
	108-144	CV145	5302	788	442	640	119	1969	600	300	3
170	132-144	CM170	3685	537	287	433	82	1269	-	-	1
	132-144	CH170	4266	669	350	532	105	1697	600	300	3
	162-168	CH170	4266	669	350	532	105	1697	-	-	2
	132-168	CV170	5302	788	442	640	120	1969	600	300	3
Neutral-ground arresters											
52	30-36	CN052	1615	275	129	212	43	725	-	-	1
72	42-54	CN072	1615	275	129	212	45	725	-	-	1
100	60	CN100	1615	275	129	212	45	725	-	-	1
123	72	CN123	1615	275	129	212	62	725	-	-	1
	84-108	CN123	2651	394	221	320	64	997	-	-	1
	120	CN123	3685	537	287	433	79	1268	-	-	1
145	84	CN145	2651	394	221	320	62	997	-	-	1
	90-108	CN145	2651	394	221	320	64	997	-	-	1
	120	CN145	3685	537	287	433	79	1268	-	-	1
170	96-108	CN170	2651	394	221	320	64	997	-	-	1
	120	CN170	3685	537	287	433	79	1268	-	-	1

4) Sum of withstand voltages for empty units of arrester.

EXLIM R
Technical data for housings

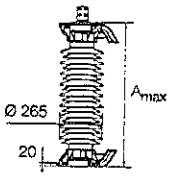


Figure 1

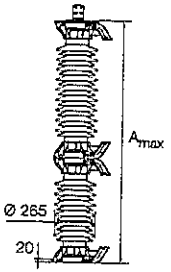


Figure 2

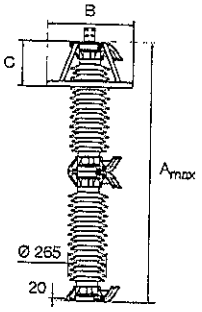
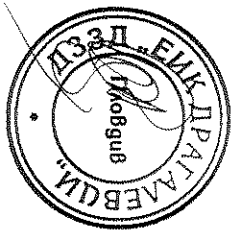
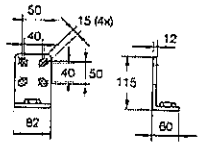


Figure 3

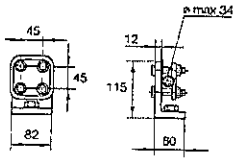


EXLIM R
Accessories

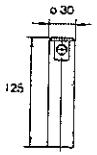
Line terminals



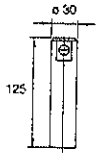
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

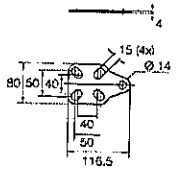


1HSA410 000-C
Aluminium

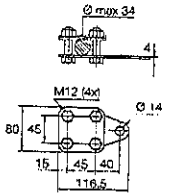


1HSA410 000-D
Stainless steel

Earth terminals

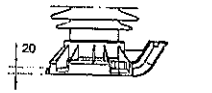


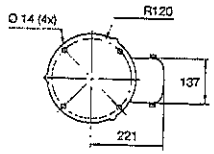
1HSA420 000-A
Stainless steel



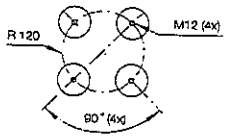
1HSA420 000-B
Stainless steel

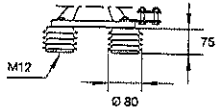
Drilling plans





Without insulating base
Aluminium





Insulating base
1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

EXLIM R
Shipping data

Rated voltage	Housing	Number of arrestors per crate					
		One		Three		Six	
U_r		Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg
24-39	CV036	0.3	74	0.5	171	1.0	337
42-60	CV052	0.3	76	0.5	177	1.0	349
54-75	CM072	0.3	77	0.5	180	1.0	355
54-84	CV072	0.3	93	0.7	228	1.4	451
75-96	CH100	0.3	94	0.7	231	1.4	457
84-96	CV100	0.4	115	0.8	276	1.7	547
90-108	CM123	0.3	92	0.7	234	1.4	463
90-138	CH123	0.4	116	0.8	279	1.7	553
90-138	CV123	0.7	131	1.4	367	-	-
108-144	CH145	0.4	119	0.9	288	1.7	571
108-144	CV145	0.7	147	1.4	415	-	-
132-144	CM170	0.4	119	0.9	288	1.7	571
132-168	CH170	0.7	133	1.4	373	-	-
132-168	CV170	0.7	148	1.4	418	-	-
Neutral-ground arrestors							
30-36	CN052	0.3	75	0.5	175	1.0	340
42-54	CN072	0.3	80	0.5	180	1.0	350
60	CN100	0.3	80	0.5	180	1.0	350
72	CN123	0.3	80	0.5	180	1.0	355
84-108	CN123	0.3	95	0.7	235	1.4	465
120	CN123	0.4	115	0.8	280	1.7	555
84	CN145	0.3	95	0.7	230	1.4	455
90-108	CN145	0.3	95	0.7	235	1.4	465
120	CN145	0.4	115	0.8	280	1.7	555
96-108	CN170	0.3	95	0.7	235	1.4	465
120	CN170	0.4	115	0.8	280	1.7	555

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester EXLIM Q-E

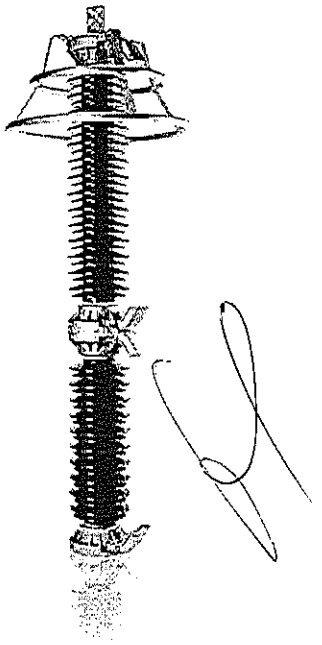
Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with high lightning intensity and high energy requirements.
- where grounding or shielding conditions are poor or incomplete.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrestor classification as per IEC 60099-4 Ed 3.0	Station; SM
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 245 kV
Rated voltages (U_r)	43 - 228 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	2.0 C
Thermal energy rating, W_{th} (IEC)	8 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	4.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1000 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	E
Single-impulse withstand rating as per IEEE standard	2.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	2.7 C
Short-circuit/Pressure relief capability	65 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	3000 Nm
Specified short-term load (SSL)	7500 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 3

Further data according to the IEEE standard can be supplied on request



EXLIM Q-E
Guaranteed protective data 36 - 145 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
36[3]	24	19.2	19.5	26.2	24.7	48.1	47.6	49.5	53.6	56.4	62.1	69.4
	30	24.0	24.4	32.8	30.9	57.6	59.5	61.8	67.0	70.5	77.6	86.8
	33	26.4	26.7	36.1	34.0	63.4	65.4	68.0	73.7	77.6	85.4	95.4
	36	28.8	29.0	39.4	37.1	69.2	71.4	74.2	80.4	84.6	93.1	105
	39	31.2	31.5	42.7	40.2	74.9	77.3	80.3	87.1	91.7	101	113
52	42	34	34.0	45.9	43.3	80.7	83.3	86.5	93.8	98.7	109	122
	48	38	39.0	52.5	49.4	92.2	95.1	98.9	108	113	125	139
	51	41	41.3	55.8	52.5	98.0	102	105	114	120	132	148
	54	43	43.0	59.1	55.6	104	107	112	121	127	140	157
	60	48	48.0	65.7	61.8	116	119	124	134	141	156	174
72	54	43	43.0	59.1	55.6	104	107	112	121	127	140	157
	60	48	48.0	65.7	61.8	116	119	124	134	141	156	174
	66	53	53.4	72.2	68.0	127	131	136	148	156	171	191
	72	58	58.0	78.8	74.2	139	143	149	161	170	187	209
	75	60	60.7	82.1	77.3	144	149	155	168	177	194	217
	78	62	63.1	85.4	80.4	150	155	161	175	184	202	226
	81	65	65.6	88.6	83.5	156	161	167	181	191	210	235
	84	67	68.0	91.9	86.6	162	167	173	188	198	218	243
100	84	67	68.0	91.9	86.6	162	167	173	188	198	218	243
	90	72	72.0	98.5	92.7	173	179	186	201	212	233	261
	96	77	77.0	105	98.9	185	191	198	215	226	249	278
123	90	72	72.0	98.5	92.7	173	179	186	201	212	233	261
	96	77	77.0	105	98.9	185	191	198	215	226	249	278
	108	78	84.0	118	111	208	214	223	242	254	280	313
	120	78	98.0	131	123	231	238	248	268	282	311	347
	132	78	106	144	136	254	262	272	295	311	342	382
	138	78	111	151	142	265	274	285	309	325	357	399
145	108	86	86.0	118	111	208	214	223	242	254	280	313
	120	92	98.0	131	123	231	238	248	268	282	311	347
	132	92	106	144	136	254	262	272	295	311	342	382
	138	92	111	151	142	265	274	285	309	325	357	399
	144	92	115	157	148	277	286	297	322	339	373	417

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_r higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 8 kJ/kV (U_r).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

EXLIM Q-E
Guaranteed protective data 170 - 245 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
170	132	106	106	144	136	254	262	272	295	311	342	382
	144	108	115	157	148	277	286	297	322	339	373	417
	162	108	131	177	167	312	321	334	362	381	419	469
	168	108	131	183	173	323	333	346	376	395	435	486
245	180	144	144	197	185	346	357	371	402	423	466	521
	192	154	154	210	197	369	381	396	429	452	497	555
	198	156	160	216	204	381	393	408	443	466	512	573
	210	156	170	229	216	404	417	433	469	494	543	608
	216	156	175	236	222	415	428	445	483	508	559	625
	219	156	177	239	225	421	434	451	489	515	567	634
	222	156	179	243	228	427	440	458	496	522	574	642
	228	156	180	249	235	438	452	470	510	536	590	660

1) The continuous operating voltages Uc (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_r higher than or equal to the actual system voltage divided by √3 can be selected.

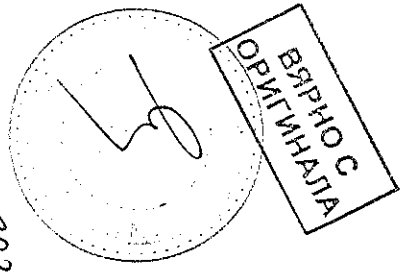
2) With prior duty equal to the thermal energy rating of 8 kJ/kV (U_r).

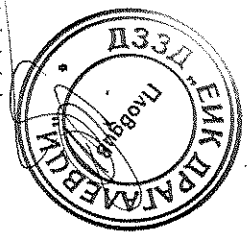
Arresters with lower or higher rated voltages may be available on request for special applications.

EXLIM Q-E
Technical data for housings

Max. system voltage U_m kV$_{rms}$	Rated voltage U_r kV$_{rms}$	Housing	Creepage distance mm	External insulation *) 1.2/50 µs dry kV$_{peak}$	50 Hz wet (60s) kV$_{rms}$	60 Hz wet (10s) kV$_{rms}$	250/2500 µs wet kV$_{peak}$	Dimensions Mass kg	A_{max} mm	B mm	C mm	D mm	Fig.
36	24-39	EV036	1615	275	129	133	n.a.	45	725	-	-	-	1
52	42-60	EV052	1615	275	129	133	n.a.	48	725	-	-	-	1
72	54-84	EV072	2651	394	221	203	n.a.	66	997	-	-	-	1
100	84-96	EH100	2651	394	221	203	n.a.	67	997	-	-	-	1
	84-96	EV100	3685	537	287	261	n.a.	82	1268	-	-	-	1
123	90-108	EM123	2651	394	221	203	n.a.	69	997	-	-	-	1
	90-138	EH123	3685	537	287	261	n.a.	88	1268	-	-	-	1
	90-96	EV123	4256	669	350	336	n.a.	106	1697	600	-	300	3
	108-138	EV123	4256	669	350	336	n.a.	110	1697	-	-	-	2
145	108-144	EM145	3685	537	287	261	n.a.	88	1268	-	-	-	1
	108-120	EV145	5302	788	442	406	n.a.	124	1969	600	-	300	3
	132-144	EV145	5302	788	442	406	n.a.	125	1969	-	-	-	2
170	132-144	EM170	3685	568	287	261	n.a.	88	1268	-	-	-	1
	132	EH170	4256	669	350	336	n.a.	111	1697	600	-	300	3
	144-168	EH170	4256	669	350	336	n.a.	113	1697	-	-	-	2
	132-144	EV170	5302	788	442	406	n.a.	127	1969	600	-	300	3
	150-168	EV170	5302	788	442	406	n.a.	128	1969	-	-	-	2
245	180-198	EH245	6336	931	508	464	753	151	2240	800	-	500	3
	210-228	EH245	6336	931	508	464	753	153	2240	600	-	300	3
	180-228	EV245	7953	1182	663	609	960	201	2941	1000	1400	700	4
Neutral-ground arresters													
52	30-36	EN052	1615	275	129	133	n.a.	45	725	-	-	-	1
72	42-54	EN072	1615	275	129	133	n.a.	48	725	-	-	-	1
100	60	EN100	1615	275	129	133	n.a.	48	725	-	-	-	1
123	72-108	EN123	2651	394	221	203	n.a.	69	997	-	-	-	1
	120	EN123	3685	537	287	261	n.a.	88	1268	-	-	-	1
145	84-108	EN145	2651	394	221	203	n.a.	69	997	-	-	-	1
	120	EN145	3685	537	287	261	n.a.	88	1268	-	-	-	1
170	96-108	EN170	2651	394	221	203	n.a.	69	997	-	-	-	1
	120	EN170	3685	537	287	261	n.a.	88	1268	-	-	-	1
245	108	EN245	2651	394	221	203	n.a.	69	997	-	-	-	1
	120-144	EN245	3685	537	287	261	n.a.	88	1268	-	-	-	1

*) Sum of withstand voltages for empty units of arrester.





EXLIM Q-E
Technical data for housings

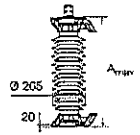


Figure 1

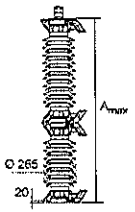


Figure 2

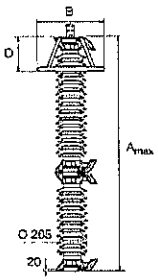


Figure 3

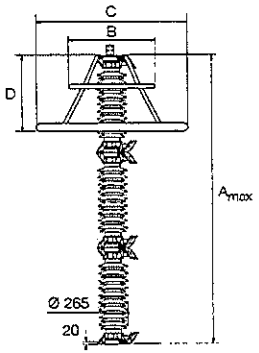
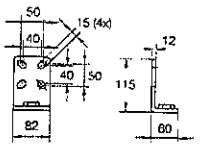


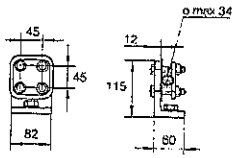
Figure 4

EXLIM Q-E
Accessories

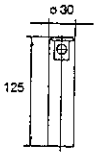
Line terminals



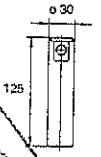
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other
items in stainless steel

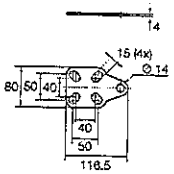


1HSA410 000-C
Aluminium

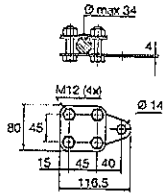


1HSA410 000-D
Stainless steel

Earth terminals

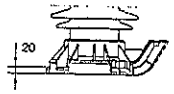


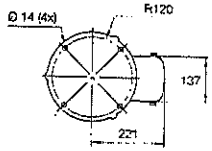
1HSA420 000-A
Stainless steel



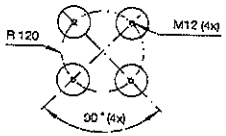
1HSA420 000-B
Stainless steel

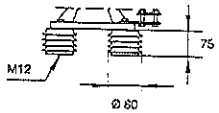
Drilling plans





Without insulating base
Aluminium





Insulating base
1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

EXLIM Q-E
Shipping data

Rated voltage U_r	Housing	Number of arresters per crate: One Volume	One Gross	Three Volume	Three Gross	Six Volume	Six Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg
24-39	EV036	0.3	76	0.5	177	1.0	349
42-60	EV052	0.3	79	0.5	186	1.0	367
54-84	EV072	0.3	97	0.7	240	1.4	475
84-96	EH100	0.3	98	0.7	243	1.4	481
84-96	EV100	0.4	119	0.8	288	1.7	571
90-108	EM123	0.3	100	0.7	249	1.4	493
90-138	EH123	0.4	125	0.8	306	1.7	607
90-138	EV123	0.7	138	1.4	389	-	-
108-144	EH145	0.4	125	0.9	306	1.7	607
108-144	EV145	0.7	152	1.4	431	-	-
132-144	EM170	0.4	125	0.9	306	1.7	607
132-168	EH170	0.7	141	1.4	398	-	-
132-168	EV170	0.7	156	1.4	662	-	-
180-228	EH245	0.8	181	1.7	518	-	-
180-228	EV245	1.7	320	3.1	743	-	-
Neutral-ground arresters							
30-36	EN052	0.3	80	0.5	180	1.0	350
42-54	EN072	0.3	80	0.5	190	1.0	370
60	EN100	0.3	80	0.5	190	1.0	370
72-108	EN123	0.3	100	0.7	250	1.4	495
120	EN123	0.4	125	0.8	310	1.7	610
84-108	EN145	0.3	100	0.7	250	1.4	495
120	EN145	0.4	125	0.8	310	1.7	610
96-108	EN170	0.3	100	0.7	250	1.4	495
120	EN170	0.4	125	0.8	310	1.7	610
108	EN245	0.3	100	0.7	250	1.4	495
120-144	EN245	0.4	125	0.8	310	1.7	610

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester EXLIM Q-D

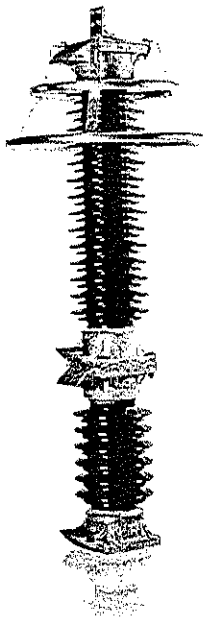
Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with high lightning intensity and high energy requirements.
- where grounding or shielding conditions are poor or incomplete.

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station: SM
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	170 - 420 kV
Rated voltages (U_r)	132 - 420 kV
Nominal discharge current (IEC)	10 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	2.0 C
Thermal energy rating, W_{th} (IEC)	8 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	4.5 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1000 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	E
Single-impulse withstand rating as per IEEE standard	2.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	2.7 C
Short-circuit/Pressure relief capability	65 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	8000 Nm
Specified short-term load (SSL)	20000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 3

Further data according to the IEEE standard can be supplied on request



EXLIM Q-D

Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
170	132	106	106	144	136	254	262	272	295	311	342	382
	144	108	115	157	148	277	286	297	322	339	373	417
	162	108	131	177	167	312	321	334	362	381	419	469
	168	108	131	183	173	323	333	346	376	395	435	486
245	180	144	144	197	185	346	357	371	402	423	466	521
	192	154	154	210	197	369	381	396	429	452	497	555
	198	156	160	216	204	381	393	408	443	466	512	573
	210	156	170	229	216	404	417	433	469	494	543	608
	216	156	175	236	222	415	428	445	483	508	559	625
	219	156	177	239	225	421	434	451	489	515	567	634
	228	156	180	249	235	438	452	470	510	536	590	660
300	216	173	175	236	222	415	428	445	483	508	559	625
	228	182	182	249	235	438	452	470	510	536	590	660
	240	191	191	262	247	461	476	495	536	564	621	694
	258	191	209	282	265	496	512	532	576	607	667	745
	264	191	212	289	272	507	523	544	590	621	683	764
362	258	206	209	282	265	496	512	532	576	607	667	746
	264	211	212	289	272	507	523	544	590	621	683	764
	276	211	221	302	284	530	547	569	617	649	714	798
	288	230	230	315	296	553	571	593	643	677	745	833
420	330	264	267	361	340	634	654	680	737	776	854	954
	336	267	272	367	346	646	666	692	751	790	869	972
	360	267	291	394	371	692	714	742	804	846	931	1046
	372	267	301	407	383	715	737	766	831	875	962	1080
	378	267	306	413	389	726	749	778	844	889	978	1098
	381	267	308	417	392	732	755	785	851	896	985	1106
	390	267	315	427	402	749	773	803	871	917	1013	1138
	396	267	318	433	408	761	785	816	885	931	1029	1156
	420	267	335	459	433	807	833	865	938	987	1091	1211

[1] The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

[2] With prior duty equal to the thermal energy rating of 8 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications.

EXLIM Q-D
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation *)				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
170	132	DH170	4432	765	378	359	n.a.	155	1645	600	-	300	2
	144-168	DH170	4432	765	378	359	n.a.	155	1645	-	-	-	1
	132-144	DV170	6570	1160	556	546	924	230	2585	800	-	500	3
	162-168	DV170	6570	1160	556	546	924	230	2585	600	-	300	3
245	180-219	DH245	6570	1160	556	546	924	230	2585	600	-	300	3
	228	DH245	6570	1160	556	546	924	230	2585	800	-	500	3
	180	DV245	7717	1345	656	632	1078	235	2585	600	-	300	3
	192-198	DV245	7717	1345	656	632	1078	270	2915	1400	1000	700	4
	210-228	DV245	7717	1345	656	632	1078	270	2915	1200	1000	600	4
300	228-264	DM300	6570	1160	556	546	924	270	2915	800	-	500	3
	216	DH300	7717	1345	656	632	1078	240	2585	800	-	500	3
	228-240	DH300	7717	1345	656	632	1078	275	2915	1400	1000	700	4
	258-264	DH300	7717	1345	656	632	1078	280	2915	1200	1000	600	4
	216	DV300	9855	1740	834	819	1386	275	2915	800	-	500	3
	228-240	DV300	9855	1740	834	819	1386	350	3859	1600	1000	1200	6
	258-264	DV300	9855	1740	834	819	1386	355	3859	1600	1000	1000	6
362	258-264	DM362	7717	1345	656	632	1078	355	3859	1200	1000	800	6
	276-288	DM362	7717	1345	656	632	1078	280	2915	1400	1000	700	5
	258-288	DH362	9855	1740	834	819	1386	285	2915	1200	1000	600	5
	258-288	DV362	12149	2110	1034	991	1694	360	3859	1600	1000	1000	6
420	330-360	DM420	8864	1530	756	718	1232	415	4520	1800	1000	1000	6
	330-360	DH420	11002	1925	934	905	1540	325	3245	1400	1000	700	5
	372-396	DH420	11002	1925	934	905	1540	400	4190	1800	1000	1000	6
	420	DH420	11002	1925	934	905	1540	400	4190	1400	1000	700	6
	330-420	DV420	13296	2295	1134	1077	1848	465	4850	1800	1000	1000	6

*) Sum of withstand voltages for empty units of arrester.

EXLIM Q-D
Technical data for housings

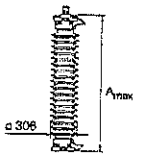


Figure 1

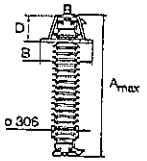


Figure 2

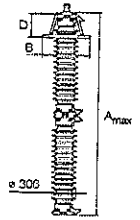


Figure 3

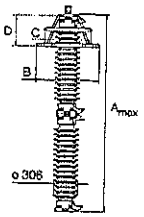


Figure 4

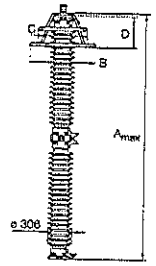


Figure 5

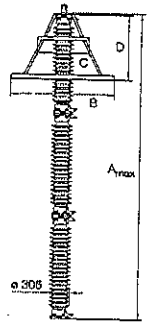
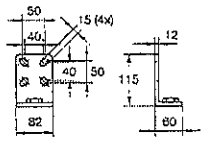


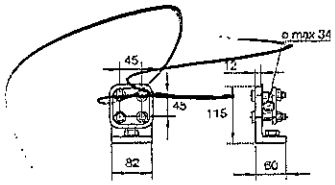
Figure 6

EXLIM Q-D
Accessories

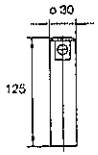
Line terminals



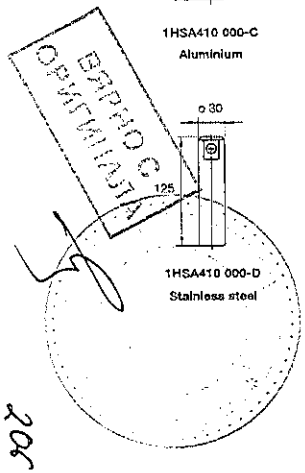
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

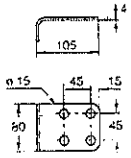


1HSA410 000-C
Aluminium

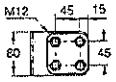


1HSA410 000-D
Stainless steel

Earth terminals

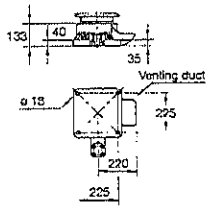


1HSA420 000-C
Stainless steel

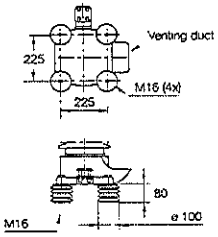


1HSA420 000-D
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

EXLIM Q-D
Shipping data

Rated voltage U_r kV_{rms}	Housing	Number of arresters per crate One Volume m^3	Gross kg	Three Volume m^3	Gross kg	Six Volume m^3	Gross kg
132-168	DH170	0.5	195	1.7	365	1.7	530
132-168	DV170	1.4	275	2.8	545	2.8	790
180-228	DH245	1.4	280	2.8	555	2.8	805
180	DV245	2.4	375	4.2	685	4.1	960
192-198	DV245	2.2	360	3.8	670	3.9	950
210-228	DV245	1.7	315	3.1	615	3.1	890
228-264	DM300	1.4	290	2.8	575	2.8	835
216	DH300	2.4	380	4.2	695	4.1	975
228-240	DH300	2.2	365	3.8	680	3.9	965
258-264	DH300	1.7	320	3.1	630	3.1	910
216-240	DV300	2.9	500	5.7	930	6.1	1315
258-264	DV300	1.9	445	3.6	875	5.0	1240
258-264	DM362	2.4	385	4.2	705	4.1	995
276-288	DM362	2.2	375	3.8	690	3.9	985
258-288	DH362	2.9	505	5.7	940	6.1	1330
258-264	DV362	3.2	575	6.3	1075	6.7	1535
276-288	DV362	3.2	575	6.0	1060	6.7	1525
330-360	DM420	4.2	475	4.9	835	5.3	1175
330-360	DH420	3.2	545	6.0	1015	6.7	1430
372-396	DH420	2.4	505	5.6	970	5.5	1380
420	DH420	2.2	485	5.2	945	5.3	1370
330-360	DV420	3.2	615	6.6	1150	7.0	1450

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

Zinc Oxide Surge Arrester EXLIM P

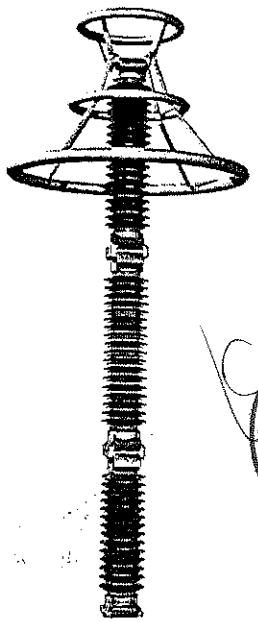
Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity.
- where grounding or shielding conditions are poor or incomplete.
- for important installations.
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 550 kV
Rated voltages (U_r)	42 - 444 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10/15 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	3.2 C
Thermal energy rating, W_{th} (IEC)	11 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	7 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	1600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	G
Single-impulse withstand rating as per IEEE standard	3.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	4.0 C
Short-circuit/Pressure relief capability	80 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	8000 Nm
Specified short-term load (SSL)	20000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 4

Further data according to the IEEE standard can be supplied on request



EXLIM P

Guaranteed protective data 36 - 170 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
36 [3]	30	24.0	24.4	32.7	31.1	58.5	60.7	62.2	64.9	68.3	74.8	81.9
	33	26.4	26.7	36.0	34.2	64.4	66.7	68.4	71.4	75.1	82.3	90.1
	36	28.8	29.0	39.3	37.3	70.2	72.8	74.6	77.9	81.9	89.7	98.3
	39	31.2	31.5	42.6	40.4	76.1	78.8	80.8	84.3	88.8	97.2	107
52	42	34	34.0	45.9	43.5	81.9	84.9	87.0	90.8	95.6	105	115
	48	38	39.0	52.4	49.7	93.6	97.0	99.4	104	110	120	132
	54	43	43.0	59.0	55.8	106	110	112	117	123	135	148
	60	48	48.0	65.5	62.2	117	122	125	130	137	150	164
72	54	43	43.0	59.0	55.8	106	110	112	117	123	135	148
	60	48	48.0	65.5	62.2	117	122	125	130	137	150	164
	66	53	53.4	72.1	68.4	129	134	137	143	151	165	181
	72	58	58.0	78.6	74.6	141	146	150	156	164	180	197
	75	60	60.7	81.9	77.7	147	152	156	163	171	187	205
	78	62	63.1	85.2	80.8	153	158	162	169	178	195	213
	84	67	68.0	91.8	87.1	164	170	174	182	192	210	230
100	84	67	68.0	91.8	87.1	164	170	174	182	192	210	230
	90	72	72.0	98.3	93.3	176	182	187	195	205	225	246
	96	77	77.0	104	100	188	194	199	208	219	240	263
123	90	72	72.0	98.3	93.3	176	182	187	195	205	225	246
	96	77	77.0	104	100	188	194	199	208	219	240	263
	108	78	84.0	118	111	211	219	224	234	246	270	295
	120	78	98.0	131	124	234	243	249	260	273	299	328
	132	78	106	144	136	258	267	274	286	301	329	361
	138	78	111	150	143	270	279	286	299	314	344	377
145	108	86	86.0	118	111	211	219	224	234	246	270	295
	120	92	98.0	131	124	234	243	249	260	273	299	328
	132	92	106	144	136	258	267	274	286	301	329	361
	138	92	111	150	143	270	279	286	299	314	344	377
	144	92	115	157	149	281	291	299	312	328	359	394
170	132	106	106	144	136	258	267	274	286	301	329	361
	144	108	115	157	149	281	291	299	312	328	359	394
	150	108	121	163	155	293	304	311	325	342	374	410
	162	108	131	177	167	316	328	336	351	369	404	443
	168	108	131	183	174	328	340	348	364	383	419	459

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_r has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with Uc higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

EXLIM P

Guaranteed protective data 245 - 550 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
245	180	144	144	196	186	351	364	373	390	410	449	492
	192	154	154	209	199	375	388	398	415	437	479	525
	198	156	160	216	205	387	400	410	428	451	494	541
	210	156	170	229	217	410	425	435	454	478	524	574
	216	156	174	236	223	422	437	448	467	492	539	590
	219	156	177	239	227	427	443	454	474	499	546	598
	228	156	180	249	236	445	461	473	493	519	568	623
300	216	173	174	236	223	422	437	448	467	492	539	590
	228	182	182	249	236	445	461	473	493	519	568	623
	240	191	191	262	248	468	485	497	519	546	598	656
	258	191	209	281	267	504	522	535	558	587	643	705
	264	191	212	288	273	515	534	547	571	601	658	721
362	258	206	209	281	267	504	522	535	558	587	643	705
	264	211	212	288	273	515	534	547	571	601	658	721
	276	221	221	301	286	539	558	572	597	628	688	754
	288	230	230	314	298	562	582	597	623	656	718	787
420	330	264	267	360	342	644	667	684	714	751	823	901
	336	267	272	367	348	656	679	696	727	765	838	918
	360	267	291	393	373	702	728	746	779	819	897	983
	372	267	301	406	385	726	752	771	804	847	927	1021
	378	267	306	413	391	737	764	783	817	860	942	1037
	381	267	308	416	395	743	770	789	824	867	950	1045
	390	267	315	426	404	761	788	808	843	888	972	1070
	396	267	318	432	410	773	800	820	856	901	987	1086
	420	267	336	459	435	819	849	870	908	956	1051	1152
550	396	317	318	432	410	773	800	820	856	901	987	1086
	420	336	336	459	435	819	849	870	908	956	1051	1152
	444	349	353	485	460	866	897	920	960	1015	1111	1217

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with Uc higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r).

Arresters with lower or higher rated voltages may be available on request for special applications.

EXLIM P

Technical data for housings 36 - 362 kV

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
U_s	U_r												
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
36	30-39	GV035	1444	300	151	135	228	85	785	-	-	-	1
52	42-60	GH052	1444	300	151	135	228	90	785	-	-	-	1
	42-60	GV052	3285	580	278	273	462	115	1315	-	-	-	1
72	54-84	GV072	3285	580	278	273	462	115	1315	-	-	-	1
100	84-96	GV100	3285	580	278	273	462	120	1315	-	-	-	1
123	90-138	GH123	3285	580	278	273	462	120	1315	-	-	-	1
	90-138	GV123	4432	765	378	359	616	150	1645	-	-	-	1
145	108-138	GM145	3285	580	278	273	462	120	1315	-	-	-	1
	108-120	GH145	4432	765	378	359	616	150	1645	-	-	-	1
	132-144	GH145	4432	765	378	359	616	155	1645	-	-	-	1
	108-144	GV145	4729	880	429	408	680	200	2060	-	-	-	2
170	132-168	GH170	4432	765	378	359	616	155	1645	-	-	-	1
	132	GV170	6570	1160	556	546	924	230	2585	800	-	500	3
	144-150	GV170	6570	1160	556	546	924	230	2585	600	-	300	3
	162-168	GV170	6570	1160	556	546	924	230	2585	-	-	-	2
245	180-198	GH245	6570	1160	556	546	924	240	2585	800	-	500	4
	210-228	GH245	6570	1160	556	546	924	240	2585	600	-	300	4
	180	GV245	7717	1345	656	632	1078	275	2915	1200	1000	600	5
	192-210	GV245	7717	1345	656	632	1078	270	2915	800	-	500	3
	216-228	GV245	7717	1345	656	632	1078	270	2915	600	-	300	4
300	228-264	GM300	6570	1160	556	546	924	245	2585	800	-	500	4
	216	GH300	7717	1345	656	632	1078	280	2915	1400	1000	700	5
	228-264	GH300	7717	1345	656	632	1078	275	2915	800	-	500	4
	216	GV300	9855	1740	834	819	1386	355	3860	1600	1000	1000	6
	228	GV300	9855	1740	834	819	1386	355	3860	1400	1000	700	6
	240	GV300	9855	1740	834	819	1386	355	3860	1200	1000	800	6
	258-264	GV300	9855	1740	834	819	1386	355	3860	1200	1000	600	6
362	258	GM362	7717	1345	656	632	1078	285	2915	1400	1000	700	5
	264-288	GM362	7717	1345	656	632	1078	285	2915	1200	1000	600	5
	258-264	GH362	9855	1740	834	819	1386	360	3860	1600	1000	1000	6
	276-288	GH362	9855	1740	834	819	1386	360	3860	1400	1000	700	6
	258-288	GV362	12149	2110	1034	991	1694	420	4850	1600	1000	1200	6

*) Sum of withstand voltages for empty units of arrester.

EXLIM P

Technical data for housings 420 - 550 kV

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation *)				Dimensions					
U_m	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
420	330-360	GM420	8864	1530	756	718	1232	325	3245	1200	1000	600	5
	330-336	GH420	11002	1925	934	905	1540	405	4190	1800	1000	1000	6
	360-372	GH420	11002	1925	934	905	1540	405	4190	1400	1000	700	6
	378-420	GH420	11002	1925	934	905	1540	405	4190	1200	1000	600	6
	330-396	GV420	13296	2295	1134	1077	1848	460	4850	1600	1000	1000	6
	420	GV420	13296	2295	1134	1077	1848	460	4850	1400	1000	700	6
550	396	GM550	11002	1925	934	905	1540	425	4500	2000	1000	1200	7
	420	GM550	11002	1925	934	905	1540	420	4500	1800	1000	1000	7
	444	GM550	11002	1925	934	905	1540	420	4500	1800	1000	800	7
	396-444	GH550	14287	2505	1212	1178	2002	530	5763	2000	1000	1200	8
Neutral-ground arresters													
123	72-84	GN123	3285	580	278	273	462	115	1315	-	-	-	1
	90-120	GN123	3285	580	278	273	462	120	1315	-	-	-	1
145	84	GN145	3285	580	278	273	462	115	1315	-	-	-	1
	90-120	GN145	3285	580	278	273	462	120	1315	-	-	-	1
170	96-120	GN170	3285	580	278	273	462	120	1315	-	-	-	1
245	108-120	GN245	3285	580	278	273	462	120	1315	-	-	-	1
	132	GN245	3285	580	278	273	462	125	1315	-	-	-	1
	144	GN245	4432	765	378	359	616	155	1645	-	-	-	1

*) Sum of withstand voltages for empty units of arrester.

EXLIM P

Technical data for housings

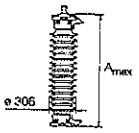


Figure 1

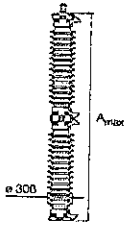


Figure 2

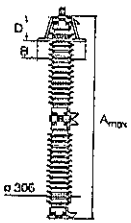


Figure 3

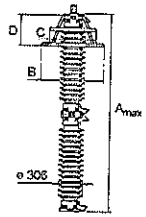


Figure 4

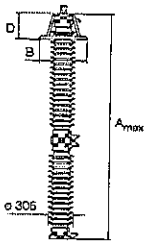


Figure 5

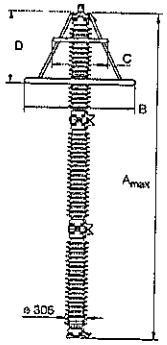


Figure 6

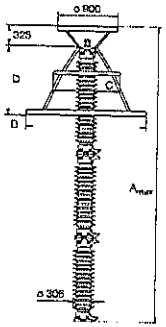


Figure 7

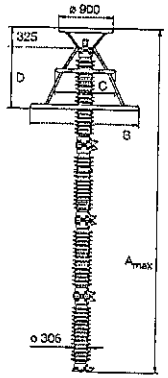
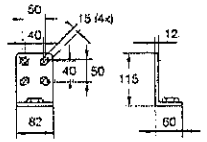


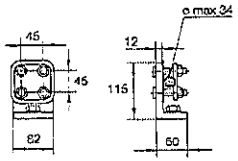
Figure 8

EXLIM P
Accessories

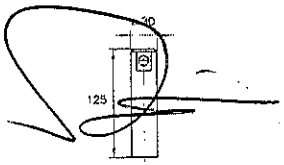
Line terminals



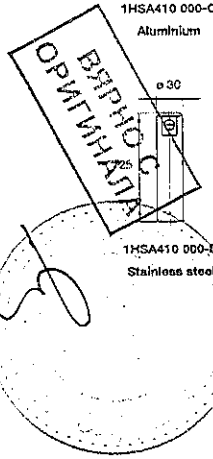
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

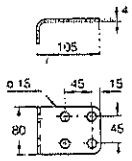


1HSA410 000-C
Aluminium

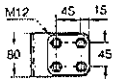


1HSA410 000-D
Stainless steel

Earth terminals

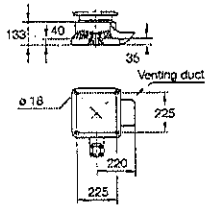


1HSA420 000-C
Stainless steel

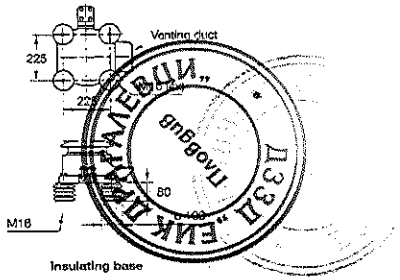


1HSA420 000-D
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15–20 mm.

EXLIM P
Shipping data

Rated voltage U_r	Housing	Number of arresters per crate: One Volume	One Gross	Two Volume	Two Gross	Three Volume	Three Gross
kV_{rms}		m³	kg	m³	kg	m³	kg
30-39	GV036	0.4	115	0.9	225	0.90	320
42-60	GH052	0.4	120	0.9	235	0.9	335
42-60	GV052	0.5	150	1.4	285	1.4	410
54-84	GV072	0.5	150	1.4	285	1.4	410
84-96	GV100	0.5	155	1.4	295	1.4	425
90-138	GH123	0.5	155	1.4	295	1.4	425
90-138	GV123	0.5	190	1.7	355	1.7	515
108-138	GM145	0.5	155	1.4	295	1.4	425
108-144	GH145	0.5	190	1.7	355	1.7	515
108-144	GV145	1.4	245	2.3	470	2.3	690
132-168	GH170	0.5	195	1.7	365	1.7	530
132-168	GV170	1.4	275	2.8	545	2.8	780
180-228	GH245	1.4	285	2.8	565	2.8	810
180	GV245	2.2	365	3.8	665	3.9	945
192-228	GV245	1.7	315	3.1	615	3.1	895
228-264	GM300	1.4	280	2.8	575	2.8	825
216	GH300	2.4	385	4.2	690	4.1	975
228-264	GH300	1.7	320	3.1	630	3.1	905
216	GV300	2.5	500	5.2	930	6.1	1315
228	GV300	2.1	460	5.2	890	5.2	1255
240-264	GV300	1.9	445	4.9	875	5.0	1240
258	GM362	2.4	390	4.2	705	4.1	995
264-288	GM362	2.2	375	3.8	690	3.9	985
258-264	GH362	2.5	505	5.2	940	6.1	1330
276-288	GH362	2.1	465	5.2	900	5.2	1270
258-288	GV362	3.2	565	6.3	1050	6.7	1500
330-360	GM420	2.2	410	4.1	770	4.2	1105
330-336	GH420	3.2	545	6.0	1010	6.0	1440
360-372	GH420	2.4	505	5.5	970	5.5	1375
378-420	GH420	2.2	490	3.8	960	5.3	1370
330-420	GV420	3.2	610	6.6	1150	7.0	1645
396	GM550	5.1	615	6.5	1100	6.5	1520
420-444	GM550	3.2	565	6.0	1045	6.0	1485
396-444	GH550	5.1	805	7.9	1330	7.9	1860
Neutral-ground arresters							
72-78	GN123	0.4	150	1.4	285	1.4	410
84	GNxxx	0.4	150	1.4	285	1.4	410
90-132	GNxxx	0.4	155	1.4	295	1.4	425
144	GNxxx	0.5	190	1.7	355	1.7	515

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

i The table above is to be seen as an approximation and specific data for delivenes may differ from the values given.

Zinc Oxide Surge Arrester EXLIM T

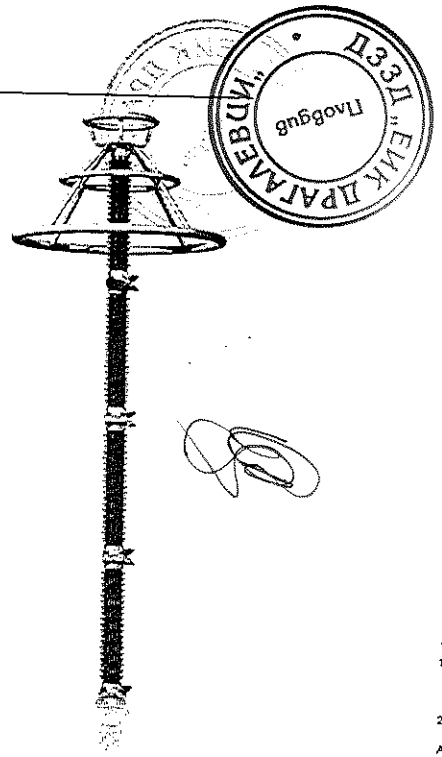
Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	245 - 800 kV
Rated voltages (U_r)	180 - 624 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10/15/20 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	5.2 C
Thermal energy rating, W_{th} (IEC)	15 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	11 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 µs	150 kA_{peak}
Low current 2000 µs, (based on Q_{rs})	2600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	J
Single-impulse withstand rating as per IEEE standard	5.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	5.2 C
Short-circuit/Pressure relief capability	80 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	8000 Nm
Specified short-term load (SSL)	20000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 5

Further data according to the IEEE standard can be supplied on request



EXLIM T
Guaranteed protective data

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
245	180	144	144	198	189	346	356	363	381	396	428	466
	192	154	154	212	201	369	380	387	406	423	457	497
	198	156	160	218	208	381	392	399	419	436	471	512
	210	156	170	232	220	404	415	423	444	462	499	543
	216	156	174	238	227	415	427	435	457	476	514	559
	218	156	177	242	230	421	433	441	463	482	521	567
	228	156	180	252	239	438	451	459	482	502	542	590
300	216	173	174	238	227	415	427	435	457	476	514	559
	228	182	182	252	239	438	451	459	482	502	542	590
	240	191	191	265	252	461	475	484	507	528	571	621
	258	191	209	285	271	496	510	520	545	568	614	667
	264	191	212	291	277	508	522	532	558	581	628	683
362	258	205	209	285	271	496	510	520	545	568	614	667
	264	211	212	291	277	508	522	532	558	581	628	683
	276	221	221	305	290	531	546	556	583	608	656	714
	288	230	230	318	302	554	569	580	609	634	685	745
420	330	264	267	364	347	634	652	665	697	726	785	854
	336	267	272	371	353	646	664	677	710	740	799	869
	360	267	291	398	378	692	712	725	761	792	856	931
	372	267	301	411	391	715	735	749	786	819	884	962
	378	267	306	418	397	726	747	761	799	832	899	978
	381	267	308	421	400	732	753	767	805	839	906	985
	390	267	315	431	410	750	771	786	824	858	927	1013
	396	267	318	437	416	761	783	798	837	872	941	1029
	420	267	336	464	441	807	830	846	888	924	998	1091
550	396	317	318	437	416	761	783	798	837	872	941	1029
	420	336	336	464	441	807	830	846	888	924	998	1091
	444	349	353	491	467	853	878	894	938	977	1060	1153
800	588	470	470	650	618	1134	1167	1189	1247	1299	1402	1525
	612	490	490	676	643	1180	1214	1237	1298	1351	1459	1587
	624	499	499	690	656	1203	1238	1261	1323	1378	1488	1618

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with Uc higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 15 kJ/kV (U_r)

Arresters with lower or higher rated voltages may be available on request for special applications

EXLIM T
Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation [a]				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
245	180-192	BH245	6570	1160	556	546	924	270	2585	800	-	500	2
	198-228	BH245	6570	1160	556	546	924	275	2585	800	-	300	2
	180-198	BV245	7717	1345	656	632	1078	300	2915	800	-	500	2
	210-228	BV245	7717	1345	656	632	1078	305	2915	800	-	300	2
300	228-264	BM300	6570	1160	556	546	924	295	2585	800	-	500	2
	216-264	BH300	7717	1345	656	632	1078	315	2915	800	-	500	2
	216-240	BV300	9855	1740	834	819	1386	395	3860	1600	1000	1000	4
	258-264	BV300	9855	1740	834	819	1386	400	3860	1200	1000	800	4
362	258	BM362	7717	1345	656	632	1078	330	2915	1400	1000	700	3
	264-288	BM362	7717	1345	656	632	1078	335	2915	1200	1000	600	3
	258-288	BH362	9855	1740	834	819	1386	410	3859	1600	1000	1000	4
	258-288	BV362	12148	2110	1034	991	1694	470	4520	1600	1000	1200	4
420	330-360	BM420	8864	1530	755	718	1232	385	3245	1200	1000	600	3
	330-336	BH420	11002	1925	934	905	1540	460	4190	1600	1000	1000	4
	360	BH420	11002	1925	934	905	1540	465	4190	1400	1000	700	4
	372-420	BH420	11002	1925	934	905	1540	475	4190	1200	1000	600	4
	330-372	BV420	13296	2295	1134	1077	1848	515	4850	1600	1000	1000	4
	378-396	BV420	13296	2295	1134	1077	1848	530	4850	1400	1000	700	4
	420	BV420	13296	2295	1134	1077	1848	540	4850	1200	1000	600	4
550	396-444	BM550	11002	1925	934	905	1540	490	4500	1800	1000	800	5
	396-444	BH550	14287	2505	1212	1178	2002	595	5763	2000	1000	1200	6
800	On request												
Neutral-ground arresters													
245	108	BN245	3285	580	278	273	462	140	1315	-	-	-	1
	120-132	BN245	3285	580	278	273	462	145	1315	-	-	-	1
	144	BN245	4432	785	378	369	616	180	1545	-	-	-	1

[a] Sum of withstand voltages for empty units of arrester.

EXLIM T
Technical data for housings

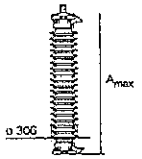


Figure 1

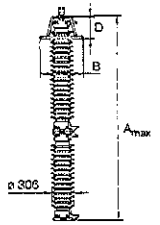


Figure 2

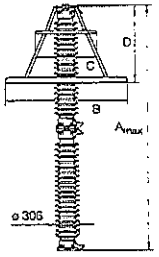


Figure 3

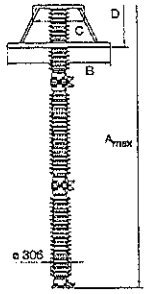


Figure 4

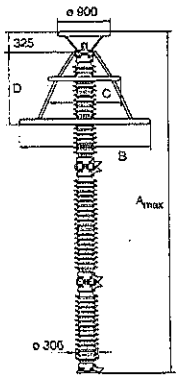


Figure 5

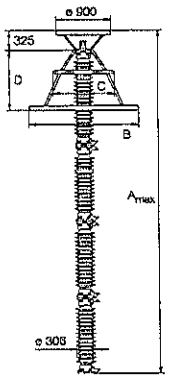
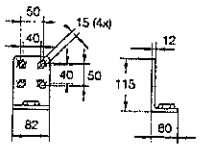


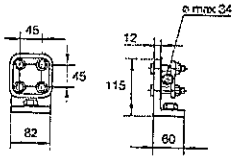
Figure 6

EXLIM T
Accessories

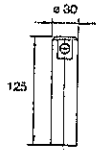
Line terminals



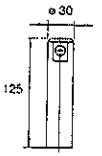
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

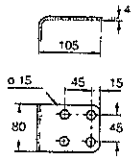


1HSA410 000-C
Aluminium

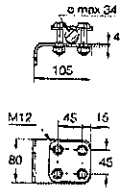


1HSA410 000-D
Stainless steel

Earth terminals

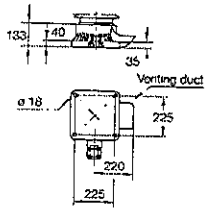


1HSA420 000-C
Stainless steel

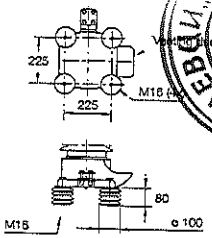


1HSA420 000-D
Stainless steel

Drilling plans



Without insulating base
Aluminium



Insulating base
1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

EXLIM T
Shipping data

Rated voltage U_r kV$_{rms}$	Housing	Number of arresters per crate: One Volume m³	One Gross kg	Two Volume m³	Two Gross kg	Three Volume m³	Three Gross kg
180-228	BH245	1.4	320	2.8	635	2.8	925
180-228	BV245	1.7	360	3.1	705	3.1	1025
228-264	BM300	1.4	340	2.8	675	2.8	985
216	BH300	2.2	410	3.8	755	3.8	1080
228-264	BH300	1.7	375	3.1	730	3.1	1060
216-240	BV300	2.9	540	5.7	1010	6.1	1435
258-264	BV300	1.9	490	3.5	965	5.0	1375
258	BM362	2.4	435	4.2	800	4.2	1140
264-288	BM362	2.2	430	3.8	800	3.8	1145
258-288	BH362	2.9	555	5.7	1040	6.1	1480
258-288	BV362	3.2	620	6.3	1150	6.3	1500
330-360	BM420	2.2	485	4.1	900	3.4	1300
330-336	BH420	3.2	605	6.3	1130	6.3	1620
360	BH420	2.4	570	4.2	1100	4.2	1570
372-420	BH420	2.2	575	3.8	1120	3.8	1610
330-336	BV420	3.2	665	6.6	1255	7.0	1805
360-378	BV420	3.2	680	6.6	1280	7.0	1840
381-396	BV420	2.4	640	6.1	1240	6.1	1780
420	BV420	2.2	635	5.8	1225	5.9	1795
396-420	BM550	5.1	710	6.5	1270	6.5	1795
444	BM550	3.2	685	6.0	1215	6.0	1745
396-444	BH550	5.1	805	7.9	1500	7.9	2105
Neutral-ground arresters							
108-132	BN245	0.5	180	1.4	345	1.4	500
144	BN245	0.5	220	1.7	415	1.7	605

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

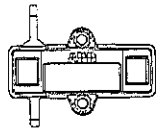
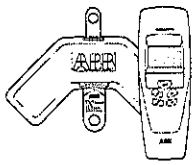
Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

EXCOUNT

Surge arrester monitors matched with the surge arresters

With our state-of-the-art product family EXCOUNT, ABB has the full range of counters and monitors to cater for all customer needs – from simple discharge operation count (EXCOUNT-C) through leakage current measurement (EXCOUNT-I) to on-line monitoring and diagnostics (EXCOUNT-II).

	EXCOUNT-C	EXCOUNT-I	EXCOUNT-II
			
Surge registration			
Number of impulses	Yes	Yes	Yes
Impulse amplitude	-	-	Yes
Leakage current measurement			
Total current	-	Yes (also available without)	Yes
Resistive leakage current	-	-	Yes (also available without)
Display	6-digit, electromechanical counter	6 digit, Ch-LCD	Remote reading, PC connectivity
Power supply	Not applicable	Solar panel	Solar panel and field probe

EXCOUNT

Monitoring the health of surge arresters

Well-designed and tested, ABB surge arresters are maintenance-free and can reasonably be expected to have a long service life. Nevertheless, considering the type of expensive equipment which an arrester is protecting, together with how costly and devastating an unplanned power outage can be, there are good reasons for "monitoring" the condition of arresters.

Surge arresters present a high impedance at normal service voltage such that they behave as an insulator for the majority of their life. This is necessary to assure a long life for the arrester itself as well as stability of the electrical network as a whole. A deterioration of an arrester's insulating properties is therefore important to detect early before the situation becomes acute.

In order to truly evaluate the health of an arrester, testing of the kind made as routine during manufacture would need to be performed. However, such testing is not practical to make in the field and removal of the arrester to a HV lab is deemed uneconomic. Instead some kind of in-service diagnostic is required.

Surge registration

The primary reason for the use of surge counters on modern gapless ZnO arresters is to check if a particular transmission line or phase suffers from an exceptionally high number of overvoltages leading to arrester operation — lightning faults on a line, for example. If this is the case, whilst it validates the need for the arresters, use of some preventative countermeasures may be warranted to limit the number of surges. A sudden increase in the counting rate may also indicate an internal arrester fault, in which case the arrester should be investigated further.

However, simple surge counters tell only part of the story, as they only register the number of surges according to their operating characteristic. The user therefore has no way of telling the magnitude of the surge and if it was significant, nor when it occurred and if it was coincident with a system event.

Leakage current measurement

Surge counters can be complimented with the facility to measure leakage currents (total and/or resistive), with the intention of monitoring and diagnosing the condition of the arrester and its state of fitness for continued service. However it is important to understand the validity of the information provided.

At continuous operating voltage (U_c), a metal-oxide varistor acts as a capacitor, leading to a predominantly capacitive component of current and a significantly smaller resistive part. For a complete surge arrester, the capacitive current is further dependent on stray capacitances, pollution currents on the insulator surface, number of varistor columns in parallel and the actual operating voltage. Meanwhile the small resistive component of the leakage current is temperature and voltage dependant.

Since the capacitive component of the current dominates so greatly, the total leakage current measured on a basic mA-meter will be very sensitive to the installation; making interpretation of the readings difficult. Furthermore, the capacitive current does not change significantly due to deterioration of the voltage-current characteristic of the surge arrester. Consequently, measurement of capacitive current cannot reliably indicate the condition of metal-oxide arresters. Nevertheless, increasing values may be of some use in indicating that cleaning of the insulators is necessary.

EXCOUNT
Monitoring the health of surge arresters

Instead, it is generally recognized (IEC 60099-5) that the only reliable indicator for the condition of a gapless arrester that can be assessed during normal service is to measure the resistive component of the leakage current (or estimate it from the 3rd harmonic). The obtained value may then be compared with the maximum allowable resistive current as given by the manufacturer under prevailing service conditions i.e. temperature and applied voltage.

Remote reading with EXCOUNT-II

If a metal-oxide varistor ages or is damaged by impulses etc, the arrester resistive leakage current, and hence power losses, increase permanently. This may result in an increase in temperature, which in turn, increases the leakage current and so on until a so-called thermal runway occurs. Early detection of a possible harmful increase may prevent a failure and subsequent unplanned shutdown. Hence, to provide true diagnostics, a good monitor must be able to detect the arrester leakage current and isolate and measure the resistive component flowing internally.

Diagnostic plan

A surge arrester does not contain any moving parts or items that can break. Consequently there is nothing to maintain, adjust, correct or repair, which is why there is normally no need to perform any form of periodical checking or monitoring. In general, a correctly chosen and installed arrester is maintenance free during its entire lifetime. A correctly chosen arrester in this context means that its electrical and mechanical characteristics are matched to actual service conditions.

Nonetheless, since external factors can place stresses on the arrester, potentially leading to its deterioration and ultimato overload, it may be prudent to draw up a schedule for regular checks. Such consideration is all the more important if an unplanned outage is unacceptable for reasons of system stability or economics. The older the arrester, the more regular these checks may need to be, since the statistical risk for overload increases with age.

As a guide, the following strategy is proposed to be made at regular intervals as required and determined by site availability and importance:

- Visual inspection and possible cleaning
- Diagnostics in advance of the designated lighting season and thereafter following periods with bad weather conditions.
- Diagnostics after special fault conditions causing flashover in the network or TOV's of high amplitude and/or long duration.

Because of their nature, old-style gapped arresters should be removed as soon as possible as part of a scheduled replacement program. Their age and inherent design does not warrant detailed evaluation. Early models of gapless arresters may require additional visual checks to look for signs of mechanical or physical deterioration as well as monitoring of the internals. Newly purchased arresters can also benefit from diagnostic monitoring right from first installation since this permits easy trend analysis to detect potential deterioration later on in its service life.

EXCOUNT
When safety comes first

EXCOUNT draws upon over 75 years of experience by ABB in the development of arresters and associated accessories. Safety, functionality and longevity are key elements which are given priority in selection and design of components. In stark contrast to many other competing products, EXCOUNT has not neglected short-circuit safety which lies inherent in the design concept.

The EXCOUNT family is characterized by:

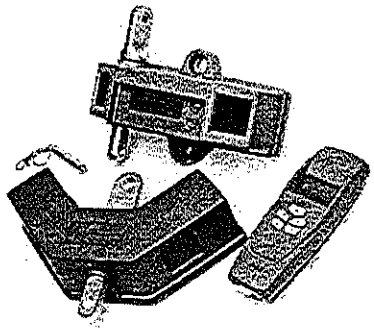
Highest personnel safety
- Explosion-proof for short-circuit currents up to 65 kA.
- Same safe performance as ABB arresters.

Negligible residual voltage
- Does not reduce protection margins.
- Minimized risk for injury in case of accidental contact during surges.

Maintenance free
- Sealed components.
- Requires no external power supply.

Long life
- Moulded components, non-sensitive to humidity or temperature variations.

Universal application
- All makes and types of gapless surge arresters.
- All weather and temperature conditions.



Design

The use of an impulse current transformer with a single-turn primary ensures that the voltage drop across the counter is negligible, even at the highest impulse currents encountered in service. This leads to added personnel safety and no increase in the protection level of the arrester. Since no gaps or series impedance are used, there is no risk of internal arcing and consequent explosive failure in the event of a short-circuit following an arrester failure.

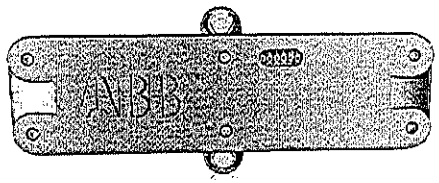
One further common feature with the entire EXCOUNT family is that all internal components are fully encapsulated in polymer. This provides sealing to IP67, which ensures no harmful ingress of dust or moisture as well as providing personal safety through complete protection against contact with the internals.

EXCOUNT is available in different variants, depending on the user's needs: simple, basic or extensive.

Surge counter EXCOUNT-C

EXCOUNT-C
Technical data

EXCOUNT-C is a simple surge counter with all the essentials for easy installation and highest personnel safety. The counter is maintenance free; powered by the surge current and suitable for all weather and temperature conditions.



Design features
EXCOUNT-C is to be fitted in the earth circuit between the arrester and ground. For simplicity, the EXCOUNT-C does not have a termination point for the earth cable. Instead an opening is provided to draw the entire earth conductor from the arrester completely through and down to ground. In case the conductor is too large to fit through the hole, an optional conductor kit may be ordered separately.

The secondary circuit is connected to a mechanical counting relay and all components are totally sealed in polymer. A viewing window permits easy reading of the six-digit cyclometer-type counter.

Surge registration
The counting threshold for EXCOUNT-C is adapted for gapless surge arresters. Only pulses that are considered significant to the arrester capability and life are therefore registered.

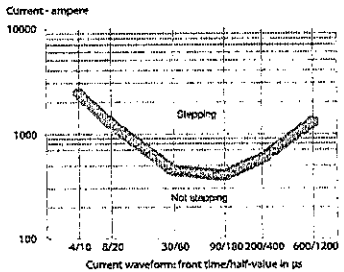
Maintenance free
A robust plastic casing is fitted over the encapsulated internals, which makes EXCOUNT-C non-sensitive to humidity or temperature variations. It can be exposed to all environments regardless of weather and temperature conditions. The current transformer secondary output is sufficient for driving the counter and an external supply source is hence not needed.

General

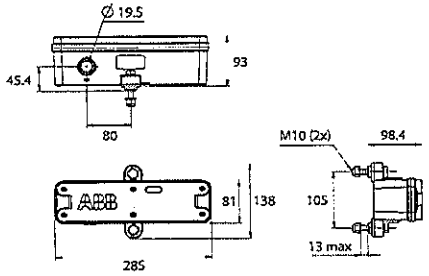
Item number	1HSA448000-A
Climatic conditions	Sealed water-tight design, IP67
Short-circuit capability	65 kA according to IEC 60099-4
Power supply	Impulse current

Surge registration

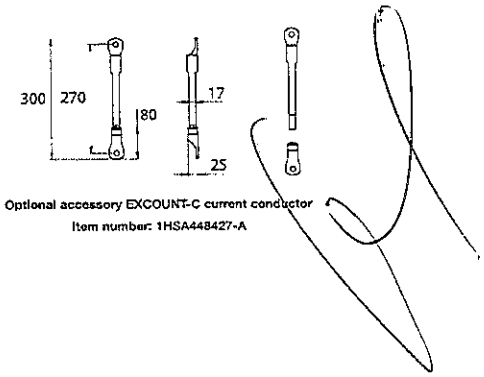
Minimum counting threshold (8/20 µs)	1.5 kA



Stepping criteria



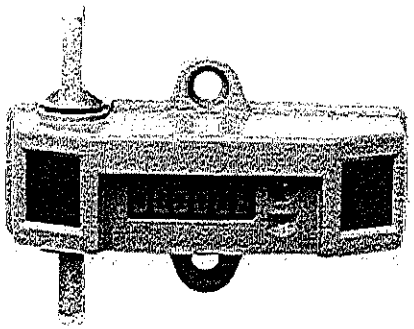
Dimensions



Optional accessory EXCOUNT-C current conductor
Item number: 1HSA448427-A

Surge counter EXCOUNT-I
with mA-meter

EXCOUNT-I is a surge counter with basic leakage current measurement function. The counter provides a number of unique features such as short-circuit safety and a well proven electronic display which is easy to read, even in direct sunlight. EXCOUNT-I is specially designed for use with all makes and types of gapless arresters and in diverse environments.



Design features.
As with all surge counters from ABB, EXCOUNT-I does not negatively affect the residual voltage of the arrester.
EXCOUNT-I is housed in a sealed, weather-proof case, suitable for outdoor use and proven to match the short circuit capability of the arresters. EXCOUNT-I has been designed for highest personal safety and has been successfully short circuit tested at 65 kA.

EXCOUNT-I requires no external power supply as it incorporates its own internal power source in the form of a high-efficiency capacitor charged by solar cells.

The electronic display is of Cholesteric Liquid Crystal Display type. This ensures highest readability, even in direct sunlight. The display is Bi-stable, which means that power is only required during refresh of the display.

Surge registration
EXCOUNT-I registers the surge each time the arrester has discharged a current over 10 A. The accumulated number of surges is continuously shown on the electronic display.

Leakage current measurement
ABB's unique design ensures that total leakage current through the arrester can be measured without risking personnel safety.

The measurement is initiated by triggering a light sensitive diode using a standard laser pointer. This will initiate EXCOUNT-I to start measuring the total leakage current for several cycles and shortly thereafter display the average value (in mA). The counter will then automatically return to its normal state and display number of impulses. Thus, the measurement can be made at a discreet distance without coming into direct contact with the equipment.

Maintenance free
EXCOUNT-I is a maintenance free product in outdoor applications. The display and solar panels might however need to be wiped off before measurement in extremely polluted conditions.

EXCOUNT-I
Technical data

General

Climatic conditions	Sealed water-tight design, IP67
Short-circuit capability	65 kA according to IEC 60099-4
Power supply	Built-in solar cells (battery alternative for indoor use)

Surge registration

Minimum counting threshold (8/20 µs)	10 A
Surge counting memory capacity	999999 registrations (wrap-around)
Time resolution	< 0.5 s

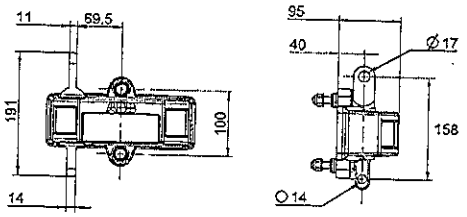
Leakage current measurement

Measuring range of total leakage current	0.1 - 50 mA_{peak}
Measuring frequency range	48 - 62 Hz
Laser pointer wavelength	630 nm

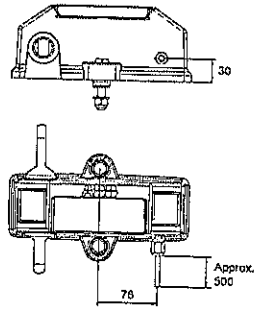
EXCOUNT-I versions
EXCOUNT-I can be supplied with an output connection (auxiliary contact) for interfacing to external signalling equipment. Versions with only surge counting function are also available.

Model	Surge counting	Leakage current measurement	Auxiliary contact	Laser pointer included
1HSA440000-C	Yes	-	-	-
1HSA440000-E	Yes	-	Yes	-
1HSA440000-J	Yes	Yes	-	Yes
1HSA440000-L	Yes	Yes	Yes	Yes

The auxiliary pulse contact is suitable for use with AC or DC voltage (max. 250V, 1A). An auxiliary relay of suitable type must be connected separately to the EXCOUNT-I auxiliary contact (not included as standard).



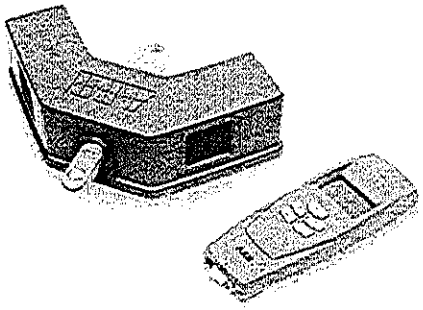
Dimensions



Auxiliary contact brought out via dual-core (2 x 1 mm) cable 1HSA440000-E and 1HSA440000-L

Surge arrester monitor EXCOUNT-II

EXCOUNT-II is our top-of-the line product combining outstanding looks with the most extensive and powerful features. Included are a variety of surge counting features together with all the essential leakage current measurement functions. EXCOUNT-II enables users to keep track of overvoltages in the network as well as providing state-of-the art on-line condition monitoring of arresters.



Design features

EXCOUNT-II is a unique monitoring system, which can be used as an aid to assess the health of the entire substation by monitoring surges transmitted in and out of the network. Each surge arrester is fitted with a sensor, which detects the total number of discharges, the surge amplitude, date and time of occurrence, as well as the leakage current through the arrester. The measurements can be remotely read when convenient with the aid of a hand-held transceiver (and optional external antenna).

Remote reading provides increased personnel safety compared with conventional counters. With a communication distance of up to 60 m (120 m with external antenna), the person does not necessarily have to even be inside the substation perimeter, so saving the need to arrange entry permits or have electrically trained personnel perform the work.

The measured data can then be transferred to a computer for statistical analysis. Included with EXCOUNT-II is specially designed software which facilitates download of the measured data from the transceiver and permits analysis and reporting of the collected information.

Surge registration

EXCOUNT-II does more than just count surges. It also registers the date and time as well as amplitude of the surge each time the arrester has discharged a current over 10 A. Time and amplitude measurement gives the user better information about overvoltages in the network and the operation of the arrester.

Leakage current measurement and condition monitoring

EXCOUNT-II gives the user the possibility to measure both the total leakage current as well as the resistive component of the current through the arrester. Measurement of the resistive current gives a good indication of the arrester's condition and fitness for continued service. The measurement method employed is based on third-harmonic analysis which is considered the most reliable measuring method for condition monitoring according to IEC 60099-5.

Safe and secure

The sensor is housed in a sealed, weather-proof case, suitable for outdoor use and proven to match the short-circuit capability of the arrester to which it is connected. The sensor requires no external power supply as it incorporates its own internal power source in the form of a high-efficiency capacitor automatically charged by solar cells and electric field probe.

EXCOUNT-II
Technical data

General	
Climatic conditions	Sealed water-tight design, IP67
Short-circuit capability	65 kA according to IEC 60099-4
Power supply	Built-in solar cells and field probe (battery alternative for indoor use)

Surge registration	
Minimum counting threshold (8/20 µs)	10 A
Amplitude classification (8/20 µs)	10 - 99 A 100 - 999 A 1000 - 4999 A 5000 - 9999 A > 10000 A
Time stamp	Yes
Time resolution	< 0.5 s
Memory capacity	1000 registrations (wrap-around)

Leakage current measurement	
Measuring range of total leakage current	0.2 - 12 mA_{peak}
Measuring range of resistive leakage current (peak level)	10 - 2000 µA
Measuring frequency range	48 - 62 Hz

EXCOUNT-II versions

EXCOUNT-II are available for two different frequencies depending on national regulations. Contact ABB for guidance.

Sensor

Model	Frequency
1HSA441 000-A	for 868.35 MHz
1HSA441 000-C	for 916.50 MHz

Sensors for inverted mounting

Model	Frequency
1HSA441 000-D	for 868.35 MHz
1HSA441 000-E	for 916.50 MHz

Transceiver model 1

Application: Measuring total leakage current and surge data

Model	Frequency
1HSA442 000-C	for 868.35 MHz
1HSA442 000-E	for 916.50 MHz

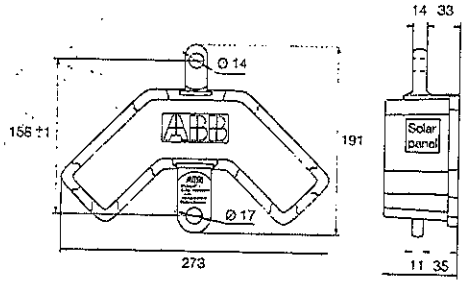
Transceiver model 2

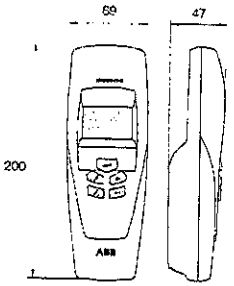
Application: Measuring total leakage current, resistive leakage current and surge data.

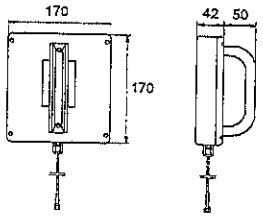
Model	Frequency
1HSA442 000-A	for 868.35 MHz
1HSA442 000-D	for 916.50 MHz

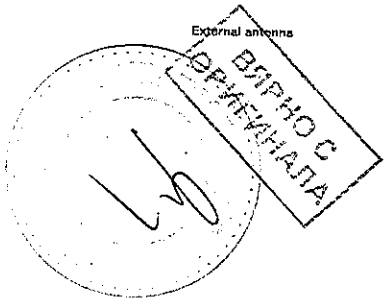
External antenna

Model	Frequency
1HSA446 000-A	for 868.35 MHz
1HSA446 000-B	for 916.50 MHz









EXCOUNT-II
Dimensions

Sensor

Transceiver

External antenna

ВЯРНО С ОРИГИНАЛА

ДЗЗД „ЕИК ДРАГАЛЕВЦИ" Пловдив

Purchase order

Project		Handled by, e-mail or fax		Tender reference no (if any)
Buyer			Date (yyyy-mm-dd)	Buyer reference
End user				End user reference (if any)
Shipping terms	Destination			Means of transport
Freight forwarder (if FCA or FOB)				Payment terms
Goods marking ☐No ☐Yes		Delivery address		
Inspection of routine tests	Routine test standard	Documentation language	Rating plate language	Currency

Items

Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

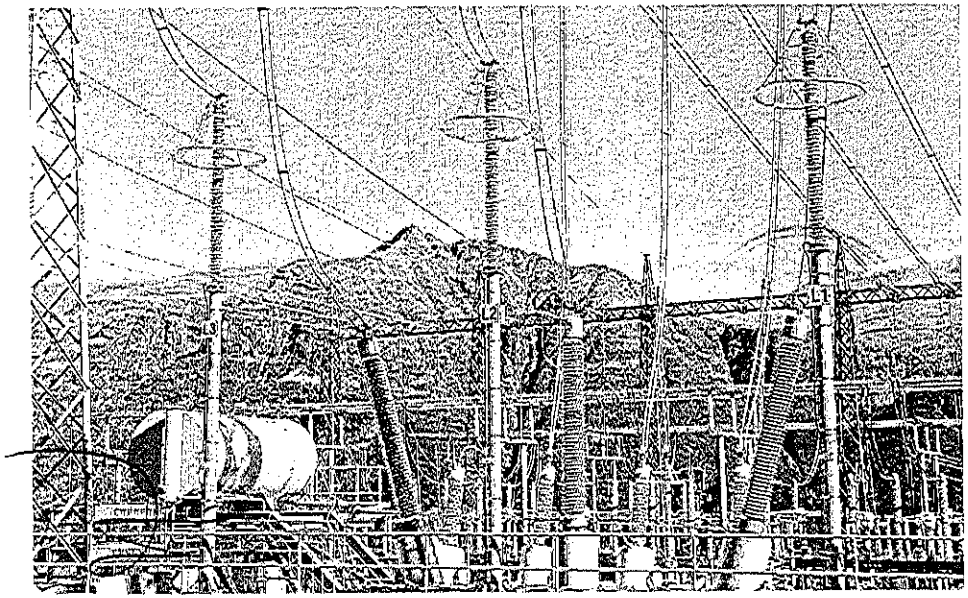
Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

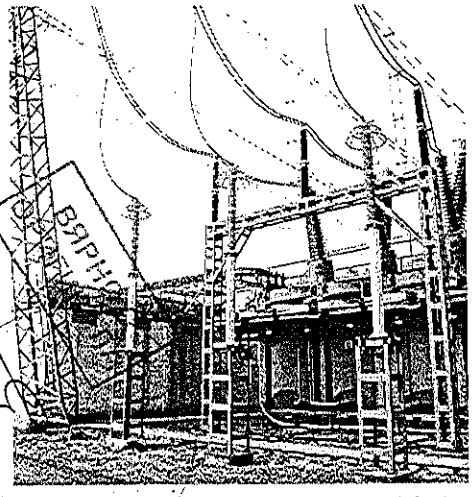
Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

It is recommended that the following form is used when ordering EXLIM/PEXLIM/TEXLIM surge arresters and accessories. Send to fax: +46 (0)240 179 83 or mail to *ordersa.swg@se.abb.com*.

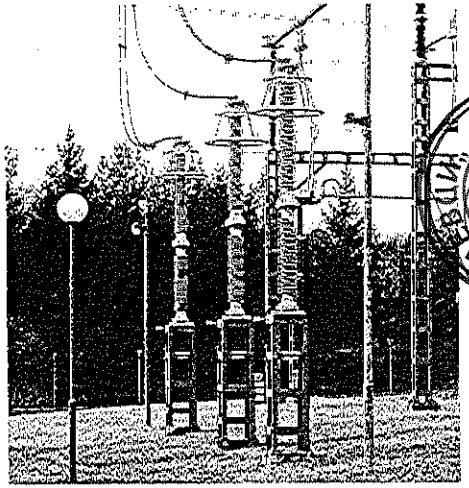
Installations with ABB surge arresters



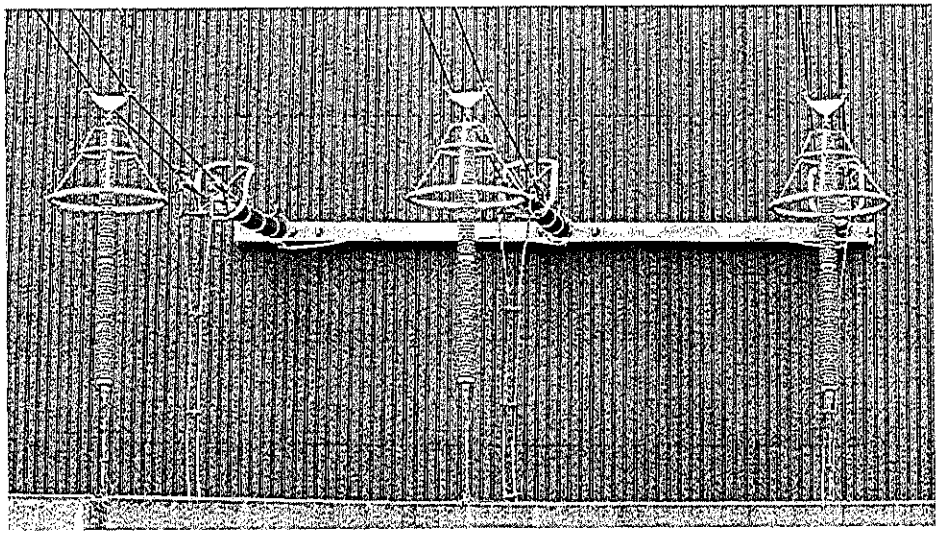
PEXLIM surge arresters protecting a 420 kV power transformer in Norway



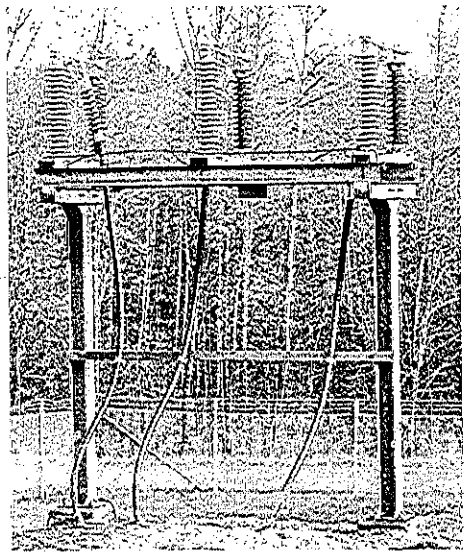
PEXLIM surge arresters protecting a 420 kV power transformer in Sweden



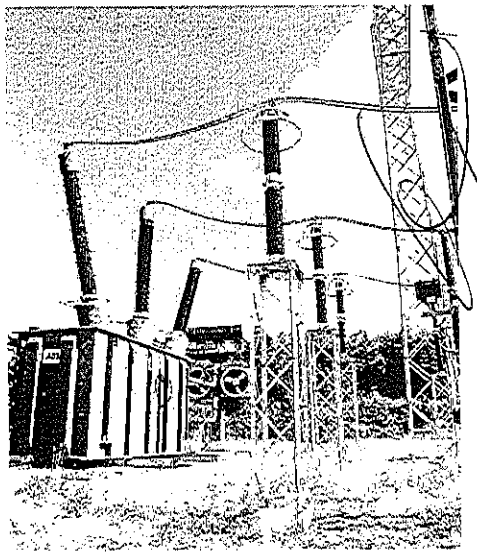
TEXLIM surge arresters connected to the line entrance



PEXLIM surge arresters connected to the 420 kV the secondary winding on a step-up transformer in a nuclear power plant



PEXLIM surge arresters protecting a cable entrance



EXLIM surge arresters protecting a 420 kV power transformer

Contact us

ABB AB
High Voltage Products
Surge Arresters
SE-771 80 Ludvika, Sweden
Phone: +46 (0)240 78 20 00
Fax: +46 (0)240 179 83
E-Mail: arresters.div@se.abb.com

www.abb.com/arrestersonline

Document ID 1HSM 9543 12-00en, High Voltage Surge Arresters, Buyer's Guide, Edition 12, 2016-11

Приложение № 1.2 Заверено копие на каталог на Оптичен кабел

Multi Loose Tube Cable

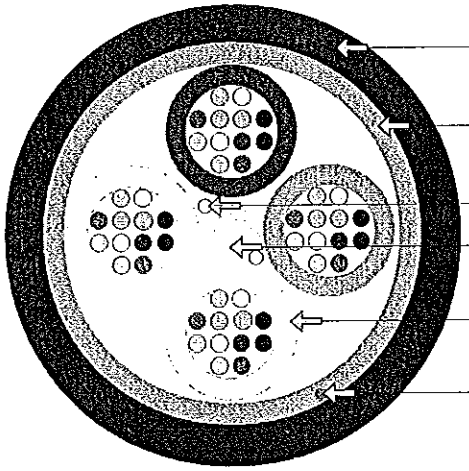
ID: **LE02**

KDP
KABELOVNA Děčín Podmokly s.r.o.
Ústecká 840/33, 405 33 Děčín 5
Czech Republic
DIČ CZ26759993
tel.: +420 412 706 222
www.kabelovna.cz

6.5.2016 ver.8

J/A-DQ(BN)H 4×2,3 max. 48F

This cable is is suitable for indoor or outdoor use. The cable has standard level of rodent protection.



Order example

2100 m J/A-DQ(BN)H 48E9/125 G.657.A1 jacket coulour BLK, cable specification LE02

Fibre colour coding

According to IEC 60304

1 Red	7 Brown
2 Green	8 Violet
3 Blue	9 Turquoise
4 Yellow	10 Black
5 White	11 Orange
6 Grey	12 Pink

Other fibre colour sequences available on request

Fibre Type

Single mode fiber 9/125
Multi mode fiber 50/125
Multi mode fiber 62,5/125

See the Fibre Specification sheet

Sheat Marking

Print colour	White
Print method	INK-Jet
Print legend	manufacturer's name, Job number, type of cable, length marking @ 1 m intervals

Other print legends available on request

Tube colour coding

1 Red
2 Green
3-4 White

in the case of lower number of fibres some tubes are replaced by uncoloured fillers

Other tubes colour sequences available on request

Packaging	Standard put-up length	Drum size
Plywood	2100 m ±5 %, other lengths on request	1000×640×600
Plywood	4100 m ±5 %, other lengths on request	1200×640×600

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Multi Loose Tube Cable

ID: **LE02**

KDP
KABELOVNA Děčín Podmokly s.r.o.
Ústecká 840/33, 405 33 Děčín 5
Czech Republic
DIČ CZ26759993
tel.: +420 412 706 222
www.kabelovna.cz

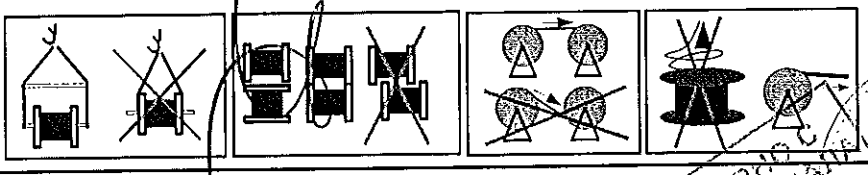
6.5.2016 ver.8

J/A-DQ(BN)H 4×2,3 max. 48F

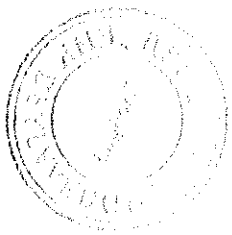
Mechanical and Environmental properties

Test		Value	Unit	Method
Cable outer diameter		8,9 ±0,4	mm	EN 60811-1-1
Cable weight		86	kg/km	
Outer jacket thickness		1,5	mm	
Loose tube diameter		2,3	mm	
Max. tensile strength		1400	N	EN 60974-1-2-E1
Crush resistance test		2000	N	EN 60974-1-2-E3
Impact resistance test		3	Number of. impact	EN 60974-1-2-E4
Min. bend radius (no load) Min. bend radius (load)		15 20	×OD ×OD	EN 60974-1-2-E11a EN60974-1-2-E11b
Moisture resistance test		pass		EN 60794-1-22-FS
Temperature range	Installation Operation Storage	-15 to +50°C -40 to +70°C -40 to +70°C		EN 60794-1-22-F1
Fire properties – Flammability		pass		EN60332-3-22 (cat.A) ČSN EN 50266-2-2
Fire properties – Acid gases		pass		EN 50267 EN 50267-2-2 EN 50267-2-3
Fire properties – Smoke density		pass		EN 61034-1 EN 61034-2

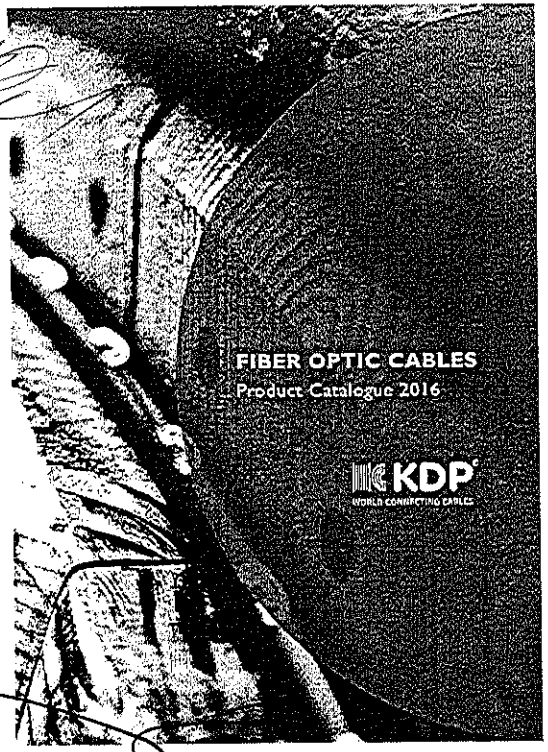
Cable life time - minimum 30 years



224



Каталогът е достъпен онлайн:
www. .abelovna.cz



Dear Customers,

since 1910 we have been supplying the cables which help you to solve your problems in data communication. Enclosed, please, find a new comprehensive and clear guide summary the best for the best list of our company.

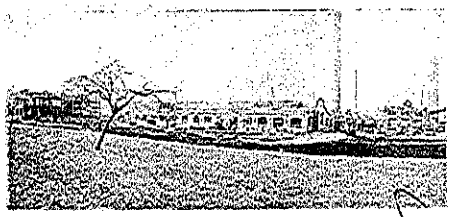
We tried not only to include the standard products that you presently know, carry and buy, but some innovations and brand new products as well. Despite the catalogue is considered as a complete presentation of our production, not all versions can be published and included.

For some special products, please, contact our Sales Departments that will gladly give you any information requested. Let us advise you of the fact that all cable parameters in this catalogue are for information only.

Summary

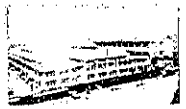
Index

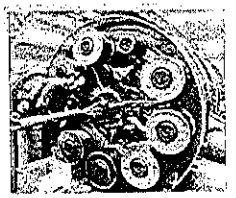
History and present of **KABELOVNA** Děčín Podmokly



KDP was founded in 1909 and 1910 as a branch of the Bergmann cable plant in Berlin, the original name of the company being „Rakousko-Uherská továrna pro dráty a kabely Siemens Podmokly".

From the very outset, the plant manufactured all types of power and communication cables with lead sheaths and the relevant cable tins, as well as mechanical and accessories, cable wires and insulation parts with accessories. Company activity at that time also included projects involving electrical equipment and its installation.





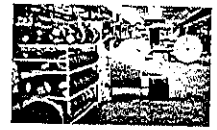
The cable factory came into the hands of Anglo-Continental as part of KDP&B a spol. Prvše when the Four Weddings war the company reconnected the above business. The production of metal communications cables got underway at this new Tuhn cable factory and neighbouring copper works were then merged in 1927 as the „Kabelwerk, Industriale a elektrotechnické závody KABEL-Chuderov, Praha." However the production programme at the cable factory did not change very materially.

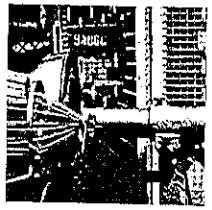
The company was nationalised after 1945. It was later incorporated as part of KABLO Kladno and its specialisation simplified. The main production programmes became the manufacture of communication cables and in 1961 KABLO Dolní Lhota became the commonly produced all cables for local and long-distance telecommunication networks using transfer technology. The company was privatised after 1990 became independent again and regained its original name of KABELOVNA Dolní Podmoklí a.s. SIEMENS AG Wien acquired the company in 1992. The result of mutual cooperation here was a considerable modernisation of production technology, the expansion of the range produced and the strengthening of KABELOVNA Dolní Podmoklí a.s. on global markets.

SIEMENS sold its share in KABELOVNA to American venture capital and Bancroft Eastern Europe Fund L.P. in July 2000, before this company in turn sold its share to American company CDT (Cable Design Technology) in December 2001.

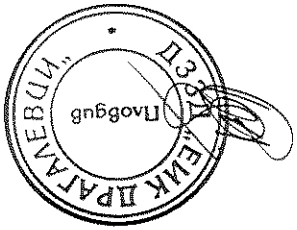
CDT then merged with American company BALDER in 2004, the newly-founded company taking on the name of Belden CDT Inc.

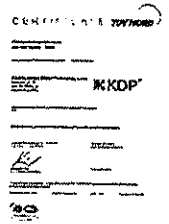
2007 the cable works is sold to Nilins Groups, the company is divided into Kabelovna Dolní Podmoklí, s.r.o. and KDP Assembly, s.r.o.

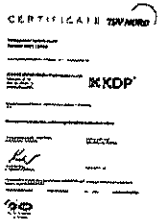




Certificates







History

c. 1. 1899	[illegible]
27. 6. 1911	[illegible]
05/1919	[illegible]
03/1930	[illegible]
05/1945	[illegible]
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1959	[illegible]
1961	[illegible]
1982–1984	[illegible]
1985	[illegible]
1988	[illegible]
31. 12. 1990	[illegible]
1992	[illegible]
1994	[illegible]
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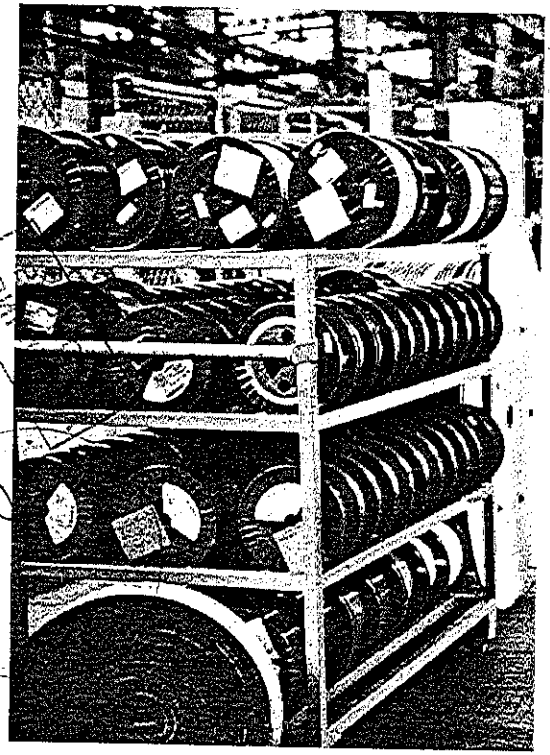
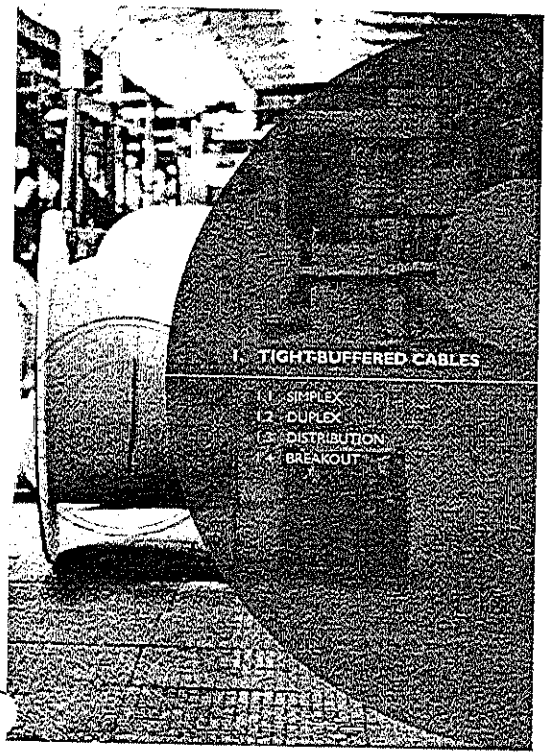
2015	[illegible]
1. 1. 2016	[illegible]

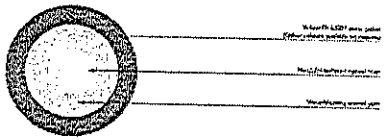




1
1.1

SIMPLEX FR-LSZH

DIN CODE J-V(ZN)H 1F | ID: 16x1, 17x1, 11x1, 12x1, Z026, 14x1, 15x1, Z174, 18x1, 19x1, 13x1



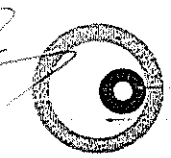
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

DUPLEX

DIN CODE: J-V(ZN)H Duplex 2.8 mm 2F | ID: 20x1



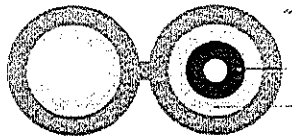
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

DUPLEX-ZIP CABLE FR-LSZH

DIN CODE: J-V(ZN)H 2F | ID: 2x1, 21x1, 22x1, 24x1, Z175, 28x1, 23x1



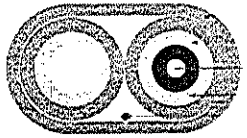
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

HEAVYDUPLEX FR-LSZH

DIN CODE: J-V(ZN)HH | ID: 32x1, 34x1, 38x1, Z17x, Z23.5, Z279



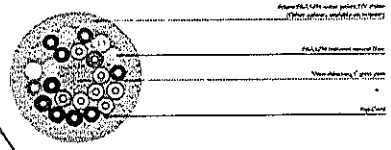
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

DISTRIBUTION

DIN CODE: J/A-VQ(BN)H max. 24F | ID: 5Ex1



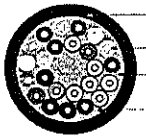
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

DISTRIBUTION

DIN CODE: J/A-VQ(BN)11Y max. 24F | ID: 5Ex7



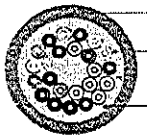
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

DISTRIBUTION

DIN CODE: J/A-VQ(ZN)H max. 24F | ID: 5Vx1



Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

DISTRIBUTION

DIN CODE:J/A-VQ(ZN)11Y max 24F | ID: 5Vx"

Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength	EN	
Color / marking		
Impact resistance		
Min. bend radius (long term)		
Min. bend radius		
Temperature range		
Cable resistance (nominal value for info.)		
Conductor per cable length		
Packaging		
Partial discharge		
Overall cable resistance		
Cable outer diameter		

KDP

DISTRIBUTION

DIN CODE:J/A-VQ(ZN)H max. 24F | ID 5V4

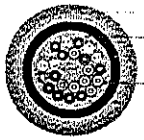
Mechanical and Environmental properties

Test	Value	Unit	Method	Comments
Cable nominal diameter				
Cable weight				
Outer jacket thickness				
Secondary covering thickness				
Max tensile strength				
Crush resistance test				
Impact resistance				
Min. bend radius (for laid)				
Min. bend radius (fixed)				
Maximum resistance test				
Temperature range				

KDP

DISTRIBUTION

DIN CODE:A-VQ(BN)H0H max 24F | ID 5C4R



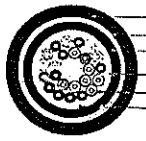
Mechanical and Environmental properties

Test	Value	Unit	Method	Comments
Cable nominal diameter				
Cable weight				
Outer jacket thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius (for laid)				
Min. bend radius (fixed)				
Maximum resistance test				
Temperature range				

KDP

DISTRIBUTION

DIN CODE:A-VQ(ZN)H(SR)2Y max. 24F | ID:55x0



Mechanical and Environmental properties

Test	Value	Unit	Method	Comments
Cable nominal diameter				
Cable weight				
Outer jacket thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius (for laid)				
Min. bend radius (fixed)				
Temperature range				

KDP

DISTRIBUTION

DIN CODE:J/A-VQ(ZN)H(SR)H max. 24F | ID: 55x1

Mechanical and Environmental properties

Test	Value	Unit	Method	Comments
Cable nominal diameter				
Cable weight				
Outer jacket thickness				
Secondary covering thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius (for laid)				
Min. bend radius (fixed)				
Temperature range				

KDP

DISTRIBUTION

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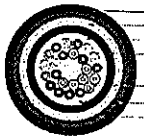


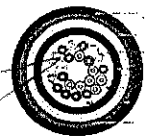
Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius (long term)		
Min. bend radius		
Temperature range		
Cable resistance (nominal value for info.)		
Conductor per cable length		
Packaging		
Partial discharge		
Overall cable resistance		
Cable outer diameter		

KDP

DISTRIBUTION

DIN CODE:JA-V(ZN)HBH max. 24F | ID: 5AxH



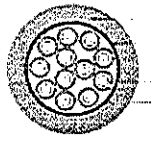
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

BREAKOUT FR-LSZH

DIN CODE:J-V(ZN)HH max. 48F, Breakout 2.0 mm | ID: 92F1, 92T1



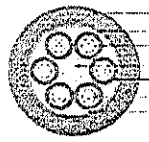
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

42X1

DIN CODE:J-V(ZN)HH max. 48F, Breakout 2.0 mm | ID: 42F1, 42T1



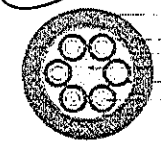
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

BREAKOUT FR-LSZH

DIN CODE:J-V(ZN)HH max. 24F, Breakout 2.0 mm | ID: 49F1, 49T1



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

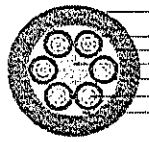
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

BREAKOUT FR-LSZH

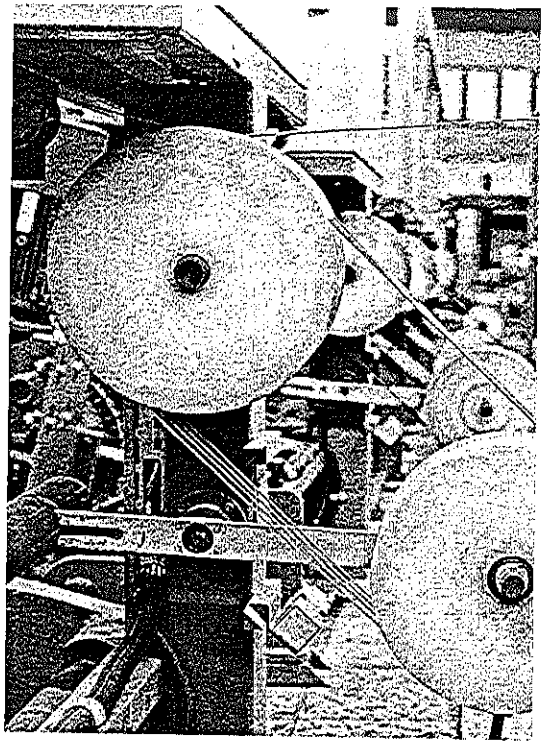
DIN CODE:J-V(ZN)H(BN)H max. 24F, Breakout 2.4 mm | ID: 44xI

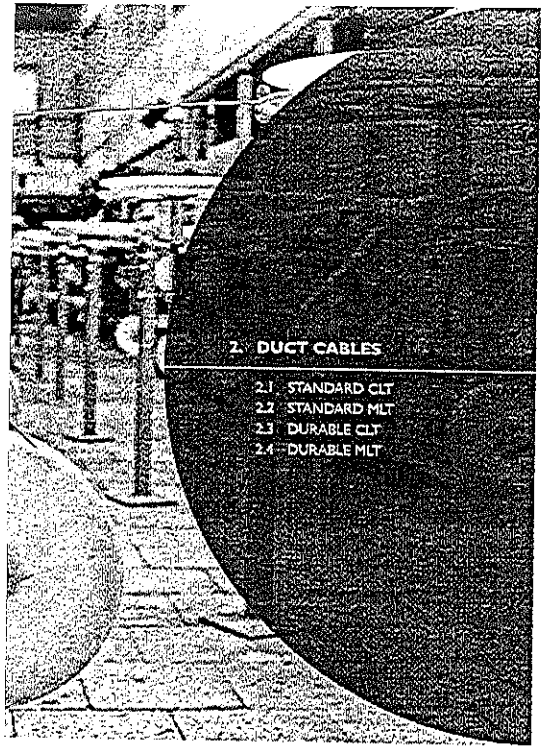


Mechanical and Environmental properties

Test	Method	Value/Unit

KDP





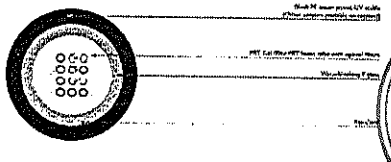
2. DUCT CABLES

KDP

2
2.1

CLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 1× 2.5 max. 12F | ID:AE01



Mechanical and Environmental properties

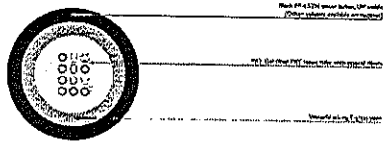
Test	Method	Value/class
Min. bend radius (single)		
Cyclic resistance		
Impact resistance		
Max. load (static)		
Flexural resistance		
Compound flow		
Coefficient of friction		
Temperature range		
Cable resistance, nominal length (cable)		
Minimum groove length		
Reference		
Outer jacket thickness		
Cable outer diameter		

KDP

2
2.1

CLT DUCT STANDARD

DIN CODE:JA-DQ(BN)H 1× 2.5 max. 12F | ID:AE02



Mechanical and Environmental properties

Test	Method	Value/class
Min. bend radius (single)		
Cyclic resistance		
Impact resistance		
Max. load (static)		
Flexural resistance		
Compound flow		
Coefficient of friction		
Temperature range		
Cable resistance, nominal length (cable)		
Minimum groove length		
Reference		
Outer jacket thickness		
Cable outer diameter		

KDP

2
2.1

UNI TUBE CABLE

DIN CODE:A-DQ(ZN)2Y max. 12F | ID:Z339

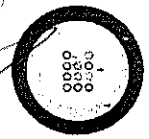
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight		kg/km		nominal
Outer jacket thickness				
Central tube diameter				
Min. bending radius				
Cable resistance, max.				
Impact test on tube				
Max. load (static, long term)				
Max. load (static, short term)				
Min. groove width				
Temperature range				

KDP

UNI TUBE CABLE

DIN CODE:A-DQ(ZN)2Y max.12F | ID:AL0



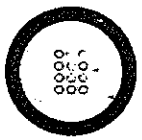
Mechanical and Environmental properties

Test	Value	Unit	Method	Comments
Cable outer diameter				
Cable weight				
Outer jacket thickness				
Conductor diameter				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (one shot)				
Min bend radius (per time)				
Flame resistance test				
Temperature range				

Cable life time minimum 30 years. The cable is suitable for outdoor installation.

CLT DUCT STANDARD

DIN CODE:A-DQ(ZN)2Y 1× 2.5 max.12F | ID:AA01

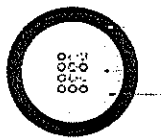


Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength		
Crush resistance		
Impact resistance		
Min bend radius		
Flame test method		
Conductor Fuse		
Temperature range		
Cable inflammation retarded length grade 1		
Standard package length		
Packaging		
Loose tube diameter		
Outer jacket thickness		
Cable outer diameter		

CLT DUCT STANDARD

DIN CODE:JA-DQ(ZN)H 1× 2.5 max.12F | ID:AA02

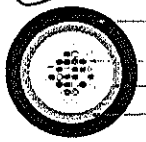


Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength		
Crush resistance		
Impact resistance		
Min bend radius		
Flame test method		
Conductor Fuse		
Temperature range		
Cable inflammation retarded length grade 1		
Standard package length		
Packaging		
Loose tube diameter		
Outer jacket thickness		
Cable outer diameter		

CLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 1× 3.0 max.24F | ID:BE01

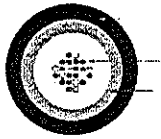


Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength		
Crush resistance		
Impact resistance		
Min bend radius		
Flame test method		
Conductor Fuse		
Temperature range		
Cable inflammation retarded length grade 1		
Standard package length		
Packaging		
Loose tube diameter		
Outer jacket thickness		
Cable outer diameter		

CLT DUCT STANDARD

DIN CODE:JA-DQ(BN)H 1× 3.0 max.24F | ID:BE02

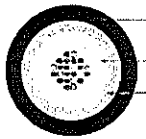


Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength		
Crush resistance		
Impact resistance		
Min bend radius		
Flame test method		
Conductor Fuse		
Temperature range		
Cable inflammation retarded length grade 1		
Standard package length		
Packaging		
Loose tube diameter		
Outer jacket thickness		
Cable outer diameter		

CLT DUCT STANDARD

DIN CODE:A-DQ(ZN)2Y 1× 3.0 max.24F | ID:BA01

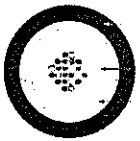


Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength		
Crush resistance		
Impact resistance		
Min bend radius		
Flame test method		
Conductor Fuse		
Temperature range		
Cable inflammation retarded length grade 1		
Standard package length		
Packaging		
Loose tube diameter		
Outer jacket thickness		
Cable outer diameter		

CLT DUCT STANDARD

DIN CODE:J/A-DQ(ZN)H 1× 3.0 max. 24F | ID: BA02



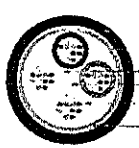
Mechanical and Environmental properties

Test	Method	Value/Unit
Min. bend radius		
Operating temperature		
Max. tensile strength		
Max. crush resistance		
Min. bend radius		
Max. tensile load		
Max. no. of bends		
Cable weight		
Flame test		
Suspension length		
Cable conductor material (wire)		
Conductor section weight		
Sheathing		
Sheath outer diameter		
Outer jacket thickness		
Cable outer diameter		

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 4× 2.3 max. 48F | ID: LE0



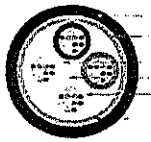
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Fiber pulse distance				
Cable bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius one load				
Min. bend radius dynamic				
Maximum crush test load				
Temperature range				

KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 4× 2.3 max. 48F | ID: LE02



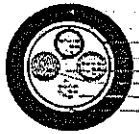
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Fiber pulse distance				
Cable bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius one load				
Min. bend radius dynamic				
Maximum crush test load				
Temperature range				

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(ZN)2Y 4× 2.3 max. 48F | ID: LA01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Fiber pulse distance				
Cable bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius one load				
Min. bend radius dynamic				
Maximum crush test load				
Temperature range				

KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(ZN)H 4× 2.3 max. 48F | ID: LA02

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Fiber pulse distance				
Cable bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius one load				
Min. bend radius dynamic				
Maximum crush test load				
Temperature range				

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y S× 1.7 max. 60F | ID: UE01

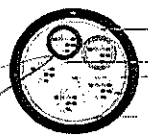
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Fiber pulse distance				
Cable bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius one load				
Min. bend radius dynamic				
Maximum crush test load				
Temperature range				

KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 5× 1.7 max. 60F | ID: UE02

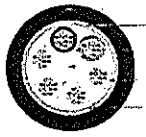


Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 6× 1.7 max. 72F | ID: CE0F

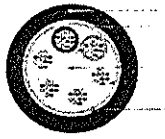


Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 6× 1.7 max. 72F | ID: CE02

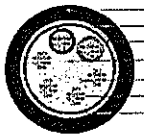


Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 6× 2.3 max. 72F | ID: FE01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

MLT DUCT STANDARD

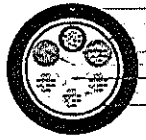
DIN CODE:J/A-DQ(BN)H 6× 2.3 max. 72F | ID: FE02

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

MLT DUCT STANDARD

DIN CODE:A-DQ(ZN)2Y 6× 2.3 max. 72F | ID: FA01



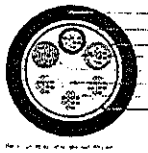
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

233

MLT DUCT STANDARD

DIN CODE:J/A-DQ(ZN)H 6× 2,3 max 72F | ID:FA0[illegible]



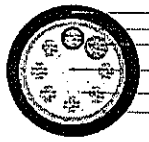
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 8× 1,7 max 96F | ID:[illegible]



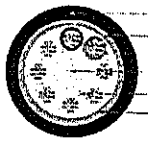
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 8× 1,7 max 96F | ID:[illegible]



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 8× 2,3 max 96F | ID:GE01

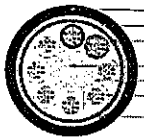
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 8× 2,3 max 96F | ID:GE02



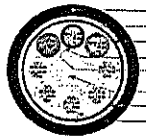
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(ZN)2Y 8× 2,3 max 96F | ID:GA01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
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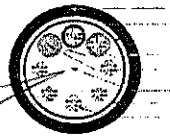
KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(ZN)H 8× 2.3 max. 96F | ID:GA02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm	EN 60811-1-1	
Cable weight	~9	kg/km		nominal
Outer jacket thickness	~1	mm		
Inner tube diameter	~7	mm		
Max tensile strength	1690	N	EN 60794-1-E1	Max fiber strain 0.6% long term 0.25% Max fiber load 2.8 N/tex, up to 1 year Max cable load 1690 N, up to 1 year Cable damaged, do not use
Crush resistance max	2000	N	EN 60794-1-E3A	Test length 100 mm Load applied for 1 min Max load applied 2000 N Fiber strain ≤ 0.33% Cable damaged, do not use
Impact resistance	10	Number of impacts	EN 60794-1-E4	Impact energy 4 Nm Impact applied at 20 °C Max load applied 10 Fiber strain ≤ 0.33% Cable damaged, do not use
Max bend radius (no load)	15	× OD	EN 60794-1-E11	Max bend radius applied 15 × OD Fiber strain ≤ 0.33% Cable damaged, do not use
Max bend radius (load)	20	× OD	EN 60794-1-E11	Max bend radius applied 20 × OD Max load applied 1690 N Fiber strain ≤ 0.33% Cable damaged, do not use
Maximum installation load	1690	N	EN 60794-1-E1	Max load applied 1690 N Fiber strain ≤ 0.33% Cable damaged, do not use
Temperature range	Installation Operation Storage	-15 to +50 °C -40 to +70 °C -40 to +70 °C	EN 60794-1-E11	Cable tested down to -40 °C Fiber strain ≤ 0.33% Cable damaged, do not use

Cable lifetime: minimum 20 years. This cable is suitable for outdoor use.

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 12× 1.7 max. 144F | ID:RE01

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	11.2 ±0.5	mm	EN 60811-1-1	
Cable weight	~95	kg/km		nominal
Outer jacket thickness	1.5 ±0.2	mm		
Loose tube diameter	2.7	mm		
Max tensile strength	4500	N	EN 60794-1-E1	Max fiber strain 0.6% long term 0.25% Max fiber load 2.8 N/tex, up to 1 year Max cable load 4500 N, up to 1 year Cable damaged, do not use
Crush resistance max	2000	N	EN 60794-1-E3A	Test length 100 mm Load applied for 1 min Max load applied 2000 N Fiber strain ≤ 0.33% Cable damaged, do not use
Impact resistance	5	Number of impacts	EN 60794-1-E4	Impact energy 4 Nm Impact applied at 20 °C Max load applied 5 Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (no load)	15	× OD	EN 60794-1-E11	Min bend radius applied 15 × OD Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (load)	20	× OD	EN 60794-1-E11	Min bend radius applied 20 × OD Max load applied 4500 N Fiber strain ≤ 0.33% Cable damaged, do not use
Maximum installation load	4500	N	EN 60794-1-E1	Max load applied 4500 N Fiber strain ≤ 0.33% Cable damaged, do not use
Temperature range	Installation Operation Storage	-15 to +50 °C -40 to +70 °C -40 to +70 °C	EN 60794-1-E11	Cable tested down to -40 °C Fiber strain ≤ 0.33% Cable damaged, do not use

Cable lifetime: minimum 20 years. This cable is suitable for outdoor use.

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 12× 1.7 max. 144F | ID:RE02

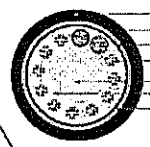
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	11.2 ±0.5	mm	EN 60811-1-1	
Cable weight	~95	kg/km		nominal
Outer jacket thickness	1.5 ±0.2	mm		
Loose tube diameter	2.7	mm		
Max tensile strength	4500	N	EN 60794-1-E1	Max fiber strain 0.6% long term 0.25% Max fiber load 2.8 N/tex, up to 1 year Max cable load 4500 N, up to 1 year Cable damaged, do not use
Crush resistance max	2000	N	EN 60794-1-E3A	Test length 100 mm Load applied for 1 min Max load applied 2000 N Fiber strain ≤ 0.33% Cable damaged, do not use
Impact resistance	5	Number of impacts	EN 60794-1-E4	Impact energy 4 Nm Impact applied at 20 °C Max load applied 5 Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (no load)	15	× OD	EN 60794-1-E11	Min bend radius applied 15 × OD Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (load)	20	× OD	EN 60794-1-E11	Min bend radius applied 20 × OD Max load applied 4500 N Fiber strain ≤ 0.33% Cable damaged, do not use
Maximum installation load	4500	N	EN 60794-1-E1	Max load applied 4500 N Fiber strain ≤ 0.33% Cable damaged, do not use
Temperature range	Installation Operation Storage	-15 to +50 °C -40 to +70 °C -40 to +70 °C	EN 60794-1-E11	Cable tested down to -40 °C Fiber strain ≤ 0.33% Cable damaged, do not use

Cable lifetime: minimum 20 years. This cable is suitable for outdoor use.

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 12× 2.3 max. 144F | ID:HE01



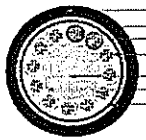
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.6 ±0.5	mm	EN 60811-1-1	
Cable weight	~175	kg/km		nominal
Outer jacket thickness	1.5	mm		
Loose tube diameter	2.9	mm		
Max tensile strength	6200	N	EN 60794-1-E1	Max fiber strain 0.6% long term 0.25% Max fiber load 2.8 N/tex, up to 1 year Max cable load 6200 N, up to 1 year Cable damaged, do not use
Crush resistance max	2000	N	EN 60794-1-E3A	Test length 100 mm Load applied for 1 min Max load applied 2000 N Fiber strain ≤ 0.33% Cable damaged, do not use
Impact resistance	5	Number of impacts	EN 60794-1-E4	Impact energy 4 Nm Impact applied at 20 °C Max load applied 5 Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (no load)	15	× OD	EN 60794-1-E11	Min bend radius applied 15 × OD Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (load)	20	× OD	EN 60794-1-E11	Min bend radius applied 20 × OD Max load applied 6200 N Fiber strain ≤ 0.33% Cable damaged, do not use
Maximum installation load	6200	N	EN 60794-1-E1	Max load applied 6200 N Fiber strain ≤ 0.33% Cable damaged, do not use
Temperature range	Installation Operation Storage	-15 to +50 °C -40 to +70 °C -40 to +70 °C	EN 60794-1-E11	Cable tested down to -40 °C Fiber strain ≤ 0.33% Cable damaged, do not use

Cable lifetime: minimum 20 years. This cable is suitable for outdoor use.

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 12× 2.3 max. 144F | ID:HE02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.6 ±0.5	mm	EN 60811-1-1	
Cable weight	~175	kg/km		nominal
Outer jacket thickness	1.5	mm		
Loose tube diameter	2.9	mm		
Max tensile strength	6200	N	EN 60794-1-E1	Max fiber strain 0.6% long term 0.25% Max fiber load 2.8 N/tex, up to 1 year Max cable load 6200 N, up to 1 year Cable damaged, do not use
Crush resistance max	2000	N	EN 60794-1-E3A	Test length 100 mm Load applied for 1 min Max load applied 2000 N Fiber strain ≤ 0.33% Cable damaged, do not use
Impact resistance	5	Number of impacts	EN 60794-1-E4	Impact energy 4 Nm Impact applied at 20 °C Max load applied 5 Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (no load)	15	× OD	EN 60794-1-E11	Min bend radius applied 15 × OD Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (load)	20	× OD	EN 60794-1-E11	Min bend radius applied 20 × OD Max load applied 6200 N Fiber strain ≤ 0.33% Cable damaged, do not use
Maximum installation load	6200	N	EN 60794-1-E1	Max load applied 6200 N Fiber strain ≤ 0.33% Cable damaged, do not use
Temperature range	Installation Operation Storage	-15 to +50 °C -40 to +70 °C -40 to +70 °C	EN 60794-1-E11	Cable tested down to -40 °C Fiber strain ≤ 0.33% Cable damaged, do not use

Cable lifetime: minimum 20 years. This cable is suitable for outdoor use.

MLT DUCT STANDARD

DIN CODE:A-DQ(ZN)2Y 12× 2.3 max. 144F | ID:HA01

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.6 ±0.5	mm	EN 60811-1-1	
Cable weight	~175	kg/km		nominal
Outer jacket thickness	1.5	mm		
Loose tube diameter	2.9	mm		
Max tensile strength	6200	N	EN 60794-1-E1	Max fiber strain 0.6% long term 0.25% Max fiber load 2.8 N/tex, up to 1 year Max cable load 6200 N, up to 1 year Cable damaged, do not use
Crush resistance max	2000	N	EN 60794-1-E3A	Test length 100 mm Load applied for 1 min Max load applied 2000 N Fiber strain ≤ 0.33% Cable damaged, do not use
Impact resistance	5	Number of impacts	EN 60794-1-E4	Impact energy 4 Nm Impact applied at 20 °C Max load applied 5 Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (no load)	15	× OD	EN 60794-1-E11	Min bend radius applied 15 × OD Fiber strain ≤ 0.33% Cable damaged, do not use
Min bend radius (load)	20	× OD	EN 60794-1-E11	Min bend radius applied 20 × OD Max load applied 6200 N Fiber strain ≤ 0.33% Cable damaged, do not use
Maximum installation load	6200	N	EN 60794-1-E1	Max load applied 6200 N Fiber strain ≤ 0.33% Cable damaged, do not use
Temperature range	Installation Operation Storage	-15 to +50 °C -40 to +70 °C -40 to +70 °C	EN 60794-1-E11	Cable tested down to -40 °C Fiber strain ≤ 0.33% Cable damaged, do not use

Cable lifetime: minimum 20 years. This cable is suitable for outdoor use.

MLT DUCT STANDARD

DIN CODE:J/A-DQ(ZN)H 12× 2,3 max. 144F | ID: HAU2

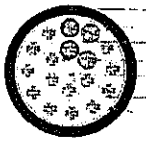
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm	EN ISO 6...	
Cable weight	96	kg/km		
Outer jacket thickness		mm		
Strain hole diameter		mm		
Max. allowable tension		N		Short-term: ... N Long-term: ... N
Crush resistance test		N/cm		
Impact resistance test		Nm/mm		
Min. bend radius (no load)				
Min. bend radius (load)				
Maximum temperature rate				
Temperature range				

Cable life time > minimum 20 years. This table is a guideline for indoor or outdoor use.

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 18× 1,7 max. 216 F | ID VL01



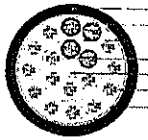
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Strain hole diameter		mm		
Max. allowable tension	5300	N		Short-term: ... N Long-term: ... N
Crush resistance test	5700	N		
Impact resistance test	7	Nm/mm		
Min. bend radius (no load)	15	x OD		
Min. bend radius (load)	20	x OD		
Maximum temperature rate				
Temperature range				

Cable life time > minimum 20 years. This table is a guideline for indoor or outdoor use.

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 18× 1,7 max. 216 F | ID VL02



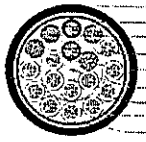
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Strain hole diameter		mm		
Max. allowable tension	5300	N		Short-term: ... N Long-term: ... N
Crush resistance test	5700	N		
Impact resistance test	7	Nm/mm		
Min. bend radius (no load)	15	x OD		
Min. bend radius (load)	20	x OD		
Maximum temperature rate				
Temperature range				

Cable life time > minimum 20 years. This table is a guideline for indoor or outdoor use.

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 18× 2,3 max. 216F | ID: IE01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Strain hole diameter		mm		
Max. allowable tension	5700	N		Short-term: ... N Long-term: ... N
Crush resistance test	5700	N		
Impact resistance test		Nm/mm		
Min. bend radius (no load)				
Min. bend radius (load)				
Maximum temperature rate				
Temperature range				

Cable life time > minimum 20 years. This table is a guideline for indoor or outdoor use.

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 18× 2,3 max. 216F | ID: IE02

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Strain hole diameter		mm		
Max. allowable tension	5300	N		Short-term: ... N Long-term: ... N
Crush resistance test	5700	N		
Impact resistance test		Nm/mm		
Min. bend radius (no load)				
Min. bend radius (load)				
Maximum temperature rate				
Temperature range				

Cable life time > minimum 20 years. This table is a guideline for indoor or outdoor use.

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 36× 2,5 max. 432F | ID: ME00

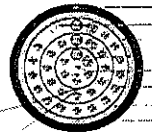
Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Max. pulling force		
Operating temperature		
Cable weight		
Cable construction		
Fiber type		
Temperature range	Installation Operation Storage	

Cable life time > minimum 20 years. This table is a guideline for indoor or outdoor use.

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 36≠ 2,5 max 432F | ID: MT02



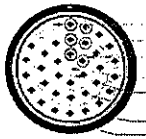
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

MLT DUCT STANDARD

DIN CODE:A-DQ(BN)2Y 36≠ 3,0 max. 864F | ID. Z017



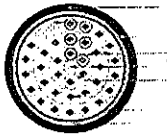
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT DUCT STANDARD

DIN CODE:J/A-DQ(BN)H 36≠ 3,0 max. 864F | ID. Z018



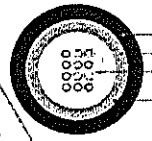
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

CLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 1×2,5 max. 12F | ID:AR01



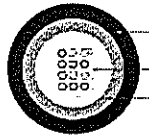
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

CLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 1×2,5 max. 12F | ID:AR02



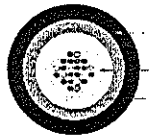
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

CLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y II 1×3,0 max. 24F | ID: BP01



Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

CLT DUCT DURABLE

DIN CODE: J/A-DQ(BN)BH II 1×3,0 max. 24F | ID: RK07

Mechanical and Environmental properties

[illegible]

KDP

MLT DUCT DURABLE

DIN CODE: A-DQ(BN)B2Y 4×2,3 max. 48F | ID: LRC1

Mechanical and Environmental properties

[illegible]

KDP

MLT DUCT DURABLE

DIN CODE: J/A-DQ(BN)BH 4×2,3 max. 48F | ID: LRL

Mechanical and Environmental properties

[illegible]

KDP

MLT DUCT DURABLE

DIN CODE: A-DQ2Y(BN)B2Y 4×2,3 max. 48F | ID: LQP1

Mechanical and Environmental properties

[illegible]

KDP

MLT DUCT DURABLE

DIN CODE: J/A-DQH(BN)BH 4×2,3 max. 48F | ID: LQF2

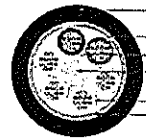
Mechanical and Environmental properties

[illegible]

KDP

MLT DUCT DURABLE

DIN CODE: A-DQ(BN)B2Y 6×1,7 max. 72F | ID: CR01



Mechanical and Environmental properties

[illegible]

KDP

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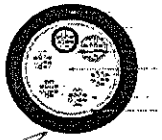
MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 6×1.7 max. 72F | ID: CR2L



Mechanical and Environmental properties

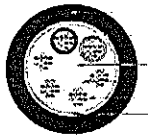
Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Outer jacket thickness				
Lowest bend diameter				
Max. tensile strength				
Crush resistance				
Impact resistance test				
Max. bend radius (fixed)				
Max. bend radius (load)				
Moisture resistance test				
Temperature range				

Cable life time – minimum 30 years. This cable is suitable for outdoor use.

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 6×2.3 max. 72F | ID: FR01



Mechanical and Environmental properties

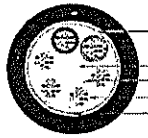
Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Outer jacket thickness				
Lowest bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Max. bend radius				
Moisture resistance test				
Temperature range				

Cable life time – minimum 30 years. This cable is suitable for outdoor use.

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 6×2.3 max. 72F | ID: FR02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Outer jacket thickness				
Lowest bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Max. bend radius				
Moisture resistance test				
Temperature range				

Cable life time – minimum 30 years. This cable is suitable for outdoor use.

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ2Y(BN)B2Y 6×2.3 max. 72F | ID: FOP1

Mechanical and Environmental properties

Test	Method	Value/Unit
Tensile strength (long term)		
Tensile strength (short term)		
Crush resistance		
Impact resistance		
Min. bend radius		
Maximum pulling force		
Compound force		
Temperature range		
Cable refurbishment (minimum weight/m)		
Standard cable length		
Packaging		
Lowest cable installation		
Inner jacket thickness		
Outer jacket thickness		
Cable outer diameter		

Cable life time – minimum 30 years. This cable is suitable for outdoor use.

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQH(BN)BH 6× 2.3 max. 72F | ID: FOF2

Mechanical and Environmental properties

Test	Method	Value/Unit
Tensile strength (long term)		
Tensile strength (short term)		
Crush resistance		
Impact resistance		
Min. bend radius		
Maximum pulling force		
Compound force		
Temperature range		
Cable refurbishment (minimum weight/m)		
Standard cable length		
Packaging		
Lowest cable installation		
Inner jacket thickness		
Outer jacket thickness		
Cable outer diameter		

Cable life time – minimum 30 years. This cable is suitable for outdoor use.

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 8× 1.7 max. 96F | ID: PR01

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Outer jacket thickness				
Lowest bend diameter				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Max. bend radius (fixed)				
Max. bend radius (load)				
Moisture resistance test				
Temperature range				

Cable life time – minimum 30 years. This cable is suitable for outdoor use.

KDP

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MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 8= 1,7 max. 96F | ID: PRO...

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable armor thickness				
Cable weight				
Outer jacket thickness				
Inner tube thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Water penetration test				
Temperature range				

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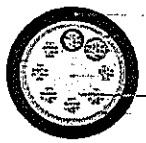
KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 8= 2,3 max. 96F | ID: GR01



Mechanical and Environmental properties

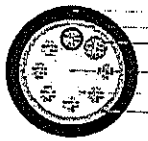
Test	Value	Unit	Method	Comment
Cable armor thickness				
Cable weight				
Outer jacket thickness				
Inner tube thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius				
Water penetration test				
Temperature range				

2 / 24

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 8= 2,3 max. 96F | ID: GR02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable armor thickness				
Cable weight				
Outer jacket thickness				
Inner tube thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius				
Water penetration test				
Temperature range				

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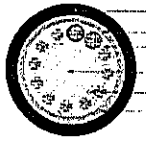
KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 12= 1,7 max. 144F | ID: RR01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable armor thickness				
Cable weight				
Outer jacket thickness				
Inner tube thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius				
Water penetration test				
Temperature range				

2 / 24

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 12= 1,7 max. 144F | ID: RR02

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable armor thickness				
Cable weight				
Outer jacket thickness				
Inner tube thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius				
Water penetration test				
Temperature range				

2 / 24

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 12= 2,3 max. 144F | ID: HR01

Mechanical and Environmental properties

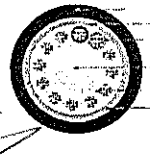
Test	Value	Unit	Method	Comment
Cable armor thickness				
Cable weight				
Outer jacket thickness				
Inner tube thickness				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius				
Water penetration test				
Temperature range				

2 / 24

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 12× 2,3 max. 144F | ID:HR02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/cm		
Impact resistance		N·m		
Min. bend radius		mm		
Minimum elongation		%		
Compound type				
Temperature range	operation	°C		
	storage	°C		
	transportation	°C		
Cable coil package nominal weight (+/-)		kg/pcs		
Coil/drum package length		mm		
Packaging				
Loose tube material				
Optical fiber attenuation				
Cable sheath thickness		mm		

Cable life time > minimum 30 years. The cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 12× 2,8 max. 288F | ID:YR01

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		N, kg/km
Crush resistance		N/cm
Impact resistance		N·m, kg/km
Min. bend radius		mm
Minimum elongation		%
Compound type		
Temperature range	operation	°C
	storage	°C
	transportation	°C
Cable coil package nominal weight (+/-)		kg/pcs
Coil/drum package length		mm
Packaging		
Loose tube material		
Optical fiber attenuation		
Cable sheath thickness		mm

Cable life time > minimum 30 years. The cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 12× 2,8 max. 288F | ID:YR02

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		N, kg/km
Crush resistance		N/cm
Impact resistance		N·m, kg/km
Min. bend radius		mm
Minimum elongation		%
Compound type		
Temperature range	operation	°C
	storage	°C
	transportation	°C
Cable coil package nominal weight (+/-)		kg/pcs
Coil/drum package length		mm
Packaging		
Loose tube material		
Optical fiber attenuation		
Cable sheath thickness		mm
Cable outer diameter		mm

Cable life time > minimum 30 years. The cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 18× 1,7 max. 216F | ID:VR01

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/cm		
Impact resistance		N·m		
Min. bend radius		mm		
Minimum elongation		%		
Compound type				
Temperature range	operation	°C		
	storage	°C		
	transportation	°C		

Cable life time > minimum 30 years. The cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:J/A-DQ(BN)BH 18× 1,7 max. 216F | ID:VR02

Mechanical and Environmental properties

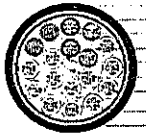
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/cm		
Impact resistance		N·m		
Min. bend radius		mm		
Minimum elongation		%		
Compound type				
Temperature range	operation	°C		
	storage	°C		
	transportation	°C		

Cable life time > minimum 30 years. The cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 18× 2,3 max. 216F | ID:IR01



Mechanical and Environmental properties

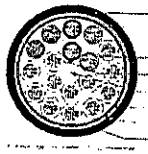
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/cm		
Impact resistance		N·m		
Min. bend radius		mm		
Minimum elongation		%		
Compound type				
Temperature range	operation	°C		
	storage	°C		
	transportation	°C		

Cable life time > minimum 30 years. The cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:JA-DQ(BN)BH 18× 2.3 max. 216F | ID: RU2



2
2.4

Mechanical and Environmental properties

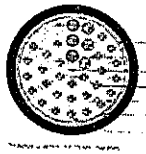
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight	24	kg/km		
Outer jacket thickness	1.8 ±0.3	mm		
Loose tube diameter	2.4	mm		
Max. tensile strength	4700	N		
Crush resistance max.	1500	N		
Bend radius min. short	15	x OD		
Bend radius min. long	10	x OD		
Max. temperature rise		dBm		
Temperature range	Installation Operation Storage			

Cable must be ... Installation ... This cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:A-DQ(BN)B2Y 36× 2.3 max. 932F | ID: MR00



2
2.4

Mechanical and Environmental properties

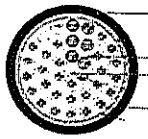
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		calculated
Outer jacket thickness		mm		
Loose tube diameter		mm		
Max. tensile strength		N		
Crush resistance max.		N		
Bend radius min. short		x OD		
Bend radius min. long		x OD		
Max. temperature rise		dBm		
Temperature range	Installation Operation Storage			

Cable must be ... Installation ... This cable is suitable for outdoor use

KDP

MLT DUCT DURABLE

DIN CODE:JA-DQ(BN)BH 36× 2.3 max. 932F | ID: MR02



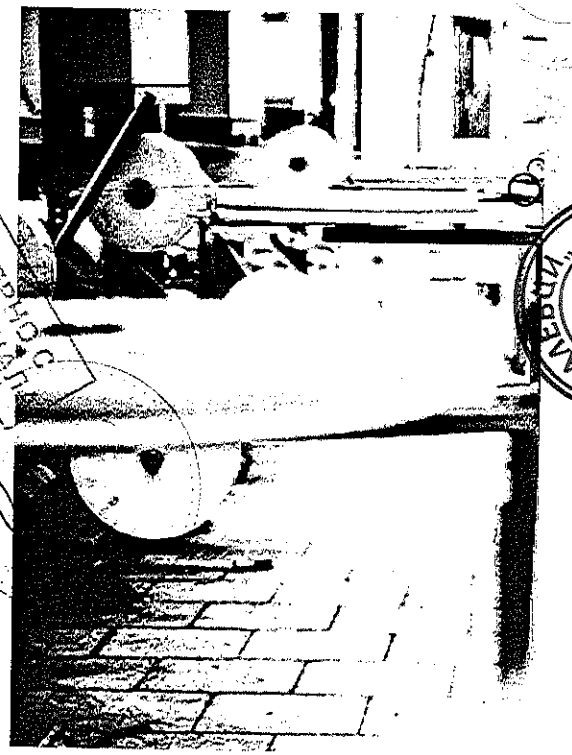
2
2.4

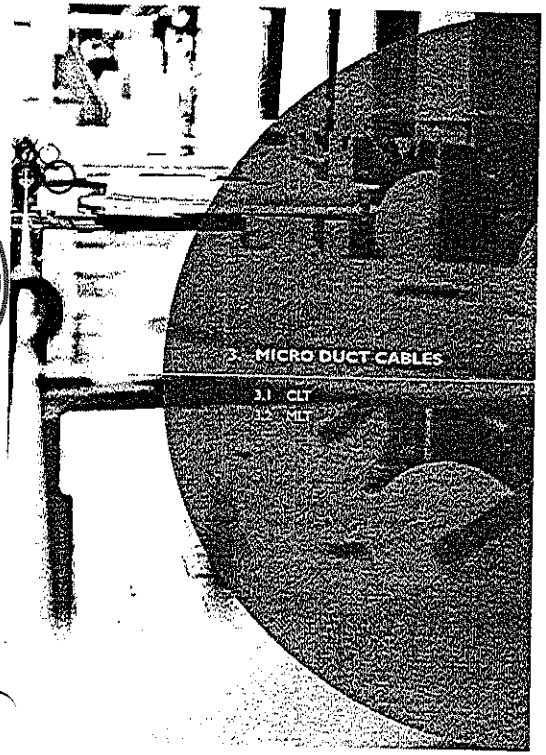
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Max. tensile strength		N		
Crush resistance max.		N		
Bend radius min. short		x OD		
Bend radius min. long		x OD		
Max. temperature rise		dBm		
Temperature range	Installation Operation Storage			

Cable must be ... Installation ... This cable is suitable for outdoor use

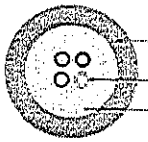
KDP





AIR BLOWN UNIT

DIN CODE:Air Blown Unit 2.0 mm max. 4F | ID: Z044



3
2.1

Mechanical and Environmental properties

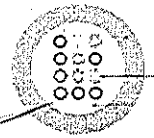
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		calculated
Outer jacket thickness		mm		
Coefficient of friction				
Max. tensile strength		N		
Crush resistance max.		N		
Bend radius min. short		x OD		
Bend radius min. long		x OD		
Max. temperature rise		dBm		
Temperature range	Installation Operation Storage			

Cable must be ... Installation ... This cable is suitable for outdoor use

KDP

AIR BLOWN UNIT

DIN CODE:Air Blown Unit 2,5 mm max. 12F | ID: Z008



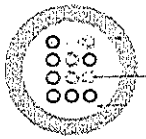
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

AIR BLOWN UNIT

DIN CODE:Air Blown Unit 2,8 mm max. 12F | ID: Z006



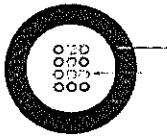
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

AIR BLOWN UNIT

DIN CODE:A-D4Y Blown Cable 3,5 mm max. 12F | ID: Z007



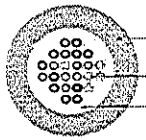
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

AIR BLOWN UNIT

DIN CODE:Air Blown Unit 3,2 mm max. 24F | ID: Z238



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 4×1,4 max. 48F (200 µm) | ID: Z021

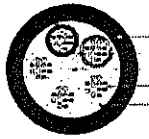
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT BLOWN MICRO CABLE

DIN CODE:A-DQ2Y 5× 1,5 max. 60F | ID: Z019



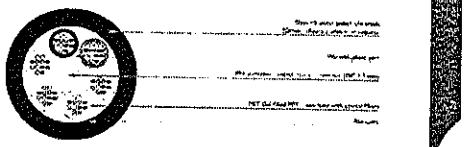
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 6×1.5 max. 72F | ID:TM01



Mechanical and Environmental properties

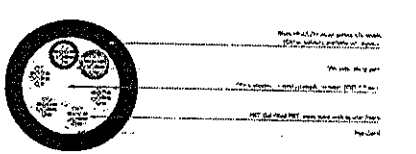
Test	Value	Unit	Method	Comment
Cable outer diameter	14.4 ± 0.5	mm	EN 60811-1-1	
Cable weight	~210	kg/km		
Cable bend radius	10	x D		
Cable tensile strength	1500	N	EN 60794-1-2 E1	
Crush resistance test	1000	N	EN 60794-1-2 E3	
Impact resistance test	5	Number of impacts	EN 60794-1-2 E4	
Min. bend radius (static)	20	x OD	EN 60794-1-2 E11	
Min. bend radius (dyn.)	30	x OD	EN 60794-1-2 E11	
Flexibility/resistance test	2000	cycles	EN 60794-1-2 E6	
Temperature range	Operation: -20 to +70 °C Storage: -40 to +70 °C		EN 60794-1-2 F1	

Cable life time > minimum 30 years. This cable is suitable for blowing into ducts.

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)H 6×1.5 max. 72F | ID:TM02



Mechanical and Environmental properties

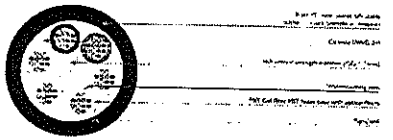
Test	Value	Unit	Method	Comment
Cable outer diameter	14.4 ± 0.5	mm	EN 60811-1-1	
Cable weight	~210	kg/km		
Cable bend radius	10	x D		
Cable tensile strength	1500	N	EN 60794-1-2 E1	
Crush resistance test	1000	N	EN 60794-1-2 E3	
Impact resistance test	5	Number of impacts	EN 60794-1-2 E4	
Min. bend radius (static)	20	x OD	EN 60794-1-2 E11	
Min. bend radius (dyn.)	30	x OD	EN 60794-1-2 E11	
Flexibility/resistance test	2000	cycles	EN 60794-1-2 E6	
Temperature range	Operation: -20 to +70 °C Storage: -40 to +70 °C		EN 60794-1-2 F1	

Cable life time > minimum 30 years. This cable is suitable for blowing into ducts.

KDP

MLT MICRO DUCT

DIN CODE:A-DSQ(ZN)2Y 6×1.5 max. 72F | ID:TM51



Mechanical and Environmental properties

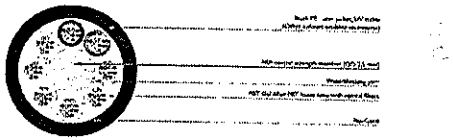
Test	Value	Unit	Method	Comment
Cable outer diameter	14.4 ± 0.5	mm	EN 60811-1-1	
Cable weight	~210	kg/km		
Cable bend radius	10	x D		
Cable tensile strength	1500	N	EN 60794-1-2 E1	
Crush resistance test	1000	N	EN 60794-1-2 E3	
Impact resistance test	5	Number of impacts	EN 60794-1-2 E4	
Min. bend radius (static)	20	x OD	EN 60794-1-2 E11	
Min. bend radius (dyn.)	30	x OD	EN 60794-1-2 E11	
Flexibility/resistance test	2000	cycles	EN 60794-1-2 E6	
Temperature range	Operation: -20 to +70 °C Storage: -40 to +70 °C		EN 60794-1-2 F1	

Cable life time > minimum 30 years. This cable is suitable for blowing into ducts.

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 8×1.5 max. 96F | ID:QM01



Mechanical and Environmental properties

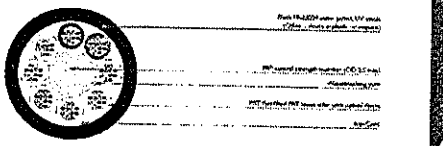
Test	Value	Unit	Method	Comment
Cable outer diameter	16.4 ± 0.5	mm	EN 60811-1-1	
Cable weight	~270	kg/km		
Cable bend radius	10	x D		
Cable tensile strength	1500	N	EN 60794-1-2 E1	
Crush resistance test	1000	N	EN 60794-1-2 E3	
Impact resistance test	5	Number of impacts	EN 60794-1-2 E4	
Min. bend radius (static)	20	x OD	EN 60794-1-2 E11	
Min. bend radius (dyn.)	30	x OD	EN 60794-1-2 E11	
Flexibility/resistance test	2000	cycles	EN 60794-1-2 E6	
Temperature range	Operation: -20 to +70 °C Storage: -40 to +70 °C		EN 60794-1-2 F1	

Cable life time > minimum 30 years. This cable is suitable for blowing into ducts.

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)H 8×1.5 max. 96F | ID:QM02



Mechanical and Environmental properties

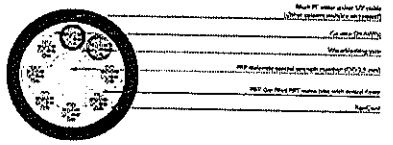
Test	Value	Unit	Method	Comment
Cable outer diameter	16.4 ± 0.5	mm	EN 60811-1-1	
Cable weight	~270	kg/km		
Cable bend radius	10	x D		
Cable tensile strength	1500	N	EN 60794-1-2 E1	
Crush resistance test	1000	N	EN 60794-1-2 E3	
Impact resistance test	5	Number of impacts	EN 60794-1-2 E4	
Min. bend radius (static)	20	x OD	EN 60794-1-2 E11	
Min. bend radius (dyn.)	30	x OD	EN 60794-1-2 E11	
Flexibility/resistance test	2000	cycles	EN 60794-1-2 E6	
Temperature range	Operation: -20 to +70 °C Storage: -40 to +70 °C		EN 60794-1-2 F1	

Cable life time > minimum 30 years. This cable is suitable for blowing into ducts.

KDP

MLT MICRO DUCT

DIN CODE:A-DSQ(ZN)2Y 8×1.5 max. 96F | ID:QM51



Mechanical and Environmental properties

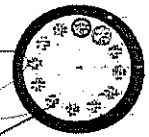
Test	Value	Unit	Method	Comment
Cable outer diameter	16.4 ± 0.5	mm	EN 60811-1-1	
Cable weight	~270	kg/km		
Cable bend radius	10	x D		
Cable tensile strength	1500	N	EN 60794-1-2 E1	
Crush resistance test	1000	N	EN 60794-1-2 E3	
Impact resistance test	5	Number of impacts	EN 60794-1-2 E4	
Min. bend radius (static)	20	x OD	EN 60794-1-2 E11	
Min. bend radius (dyn.)	30	x OD	EN 60794-1-2 E11	
Flexibility/resistance test	2000	cycles	EN 60794-1-2 E6	
Temperature range	Operation: -20 to +70 °C Storage: -40 to +70 °C		EN 60794-1-2 F1	

Cable life time > minimum 30 years. This cable is suitable for blowing into ducts.

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 12×1.5 max. 144F | ID:WM01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Fiber count maximum	144	no.		
Cable weight	20	kg/km		approx.
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Coefficient of friction	0.15			
Max. tensile strength	1500	N		
Crush resistance test	400	N		
Impact resistance test	5	Number of knocks		
Min. bend radius (no load)	15	x OD		
Min. bend radius (load)	30	x OD		
Maximum resistance test		ohm		
Temperature range	Installation Operation Storage	-20 to +60 °C -40 to +70 °C -40 to +70 °C		

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)H 12×1.5 max. 144F | ID:WM02

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.5	mm		
Cable weight	210	kg/km		
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Max. tensile strength	1500	N		
Crush resistance test	400	N		
Impact resistance test	5	Number of knocks		
Min. bend radius (no load)	15	x OD		
Min. bend radius (load)	30	x OD		
Maximum resistance test		ohm		
Temperature range	Installation Operation Storage	-20 to +60 °C -40 to +70 °C -40 to +70 °C		

KDP

MLT MICRO DUCT

DIN CODE:A-DSQ(ZN)2Y 12×1.5 max. 144F | ID:WM03

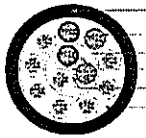
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.5	mm		
Cable weight	210	kg/km		
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Max. tensile strength	1500	N		
Crush resistance test	400	N		
Impact resistance test	5	Number of knocks		
Min. bend radius (no load)	15	x OD		
Min. bend radius (load)	30	x OD		
Maximum resistance test		ohm		
Temperature range	Installation Operation Storage	-20 to +60 °C -40 to +70 °C -40 to +70 °C		

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 12×1.5 max. 144F | ID:ZI02



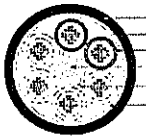
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Fiber count maximum	144	no.		
Cable weight	20	kg/km		approx.
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Coefficient of friction	0.15			
Max. tensile strength	1500	N		
Crush resistance test	400	N		
Impact resistance test	5	Number of knocks		
Min. bend radius (no load)	15	x OD		
Maximum resistance test		ohm		
Temperature range	Installation Operation Storage	-20 to +60 °C -40 to +70 °C -40 to +70 °C		

KDP

DIAMETER MULTI LOOSE TUBE CABLE

DIN CODE:A-DQ(ZN)2Y HD 6× 1.7 max. 144F | ID: 2024



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Fiber count maximum	144	no.		
Cable weight	21	kg/km		approx.
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Coefficient of friction	0.15			
Max. tensile strength	1500	N		
Crush resistance test	400	N		
Impact resistance test	5	Number of knocks		
Min. bend radius (no load)	15	x OD		
Maximum resistance test		ohm		
Temperature range	Installation Operation Storage	-20 to +60 °C -40 to +70 °C -40 to +70 °C		

KDP

DIAMETER MULTI LOOSE TUBE CABLE

DIN CODE:A-DQ(ZN)2Y HD 12× 1.7 max. 288F | ID: 2025

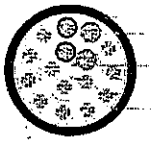
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Fiber count maximum	288	no.		
Cable weight	170	kg/km		approx.
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Max. tensile strength	1500	N		
Crush resistance test	400	N		
Impact resistance test	5	Number of knocks		
Min. bend radius (no load)	15	x OD		
Min. bend radius (load)	30	x OD		
Maximum resistance test		ohm		
Temperature range	Installation Operation Storage	-20 to +60 °C -40 to +70 °C -40 to +70 °C		

KDP

MLT BLOWN MICRO CABLE

DIN CODE:A-DQ(ZN)2Y HD 16× 1.5 max. 192F | ID: Z1J8



Mechanical and Environmental properties

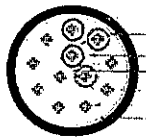
Test	Value	Unit	Method	Comment
Cable outer diameter	4.8 +/-	mm		
Cable weight	32	kg/km		
Outer jacket thickness	ref	mm		
Inner tube diameter	1.5	mm		
Max. tensile strength	700	N	EN 60794-1-E1	
Tensile elongation test	10%	%	EN 60794-1-E1	
Impact resistance test	5	Number of impact	EN 60794-1-E4	
Min. bend radius (static)	15	x D	EN 60794-1-E11	
Maximum number of fiber	144			
Temperature range	Installation Operation Storage	-20 to +70°C -40 to +70°C -40 to +70°C		

Cable life time: minimum 30 years. The cable is suitable for blowing

KDP

MLT BLOWN MICRO CABLE

DIN CODE:A-DQ(ZN)2Y HD 12× 2.3 max. 288F | ID: Z03A



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	6.7 +/-	mm		
Cable weight	47	kg/km		
Outer jacket thickness	2.5	mm		
Inner tube diameter	2	mm		
Max. tensile strength	1200	N		
Tensile elongation test	10%	%		
Impact resistance test	5	Number of impact		
Min. bend radius (static)	15	x D		
Maximum number of fiber	288			
Temperature range	Installation Operation Storage	-20 to +70°C -40 to +70°C -40 to +70°C		

Cable life time: minimum 30 years. The cable is suitable for blowing

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 18×1.5 max. 216F | ID: EM0H

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		N/mm²
Crush resistance		N/
Impact resistance		N
Min. bend radius		15 x Cable diameter (static) 20 x Cable diameter (dynamic)
Maximum fiber count		36
Compressive force		N
Temperature ranges	Installation Operation Storage	-5 to +50°C -40 to +70°C -40 to +70°C
Cable identification standard: example marking		Ed Optics
Standard package length		2x4000 m ± 5%
Packaging		Plastic drum
Inner duct diameter		14 mm
Outer duct diameter		18 mm
Cable outer diameter		9.6 ± 0.3 mm Ø 9.6 ± 0.3 mm

Cable life time: minimum 30 years. The cable is suitable for blowing into ducts

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 18×1.7 max. 192F | ID:VM01

Mechanical and Environmental properties

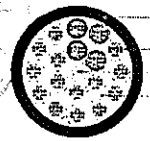
Test	Value	Unit	Method	Comment
Cable outer diameter	9.6 +/-	mm		
Cable weight	76	kg/km		
Outer jacket thickness	ref	mm		
Inner tube diameter	1.7	mm		
Max. tensile strength	900	N		
Tensile elongation test	10%	%		
Impact resistance test	5	Number of impact		
Min. bend radius (static)	5	x D		
Min. bend radius (dynamic)	20	x D		
Maximum number of fiber	192			
Temperature range	Installation Operation Storage	-5 to +50°C -40 to +70°C -40 to +70°C		

Cable life time: minimum 30 years. The cable is suitable for blowing

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)H 18×1.7 max. 192F | ID:VM02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	9.6 +/-	mm		
Cable weight	76	kg/km		
Outer jacket thickness	ref	mm		
Inner tube diameter	1.7	mm		
Max. tensile strength	900	N		
Tensile elongation test	10%	%		
Impact resistance test	5	Number of impact		
Min. bend radius (static)	5	x D		
Min. bend radius (dynamic)	20	x D		
Maximum number of fiber	192			
Temperature range	Installation Operation Storage	-5 to +50°C -40 to +70°C -40 to +70°C		

Cable life time: minimum 30 years. The cable is suitable for blowing

KDP

MLT MICRO DUCT

DIN CODE:A-DQ(ZN)2Y 36×1.7 max. 432F | ID: Z022

Mechanical and Environmental properties

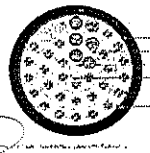
Test	Value	Unit	Method	Comment
Cable outer diameter	11.5 +/-	mm		
Cable weight	110	kg/km		
Outer jacket thickness	1.7 +/-	mm		
Inner tube diameter	2	mm		
Max. tensile strength	900	N	EN 60794-1-E1	
Tensile elongation test	10%	%	EN 60794-1-E2	
Impact resistance test	5	Number of impact	EN 60794-1-E4	
Min. bend radius (installation)	10	x D	EN 60794-1-E11	
Min. bend radius (fixed)	20	x D		
Maximum installation load	900	N	EN 60794-1-E1	
Temperature range	Installation Operation Storage	-5 to +50°C -40 to +70°C -40 to +70°C	EN 60794-1-E11	

Cable life time: minimum 30 years. The cable is suitable for blowing into ducts

KDP

MLT MICRO DUCT

DIN CODE:J/A-DQ(ZN)H 36× 1.7 max.432F | ID: Z304

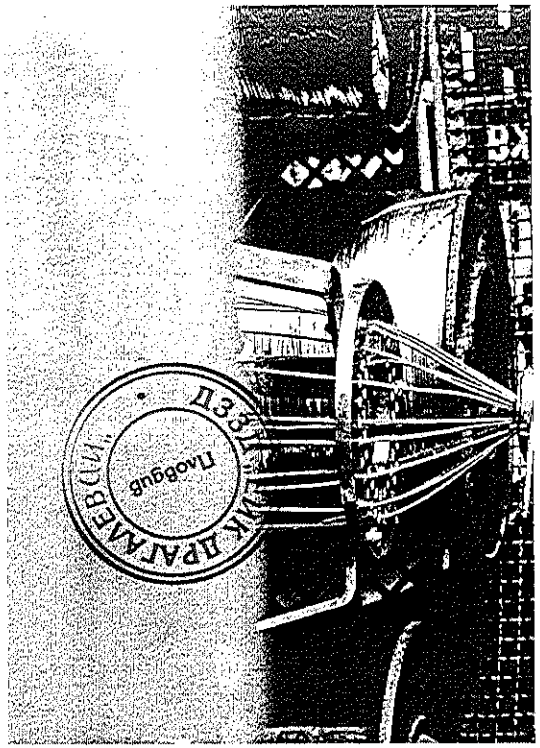


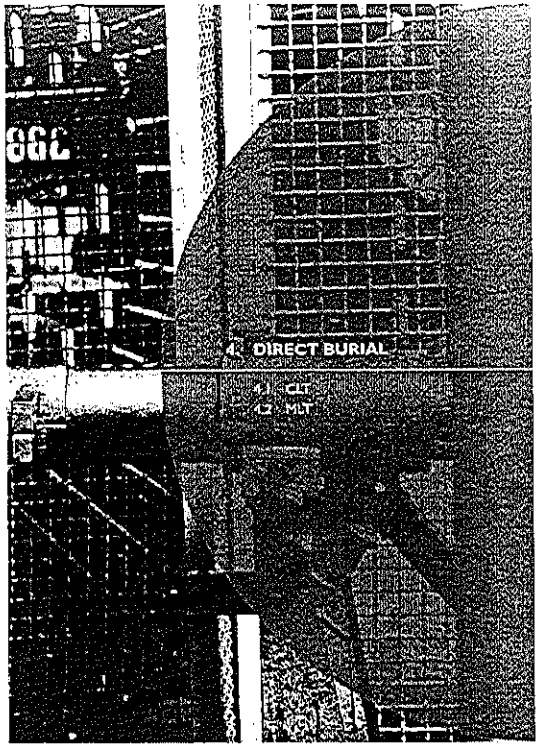
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.3 ± 0.4	mm	EN 60811-1-1	
Cable weight	195	kg/km		
Overall bend minimum	143	mm		
Lowest cable operation	-5	°C		
Max tensile strength	1500	N	EN 60811-1-4	Max load under which the fibre strain does not exceed 0.2%
Crush resistance min.	1000	N	EN 60811-1-4	Load applied for 10 minutes, no fibre damage allowed
Impact resistance test	5	No fibre damage	EN 60811-1-4	Impact energy 5 Nm, 3 blows, 300 mm drop height
Min. bend radius (per fibre)	10	x OD	EN 60811-1-4	Short term installation number: 20D, Long term installation number: 10D
Min. bend radius (cable)	20	x OD	EN 60811-1-4	Short term installation number: 20D, Long term installation number: 10D
Fibre non-measurable zone		mm	EN 60793-1-40	Measured at 1550 nm
Temperature range	Installation Operation Storage	-15 to +50 °C -30 to +70 °C +5 to +70 °C	EN 60811-1-1	Short term installation number: 20D, Long term installation number: 10D

KDP

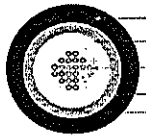
3
3.2





CLT CST ARMOURED

DIN CODE:A-DQ(BN)(SR)2Y max. 24F | ID: Z144



Mechanical and Environmental properties

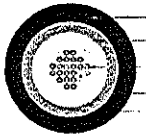
Test	Method	Value/Unit
Max tensile strength	IEC 60794-1-2 E1	2700N
Crush resistance	IEC 60794-1-2 E3	2000 N/100 mm
Impact resistance	IEC 60794-1-2 E4	5 Nm, 3 blows, 300 mm drop height
Min. bend radius	IEC 60794-1-2 E11	20 x OD (short term) 10 x OD (long term)
Torsion	IEC 60794-1-2 E7	± 180 degrees/1 m
Repeat bending	IEC 60794-1-2 E6	25 mm mandrel, 25 cycles
Kink	IEC 60794-1-2 E10	Allowed
Fibre non-measurable	IEC 60793-1-40	0.1 m
Compound type		Polyethylene (PE)
Temperature range	Installation Operation Storage	-15 to +50 °C -30 to +70 °C +5 to +70 °C
Rated cut through weight	IEC 60794-1-2 E13	1.5 kN
Packaging		4 km per drum
Cable construction maximum length		4 km
Lowest cable diameter		14.3 mm
Cable outer diameter		14.3 ± 0.4 mm
Cable weight		195 kg/km

KDP

4
4.1

CLT CST ARMOURED

DIN CODE:J/A-DQ(BN)(SR)H max. 24F | ID: Z145



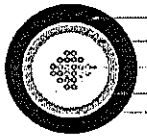
Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength	IEC 60794-1-2 E1	2700N
Crush resistance	IEC 60794-1-2 E3	2000 N/100 mm
Impact resistance	IEC 60794-1-2 E4	5 Nm, 3 blows, 300 mm drop height
Min. bend radius	IEC 60794-1-2 E11	20 x OD (short term) 10 x OD (long term)
Torsion	IEC 60794-1-2 E7	± 180 degrees/1 m
Repeat bending	IEC 60794-1-2 E6	25 mm mandrel, 25 cycles
Kink	IEC 60794-1-2 E10	Allowed
Fibre non-measurable	IEC 60793-1-40	0.1 m
Compound type		Polyethylene (PE)
Temperature range	Installation Operation Storage	-15 to +50 °C -30 to +70 °C +5 to +70 °C
Rated cut through weight	IEC 60794-1-2 E13	1.5 kN
Packaging		4 km per drum
Cable construction maximum length		4 km
Lowest cable diameter		14.3 mm
Cable outer diameter		14.3 ± 0.4 mm
Cable weight		195 kg/km

KDP

CLT CST ARMOURED

DIN CODE:A-DQ(BN)(SR)2Y max. 24F | ID: BH01



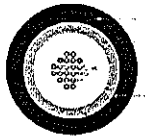
Mechanical and Environmental properties

Test	Method	Value/Unit
Max tensile strength	IEC 60794-1-2 E1	2700N
Crush resistance	IEC 60794-1-2 E3	2000 N/100 mm
Impact resistance	IEC 60794-1-2 E4	5 Nm, 3 blows, 300 mm drop height
Min. bend radius	IEC 60794-1-2 E11	20 x OD (short term) 10 x OD (long term)
Torsion	IEC 60794-1-2 E7	± 180 degrees/1 m
Repeat bending	IEC 60794-1-2 E6	25 mm mandrel, 25 cycles
Kink	IEC 60794-1-2 E10	Allowed
Fibre non-measurable	IEC 60793-1-40	0.1 m
Compound type		Polyethylene (PE)
Temperature range	Installation Operation Storage	-15 to +50 °C -30 to +70 °C +5 to +70 °C
Rated cut through weight	IEC 60794-1-2 E13	1.5 kN
Packaging		4 km per drum
Cable construction maximum length		4 km
Lowest cable diameter		14.3 mm
Cable outer diameter		14.3 ± 0.4 mm
Cable weight		195 kg/km

KDP

CLT CST ARMOURED

DIN CODE:J/A-DQ(BN)(SR)H max. 24F | ID: BHU2



Mechanical and Environmental properties

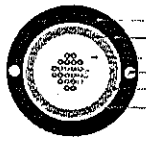
Test	Method	Value/Unit

4 | 4.1

KDP

CLT CST ARMOURED

DIN CODE:A-DQ(BN)(ZH)(SR)ZY max. 24F | ID: B[illegible]



Mechanical and Environmental properties

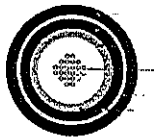
Test	Value	Unit	Method	Comment

4 | 4.1

KDP

CLT CST ARMOURED

DIN CODE:A-DQ(BN)2Y(SR)ZY max. 24F | ID: BIP1



Mechanical and Environmental properties

Test	Method	Value/Unit

4 | 4.1

KDP

CLT CST ARMOURED

DIN CODE:J/A-DQ(BN)2Y(SR)H max. 24F | ID: BIP2

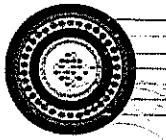
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

CLT SWA

DIN CODE:A-DQ(BN)2YB2Y (R0.63vzk) max. 24F | ID: BWP1



Mechanical and Environmental properties

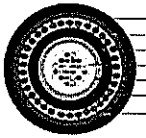
Test	Value	Unit	Method	Comment

4 | 4.1

KDP

CLT SWA

DIN CODE:J/A-DQ(BN)2YBH WBF (R0.63vzk) max. 24F | ID: BWP2



Mechanical and Environmental properties

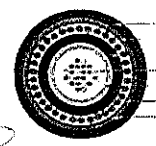
Test	Value	Unit	Method	Comment

4 | 4.1

KDP

CLT SWA

DIN CODE:A-DQ(BN)HB2Y (R0.63vzk) max.24F | ID:SWA1



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner jacket thickness				
Outer jacket thickness				
Inner tube diameter				
Outer tube diameter				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Moisture resistance test				
Temperature range				

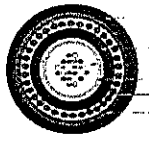
Cable life time – minimum 30 years. This cable is suitable for indoor or outdoor use, short-term water possible.

4
4.1

KDP

CLT SWA

DIN CODE:JA-DQ(BN)KBH (R0.63vzk) max.24F | ID:SWA2



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner jacket thickness				
Outer jacket thickness				
Inner tube diameter				
Outer tube diameter				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Moisture resistance test				
Temperature range				

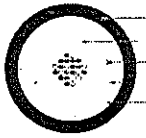
Cable life time – minimum 30 years. This cable is suitable for indoor or outdoor use, short-term water possible.

4
4.1

KDP

CLT FRP ARMOURED

DIN CODE:A-DQ(BN)B2Y (FRP1.0) max.24F | ID:BF01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner jacket thickness				
Outer jacket thickness				
Fibre strength member				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Moisture resistance test				
Temperature range				

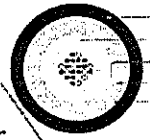
Cable life time – minimum 30 years. This cable is suitable for indoor or outdoor use, short-term water possible. This cable has a higher level of water protection.

4
4.1

KDP

CLT FRP ARMOURED

DIN CODE:JA-DQ(BN)BH (FRP1.0) max.24F | ID:BF02



Mechanical and Environmental properties

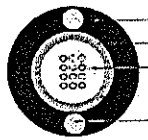
Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner jacket thickness				
Outer jacket thickness				
Fibre strength member				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Moisture resistance test				
Temperature range				

4
4.1

KDP

CLT EXTRA STRENGTH MEMBERS

DIN CODE:A-DQ(ZZM)(BN)2Y max. 12F | ID:AE91



Mechanical and Environmental properties

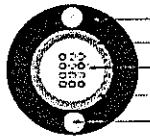
Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner jacket thickness				
Outer jacket thickness				
Fibre strength member				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Moisture resistance test				
Temperature range				

4
4.1

KDP

CLT EXTRA STRENGTH MEMBERS

DIN CODE:A-DQ(ZZN)(BN)2Y max. 12F | ID:AE81



Mechanical and Environmental properties

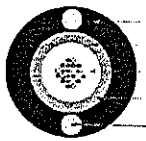
Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner jacket thickness				
Outer jacket thickness				
Fibre strength member				
Max tensile strength				
Crush resistance test				
Impact resistance test				
Min bend radius (no load)				
Min bend radius (load)				
Moisture resistance test				
Temperature range				

4
4.1

KDP

CLT EXTRA STRENGTH MEMBERS

DIN CODE:A-DO(ZM)(BN)2Y max. 24F | ID: BD9



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Optical fiber multiplicity				
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test		Number of times		
Min. bend radius (no load)		x OD		
Min. bend radius (loaded)		x OD		
Maximum compressive load		N		
Temperature range				

Cable has been manufactured for 50 years. It is safe to operate for another one

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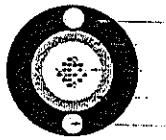
KDP

CLT EXTRA STRENGTH MEMBERS

DIN CODE:A-DO(ZN)(BN)2Y max. 24F | ID: BD8



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Optical fiber multiplicity				
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test		Number of times		
Min. bend radius (no load)		x OD		
Min. bend radius (loaded)		x OD		
Maximum compressive load		N		
Temperature range				

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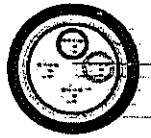
KDP

MLT CST

DIN CODE:A-DO(BN)(SR)2Y 4× 2.3 max. 48F | ID: LH01



Mechanical and Environmental properties

Test	Method	Value/class
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Flexing cycles		
Operating temperature		
Fiber type		
Max. attenuation		

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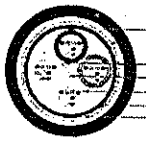
KDP

MLT CST

DIN CODE:J/A-DO(BN)(SR)H 4× 2.3 max. 48F | ID: LH02



Mechanical and Environmental properties

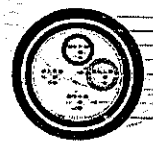
Test	Method	Value/class
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Flexing cycles		
Operating temperature		
Fiber type		
Max. attenuation		

4 / 42

KDP

MLT CST

DIN CODE:A-DO(BN)2Y(SR)2Y 4× 2.3 max. 48F | ID: LIP1



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Optical fiber multiplicity				
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test		Number of times		
Min. bend radius (no load)		x OD		
Min. bend radius (loaded)		x OD		
Maximum compressive load		N		
Temperature range				

4 / 42

KDP

MLT CST

DIN CODE:J/A-DO(BN)H(SR)H 4× 2.3 max. 48F | ID: LIF2

Mechanical and Environmental properties

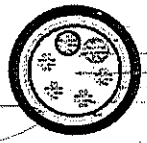
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Optical fiber multiplicity				
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test		Number of times		
Min. bend radius (no load)		x OD		
Min. bend radius (loaded)		x OD		
Maximum compressive load		N		
Temperature range				

4 / 42

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 6× 1.7 max. 72F | ID: CH01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Minimum bending radius		mm		
Tensile strength		N		
Crush resistance test				
Impact resistance test				
Min. bend radius test				
Thermal conductivity				
Temperature range				

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 6× 1.7 max. 72F | ID: CH02

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Minimum bending radius		mm		
Tensile strength		N		
Crush resistance test				
Impact resistance test				
Min. bend radius test				
Thermal conductivity				
Temperature range				

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 6× 2.3 max. 72F | ID: FH01

Mechanical and Environmental properties

Test	Method	Value/Unit
Min. bend radius		
Pressure resistance		
Compound tests		
Temperature range		
Cable dimensions (nominal weight in mm)		
Standard package length		
Packaging		
Conductor material diameter		
Minimum bending diameter		
Cable outer diameter		

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 6× 2.3 max. 72F | ID: FH02

Mechanical and Environmental properties

Test	Method	Value/Unit
Min. bend radius		
Pressure resistance		
Compound tests		
Temperature range		
Cable dimensions (nominal weight in mm)		
Standard package length		
Packaging		
Conductor material diameter		
Minimum bending diameter		
Cable outer diameter		

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 6× 2.3 max. 72F | ID: FIP1

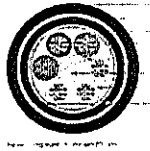
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Minimum bending radius		mm		
Tensile strength		N		
Crush resistance test				
Impact resistance test				
Min. bend radius test				
Thermal conductivity				
Temperature range				

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 6× 2.3 max. 72F | ID: FIF2



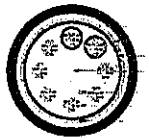
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Minimum bending radius		mm		
Tensile strength		N		
Crush resistance test				
Impact resistance test				
Min. bend radius test				
Thermal conductivity				
Temperature range				

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 8× 1.7 max. 96F | ID: PH01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Conductor nominal				
Cable weight				
Overall cable diameter				
Minimum bend radius				
Max. tensile strength				
Conductor resistance max.				
Insulation resistance min.				
Max. bend radius (no load)				
Temperature range				

4
12

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 8× 1.7 max. 96F | ID: PH02

Mechanical and Environmental properties

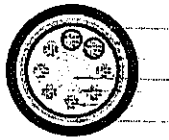
Test	Value	Unit	Method	Comment
Conductor nominal				
Cable weight				
Overall cable diameter				
Minimum bend radius				
Max. tensile strength				
Conductor resistance max.				
Insulation resistance min.				
Max. bend radius (no load)				
Temperature range				

4
12

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 8× 2.3 max. 96F | ID: GH01



Mechanical and Environmental properties

Test	Method	Value/Unit
Conductor nominal		
Cable weight		
Overall cable diameter		
Minimum bend radius		
Max. tensile strength		
Conductor resistance max.		
Insulation resistance min.		
Max. bend radius (no load)		
Temperature range		

4
12

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 8× 2.3 max. 96F | ID: GH02

Mechanical and Environmental properties

Test	Method	Value/Unit
Conductor nominal		
Cable weight		
Overall cable diameter		
Minimum bend radius		
Max. tensile strength		
Conductor resistance max.		
Insulation resistance min.		
Max. bend radius (no load)		
Temperature range		

4
12

KDP

MLT CST

DIN CODE:A-DQ(BN)2Y(SR)2Y 8× 2.3 max. 96F | ID: GI01

Mechanical and Environmental properties

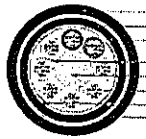
Test	Value	Unit	Method	Comment
Conductor nominal				
Cable weight				
Overall cable diameter				
Minimum bend radius				
Max. tensile strength				
Conductor resistance max.				
Insulation resistance min.				
Max. bend radius (no load)				
Max. bend radius (load)				
Minimum temperature				
Temperature range				

4
12

KDP

MLT CST

DIN CODE:J/A-DQ(BN)H(SR)H 8× 2.3 max. 96F | ID: GI02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Conductor nominal				
Cable weight				
Overall cable diameter				
Minimum bend radius				
Max. tensile strength				
Conductor resistance max.				
Insulation resistance min.				
Max. bend radius (no load)				
Max. bend radius (load)				
Minimum temperature				
Temperature range				

4
12

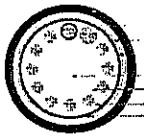
KDP

ВЯРНО С ОРИГИНАЛА

ПЗЗД „ЕИК ДРАГАЕВЦИ"

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 12× 1,7 max. 144F | ID: RH01



Mechanical and Environmental properties

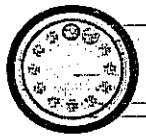
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer optical sheath		mm		
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/100 mm		
Impact resistance		N/m		
Min. bend radius		mm		
Repeated bending				
Torsion test				
Temperature range		°C		

4 4.2

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 12× 1,7 max. 144F | ID: RH0₁



Mechanical and Environmental properties

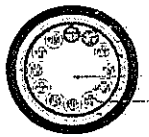
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer optical sheath		mm		
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/100 mm		
Impact resistance		N/m		
Min. bend radius		mm		
Repeated bending				
Torsion test				
Temperature range		°C		

4 4.2

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 12× 2,3 max. 144F | ID: HH01



Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Repeated bending		
Torsion test		
Temperature range		

4 4.2

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 12× 2,3 max. 144F | ID: HH02

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Repeated bending		
Torsion test		
Temperature range		

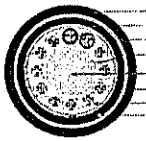
4 4.2

ВЕРНОС ОРИГИНАЛА

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y(SR)2Y 12× 2,3 max. 144F | ID: HI01



Mechanical and Environmental properties

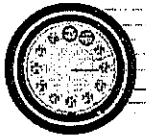
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer optical sheath		mm		
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/100 mm		
Impact resistance		N/m		
Min. bend radius (installed)		mm		
Min. bend radius (static)		mm		
Repeated bending				
Torsion test				
Temperature range		°C		

4 4.2

KDP

MLT CST

DIN CODE:J/A-DQ(BN)H(SR)H 12× 2,3 max. 144F | ID: HI02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Outer optical sheath		mm		
Central tube diameter		mm		
Max. tensile strength		N		
Crush resistance		N/100 mm		
Impact resistance		N/m		
Min. bend radius (installed)		mm		
Min. bend radius (static)		mm		
Repeated bending				
Torsion test				
Temperature range		°C		

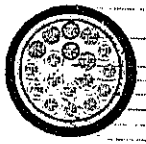
4 4.2

KDP

253

MLT CST

DIN CODE:A-DQ(BN)(SR)2Y 18≈ 1.7 max. 216F | ID: MH01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm	IEC 60811-1-1	
Cable weight		kg/km		
Core wall thickness		mm		
Screen wire diameter		mm		
Max. tensile strength		N	IEC 60811-1-1	
Short-term bending test			IEC 60811-1-1	
Impact resistance test			IEC 60811-1-1	
Max. force, routine (no load)		N	IEC 60811-1-1	
Max. force, routine (load)		N	IEC 60811-1-1	
Permanent elongation test			IEC 60811-1-1	
Temperature range				

4
4.2

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 18≈ 1.7 max. 216F | ID: MH02

Mechanical and Environmental properties

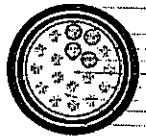
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Core wall thickness		mm		
Screen wire diameter		mm		
Max. tensile strength		N	IEC 60811-1-1	
Short-term bending test			IEC 60811-1-1	
Impact resistance test			IEC 60811-1-1	
Max. force, routine (no load)		N	IEC 60811-1-1	
Max. force, routine (load)		N	IEC 60811-1-1	
Permanent elongation test			IEC 60811-1-1	
Temperature range				

4
4.2

KDP

MLT CST

DIN CODE:A-DQ(BN)2Y(SR)2Y 18≈ 2.3 max. 216F | ID: MH01



Mechanical and Environmental properties

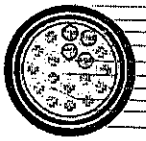
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Core wall thickness		mm		
Screen wire diameter		mm		
Max. tensile strength		N	IEC 60811-1-1	
Short-term bending test			IEC 60811-1-1	
Impact resistance test			IEC 60811-1-1	
Max. force, routine (no load)		N	IEC 60811-1-1	
Max. force, routine (load)		N	IEC 60811-1-1	
Permanent elongation test			IEC 60811-1-1	
Temperature range				

4
4.2

KDP

MLT CST

DIN CODE:J/A-DQ(BN)H(SR)H 18≈ 2.3 max. 216F | ID: MH02



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Core wall thickness		mm		
Screen wire diameter		mm		
Max. tensile strength		N	IEC 60811-1-1	
Short-term bending test			IEC 60811-1-1	
Impact resistance test			IEC 60811-1-1	
Max. force, routine (no load)		N	IEC 60811-1-1	
Max. force, routine (load)		N	IEC 60811-1-1	
Permanent elongation test			IEC 60811-1-1	
Temperature range				

4
4.2

KDP

MLT CST

DIN CODE:A-DQ(BN)(SR)H 36≈ 2.5 max. 432F | ID: MH01

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Conductor max.		
Conductor Max.		
Temperature range		
Cable maximum operating voltage (Uo/U)		
Standard operating voltage		
Packaging		
Minimum bend radius		
Outer diameter (nominal)		
Cable maximum diameter		

4
4.2

KDP

MLT CST

DIN CODE:J/A-DQ(BN)(SR)H 36≈ 2.5 max. 432F | ID: MH02

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Conductor max.		
Conductor Max.		
Temperature range		
Cable maximum operating voltage (Uo/U)		
Standard operating voltage		
Packaging		
Minimum bend radius		
Outer diameter (nominal)		
Cable maximum diameter		

4
4.2

KDP

MLT SWA

DIN CODE:A-DQ2Y82Y (R1.0 vsk) 4× 2,3 max. 48F | ID:LWF1

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Core water absorption				
Core weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Lowest cable diameter		mm		
Max. tensile strength		N		
Crush resistance test		N/m		
Impact resistance test		J	Hammer test	
Max. bend radius (no load)		D		
Minimum installation temp.		°C		
Temperature range	installation operation transport	°C °C °C		

Cable life time: maximum 20 years. This cable is suitable for outdoor direct burial possible.

4 / 4.2

KDP

MLT SWA

DIN CODE:J/A-DQHBH (R1.0 vsk) 4× 2,3 max. 48F | ID:LWF2

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Core water absorption				
Core weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Lowest cable diameter		mm		
Max. tensile strength		N		
Crush resistance test		N/m		
Impact resistance test		J	Hammer test	
Max. bend radius (no load)		D		
Minimum installation temp.		°C		
Temperature range	installation operation transport	°C °C °C		

Cable life time: maximum 20 years. This cable is suitable for outdoor direct burial possible.

4 / 4.2

KDP

MLT SWA

DIN CODE:A-DQ2Y82Y (R1.0 vsk) 4× 2,3 max. 72F | ID:LWF1

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Core water absorption				
Core weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Lowest cable diameter		mm		
Max. tensile strength		N		
Crush resistance test		N/m		
Impact resistance test		J	Hammer test	
Max. bend radius (no load)		D		
Minimum installation temp.		°C		
Temperature range	installation operation transport	°C °C °C		

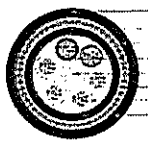
Cable life time: maximum 20 years. This cable is suitable for outdoor direct burial possible.

4 / 4.2

KDP

MLT SWA

DIN CODE:J/A-DQHBH (R1.0 vsk) 4× 2,3 max. 72F | ID:FWF2



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Core water absorption				
Core weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Lowest cable diameter		mm		
Max. tensile strength		N		
Crush resistance test		N/m		
Impact resistance test		J	Hammer test	
Max. bend radius (no load)		D		
Minimum installation temp.		°C		
Temperature range	installation operation transport	°C °C °C		

Cable life time: maximum 20 years. This cable is suitable for outdoor direct burial possible.

4 / 4.2

KDP

MLT SWA

DIN CODE:A-DQ2Y82Y (R1.0 vsk) 8× 2,3 max. 96F | ID:GWF1

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Core water absorption				
Core weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Lowest cable diameter		mm		
Max. tensile strength		N		
Crush resistance test		N/m		
Impact resistance test		J	Hammer test	
Max. bend radius (no load)		D		
Minimum installation temp.		°C		
Temperature range	installation operation transport	°C °C °C		

Cable life time: maximum 20 years. This cable is suitable for outdoor direct burial possible.

4 / 4.2

KDP

MLT SWA

DIN CODE:J/A-DQHBH (R1.0 vsk) 8× 2,3 max. 96F | ID:GWF2

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Core water absorption				
Core weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Lowest cable diameter		mm		
Max. tensile strength		N		
Crush resistance test		N/m		
Impact resistance test		J	Hammer test	
Max. bend radius (no load)		D		
Minimum installation temp.		°C		
Temperature range	installation operation transport	°C °C °C		

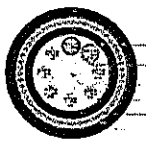
Cable life time: maximum 20 years. This cable is suitable for outdoor direct burial possible.

4 / 4.2

KDP

MLT SWA

DIN CODE:A-DQ2YDZY (R1.0 vsk) 12× 2,3 max. 144F | ID: HWF



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner profile dimensions				
Outer profile dimensions				
Number of conductors				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius (for fixed)				
Min. bend radius (for free)				
Flexible resistance test				
Temperature range				

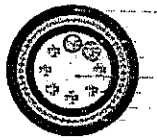
Cable life time: minimum 20 years if the cable is suitable for outdoor use, shorter if not suitable

KDP

4 | 4.2

MLT SWA

DIN CODE:J/A-DQHBH (R1.0 vsk) 12× 2,3 max. 144F | ID: HWF2



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Inner profile dimensions				
Outer profile dimensions				
Number of conductors				
Max. tensile strength				
Crush resistance test				
Impact resistance test				
Min. bend radius (for fixed)				
Flexible resistance test				
Temperature range				

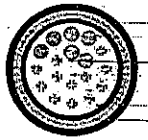
Cable life time: minimum 20 years if the cable is suitable for outdoor use, shorter if not suitable

KDP

4 | 4.2

MLT SWA

DIN CODE:A-DQ2YDZY (R1.0 vsk) 18× 2,3 max. 216F | ID: HWF



Mechanical and Environmental properties

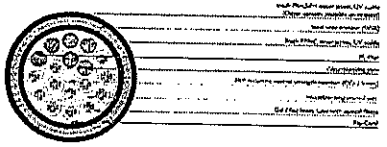
Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Flexible resistance		
Number of conductors		
Cable outer diameter		
Cable weight		
Inner profile dimensions		
Outer profile dimensions		
Temperature range		

KDP

4 | 4.2

MLT SWA

DIN CODE:J/A-DQHBH (R1.0 vsk) 18× 2,3 max. 216F | ID: HWF2

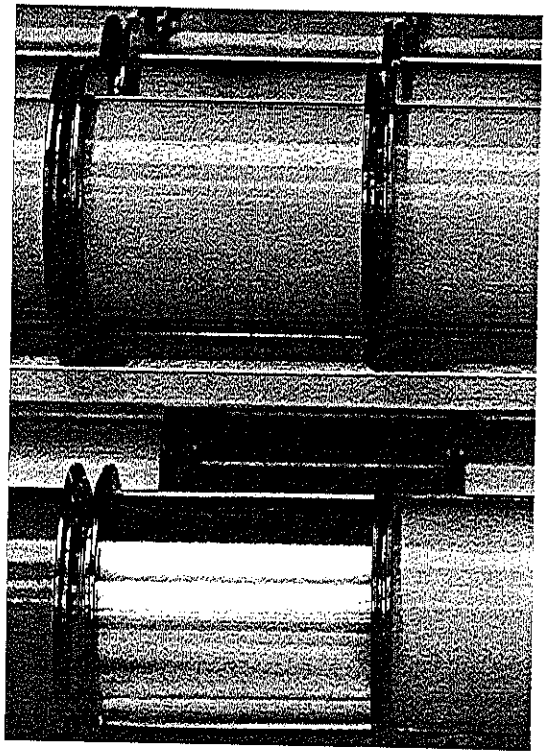


Mechanical and Environmental properties

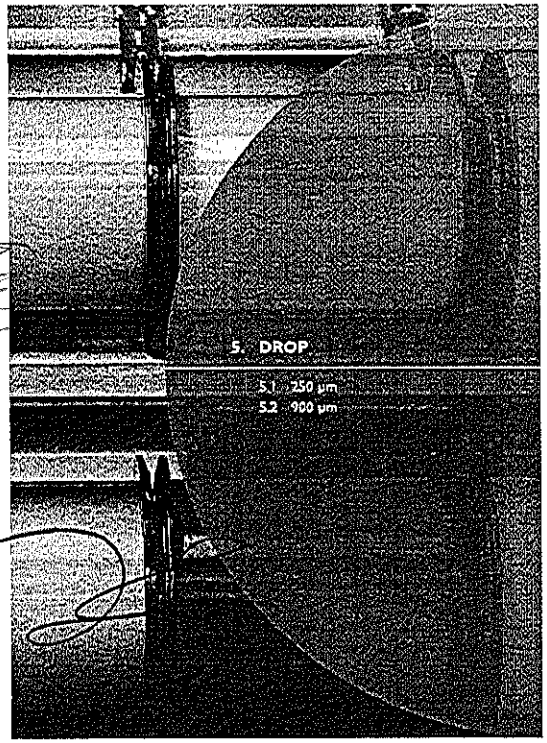
Test	Method	Value/Unit
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius		
Flexible resistance		
Number of conductors		
Cable outer diameter		
Cable weight		
Inner profile dimensions		
Outer profile dimensions		
Temperature range		

KDP

4 | 4.2



ДЗЗД „ЕИК ДРАГАЕВЦИ"



DROP 250 µm FTTx

DIN CODE: FLAT DROP max. 2F | ID: Z041

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Max. tensile strength		N		
Crush resistance max.		N/cm		
Impact resistance max.			Method	
Min. bend radius mounted				
Min. bend radius fixed				
Temperature range				

5 S1

KDP

DROP 250 µm FTTx

DIN CODE: FLAT AERIAL DROP max. 2F | ID: Z042

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Cable material				
Max. tensile strength		N		
Crush resistance max.		N/cm		
Impact resistance max.			Method	
Min. bend radius mounted				
Min. bend radius fixed				
Temperature range				

5 S1

KDP

DROP 250 µm FTTx

DIN CODE: FLAT DROP FRP max. 2F | ID: Z043

Mechanical and Environmental properties

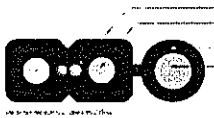
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Max. tensile strength		N		
Crush resistance max.		N/cm		
Impact resistance max.			Method	
Min. bend radius mounted				
Min. bend radius fixed				
Temperature range				

5 S1

KDP

DROP 250 µm FTTx

DIN CODE: FLAT AERIAL DROP FRP max. 2F | ID: Z046



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Max. tensile strength		N		
Crush resistance max.		N/cm		
Impact resistance max.			Method	
Min. bend radius mounted				
Min. bend radius fixed				
Temperature range				

5 S1

KDP

DROP 250 µm

DIN CODE: JIA-N(ZN)H MM max. 12F | ID: Z036

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Max. tensile strength		N		
Crush resistance max.		N/cm		
Impact resistance max.			Method	
Min. bend radius mounted				
Min. bend radius fixed				
Temperature range				

5 S1

KDP

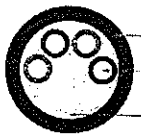
Sag during installation 1 %

Sag during installation 3 %

KDP

DROP 250 µm

DIN CODE:JA-N(ZN)H 1,000 N max 12F | ID: ZL37



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Minimum bend radius				
Max. tensile strength				
Crush resistance load				
Impact resistance test				
Max. bend radius (no load)				
Max. bend radius (loaded)				
Temperature range				

KDP

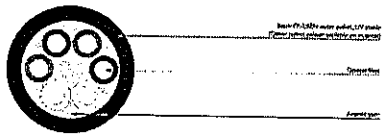
Sag during installation 1.5 %

Sag during installation 3 %

KDP

DROP 250 µm

DIN CODE:JA-N(ZN)H max. 24F | ID:7A01



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Minimum bend radius				
Max. tensile strength				
Crush resistance load				
Impact resistance test				
Max. bend radius (no load)				
Max. bend radius (loaded)				
Temperature range				

KDP

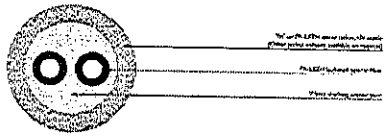
Sag during installation 1 %

Sag during installation 3 %

KDP

DROP 900 µm

DIN CODE:JA-VQ(ZN)H Drop 48 2F | ID: 2077



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				
Minimum bend radius				
Max. tensile strength				
Crush resistance load				
Impact resistance test				
Max. bend radius (no load)				
Max. bend radius (loaded)				
Temperature range				

KDP

DROP 900 µm

DIN CODE: J/A-VQ(ZN)H Drop max. 4F | ID: Z2A7

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Fibre count/ribbon				
Cable weight				
Outer jacket thickness				
Bend radius (short term)				
Tensile strength				
Crush resistance (short term)				
Impact resistance (min)				
Min. bend radius (in use)				
Min. bend radius (install)				
Temperature range	Installation Operation Storage			

KDP

DROP 900 µm

DIN CODE: J/A-VQ(BN)HH max. 2F | ID: Z2E2

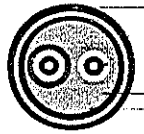
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				nominal
Outer jacket thickness				
Ripcord diameter				
Tensile strength				
Max. tensile strength	600			
Crush resistance (short term)				
Impact resistance (min)		N (max 2 cm) N (max 5 cm)		
Min. bend radius (in use)				
Min. bend radius (short term)				
Temperature range	Installation Operation Storage			

KDP

DROP 900 µm CST

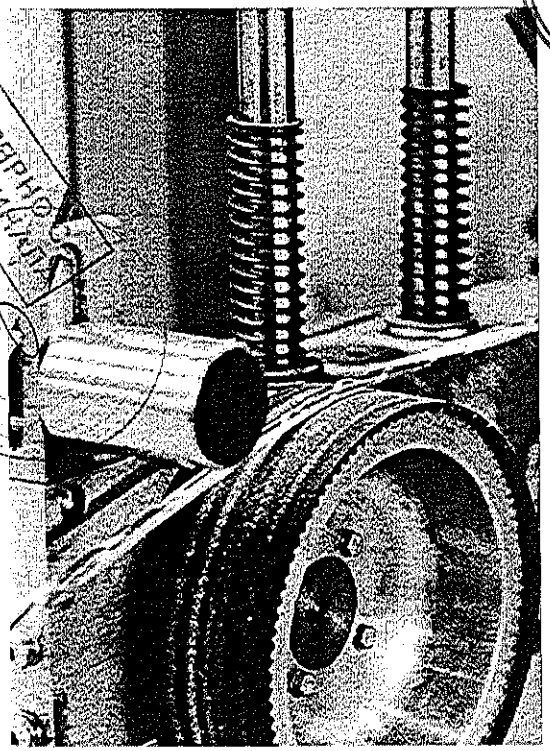
DIN CODE: J/A-VQ(ZN)H(BN)(SR)H WBF max. 2F | ID: Z25R

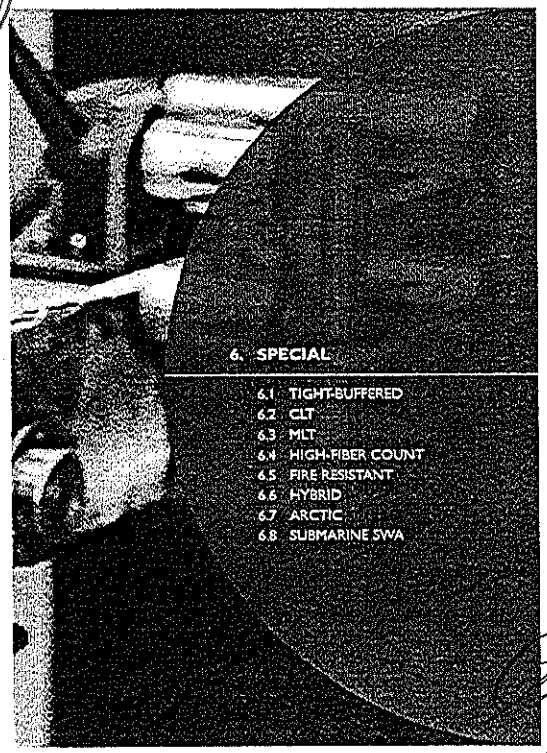


Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter				
Cable weight				nominal
Inner jacket thickness				
Ripcord diameter				
Bend radius (short term)				
Tensile strength				
Max. tensile strength	1700	N		
Crush resistance (short term)				
Impact resistance (min)				
Min. bend radius (in use)				
Min. bend radius (short term)				
Temperature range	Installation Operation Storage			

KDP





6. SPECIAL

QUADPLEX CABLE

DIN CODE: J-V(ZN)H 4×1F | ID: 9Axx

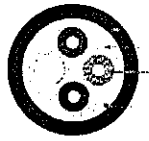
Mechanical and Environmental properties

Test	Method	Value/Note
Max. tensile strength		
Crush resistance		
Impact resistance		
Min. bend radius (long term)		
Min. bend radius (short term)		
Impact Testing		
Proof		
Temperature		
Temperature range	Max. Temp. Min. Temp.	
Cable construction weight (nom.)		
Stripped jacket length		
Packaging		
Bend diameter		
Material designation		
Cable name		

KDP

TACTICAL CABLE (HFFR)

DIN CODE:JA-VQ(ZN)11Y max 4F | ID:SVA7



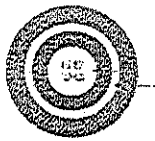
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

CLT MILITARY

DIN CODE:JA-DQ(ZN)11Y max 4F | ID:Z272



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

Mechanical and Environmental properties

Test	Value/Unit	Method	Comment

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 4×2,3 max. 48F | ID:LE06

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 5×1,7 max. 60F | ID:UE06

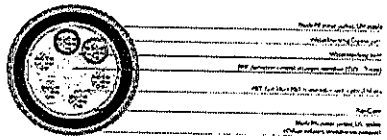
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 6×1,7 max. 72F | ID:CE06



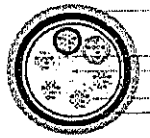
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 6×2,3 max. 72F | ID: FE06



Mechanical and Environmental properties

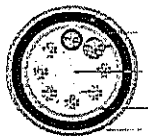
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		~ value
Inner sulfur thickness		mm		
Outer jacket thickness		mm		
Conductor diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test			Hammer drop test	
Min. bend radius pre load				
Min. bend radius (load)				
Temperature range				

Cable life time > minimum 30 years. The cable is suitable for outdoor use. The cable has higher level of mechanical protection.

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 8×1,7 max. 96F | ID: FE06



Mechanical and Environmental properties

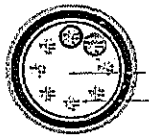
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		~ value
Inner sulfur thickness		mm		
Outer jacket thickness		mm		
Conductor diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test			Hammer drop test	
Min. bend radius pre load				
Min. bend radius (load)				
Temperature range				

Cable life time > minimum 30 years. The cable is suitable for outdoor use. The cable has higher level of mechanical protection.

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 8×2,3 max. 96F | ID: GE06



Mechanical and Environmental properties

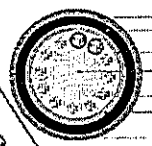
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		~ value
Inner sulfur thickness		mm		
Outer jacket thickness		mm		
Conductor diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test			Hammer drop test	
Min. bend radius pre load				
Min. bend radius (load)				
Temperature range				

Cable life time > minimum 30 years. The cable is suitable for outdoor use. The cable has higher level of mechanical protection.

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 12×1,7 max. 144F | ID: RE06



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		~ value
Inner sulfur thickness		mm		
Outer jacket thickness		mm		
Conductor diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test			Hammer drop test	
Min. bend radius pre load				
Min. bend radius (load)				
Temperature range				

Cable life time > minimum 30 years. The cable is suitable for outdoor use. The cable has higher level of mechanical protection.

KDP

MLT

DIN CODE:A-DQ(BN)2Y4Y 12×2,3 max. 144F | ID: HE06

Mechanical and Environmental properties

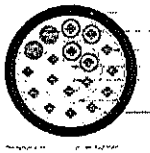
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		~ value
Inner sulfur thickness		mm		
Outer jacket thickness		mm		
Conductor diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test			Hammer drop test	
Min. bend radius pre load				
Min. bend radius (load)				
Temperature range				

Cable life time > minimum 30 years. The cable is suitable for outdoor use. The cable has higher level of mechanical protection.

KDP

MLT HIGH-FIBER COUNT & REDUCE OD

DIN CODE:A-DQ(ZN)2Y 18×2,0 max. 432F | ID: ZI56



Mechanical and Environmental properties

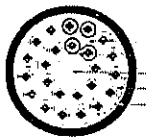
Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		~ value
Inner sulfur thickness		mm		
Outer jacket thickness		mm		
Conductor diameter		mm		
Max. tensile strength		N		
Crush resistance test		N		
Impact resistance test			Hammer drop test	
Min. bend radius pre load				
Min. bend radius (load)				
Temperature range				

Cable life time > minimum 30 years. The cable is suitable for outdoor use.

KDP

MLT HIGH-FIBER COUNT & REDUCE OD

DIN CODE:A-DQ(ZN)2Y 24×2.0 max. 576F | ID: Z157



Mechanical and Environmental properties

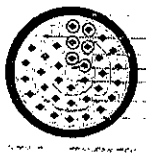
Test	Value	Unit	Method	Comment
Cable outer diameter	13.5 ± 0.5	mm	EN 60794-1-2 E1	
Cable weight	210	kg/km		calculated
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Max allowable tension	2670	N	IEC 60794-1-2 E1	long term: 890 N short term: 2670 N installation: 1335 N
Crush resistance test	1000	N	IEC 60794-1-2 E3	no fiber damage at 1000 N/100 mm
Impact resistance test	5	Nm (1 impact)	IEC 60794-1-2 E4	no damage at 5 Nm
Min bend radius (install)	20	×OD	IEC 60794-1-2 E11	20 × OD
Min bend radius (final)	10	×OD	IEC 60794-1-2 E11	10 × OD
Pressure resistance test	2000	N/100 mm	IEC 60794-1-2 E7	no damage at 2000 N/100 mm
Temperature range	Installation Operation Storage	-5 to +50 °C -30 to +70 °C -40 to +70 °C	IEC 60794-1-2 E11	

Cable is for outdoor installation. Not suitable for indoor use.

KDP

MLT HIGH-FIBER COUNT & REDUCE OD

DIN CODE:A-DQ(ZN)2Y 36×2.0 max. 864F | ID: Z158



Mechanical and Environmental properties

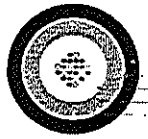
Test	Value	Unit	Method	Comment
Cable outer diameter	16.1 ± 0.5	mm	IEC 60794-1-2 E1	
Cable weight	310	kg/km		calculated
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Max allowable tension	3200	N	IEC 60794-1-2 E1	long term: 1070 N short term: 3200 N installation: 1600 N
Crush resistance test	1000	N	IEC 60794-1-2 E3	no fiber damage at 1000 N/100 mm
Impact resistance test	5	Nm (1 impact)	IEC 60794-1-2 E4	no damage at 5 Nm
Min bend radius (install)	20	×OD	IEC 60794-1-2 E11	20 × OD
Min bend radius (final)	10	×OD	IEC 60794-1-2 E11	10 × OD
Pressure resistance test	2000	N/100 mm	IEC 60794-1-2 E7	no damage at 2000 N/100 mm
Temperature range	Installation Operation Storage	-5 to +50 °C -30 to +70 °C -40 to +70 °C	EN 60794-1-2 E11	

Cable is for outdoor installation. Not suitable for indoor use.

KDP

CLT FIRE RESISTANT CABLE

DIN CODE:JA-DQ(ZN)(SR)H FSC90 max. 24F | ID: Z197



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	8.9 ± 0.5	mm	IEC 60794-1-2 E1	
Cable weight	95	kg/km		calculated
Outer jacket thickness	1.5	mm		
Loose tube diameter	2.0	mm		
Max allowable tension	1780	N	IEC 60794-1-2 E1	long term: 600 N short term: 1780 N installation: 890 N
Crush resistance test	1000	N	IEC 60794-1-2 E3	no fiber damage at 1000 N/100 mm
Impact resistance test	5	Nm (1 impact)	IEC 60794-1-2 E4	no damage at 5 Nm
Min bend radius (install)	20	×OD	IEC 60794-1-2 E11	20 × OD
Min bend radius (final)	10	×OD	IEC 60794-1-2 E11	10 × OD
Pressure resistance test	2000	N/100 mm	IEC 60794-1-2 E7	no damage at 2000 N/100 mm
Temperature range	Installation Operation Storage	-5 to +50 °C -30 to +70 °C -40 to +70 °C	IEC 60794-1-2 E11	

Cable is for outdoor installation. Not suitable for indoor use.

KDP

MLT FIRE RESISTANT CABLE

DIN CODE:JA-DQ(BN)(SR)H FSC90 max. 144F | ID: Z298 / Z299 / Z300

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter set 1	11.1 ± 0.4	mm	EN 60794-1-2 E1	
Cable outer diameter set 2	12.4 ± 0.4	mm	EN 60794-1-2 E1	
Cable outer diameter set 3	14.8 ± 0.4	mm	EN 60794-1-2 E1	
Cable weight set 1	98	kg/km		calculated
Cable weight set 2	128	kg/km		calculated
Cable weight set 3	195	kg/km		calculated
Outer jacket thickness	1.8	mm		
Loose tube diameter	2.5	mm		
Max allowable tension set 1	2670	N	IEC 60794-1-2 E1	long term: 890 N short term: 2670 N installation: 1335 N
Max allowable tension set 2	3560	N	IEC 60794-1-2 E1	long term: 1190 N short term: 3560 N installation: 1780 N
Max allowable tension set 3	4450	N	IEC 60794-1-2 E1	long term: 1480 N short term: 4450 N installation: 2225 N
Crush resistance test	1000	N	IEC 60794-1-2 E3	no fiber damage at 1000 N/100 mm
Impact resistance test	5	Nm (1 impact)	IEC 60794-1-2 E4	no damage at 5 Nm
Min bend radius (install)	20	×OD	IEC 60794-1-2 E11	20 × OD
Min bend radius (final)	10	×OD	IEC 60794-1-2 E11	10 × OD
Pressure resistance test	2000	N/100 mm	IEC 60794-1-2 E7	no damage at 2000 N/100 mm
Temperature range	Installation Operation Storage	-5 to +50 °C -30 to +70 °C -40 to +70 °C	IEC 60794-1-2 E11	

Cable is for outdoor installation. Not suitable for indoor use.

KDP

Fire properties

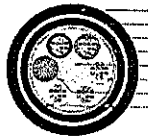
Test	Value	Unit	Method	Comment
Fire resistance – Permanence	≥ 90	min	EN 50200 / EN 50362 / IEC 60331-21	Circuit integrity ≥ 90 min
Fire resistance – Arch power	1.5	kW/m²	EN 50200 / EN 50362 / IEC 60331-21	Flame temperature ≥ 750 °C
Fire resistance – Smoke density	0.20	m²/g	EN 61034-2 / EN 50268-2	max. 0.20 m²/g
Corrosivity	–	–	EN 50267-2-1 / EN 50267-2-2 / EN 50267-2-3	Test passed

This cable is suitable for indoor or outdoor use. It has low smoke, zero halogen, and good flame retardancy characteristics.

KDP

MLT FIRE RESISTANT CABLE

DIN CODE:JA-DQ(ZN)H(GR)H WBF FSC180 max. 144F | ID: Z282 / Z283 / Z284



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter set 1	14.5 ± 0.5	mm	EN 60794-1-2 E1	
Cable outer diameter set 2	15.5 ± 0.5	mm	EN 60794-1-2 E1	
Cable outer diameter set 3	16.5 ± 0.5	mm	EN 60794-1-2 E1	
Cable weight set 1	260	kg/km		calculated
Cable weight set 2	310	kg/km		calculated
Cable weight set 3	360	kg/km		calculated
Outer jacket thickness	2.2	mm		
Loose tube diameter	2.5	mm		
Max allowable tension set 1	3560	N	IEC 60794-1-2 E1	long term: 1335 N short term: 3560 N installation: 1780 N
Max allowable tension set 2	4450	N	IEC 60794-1-2 E1	long term: 1780 N short term: 4450 N installation: 2225 N
Max allowable tension set 3	5340	N	IEC 60794-1-2 E1	long term: 2225 N short term: 5340 N installation: 2670 N
Crush resistance test	1000	N	IEC 60794-1-2 E3	no fiber damage at 1000 N/100 mm
Impact resistance test	5	Nm (1 impact)	IEC 60794-1-2 E4	no damage at 5 Nm
Min bend radius (install)	20	×OD	IEC 60794-1-2 E11	20 × OD
Min bend radius (final)	10	×OD	IEC 60794-1-2 E11	10 × OD
Pressure resistance test	2000	N/100 mm	IEC 60794-1-2 E7	no damage at 2000 N/100 mm
Temperature range	Installation Operation Storage	-5 to +50 °C -30 to +70 °C -40 to +70 °C	IEC 60794-1-2 E11	

KDP

Fire properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

CLT FIRE RESISTANT CABLE

DIN CODE:JA-VQ(BN)H(SR)H FSC180 max.24F | ID: Z285

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

Fire properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

CLT FIRE RESISTANT CABLE

DIN CODE:JA-DQ(BN)H(SR)H FSC180 max.24F | ID: Z281

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

HYBRID

DIN CODE:A-DSQ(BN)2Y 5×2,3 + 1×2×0,6 max.60F | ID: Z001

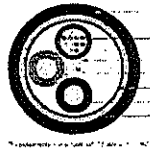
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

HYBRID

DIN CODE:A-DSQ(BN)2Y 1×2,5+3×1Cu (12F) – 3×2,5+1×1Cu (36F) | ID: Z078



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

KDP

263

HYBRID

DIN CODE:J/A-DSQ(BN)H 1×2,5+3×(Cu (12F) – 3×2,5+1×(Cu (36F) | ID: Z136

Mechanical and Environmental properties

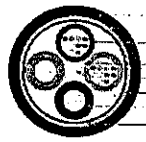
Test		Value	Unit	Method	Comment
Cable outer diameter					
Cable weight					
Conductor resistance					
Insulation resistance					
Max. tensile strength					
Flexural resistance					
Max. bend radius (one way)					
Max. bend radius (many)					
Max. outer diameter					
Temperature range					

Cable life time – minimum 10 years. This cable is suitable for indoor or outdoor use

KDP

HYBRID

DIN CODE:A-DSQ(BN)2Y 1×2,5+3×(Cu (12F) – 3×2,5+1×(Cu (36F) | ID: Z131



Mechanical and Environmental properties

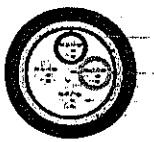
Test		Value	Unit	Method	Comment
Cable outer diameter					
Cable weight					
Conductor resistance					
Insulation resistance					
Max. tensile strength					
Flexural resistance					
Max. bend radius (one way)					
Max. bend radius (many)					
Max. outer diameter					
Temperature range					

Cable life time – minimum 10 years. This cable is suitable for indoor use

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 4×2,5 max. 48F | ID: Z040



Mechanical and Environmental properties

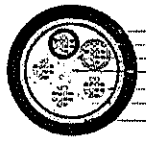
Test		Method	Value/Unit
Max. tensile strength			
Conductor resistance			
Insulation resistance			
Max. bend radius			
Flexural resistance			
Cable weight			
Conductor Max.			
Temperature range			
Cable life time (outdoor, many bends)			
Standard package length			
Packaging			
Cable outer diameter			
Other product information			
Cable outer thickness			

Cable life time – minimum 10 years. This cable is suitable for outdoor use, minimum bend requirements

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 5×2,5 max. 60F | ID: Z012



Mechanical and Environmental properties

Test		Method	Value/Unit
Max. tensile strength			
Conductor resistance			
Insulation resistance			
Max. bend radius			
Flexural resistance			
Cable weight			
Conductor Max.			
Temperature range			
Cable life time (outdoor, many bends)			
Standard package length			
Packaging			
Cable outer diameter			
Other product information			
Cable outer thickness			

Cable life time – minimum 10 years. This cable is suitable for outdoor use, minimum bend requirements

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 6×2,5 max. 72F | ID: Z030

Mechanical and Environmental properties

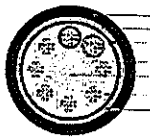
Test		Method	Value/Unit
Max. tensile strength			
Conductor resistance			
Insulation resistance			
Max. bend radius			
Flexural resistance			
Cable weight			
Conductor Max.			
Temperature range			
Cable life time (outdoor, many bends)			
Standard package length			
Packaging			
Cable outer diameter			
Other product information			
Cable outer thickness			

Cable life time – minimum 10 years. This cable is suitable for outdoor use, minimum bend requirements

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 8×2,5 max. 96F | ID: Z033



Mechanical and Environmental properties

Test		Method	Value/Unit
Max. tensile strength			
Conductor resistance			
Insulation resistance			
Max. bend radius			
Flexural resistance			
Cable weight			
Conductor Max.			
Temperature range			
Cable life time (outdoor, many bends)			
Standard package length			
Packaging			
Cable outer diameter			
Other product information			
Cable outer thickness			

Cable life time – minimum 10 years. This cable is suitable for outdoor use, minimum bend requirements

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 12×2.5 max.144F | ID 7063

Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 16×2.5 max.192F | ID:2168

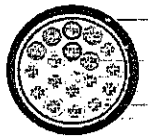
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

MLT ARCTIC

DIN CODE:A-DQ(BN)2Y ARC 18×2.5 max.216F | ID 7330



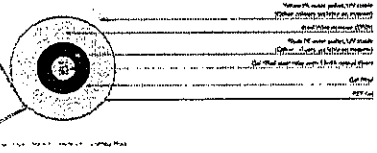
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

CLT SUBMARINE SWA

DIN CODE:Submarine SWA Cable max. 96F | ID: Z336

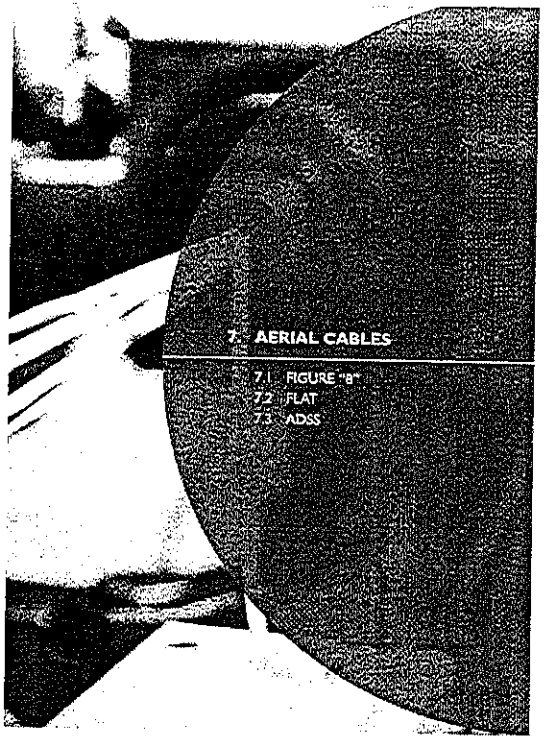


Mechanical and Environmental properties

Test	Value (D x D)	Unit	Method	Comment

KDP

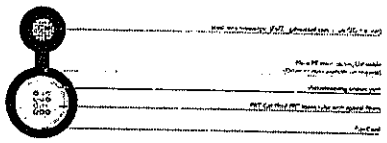
KDP



7. AERIAL CABLES

CLT FIGURE "8"

DIN CODE:A-DQ(ZN)2YT Drop max. 12F | ID: A8n0



Mechanical and Environmental properties

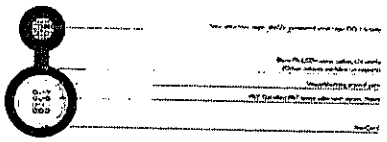
Test	Value	Unit	Method	Comment
Cable outer diameter	7.6 ± 0.4	mm		
Cable weight	56	kg/km		Guideline
Outer jacket thickness	1.5	mm		
Strength member diameter	2.2	mm		
Max. allowable tensile load	1000	N		Installation and long term
Crush resistance test	1000	N		Short term
Impact resistance test	5	N·m, 10 impacts		No fiber damage
Min. bend radius (installation)	15	x cable diameter		Installation
Min. bend radius (fixed)	10	x cable diameter		Long term
Minimum temperature test	-40°C		IEC 60794-1-22	
Temperature range	Operating: -40 to +70°C Storage: -40 to +70°C Transport: -40 to +70°C		IEC 60794-1-22	

Cable shall meet requirements of more than relevant standards for outdoor aerial use.

KDP

CLT FIGURE "8"

DIN CODE:A-DQ(ZN)HT Drop max. 12F | ID: A8A2



Mechanical and Environmental properties

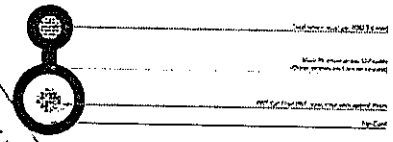
Test	Value	Unit	Method	Comment
Cable outer diameter	7.6 ± 0.4	mm		
Cable weight	56	kg/km		Guideline
Outer jacket thickness	1.5	mm		
Strength member diameter	2.2	mm		
Max. allowable tensile load	1000	N		Installation and long term
Crush resistance test	1000	N		Short term
Impact resistance test	5	N·m, 10 impacts		No fiber damage
Min. bend radius (installation)	15	x cable diameter		Installation
Min. bend radius (fixed)	10	x cable diameter		Long term
Minimum temperature test	-40°C		IEC 60794-1-22	
Temperature range	Operating: -40 to +70°C Storage: -40 to +70°C Transport: -40 to +70°C		IEC 60794-1-22	

Cable shall meet requirements of more than relevant standards for outdoor aerial use.

KDP

CLT FIGURE "8"

DIN CODE:A-D2YT max. 24F | ID: Z187



Mechanical and Environmental properties

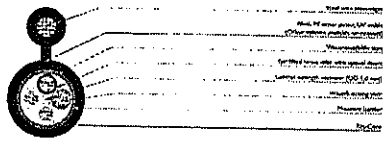
Test	Value	Unit	Method	Comment
Cable outer diameter	9.6 ± 0.5	mm		
Cable weight	78	kg/km		Guideline
Outer jacket thickness	1.8	mm		
Strength member diameter	2.8	mm		
Max. allowable tensile load	1500	N		Installation and long term
Crush resistance test	2000	N		Short term
Impact resistance test	5	N·m, 10 impacts		No fiber damage
Min. bend radius (installation)	20	x cable diameter		Installation
Min. bend radius (fixed)	15	x cable diameter		Long term
Minimum temperature test	-40°C		IEC 60794-1-22	
Temperature range	Operating: -40 to +70°C Storage: -40 to +70°C Transport: -40 to +70°C		IEC 60794-1-22	

Cable shall meet requirements of more than relevant standards for outdoor aerial use.

KDP

MLT FIGURE "8"

DIN CODE:A-DQ(L)2YT 4÷ 2.3 max. 48F | ID: LR3A



Mechanical and Environmental properties

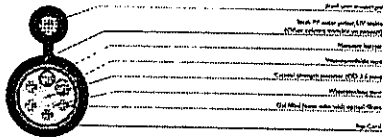
Test	Method	Value/Unit
Fiber count range		4 to 48
Cable outer diameter		9.6 ± 0.5 mm
Cable weight		78 kg/km
Tensile strength		1500 N
Crush resistance		2000 N / 100 mm
Impact resistance		5 N·m, 10 impacts
Min. bend radius (installation)		20 x cable diameter
Min. bend radius (fixed)		15 x cable diameter
Operating temperature		-40°C to +70°C
Storage temperature		-40°C to +70°C
Transport temperature		-40°C to +70°C
Flame retardancy	IEC 60332-1-2	Self-extinguishing
Water penetration	IEC 60794-1-22	No water leakage
Packaging		Wooden drum
Drum length		2 km
Drum flange diameter		1.2 m
Color code		Blue
Drum weight		Approx. 1.2 tons

Cable shall meet requirements of more than relevant standards for outdoor aerial use.

KDP

MLT FIGURE "8"

DIN CODE:A-DQ(L)2YT 6÷ 2.3 max. 72F | ID: F83A



Mechanical and Environmental properties

Test	Method	Value/Unit
Fiber count range		6 to 72
Cable outer diameter		9.6 ± 0.5 mm
Cable weight		78 kg/km
Tensile strength		1500 N
Crush resistance		2000 N / 100 mm
Impact resistance		5 N·m, 10 impacts
Min. bend radius (installation)		20 x cable diameter
Min. bend radius (fixed)		15 x cable diameter
Operating temperature		-40°C to +70°C
Storage temperature		-40°C to +70°C
Transport temperature		-40°C to +70°C
Flame retardancy	IEC 60332-1-2	Self-extinguishing
Water penetration	IEC 60794-1-22	No water leakage
Packaging		Wooden drum
Drum length		2 km
Drum flange diameter		1.2 m
Color code		Blue
Drum weight		Approx. 1.2 tons

Cable shall meet requirements of more than relevant standards for outdoor aerial use.

KDP

FLAT

DIN CODE:A-D(ZN)2YT HD 2× 12 | ID: Z 39

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		kN
Crush resistance		kN/100 m
Impact resistance		dB
Min. bend radius		mm
Compound flow		mm
Hydrolysis		
Thermal expansion coefficient		
Temperature range	Transport Operation	°C
Cable attenuation, screened cable (pm)		dB/km
Fire behaviour		
Halogens		
Loose tube diameter		mm
Outer jacket, thickness		mm
Cable outer diameter		mm

More on page No. 267

KDP

FLAT

DIN CODE:A-D(ZN)2YT HD 2× 3,5 max. 48F | ID: Z154

Mechanical and Environmental properties

Test	Method	Value/Unit
Max. tensile strength		kN
Crush resistance		kN/100 m
Impact resistance		dB
Min. bend radius		5 mm/ 5 x D max.
Compound flow		% mm
Hydrolysis		7 days/ 85 °C/ 85 % r.h.
Thermal expansion coefficient		1 E-6/K
Temperature range	Transport Operation Store	-40 °C to +70 °C -20 °C to +70 °C -40 °C to +70 °C
Cable attenuation, screened cable (pm)		dB/km
Cable construction, nominal weight (g/km)		kg/km
Longitudinal water barrier		Yes/No
Hydrolysis		7 days/ 85 °C/ 85 % r.h.
Loose tube diameter		2.5 mm
Outer jacket, thickness		1.8 mm
Cable outer diameter		12.0 mm ± 0.5 mm (12.0 mm ± 0.5 mm)

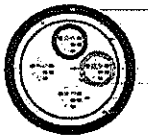
Cable life time – minimum 30 years This value is suitable for outdoor, inner, indoor direct but all no wind load

More on page No. 269

KDP

ADSS

DIN CODE:A-DQ(ZN)2Y(T) ADSS 3 kN 4× 2,5 max. 48F | ID: N309



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	12.2 ± 0.7	mm	EN 60794-1-2	
Cable weight	ca.	kg/km		calculated
Cover (jacket) thickness	1.4 ± 0.2	mm		
Inner cable diameter	≥ 9	mm		
Thermal expansion coefficient		1/K		
Modulus of elasticity		N/mm²		
Max. tensile strength		kN	EN 60794-1-2 E1	max. recommended load: 1.5 kN minimum breaking load: 3 kN short term: 3 kN, 15 min, 20 °C long term: 1.5 kN, 10 years, 20 °C min. bending diameter: 300 mm
Crush resistance test	1000	N	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Impact resistance test	5	0.5 mm	EN 60794-1-2 E4	short term: 5 J/0.5 mm at 20 °C long term: 2.5 J/0.5 mm at 20 °C impact energy: 5 J/0.5 mm at 20 °C
Min. bend radius (installed)	10	x Do	EN 60794-1-2 E11	min. recommended: 10 x Do at 20 °C short term: 10 x Do at 20 °C long term: 20 x Do at 20 °C
Min. bend radius (load)	20	x Do	EN 60794-1-2 E11	short term: 20 x Do at 20 °C long term: 40 x Do at 20 °C
Pressure resistance test		dNm	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Temperature range	Transport Operation Store	-40 °C to +70 °C -20 °C to +70 °C -40 °C to +70 °C	EN 60794-1-2 F1	short term: -40 °C to +70 °C long term: -20 °C to +70 °C installation: 0 °C to +50 °C min. bending diameter: 300 mm at 0 °C

Cable life time – minimum 30 years This value is suitable for outdoor, inner, indoor direct

More on page No. 271

KDP

ADSS

DIN CODE:A-DQ(ZN)2Y(T) ADSS 3 kN 6× 2,5 max. 72F | ID: N406

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	14.2 ± 0.7	mm		
Cable weight	ca.	kg/km		calculated
Inner cable diameter	≥ 9	mm		
Outer jacket thickness	1.4	mm		
Loose tube diameter	2.5	mm		
Thermal expansion coefficient		1/K		
Modulus of elasticity		N/mm²		
Max. tensile load	3	kN	EN 60794-1-2 E1	max. recommended load: 1.5 kN minimum breaking load: 3 kN short term: 3 kN, 15 min, 20 °C long term: 1.5 kN, 10 years, 20 °C min. bending diameter: 300 mm
Crush resistance test	1000	N	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Impact resistance test	5	0.5 mm	EN 60794-1-2 E4	short term: 5 J/0.5 mm at 20 °C long term: 2.5 J/0.5 mm at 20 °C impact energy: 5 J/0.5 mm at 20 °C
Min. bend radius (installed)	10	x Do	EN 60794-1-2 E11	min. recommended: 10 x Do at 20 °C short term: 10 x Do at 20 °C long term: 20 x Do at 20 °C
Min. bend radius (load)	20	x Do	EN 60794-1-2 E11	short term: 20 x Do at 20 °C long term: 40 x Do at 20 °C
Pressure resistance test		dNm	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Temperature range	Transport Operation Store	-40 °C to +70 °C -20 °C to +70 °C -40 °C to +70 °C	EN 60794-1-2 F1	short term: -40 °C to +70 °C long term: -20 °C to +70 °C installation: 0 °C to +50 °C min. bending diameter: 300 mm at 0 °C

Cable life time – minimum 30 years This value is suitable for outdoor, inner, indoor direct but all no wind load

More on page No. 270

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 6 kN 6× 2,5 max. 72F | ID: N4Y1

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter	ca. 14.2	mm		
Cable weight	ca.	kg/km		calculated
Inner cable diameter	≥ 9	mm		
Outer jacket thickness	1.4	mm		
Loose tube diameter	2.5	mm		
Thermal expansion coefficient		1/K		
Modulus of elasticity		N/mm²		
Max. tensile load	6	kN	EN 60794-1-2 E1	max. recommended load: 3 kN minimum breaking load: 6 kN short term: 6 kN, 15 min, 20 °C long term: 3 kN, 10 years, 20 °C min. bending diameter: 300 mm
Crush resistance test	1000	N	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Impact resistance test	5	0.5 mm	EN 60794-1-2 E4	short term: 5 J/0.5 mm at 20 °C long term: 2.5 J/0.5 mm at 20 °C impact energy: 5 J/0.5 mm at 20 °C
Min. bend radius (installed)	10	x Do	EN 60794-1-2 E11	min. recommended: 10 x Do at 20 °C short term: 10 x Do at 20 °C long term: 20 x Do at 20 °C
Min. bend radius (load)	20	x Do	EN 60794-1-2 E11	short term: 20 x Do at 20 °C long term: 40 x Do at 20 °C
Pressure resistance test		dNm	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Temperature range	Transport Operation Store	-40 °C to +70 °C -20 °C to +70 °C -40 °C to +70 °C	EN 60794-1-2 F1	short term: -40 °C to +70 °C long term: -20 °C to +70 °C installation: 0 °C to +50 °C min. bending diameter: 300 mm at 0 °C

More on page No. 272

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 10 kN 6× 2,8 max. 72F | ID: N421

Mechanical and Environmental properties

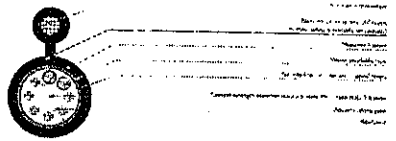
Test	Value	Unit	Method	Comment
Cable outer diameter	ca. 14.2	mm		
Cable weight	ca.	kg/km		calculated
Inner cable diameter	≥ 9	mm		
Outer jacket thickness	1.4	mm		
Loose tube diameter	2.5	mm		
Thermal expansion coefficient		1/K		
Modulus of elasticity		N/mm²		
Max. tensile load	10	kN	EN 60794-1-2 E1	max. recommended load: 5 kN minimum breaking load: 10 kN short term: 10 kN, 15 min, 20 °C long term: 5 kN, 10 years, 20 °C min. bending diameter: 300 mm
Crush resistance test	1000	N	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Impact resistance test	5	0.5 mm	EN 60794-1-2 E4	short term: 5 J/0.5 mm at 20 °C long term: 2.5 J/0.5 mm at 20 °C impact energy: 5 J/0.5 mm at 20 °C
Min. bend radius (installed)	10	x Do	EN 60794-1-2 E11	min. recommended: 10 x Do at 20 °C short term: 10 x Do at 20 °C long term: 20 x Do at 20 °C
Min. bend radius (load)	20	x Do	EN 60794-1-2 E11	short term: 20 x Do at 20 °C long term: 40 x Do at 20 °C
Pressure resistance test		dNm	EN 60794-1-2 E3	short term: 2.5 kN/100 mm, 10 min long term: 1.0 kN/100 mm, 10 years min. compression: 1.0 kN/100 mm
Temperature range	Transport Operation Store	-40 °C to +70 °C -20 °C to +70 °C -40 °C to +70 °C	EN 60794-1-2 F1	short term: -40 °C to +70 °C long term: -20 °C to +70 °C installation: 0 °C to +50 °C min. bending diameter: 300 mm at 0 °C

More on page No. 273

KDP

MLT FIGURE "8"

DIN CODE:A-DQ(L)2YT 8× 2,3 max. 96F | ID: G83A



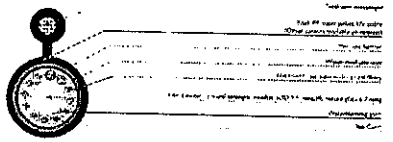
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

MLT FIGURE "8"

DIN CODE:A-DQ(L)2YT 12× 2,3 max. 144F | ID: H83A



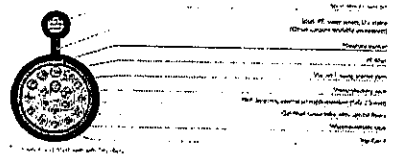
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

MLT FIGURE "8"

DIN CODE:A-DQ(L)2YT 18× 2,3 max. 216F | ID: I83A



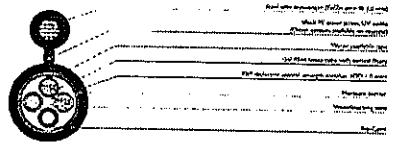
Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

HYBRID MLT FIGURE "8"

DIN CODE:A-DSQ(L)2YT 1× 2,5 + 3× 1Cu (12F) – 3× 2,5 + 1× 1Cu (36F) | ID: Z047



Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

FLAT

DIN CODE:A-V(2ZN)H2YT max. 1F | ID: Z138

Mechanical and Environmental properties

Test	Method	Value/Unit

KDP

FLAT

DIN CODE:A-D(2ZN)2YT HD 1× 2,0 max. 12F | ID: A501

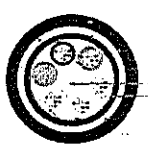
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 15 kN 6× 2,8 max. 72F | ID: N4RI



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Central tube diameter		mm		
Thermal expansion coefficient				
Modulus of elasticity				
Max allowable tension				
Crush resistance test				
Impact resistance test				
Max bend radius (no load)				
Max bend radius (load)				
Pressure resistance test				
Temperature range				

Cable life time – minimum 30 years. This value is suitable for aluminum armored cable.

More on page No. 190

KDP

ADSS

DIN CODE:A-DQ(ZN)2Y(T) ADSS 3 kN 8× 2,5 max. 96F | ID: N5XI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Central tube diameter		mm		
Thermal expansion coefficient				
Modulus of elasticity				
Max allowable tension				
Crush resistance test				
Impact resistance test				
Max bend radius (no load)				
Max bend radius (load)				
Pressure resistance test				
Temperature range				

Cable life time – minimum 30 years. This value is suitable for aluminum armored cable.

More on page No. 190

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 6 kN 8× 2,5 max. 96F | ID: N5YI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Central tube diameter		mm		
Thermal expansion coefficient				
Modulus of elasticity				
Max allowable tension				
Crush resistance test				
Impact resistance test				
Max bend radius (no load)				
Max bend radius (load)				
Pressure resistance test				
Temperature range				

Cable life time – minimum 30 years. This value is suitable for aluminum armored cable.

More on page No. 190

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 10 kN 8× 2,8 max. 96F | ID: N5ZI

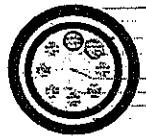
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Central tube diameter		mm		
Thermal expansion coefficient				
Modulus of elasticity				
Max allowable tension				
Crush resistance test				
Impact resistance test				
Max bend radius (no load)				
Max bend radius (load)				
Pressure resistance test				
Temperature range				

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 15 kN 8× 2,8 max. 96F | ID: N5RI



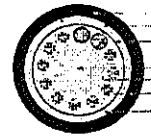
Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Central tube diameter		mm		
Thermal expansion coefficient				
Modulus of elasticity				
Max allowable tension				
Crush resistance test				
Impact resistance test				
Max bend radius (no load)				
Max bend radius (load)				
Pressure resistance test				
Temperature range				

KDP

ADSS

DIN CODE:A-DQ(ZN)2Y(T) ADSS 3 kN 12× 2,5 max. 144F | ID: N6XI



Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Central tube diameter		mm		
Thermal expansion coefficient				
Modulus of elasticity				
Max allowable tension				
Crush resistance test				
Impact resistance test				
Max bend radius (no load)				
Max bend radius (load)				
Pressure resistance test				
Temperature range				

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 6 kN 12× 2.5 max. 144F | ID: N6YI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Thermal expansion coefficient		ppm/K		
Modulus of elasticity		GPa		
Max allowable tension		N		
Crush resistance test		N		
Impact resistance test		J		
Min bend radius (no load)		mm		
Min bend radius (load)		mm		
Maximum installation load		kN		
Temperature range	Installation			
	Operation			
	Storage			

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 10 kN 12× 2.8 max. 144F | ID: N6ZI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Thermal expansion coefficient		ppm/K		
Modulus of elasticity		GPa		
Max allowable tension		N		
Crush resistance test		N/100 mm		
Impact resistance test		J		
Min bend radius (no load)		mm		
Min bend radius (load)		mm		
Maximum installation load		kN		
Temperature range	Installation			
	Operation			
	Storage			

KDP

ADSS

DIN CODE:A-DQ2Y(ZN)2Y(T) ADSS 15 kN 12× 2.8 max. 144F | ID: N6RI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Thermal expansion coefficient		ppm/K		
Modulus of elasticity		GPa		
Max allowable tension		N		
Crush resistance test		N/100 mm		
Impact resistance test		J		
Min bend radius (no load)		mm		
Min bend radius (load)		mm		
Maximum installation load		kN		
Temperature range	Installation			
	Operation			
	Storage			

KDP

ADSS

DIN CODE:A-DQ(ZN)2Y(T) ADSS 15 kN 18× 2.8 max. 216F | ID: N7SI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Thermal expansion coefficient		ppm/K		
Modulus of elasticity		GPa		
Max allowable tension		N		
Crush resistance test		N/100 mm		
Impact resistance test		J		
Min bend radius (no load)		mm		
Min bend radius (load)		mm		
Maximum installation load		kN		
Temperature range	Installation			
	Operation			
	Storage			

KDP

ADSS

DIN CODE:A-DQ(ZN)2Y(T) ADSS 15 kN 18× 2.8 max. 216F | ID: N7RI

Mechanical and Environmental properties

Test	Value	Unit	Method	Comment
Cable outer diameter		mm		
Cable weight		kg/km		
Inner jacket thickness		mm		
Outer jacket thickness		mm		
Loose tube diameter		mm		
Thermal expansion coefficient		ppm/K		
Modulus of elasticity		GPa		
Max allowable tension		N		
Crush resistance test		N/100 mm		
Impact resistance test		J		
Min bend radius (no load)		mm		
Min bend radius (load)		mm		
Maximum installation load		kN		
Temperature range	Installation			
	Operation			
	Storage			

KDP

AERIAL CABLE PROPERTIES

Z128

Span (m)	Installation (0.5 % Rm)	Wind				Heavy ice				Wind + Heavy ice			
		25 m/s		30 m/s		5 mm		10 mm		5 mm + 180 km/h		10 mm + 160 km/h	
		Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.
50	Force [N]	104		149		84		168		84		168	
	Sag [m]	0.5	0.0	0.7	0.0	0.5	0.0	0.9	0.0	0.5	0.0	0.9	0.0
60	Force [N]	104		149		84		168		84		168	
	Sag [m]	0.7	0.0	1.0	0.0	0.7	0.0	1.3	0.0	0.7	0.0	1.3	0.0
70	Force [N]	104		149		84		168		84		168	
	Sag [m]	0.9	0.0	1.3	0.0	0.9	0.0	1.8	0.0	0.9	0.0	1.8	0.0
80	Force [N]	104		149		84		168		84		168	
	Sag [m]	1.2	0.0	1.7	0.0	1.2	0.0	2.3	0.0	1.2	0.0	2.3	0.0
90	Force [N]	104		149		84		168		84		168	
	Sag [m]	1.5	0.0	2.1	0.0	1.5	0.0	2.9	0.0	1.5	0.0	2.9	0.0
100	Force [N]	104		149		84		168		84		168	
	Sag [m]	1.8	0.0	2.6	0.0	1.8	0.0	3.6	0.0	1.8	0.0	3.6	0.0

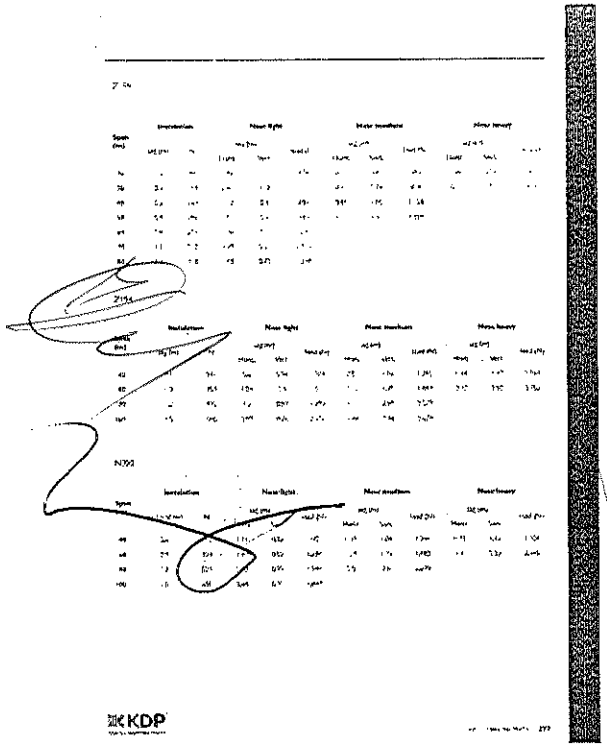
Other values are available on request.
Sag with 0 °C, 0 Pa, 0 kg/m² ice/wind.
1 kN/mm² = 10.2 mm/m² = 450 lb/in² (psi).

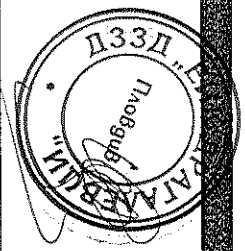
ASDI

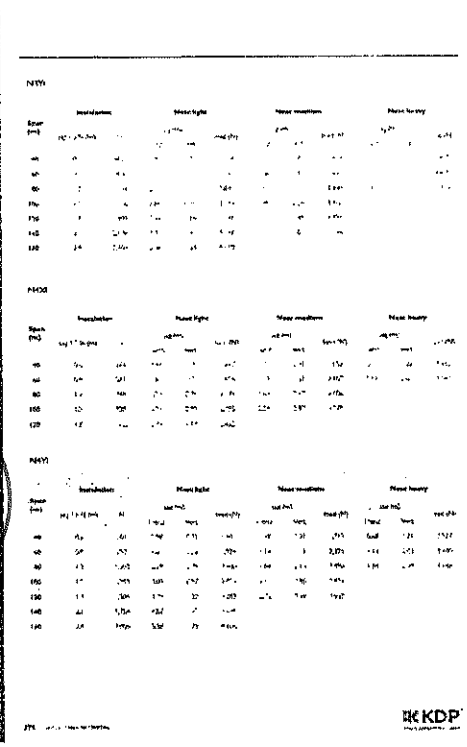
Span (m)	Installation		Mono Span		Mono Anchor		Mono Heavy	
	40 % RTS		40 % RTS		40 % RTS		40 % RTS	
	Sag [m]	%	Sag [m]	Tens. [kN]	Sag [m]	Tens. [kN]	Sag [m]	Tens. [kN]
15	0.4	1.2	0.4	1.2	0.4	1.2	0.4	1.2
20	0.7	1.6	0.7	1.6	0.7	1.6	0.7	1.6
25	1.1	2.0	1.1	2.0	1.1	2.0	1.1	2.0
30	1.5	2.4	1.5	2.4	1.5	2.4	1.5	2.4
40	2.6	3.2	2.6	3.2	2.6	3.2	2.6	3.2
50	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
60	5.8	4.8	5.8	4.8	5.8	4.8	5.8	4.8
70	7.9	5.6	7.9	5.6	7.9	5.6	7.9	5.6
80	10.3	6.4	10.3	6.4	10.3	6.4	10.3	6.4
90	13.0	7.2	13.0	7.2	13.0	7.2	13.0	7.2
100	16.0	8.0	16.0	8.0	16.0	8.0	16.0	8.0

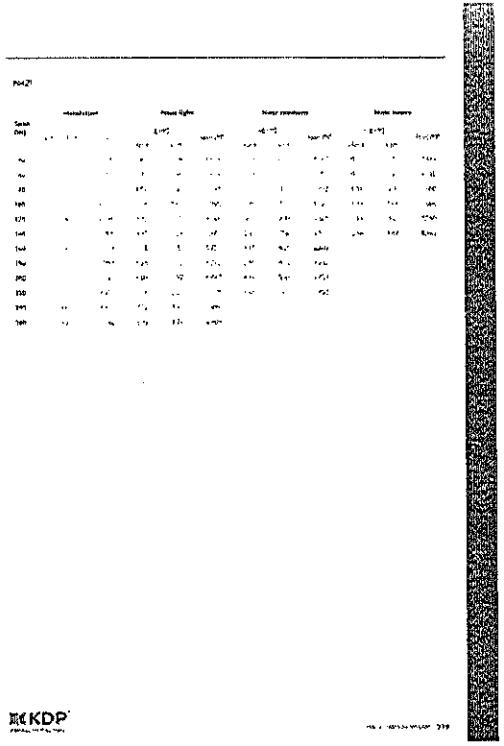
Other on request.

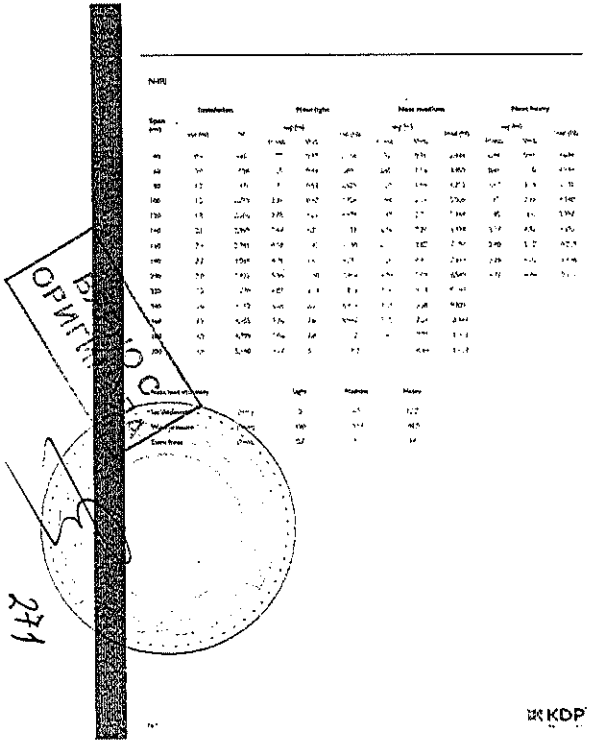
KDP

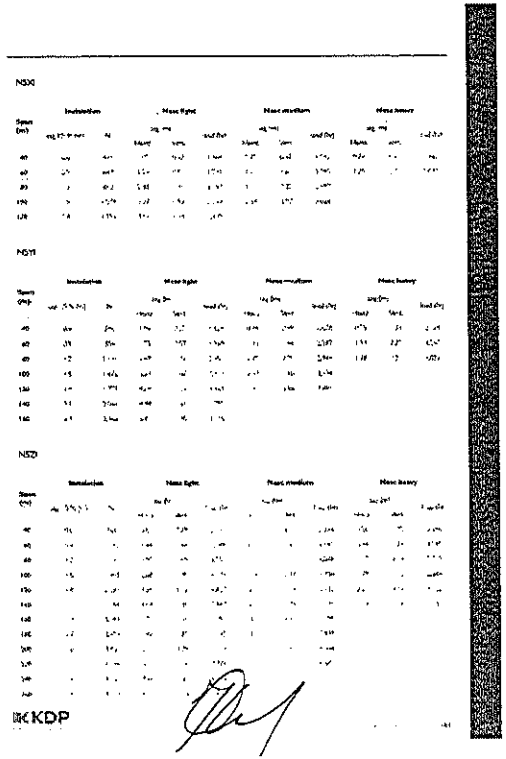


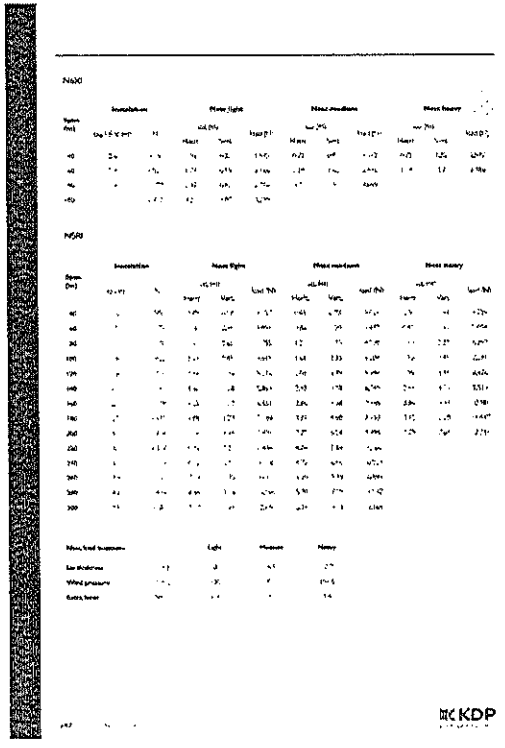


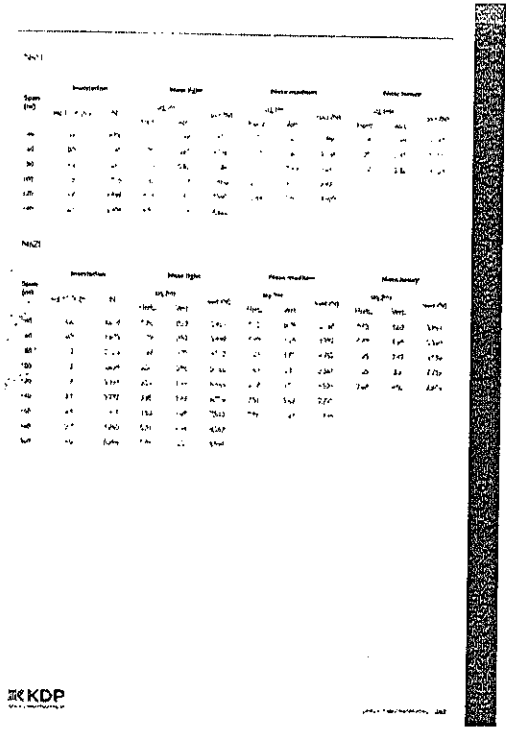


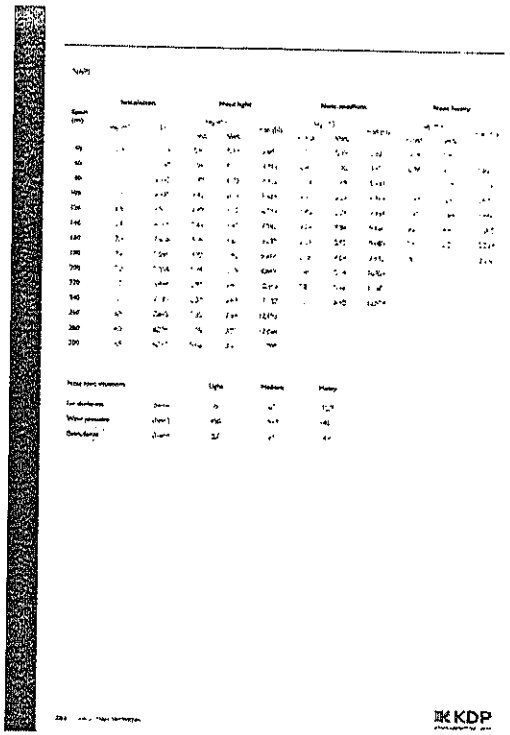


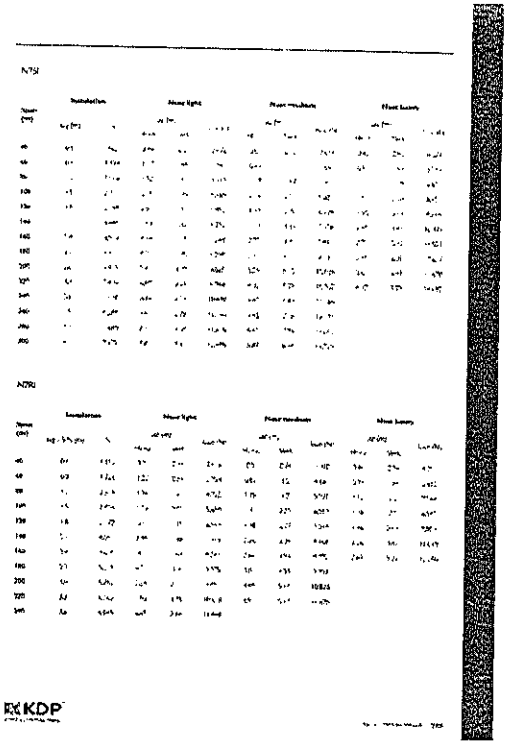


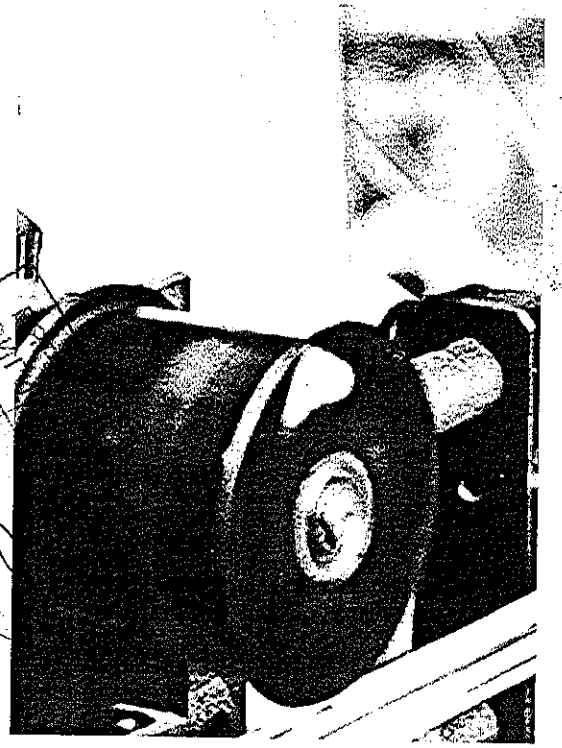


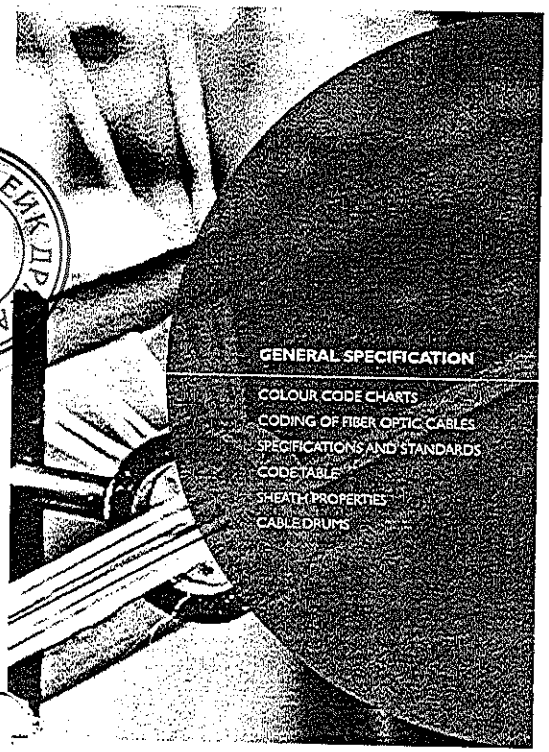






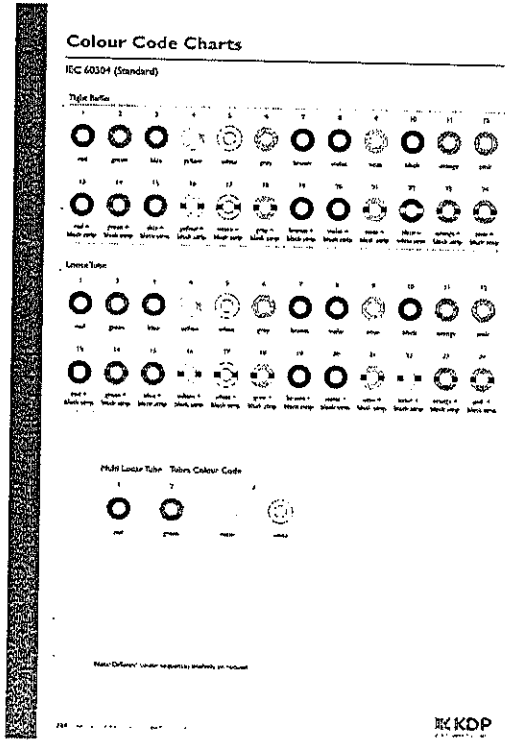






GENERAL SPECIFICATION

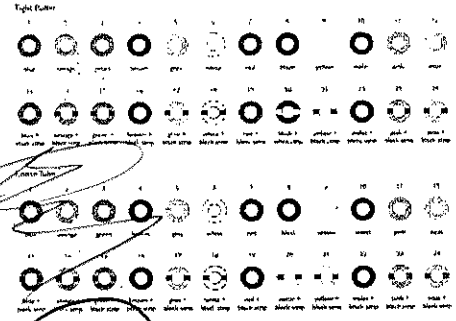
- COLOUR CODE CHARTS
- CODING OF FIBER OPTIC CABLES
- SPECIFICATIONS AND STANDARDS
- CODETABLE
- SHEATH PROPERTIES
- CABLE DRUMS



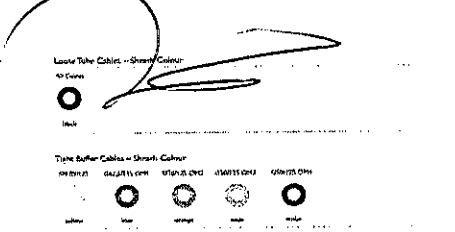
Colour Code Charts

TIA/EIA 598

Tight Buffer



Loose Tube



Loose Tube Cables – Sheath Colour

Tight Buffer Cables – Sheath Colour

Note: Different sheath colour available on request.

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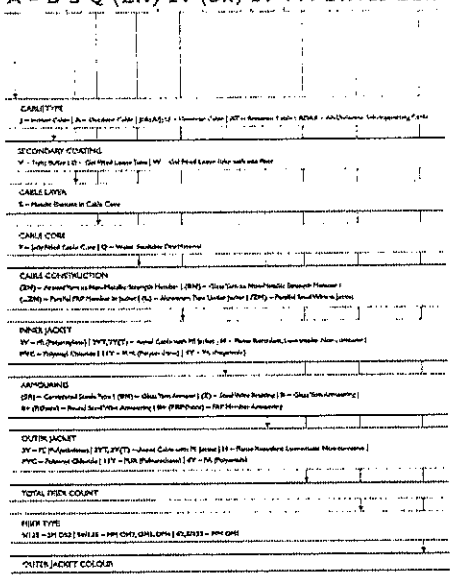
Coding of Fiber Optic Cables (according to the VDE 0888)

Example

A – D S Q (ZN) 2Y (SR) 2Y 144 E9/125 BLK



CABLE TYPE

A = Indoor Cable | A = Outdoor Cable | AK(A)(L)Y = Universal Cable | AT = Antenna Cable | AZ(A)(L) = Anti-Rodent Cable corresponding Parts

SECONDARY COATING

V = Tight Buffer | D = Gel Filled Loose Tube | W = Gel Free Loose Tube with Water Fleer

CABLE LAYER

S = Metallic Elements in Cable Core

CABLE CORE

Y = Solid Filled Cable Core | Q = Water Swellable Fleer Material

CABLE CONSTRUCTION

(ZN) = Armored Fleer vs Non-Metallic Strength Member | (2AN) = Glass Yarn as Non-Metallic Strength Member |
(=2AN) = Parallel FRP Member in Jacket | (L) = Aluminum Fleer Laminate Jacket | (ZAN) = Parallel Steel Wires e Jacket

INNER JACKET

W = PE (Polyethylene) | 2WT, 2Y(ST) = Armed Cable with PE Jacket | H = Flame Retardant, Low Smoke, Non-Corrosive |
2YHC = Polyvinyl Chloride | 11Y = PUR (Polyurethane) | 4Y = PA (Polyamide)

ARMOURING

(SR) = Corrugated Steel Tape | (RM) = Glass Yarn Armour | (G) = Steel Wire Braiding | B = Glass Yarn Armouring |
4Y (FRPmat) = Round Steel Wire Armouring | 4Y (FRP/Mat) = FRP Member Armouring

OUTER JACKET

2Y = PE (Polyethylene) | 2YT, 2Y(ST) = Armed Cable with PE Jacket | H = Flame Retardant, Low Smoke, Non-Corrosive |
2YHC = Polyvinyl Chloride | 11Y = PUR (Polyurethane) | 4Y = PA (Polyamide)

TOTAL FIBER COUNT

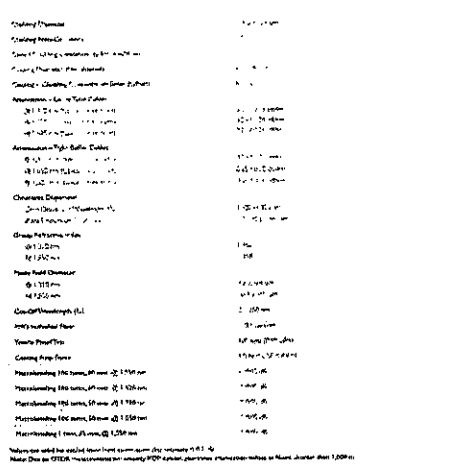
FIBER TYPE

9/125 = SM OS2 | 50/125 = MM OM2, OM3, OM4 | 62,5/125 = MM OM1

OUTER JACKET COLOUR

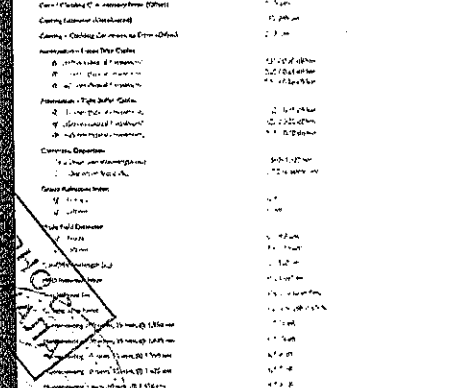
KDP

Single-Mode Fiber ITU-T G.652.D



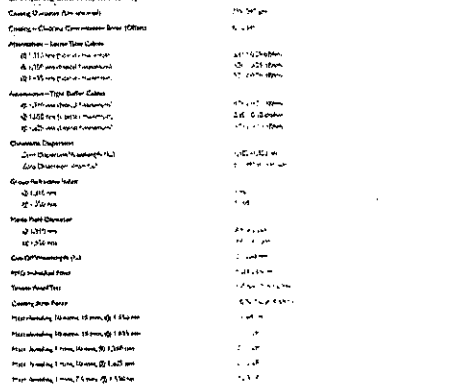
KDP

Bend Insensitive Single-Mode Fiber ITU-T G.652.D & G.657.A1



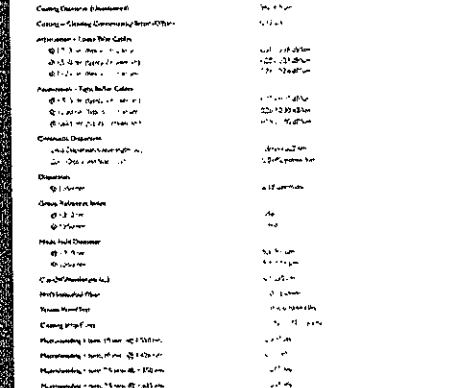
KDP

Bend Insensitive Single-Mode Fiber ITU-T G.652.D & G.657.A2



KDP

Bend Insensitive Single-Mode Fiber ITU-T G.652.D & G.657.B3



KDP

Single-Mode Fiber ITU-T G.652.D Low Loss

Single-Mode Fiber ITU-T G.654

Single-Mode Fiber ITU-T G.655 (NZDSF)

Bend Insensitive Single-Mode Fiber ITU-T G.652.D & G.657.A1 – 200 µm

Bend Insensitive Multi-Mode Fiber 50/125 OM2

	BW 500/500	BW 500/800	BW 600/1200
Core Diameter			
Core Non-Circularity			
Cladding Diameter			
Cladding Non-Circularity			
Core / Cladding Concentricity Error (Offset)			
Coating Diameter (Colored)			
Coating – Cladding Concentricity Error (Offset)			
Attenuation – Loose Tube Cables			
Attenuation – Tight Buffer Cables			
Overfilled Bandwidth			
Effective Modal Bandwidth (EMB)			
Numerical Aperture			
Laser Bandwidth (RMS)			
Tensile Proof Test			
Coating Strip Force			

Bend Insensitive Multi-Mode Fiber 50/125 OM3 & OM4

	OM3	OM4
Core Diameter		
Core Non-Circularity		
Cladding Diameter		
Cladding Non-Circularity		
Core / Cladding Concentricity Error (Offset)		
Coating Diameter (Colored)		
Coating – Cladding Concentricity Error (Offset)		
Attenuation – Loose Tube Cables		
Attenuation – Tight Buffer Cables		
Overfilled Bandwidth		
Effective Modal Bandwidth (EMB)		
Numerical Aperture		
Laser Bandwidth (RMS)		
Tensile Proof Test		
Coating Strip Force		

KDP

Multi-Mode Fiber 62.5/125 OM1

Standards – Fiber Optic Cables

Code table

TIGHT BUFFER CABLES

LOOSETUBE CABLES

Comparison of OS1 and OS2 Fiber

Stripability of the Tight Buffered Fiber

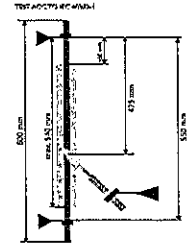
Used Abbreviations

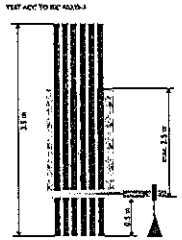
Properties of the Cable Sheath

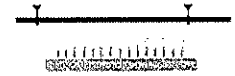
Chemical Resistance Table (@ 20 °C)

Fire properties

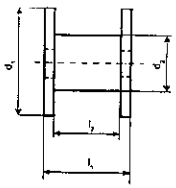
Fire Properties





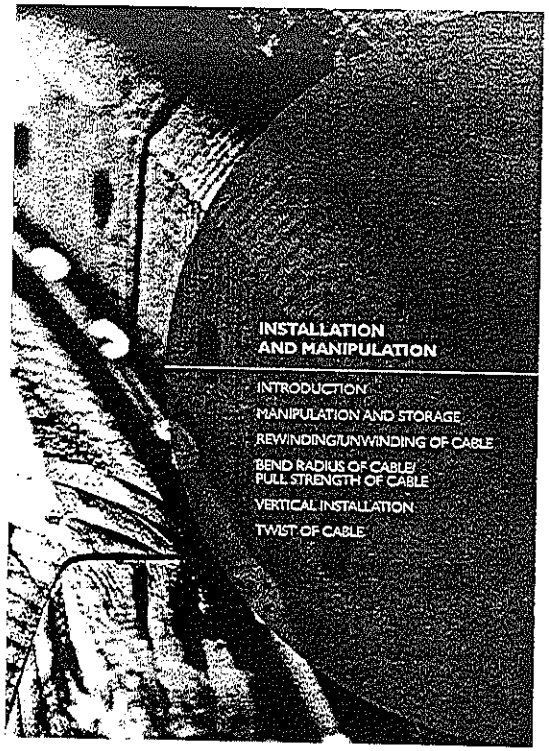


Cable Drums



Drum	Material	d_1 [mm]	d_2 [mm]	l_1 [mm]	l_2 [mm]
450	Plywood drum	450	180	470	280
600	Plywood drum	600	280	630	490
750	Plywood drum	750	305	920	580
1,000	Plywood drum	1,000	444	630	460
1,200	Plywood drum	1,200	640	870	666
1,200	Plywood drum	1,200	640	790	710
1,400	Plywood drum	1,400	640	740	700
1,400	Plywood drum	1,400	640	820	796
KT1710	Solid wood	710	315	592	400
KT1800	Solid wood	800	400	520	400
KT1900	Solid wood	900	450	642	568
KT61000	Solid wood	1,000	500	662	360
KT61250	Solid wood	1,250	630	806	760
KT61400	Solid wood	1,400	710	868	736
KT61600	Solid wood	1,600	800	1,050	980
KT61800	Solid wood	1,800	1,000	1,100	840
KT62000	Solid wood	2,000	1,250	1,350	1,095
KT62240	Solid wood	2,240	1,100	1,450	1,140

KDP



INSTALLATION AND MANIPULATION

Introduction

It is very easy to damage optical cables if manipulations with them or connection of it mechanical installations given values are not followed.

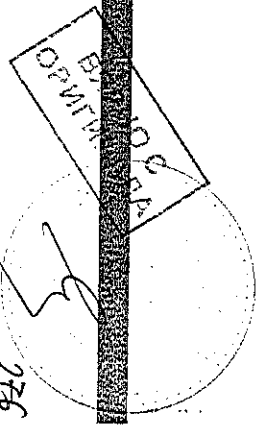
The information stated below should be taken into consideration when installing and manipulating with optical cables. Violating any of the listed rules can result in worsening of the cable's transfer characteristics or it can permanently damage it and shortens its lifetime. The manufacturer can also evolve in a possible but unlikely problem not only related to the installation of new cables but also for possible problems of cables, which have already been installed.

There is but an assumption that the customer has present knowledge about the design of optical cables and the corresponding national as well if necessary, please contact KDK.

Symbols Used

RECOMMENDED

NOT RECOMMENDED



KDP

Manipulation and Storage

The drums with the cables should be thrown from any heights! The drums with optical cables have to always stand on the edges of the head, secured with a wedge to prevent movement. The cable drums when it is not necessary to unclamp the drums with a wedge. The drums are equally secured between each other by [illegible] from counterweights. 1

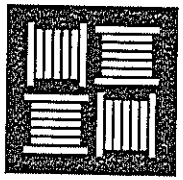
It is possible to store HEAVYTUBE, DIRECT, DUMOF type cables in the open with cables up to drums by laying them horizontal. However the cable has to be screened by drums, temperature and the tensioning of individual cable ends.

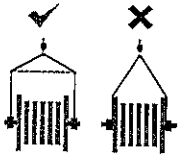
Cables intended for external use only be stored in closed areas between humidity. Cables for universal use cannot be stored [illegible] its outdoor conditions. However, the cable ends have to be waterproof. However, if the cable is in a physical speed, it has to be stored in such a manner as to prevent the adhere of water to the spread.

When manipulating with the drums using a crane, a spacer rail has to be placed between the load bearing means, so that the ropes do not exert pressure on the cable through the side drums. 2

When lifting the drums using a forklift, the drums can only be lifted from the sides and only when the slots of the forklift are long enough for the load of the drum to be positioned on it with a safe overlapping. 3

It is only possible to roll the drums short distances and only via a hand pull the pulley. 4



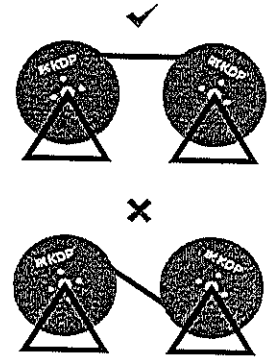


KDP

Rewinding/Unwinding of Cable

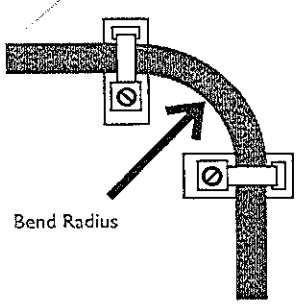
The rewinding and unwinding of cables is only possible in temperatures above 5 °C. If for any reason it is necessary to unwind the cable in a lower temperature, the cable has to be left at a minimum temperature of 20 °C for at least 24 hours beforehand. For rewinding the cable, the winding (winding) direction of the cable, has to be maintained, unwinding cannot form an "8" shape/fig. 4

When unwinding the cable, it is necessary to maintain continuous pull without excessive unwinding various pull not even lead to the loosening of individual coils and to the consequent mutual tender pull possible to the uncontrolled, sharp rigging of the cable, resulting in the damaging of the optical fibers.



KDP

Bend Radius of Cable

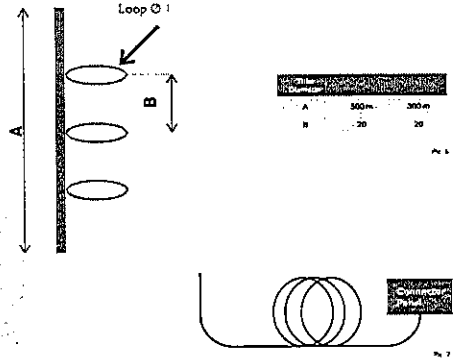


Pic 5

Pull Strength of Cable

KDP

Vertical Installation



Pic 6

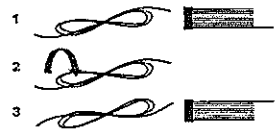
Pic 7

KDP

Twist of Cable

Pic 8

Pic 9



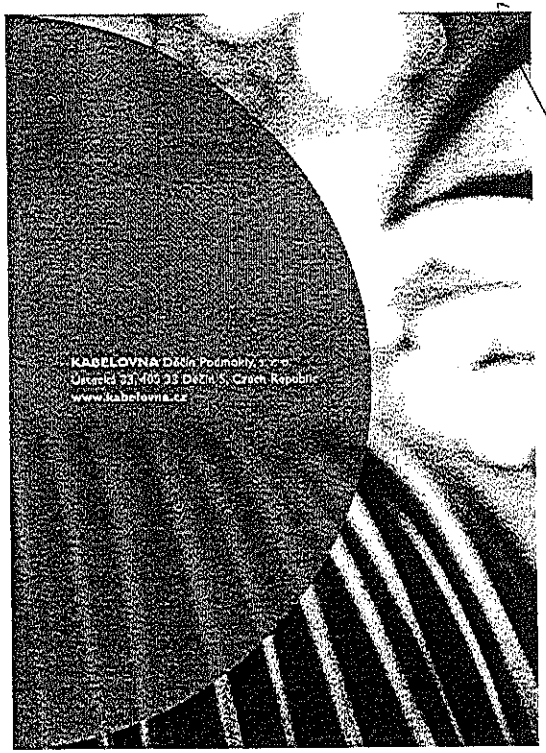
Pic 10

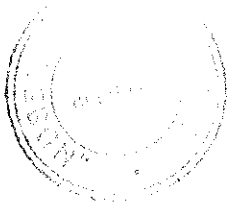
KDP

Notes

KDP

KDP

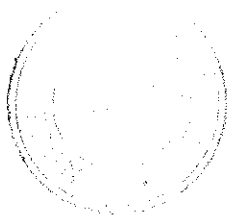




Приложение № 1.3 Заверено копие на каталог на Сух силов кабел 110 KV AL 1600 mm2 и Кабелна арматура (глави и муфи)

ДЗЗД „ЕИК ДРАГАЛЕВ ЮЛ"
Пловдив

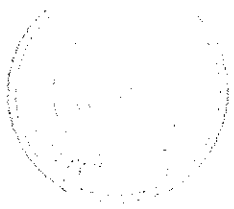
278



ESTRALIN HVC

POWER CABLES
AND CABLE SYSTEMS
6-220 KV

MODERN SOLUTIONS
FOR POWER CABLES

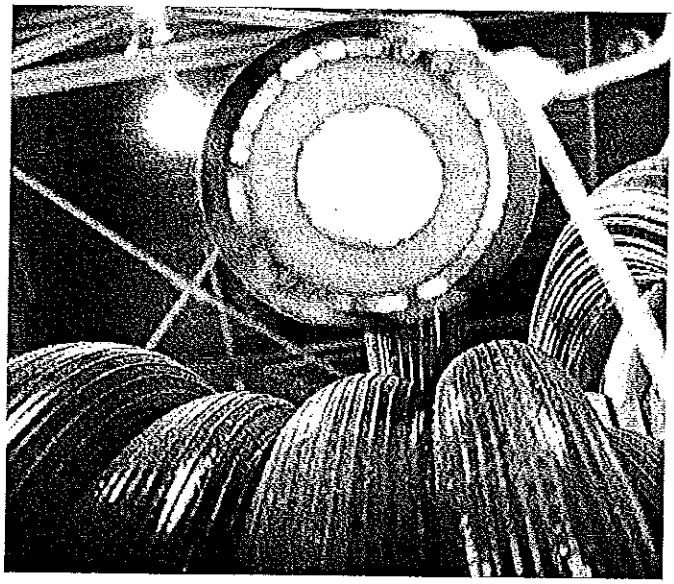


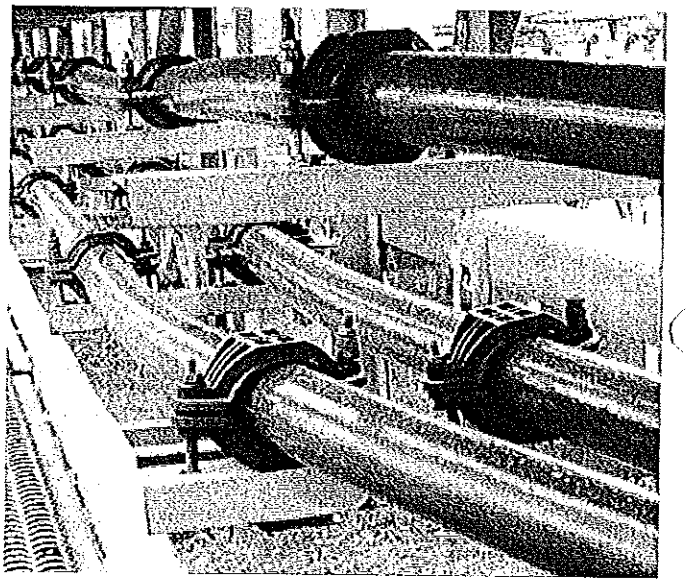
ЗАД „ЕИК ДРАГАЛЕВЦИ" Пловдив

ВЯРНО С ОРИГИНАЛА

280

XLPE power cables





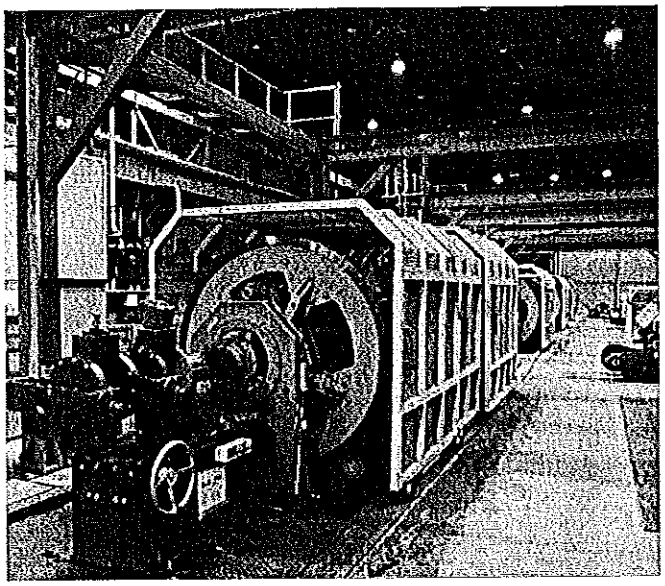
Cables 6-35 kV and 110-220 kV are widely used for electric energy transmission and distribution especially in large cities and at production plants, where electric energy consumption and load density levels are particularly high. Although basic requirements to cables (i.e. reliability, functionality, low costs of maintenance) are obvious they should be thoroughly met because their violation can cause considerable financial losses.

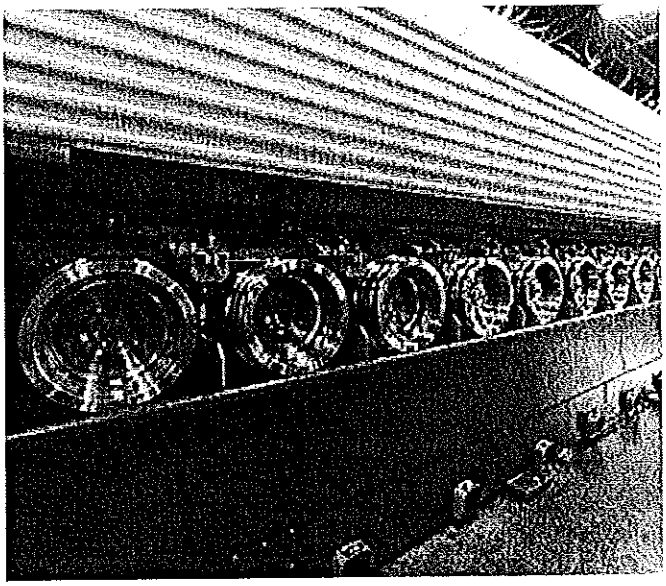
Cable's service life should be long; their function is to provide continuously the consumer with sufficient amount of electric power. Unlike cables with paper-filled or oil-filled insulation that find limited use from year to year, cables with cross-linked polyethylene insulation (Russian designation is – СПЭ, English – XLPE, German-VDE, and Swedish - PEX) meet that requirement in full.

Medium and high voltage XLPE cables due to the design, modern production technology and perfect materials have better electric and mechanical properties and the longest service life among other types of cables of mass production.

XLPE cables transfer capability is substantially higher than that of cables with paper or oil-filled insulation. According to international standards procedure, the cable is designed for continuous service with conductor temperature of 90°C and it is still active under emergency conditions even at higher temperatures, while oil-filled with paper insulation cables can withstand heating only to 70°C.

Production technology





Advantage of XLPE cable is its environmental safety. Absence of liquid inclusions ensures maintaining clean environment, which permits its laying at any projects and service-free maintenance of cable lines.

Due to its single core design, cable laying is easier, as well as the installation accessories, even in the most extreme conditions. Cable laying is still possible at temperatures up to -20°C with polyethylene cable sheath.

XLPE cable production technology was first introduced in the 70s of XX century. The cross-links are a space lattice constructed using formation of longitudinal and transversal ties between macromolecules of polymer. With its physical and electrical properties, cross-linked polymer suits ideally for insulation of medium, high and extra-high voltage cables.

During production of XLPE cable a special attention is paid on the purity and quality of insulating materials, as any inclusions released to the insulation reduces the life of the cable. It is for this reason, the concept of clean rooms, excluding ingress of foreign particles, as well as interaction with reliable suppliers of high quality raw materials, are one of the foundations of the production of reliable cable with a long trouble-free operation time.

It should be stressed that insulation and electrically conducting screens are applied in the process of triple extrusion followed with the simultaneous cross-linking of all three layers. Such a technology ensures high adhesion between the screens and insulation.

Advantages of the enhanced design and modern production technology of XLPE cables have determined their universal application in developed countries and notable decrease in the use of other type cables.

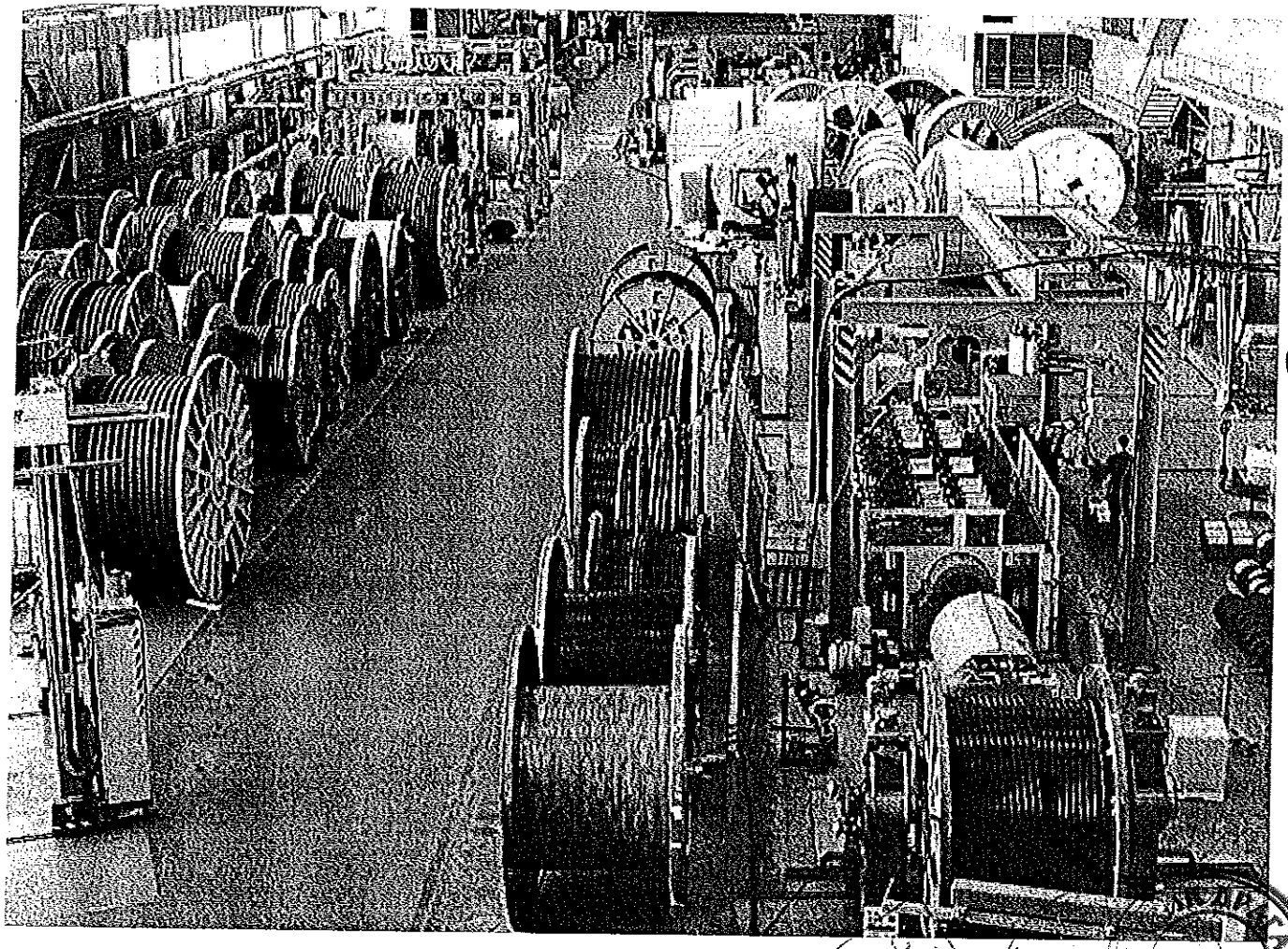
Estralin HVC – a pioneer in Russia's XLPE cable production

The aim of the plant "Estralin High Voltage Cables" (Estralin HVC) is introduction of innovative technologies in the field of power cable production. Providing high-quality production and services, we are helping our customers to raise their competitiveness and reduce the adverse impact upon environment.

Estralin HVC pays attention to technologies development and advancement that provide high quality of manufactured products. Only best materials of leading world manufacturers are used for cable insulation. These are peroxide-cross-linked polyethylenes, triingostable (TSPE) and copolymer (CCPE) polyethylenes. High skilled personnel and the use of high-quality basic materials are the key to perfect production that complies the requirements of advanced Russian and international standards and equals its West-European counterparts.

Continuous control over all phases of the process, starting with the choice of cable and accessories at the design stage and up to commissioning of completed cable line, permits the Company fully satisfy customer's requirements to modern cable lines. A systematic approach of complying international quality standards has been introduced at the factory.

High emphasis is placed upon environmental aspects of the production. Estralin HVC's successes in development and introduction of quality assurance systems and environmental management have been recognized by the largest independent European certification Company, TUV CERT: the Plant was awarded certificates of conformity with regulatory requirements ISO 9001 : 2008.



Main types of products and services

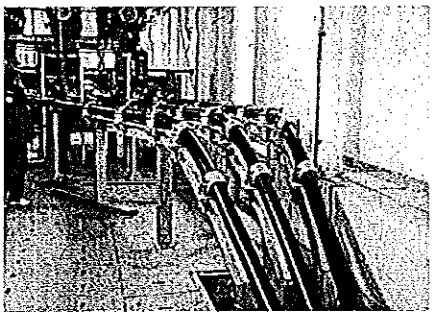
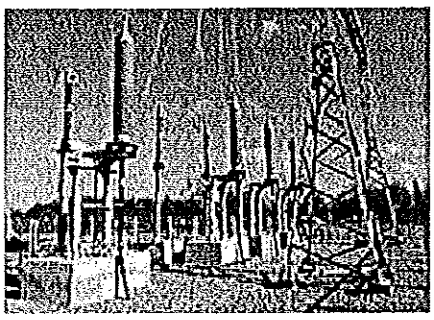
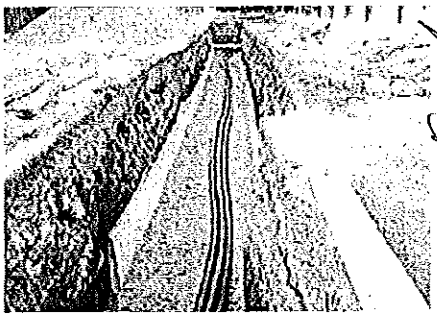
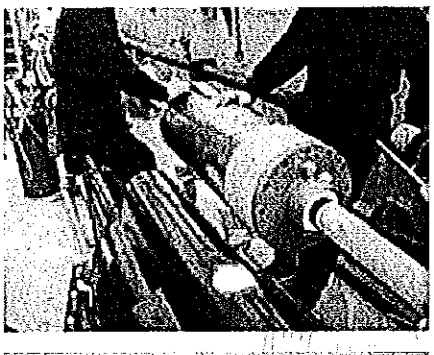
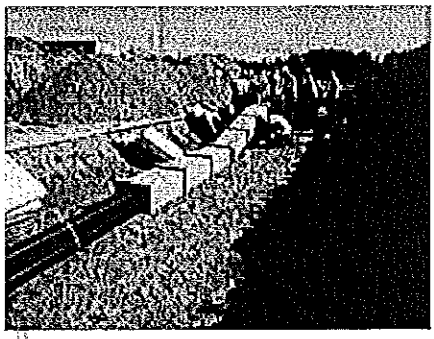
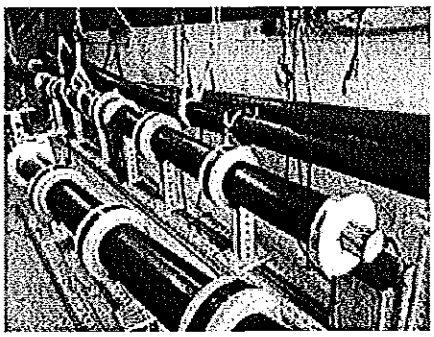
A main activity of Estralin HVC is XLPE cable 6-220 kV production, which use in insulated or earthed networks.

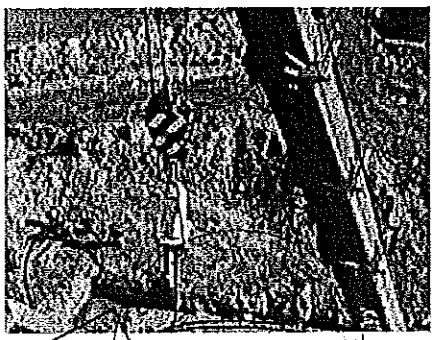
All cables, by their design, technological data and service characteristics comply the international standard requirements: IEC 60502-2 (6-35 kV cables), IEC 60840 (110 kV cables), and IEC 62067 (220 kV cables), as well as with the GOST R certification, including those with regard to fire safety.

Our company offers:

– medium and high voltage cable accessories;

– technical support at all stages of cooperation.

Markings

Conductor material	**Without designation**	Copper conductor
	A	Aluminum conductor
	RMS	Segmented conductor
Insulation material	Y	PVC insulation
	2XS	XLPE insulation
Screen	S	Copper wire and copper tape screen
	SE	Copper wire and copper tape screen around each cable conductor
	(F)	Watertight screen from swelling tape which provides longitudinal water sealing
	(FL)	Watertight screen from swelling tape which provides longitudinal water sealing and laminated polymer
Armouring	F	Wires armouring from galvanized steel
	G	Armouring: tape from galvanized steel winding with 2 spirals in the opposite directions
	B	Armouring from double steel tape
	R	Armouring from galvanized steel wire of coaxial shape
Sheath	K	Lead sheath
	Y	PVC sheath
	2Y	XLPE sheath
	H	Halogen free flame retardant sheath
	LWL (following screen designation)	Optic fibers in steel tubing inserted into copper

Comparative characteristics	6-35 kV XLPE-cables	Paper-insulated cables	
		10 kV	20-35 kV
Continuous permissible temperature, °C	90	70	65
Permissible heating in emergency, °C	130	90	65
Maximum permissible temperature under short-circuit current flow, °C	250	200	130
Minimum cable laying temperature without pre-heating, °C	-20	0	0
Relative permittivity ε at 20°C	2,4	4,0	4,0
Dielectric loss ratio tg δ at 20°C	0,001	0,008	0,008
Level differential at cable laying operation, m	not limited	15	15

Main advantages of XLPE-cables are:

- big cable transmission capability due to increased conductor permissible temperature (permissible load currents are 15-30% higher than those of paper-insulated cables, depending on cable laying conditions);
- high-current thermal stability at short circuit that is of a special importance when a cross-section has been chosen on the basis of short-circuit nominal current only;
- light-weight, smaller diameter and bending radius, which facilitates cable laying in both cable structures and underground along complicated routes;
- feasibility of cable laying at temperatures up to - 20°C without preheating due to the use of polymer materials in insulation and screening;
- low specific damageability (practice of XLPE-cables employment demonstrates that their damage resistance at least is 1-2 orders lower than that of paper-insulated and cables);
- absence of any liquid components (oils), and therefore, time and cost of cable laying and installation is reduced;
- single-core design permits cable to produce with a conductor with cross-section up to 1000 mm2 that is optimal for a large-power transmission;
- large lengths for construction: up to 2000-4000 m.

Take into account that the main type of single core cable faults are single-phase short circuit; it is possible to confirm that repair costs are drastically cut.

Strong insulation provides enormous advantages at the cable laying over a sloping, hilly or rough terrain, i.e. along the routes with considerable level difference, in vertical and inclined collectors.

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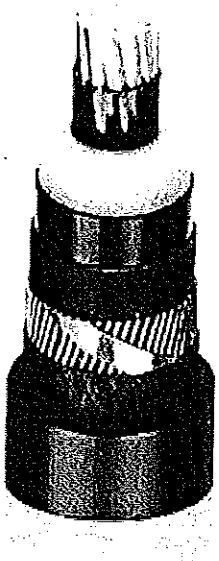
Design

6, 10, 20 and 35 kV XLPE cable consists of a round copper or aluminum stranded conductor, a semiconductive layer over the conductor, a cross-linked polyethylene insulation, a conductive layer on the insulation, a conductive tape, a screen of cooper wires and a copper band, a separating layer, a high-density polyethylene sheathing, and a PVC plasticate sheathing or PVC plasticate sheath of reduced combustibility with reduced smoke and gas emission, or a sheath of halogen-free polyethylene composite.



In order to ensure the screen longitudinal sealing, a water-blocking conductive tape can be used in place of a conductive tape, and a water-blocking conductive tape layer can replace a separation layer.

Cables indexed «FL» are provided with an alumo-polymer tape sheath welded to the polyethylene or PVC sheath apart from having longitudinal sealing. Such a design creates an effective diffusion barrier stopping penetration of water vapors; and an outside sheath of black polyethylene provides protection against mechanical damage.

Field of application

2XS2Y, A2XS2Y, cables are used for underground lines for complicated sections of the routes, as well as for overhead lines providing proper fire protection. Cables with longitudinal sealing could be used for underground lines in humid soils and in damp, partially flooded premises.

2XSY, A2XSY, 2XS(FL)Y, and A2XS(FL)Y cables are used for cable structures and industrial premises (2XS(Fl)Y and A2XS(Fl)Y – in batch laying), and also underground in dry soils.

2XS(FL)Y-LS and A2XS(FL)Y-LS cables are intended for stationary overhead batch lines, in cable structures and premises that have specified limitation on smoke consistency in fire situations.

2XS(Fl)Y-HF and A2XS(Fl)Y-HF are used for stationary electrical installations inside public and industrial buildings limited by requirements restricting impact of corrosive gases.

6-10 kV[1] XLPE cable specifications

Nominal cross-section	mm²	50	70	95	120	150	185	240	300	400	500	630	800	1000	1200
Screen cross-section[2]	mm²	16	16	16	16	25	25	25	25	35	35	35	35	35	50
Insulation thickness	mm	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4
Sheath thickness	mm	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,7	2,7	2,9	2,9
D outside[3]	mm	27,4	29,1	30,8	32,3	33,5	35,4	37,6	39,9	42,9	45,9	49,8	54	58,2	63,4
Weight approx.[3]															
Al conductor	kg/km	689	784	891	994	1189	1329	1529	1746	2173	2512	2981	3543	4210	5152
Cu conductor	kg/km	999	1217	1479	1737	2117	2473	3014	3602	4647	5606	6894	8492	10397	12781
Min. bending radius	cm	42	44	47	49	51	53	57	60	65	69	75	81	87	95
Permissible pulling force															
Al conductor	kN	1,5	2,1	2,85	3,60	4,50	5,55	7,20	9,00	12,0	15,0	18,9	24,0	30,0	36,0
Cu conductor	kN	2,5	3,5	4,75	6,00	7,50	9,25	12,0	15,0	20,0	25,0	31,5	40,0	50,0	60,0
Max. single length supply[4]	m	11760	10380	9150	8550	7810	7090	6410	5810	5270	4760	i4290	3790	3410	3050
Continuous permis. earth current[3]															
Cu	A	223	273	326	370	414	467	540	607	683	768	858	947	1026	1060
Al	A	173	212	253	288	322	365	423	477	543	618	702	788	871	920
Continuous permis. earth current[3]															
Cu	A	231	282	336	379	421	472	542	606	662	736	814	889	957	945
Al	A	180	220	262	296	331	373	431	484	540	609	683	759	833	846
Continuous permis. air current[3]															
Cu	A	259	322	391	450	509	581	683	782	899	1030	1175	1327	1452	1541
Al	A	201	250	304	350	396	454	535	614	715	829	959	1102	1230	1334
Continuous permis. air current[3]															
Cu	A	301	374	454	522	582	662	771	875	969	1090	1222	1355	1497	1501
Al	A	234	292	355	409	458	525	615	702	796	909	1036	1170	1308	1351

1 All data in Table 1 apply for categories A and B networks (acc. to IEC 60183).

2 Cross-section of the screen shown in the Table is minimal. Cross-section of the screen is chosen under condition of short-circuit current .

3 Weight, outside diameter and continuous permissible cable currents are for cable types 2XS2Y и A2XS2Y with minimal cross-section of the screen. If a larger screen cross-section is desired, continuous permissible cable currents get lower because of increased losses in the screen.

4 Deviation from the nominal construction length is ± 1%.

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20 kV XLPE cable specifications

Nominal cross-section	mm²	50	70	95	120	150	185	240	300	400	500	630	800	1000	1200
Screen cross-section[1]	mm²	16	16	16	16	25	25	25	25	35	35	35	35	35	50
Insulation thickness	mm	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5	5,5
Sheath thickness	mm	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,7	2,7	2,9	2,9	2,9
D outside[2]	mm	31,6	33,3	34,9	36,4	37,7	39,6	41,8	44,1	47,5	50,5	54,0	58,6	62,4	67,6
Weight approx.[2]															
Al conductor	kg/km	849	953	1073	1185	1386	1537	1751	1981	2455	2815	3277	3899	4557	5568
Cu conductor	kg/km	1158	1386	1660	1927	2314	2681	3236	3838	4930	5908	7192	8848	10744	13197
Min. bending radius	cm	48	50	52	55	57	60	63	66	72	76	si	88	94	101
Permissible pulling force															
Al conductor	kN	1,5	2,1	2,85	3,60	4,50	5,55	7,20	9,00	12,0	15,0	18,9	24,0	30,0	36,0
Cu conductor	kN	2,5	3,5	4,75	6,00	7,50	9,25	12,0	15,0	20,0	25,0	31,5	40,0	50,0	60,0
Max. single length supply[3]	m	8380	7500	6670	6250	5770	5260	4790	4370	3990	3620	3260	2910	2640	2370
Continuous permis. earth current[2]															
Cu	A	224	274	327	371	416	469	542	610	687	774	869	961	1040	1073
Al	A	174	213	254	289	323	366	424	479	545	621	706	794	879	928
Continuous permis. earth current[2]															
Cu	A	231	282	337	382	423	474	545	609	667	742	823	900	966	953
Al	A	180	220	262	298	332	374	432	485	543	612	688	765	839	852
Continuous permis. air current[2]															
Cu	A	261	325	394	453	512	585	687	786	903	1036	1182	1336	1468	1555
Al	A	203	252	306	352	398	457	537	616	717	830	960	1104	1236	1340
Continuous permis. air current[2]															
Cu	A	298	371	450	517	577	657	764	868	965	1088	1221	1359	1500	1509
Al	A	232	289	351	404	454	519	608	694	788	902	1028	1165	1304	1352

[1] Cross-section of the screen shown in the Table is minimal. Cross-section of the screen is chosen under condition of short-circuit current.

[2] Weight, outside diameter and continuous permissible cable currents are for cable types 2XS2Y и A2XS2Y with minimal cross-section of the screen. If a larger screen cross-section is desired, continuous permissible cable currents get lower because of increased losses in the screen.

[3] Deviation from the nominal construction length is ± 1%.

35 kV XLPE cable specifications

Nominal cross-section	mm²	50	70	95	120	150	185	240	300	400	500	630	800	1000	1200
Screen cross-section[1]	mm²	16	16	16	16	25	25	25	25	35	35	35	35	35	50
Insulation thickness	mm	9,0	9,0	9,0	9,0	19,0	2,5	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0
Sheath thickness	mm	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,7	2,7	2,9	2,9	2,9	2,9	2,9
D outside[2]	mm	38,2	39,9	41,6	43,1	44,7	46,7	49,3	51,6	55,0	58,0	61,4	65,6	69,4	74,6
Weight approx.[2]															
Al conductor	kg/km	1171	1293	1428	1556	1770	1948	2214	2470	2980	3371	3863	4495	5162	6324
Cu conductor	kg/km	1480	1726	2016	2298	2698	3093	3699	4326	5455	6465	7781	9445	11379	13953
Min. bending radius	cm	57	59	63	65	67	70	74	78	83	87	92	99	104	112
Permissible pulling force															
Al conductor	kN	1,5	2,1	2,85	3,60	4,50	5,55	7,20	9,0	12,0	15,0	18,9	24,0	30,0	36,0
Cu conductor	kN	2,5	3,5	4,75	6,0	7,50	9,25	12,0	15,0	20,0	25,0	31,5	40,0	50,0	60,0
Max. single length supply[3]	m	7690	6990	6290	5950	520	5100	4670	4350	3950	3610	3280	2510	2700	2430
Continuous permis. earth current[2]															
 Cu	A	224	274	327	371	1416	469	542	610	687	774	869	961	1040	1091
Al	A	174	213	254	289	1323	366	424	479	545	621	706	794	879	939
Continuous permis. earth current[2]															
 Cu	A	231	282	337	382	1423	474	545	609	667	742	823	900	966	965
Al	A	180	220	262	298	1332	374	432	485	543	612	688	765	839	861
Continuous permis. air current[2]															
 Cu	A	261	325	394	453	512	585	687	786	903	1036	1182	1336	1468	1572
Al	A	203	252	306	352	398	457	537	616	717	830	960	1104	1236	1346
Continuous permis. air current[2]															
 Cu	A	298	371	450	517	577	657	764	868	965	1088	1221	1359	1500	1520
Al	A	232	289	351	404	454	519	608	694	788	902	1028	1165	1304	1352

1 Cross-section of the screen shown in the Table is minimal. Cross-section of the screen is chosen under condition of short-circuit current.

2 Weight, outside diameter and continuous permissible cable currents are for cable types 2XS2Y и A2XS2Y with minimal cross-section of the screen. If a larger screen cross-section is desired, continuous permissible cable currents get lower because of increased losses in the screen.

3 Deviation from the nominal construction length is ± 1%.

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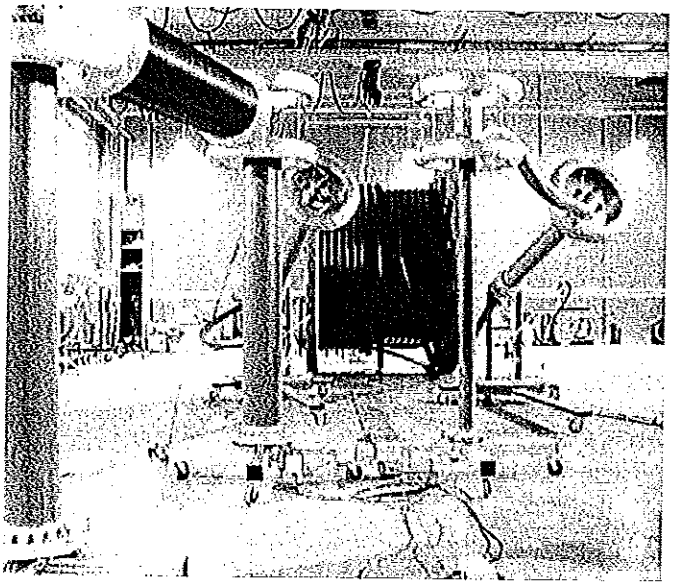


Medium voltage cables load capacity is calculated for the following conditions:

Laid in ground:

load factor	1,0
depth of cable laying	0,7 m
soil thermal resistance	1,2 K•m/W
ambient temperature, t°	15°C
conductor temperature, t°	90°C

Laid in air

load factor	1,0
ambient temperature, t°	25°C
conductor temperature, t°	90°C

Continuous permissible currents are fixed for each cable line under service conditions with regard to specific requirements. At different design ambient temperatures, it is advised to use corrective ratios, given in the following Table.

When single-core cables are fixed in triangle formation they are laid immediately adjacent. When single core cables are laid in flat formation, clear distance between them is one cable diameter.

Correction factors for ambient temperatutre												
Temperatutre	-5	0	5	10	15	20	25	30	35	40	45	50
in ground	1,13	1,10	1,06	1,03	1,00	0,97	0,93	0,89	0,86	0,82	0,77	0,73
in air	1,21	1,18	1,14	1,11	1,07	1,04	1,00	0,96	0,92	0,88	0,83	0,78

Correction factors for specific soil resistance						
Soil specific thermal resistance, K·m/W	0.8	1,0	1.2	1.5	2.0	2.5
Correction factor	1,13	1,05	1,00	0,93	0,85	0,8

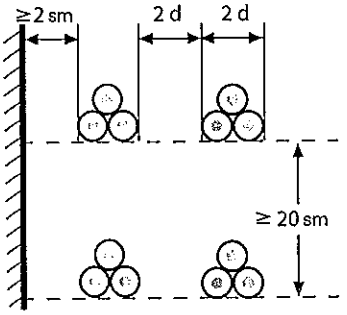
Correction factors for the laying depth						
Depth of cable laying, m	0,50	0,70	0,90	1,00	1,20	1,50
Correction factor	1,05	1,00	0,96	0,95	0,93	0,9

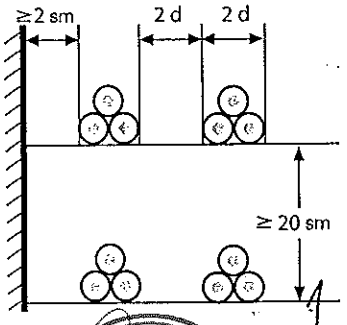
Correction factors on number of working cables arranged in plane side by side underground in pipes or without pipes, are used, when a section of a cable line between the earthing points is partially laid in pipes, under following conditions:

- cable are laid in a triangle formation over a substantial part of the line section;
- pipes are laid in flat formation;
- length of piping composes less than 10% of the section between the earthing points;
- each cable is laid in a separate pipe;
- pipe diameter is twice cable diameter.

Correction factors for side by side laying of the 6,10,15, 20 and 35 kV cables	
Cables partially laid in separate pipes	0,94
Cables in separate pipes on a plane	0,90
Single-conductor cables laid in triangle formation in a common pipe	0,90

Correction factors for group of cables in the ground					
Clear distance between groups, mm	Number of groups				
	2	3	4	5	6
100	0,76	0,67	0,59	0,55	0,51
200	0,81	0,71	0,65	0,61	0,49
400	0,85	0,77	0,72	0,69	0,66





Correction factors for group of cables in air arranged in a triangle			
Number of cables/systems on a rack			
Number of racks	1	2	3
1	1,00	0,98	0,96
2	1,00	0,95	0,93
3	1,00	0,94	0,92
4-6	1,00	0,93	0,90
1	0,95	0,90	0,88
2	0,90	0,85	0,83
3	0,88	0,83	0,81
4-6	0,86	0,81	0,79

Short-circuit currents

Short-circuit current for all types of cables and cross-sections are calculated on the basis of the following conditions:

Conductor temperature		Screen temperature	
before short-circuit	90°C	before short-circuit	70°C
after short-circuit	250°C	after short-circuit	350°C

Permissible conductor one-second short-circuit current														
Conductor cross-section mm²	50	70	95	120	150	185	240	300	400	500	630	800	1000	1200
Copper conductor	7,15	1,00	13,6	17,2	21,5	26,5	34,3	42,9	57,2	71,5	90,1	114,4	143,0	172,8
Aluminum conductor	4,7	6,6	8,9	11,3	14,2	17,5	22,7	28,2	37,6	47,0	59,2	75,2	93,9	114,3

Permissible screen one-second short-circuit current					
Screen [1] cross-section mm²	16	25	35	50	70
1-sec. screen short-circuit current , KA	3,3	5,1	7,1	10,2	14,2

If short-circuit duration differs from 1 sec., short-circuit values shown in the Tables are multiplied by correction coefficient:

$K = 1/\sqrt{t}$, where t — short-circuit duration, sec

[1] Values of permissible short-circuit currents for different cross-sections of the screen are calculated on request.

Electrical specification

Conductor's DC resistance at 20°C, Ω/km, not less		
Nominal cross-section of conductor, mm²	Copper conductor	Aluminum conductor
50	0,3870	0,6410
70	0,2680	0,4430
95	0,1930	0,3200
120	0,1530	0,2530
150	0,1240	0,2060
185	0,0991	0,1640
240	0,0754	0,1250
300	0,0601	0,1000
400	0,0470	0,0778
500	0,0366	0,0605
630	0,0280	0,0464
800	0,0221	0,0367
1000	0,0176	0,0291
1200	0,0151	0,0247

Conductor resistance at temperatures, different from 20°C, is calculated with the formula:

for copper conductor:
$R_\tau = R_{20} \cdot (234,5+\tau)/254,5$

for aluminum conductor:
$R_\tau = R_{20} \cdot (228+\tau)/254,5$

where:
τ — conductor's temperature, (°C),

R_{20} — conductor resistance at 20°C, (Ω/km),

R_τ — conductor resistance at d°C, (Ω/km)

Cable capacitance for various voltage levels, μF/km														
Voltage, kV	Conductor cross-section, mm²													
	50	70	95	120	150	185	240	300	400	500	630	800	1000	1200
6	0,300	0,340	0,390	0,420	0,450	0,500	0,560	0,610	0,620	0,670	0,750	0,840	0,930	1,040
6/10	0,255	0,2891	0,328	0,351	0,384	0,423	0,468	0,516	0,569	0,630	0,700	0,792	0,880	0,983
10/10	0,226	0,254	0,288	0,307	0,336	0,370	0,410	0,450	0,493	0,550	0,610	0,680	0,757	0,845
15	0,207	0,230	0,262	0,280	0,305	0,325	0,369	0,405	0,445	0,492	0,548	0,615	0,680	0,759
20	0,179	0,200	0,225	0,240	0,260	0,285	0,313	0,343	0,376	0,414	0,460	0,515	0,568	0,633
35	0,130	0,143	0,159	0,168	0,181	0,196	0,214	0,230	0,253	0,277	0,305	0,399	0,371	0,411

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Charging current for various voltage levels , A/km														
Voltage, kV	Conductor cross-section, mm²													
	50	70	95	120	150	185	240	300	400	500	630	800	1000	1200
6	0,305	0,348	0,381	0,414	0,446	0,490	0,555	0,599	0,609	0,675	0,773	0,871	0,969	1,068
10	0,435	0,490	0,544	0,580	0,635	0,689	0,780	0,852	0,961	1,070	1,215	1,378	1,524	1,780
15	0,560	0,630	0,710	0,780	0,830	0,910	1,010	1,100	1,230	1,360	1,490	1,670	1,850	2,060
20	0,617	0,689	0,762	0,834	0,943	0,979	1,052	1,161	1,270	1,415	1,560	1,778	1,959	2,290
35	0,889	1,016	1,143	1,206	1,270	1,397	1,524	1,651	1,841	2,031	2,222	2,539	2,857	2,610

Conductor inductive reactance at frequency of 50 Hz1, Ω/km						
Nominal conductor cross section,, mm²	6/10² kV		20²kV		35² KV	
						
50	0,204	0,127	0,219	0,143	0,231	0,156
70	0,196	0,119	0,210	0,134	0,222	0,146
95	0,189	0,112	0,203	0,127	0,214	0,139
120	0,184	0,108	0,198	0,122	0,209	0,133
150	0,179	0,103	0,192	0,116	0,203	0,127
185	0,175	0,099	0,188	0,112	0,198	0,122
240	0,170	0,094	0,183	0,107	0,193	0,117
300	0,167	0,091	0,179	0,103	0,189	0,113
400	0,165	0,088	0,173	0,097	0,182	0,106
500	0,161	0,085	0,169	0,093	0,178	0,102
630	0,159	0,083	0,166	0,090	0,174	0,098
800	0,157	0,081	0,163	0,087	0,170	0,094
1000	0,154	0,079	0,159	0,083	0,166	0,090
1200	0,152	0,076	0,156	0,080	0,162	0,087

Calculation of inductive reactances are carried out with cables arranged in a triangle immediately adjacent, and in flat formation with clear distance between the cables equal to cable diameter.

[1] Inductive values are calculated with regard to the screen earthing from both sides.

[2] Inductive reactance values for other classes of voltage and another arrangement of cables are calculated on request.

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Cable laying conditions and testing after medium voltage cable laying accessories installation

Bending radius of XLPE cable during cable laying and accessories installation laying procedure shall be at least 15xD, where D — outside cable diameter. When cable accessories installation is carried out with the use of a special template minimal bending radius is permitted to be reduced down to template 7,5xD.

When installing with the use of a cable sleeve or taking by the conductor, pulling tension shall not exceed the following figures:

F=Sx50 N/ mm² — for copper conductor,
F=Sx30 N/ mm² — for aluminum conductor,
where S — conductor area of the cross-section, mm².

Cable temperature during installation shall be not lower than:

-15°C – for cables with PVC- plasticate sheath;
-20°C – for cables with polyethylene sheath.

This is achieved when keeping the cable in warm (about 20°C) premises during 48 hours or with the use of special equipment.

After cable laying and accessories installation it is recommended to conduct testing with the following AC voltage, frequency 0,1 Hz during 15 minutes:

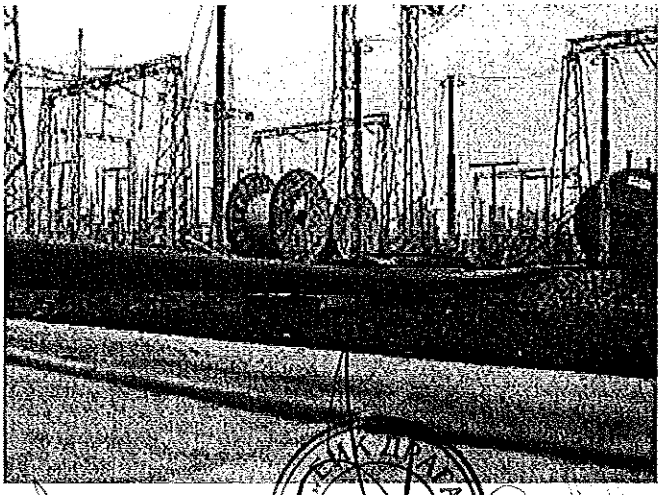
10 kV cable with 18 kV,
15 kV cable with 45 kV,
20 kV cable with 60 kV,
35 kV cable with 105 kV voltage.

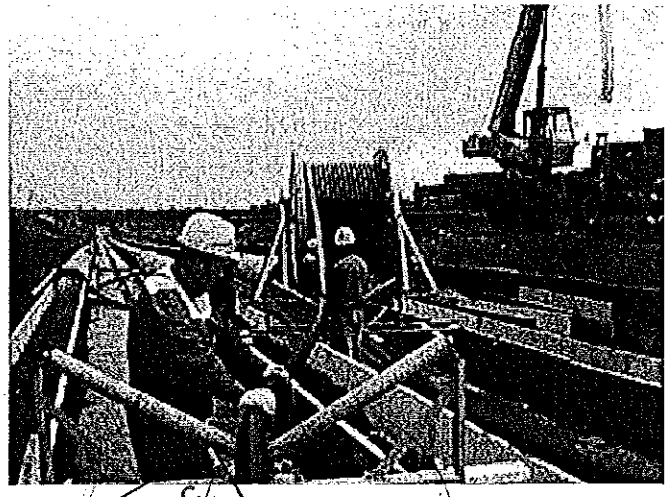
It is permissible to test with AC voltage of industrial frequency during 24 hours:

10 kV cable with 6 kV,
15 kV cable with 8,7 kV,
20 kV cable with 12 kV,
35 kV cable with 20 kV voltage.

On completing the installation and in coordination with cable manufacturing plant, cable testing is permitted with DC voltage of $4U_0$ during 15 minutes.

Cable sheath shall be tested with DC voltage of 10 kV, applied between the metallic screen and earthing device during at least 1 minute.





Capacity of cable drums

XLPE cable delivery length, m			
Cable outside diameter, mm	Construction length of cable, m		
	22D	24D	25D
26	2405	4566	6593
27	2230	4234	6113
28	2073	3937	5685
29	1933	3670	5299
30	1806	3430	4952
31	1692	3212	4638
32	1587	3014	4352
33	1493	2835	4092
34	1406	2670	3855
35	1327	2520	3638
36	1254	2382	3439
37	1187	2255	3255
38	1126	2138	3086
39	1069	2029	2930
40	1016	1929	2785
41	967	1836	2651
42	922	1750	2526
43	879	1669	2410
44	840	1594	2302
45	803	1524	2201
46	768	1459	2106
47	736	1397	2018
48	706	1340	1934

XLPE cable delivery length, m			
Cable outside diameter, mm	Construction length of cable, m		
	22D	24D	25D
49	677	1286	1856
50	650	1235	1783
51	625	1187	1713
52	601	1142	1648
53	579	1099	1587
54	557	1059	1528
55	537	1020	1473
56	518	984	1421
57	500	950	1372
58	483	918	1325
59	467	887	1280
60	452	857	1238
61	437	830	1198
62	423	803	1159
63	410	778	1123
64	397	754	1088
65	385	731	1055
66	373	709	1023
67	362	688	993
68	352	668	964
69	341	648	936
70	332	630	910

6, 10, 20 and 35 kV XLPE cable construction lengths are presented in the Table, they can be accommodated in standard wooden cable drums.

Construction lengths can be increased in coordination with customer using drums of greater capacity. In this way a special cable-carrying trucks; can be used in addition, one should be aware of oversized cargo transportation rules.

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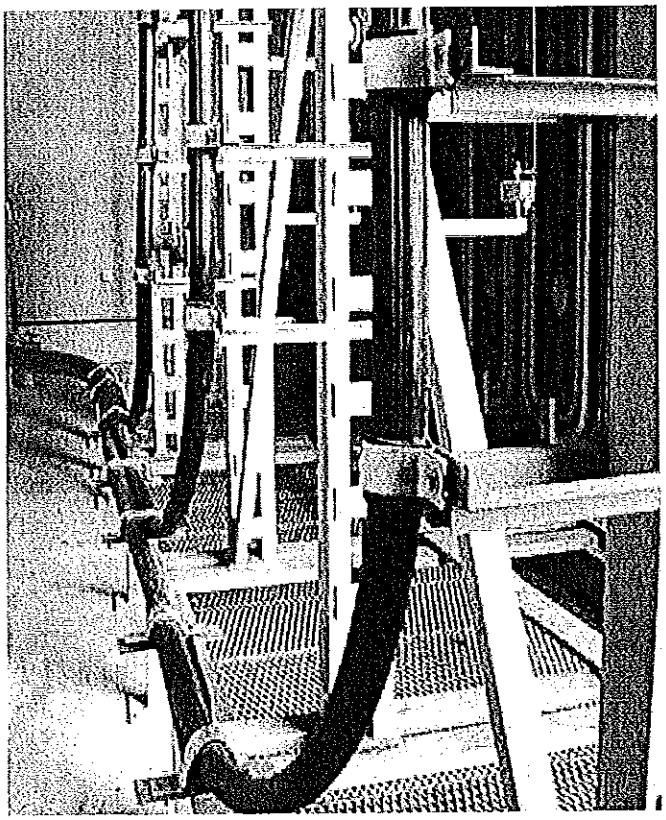
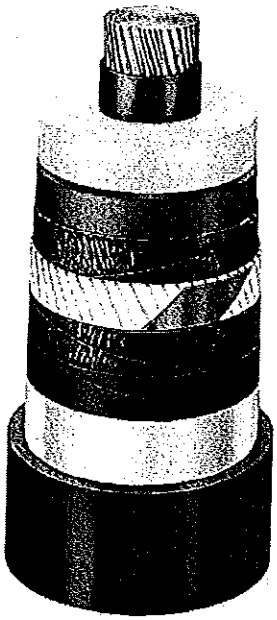
110-220 kV XLPE cables



Comparative characteristics	XLPE cable	High pressure oil-filled cable
Continuous permissible temperature, °C	90	85
Permissible heating in emergency, °C	105	90
Ultimate permissible temperature under short-circuit current flow, °C	250	200
Density of 1-sec. short-circuit current, A/mm² — copper conductor — aluminum conductor	 144 93	 101 67
Relative permittivity ε at 20°C	2,5	3,3
Dielectric loss ratio, tg δ at 20°C	0,001	0,004

Main advantages of XLPE cables are the following:

- high cable transmission capability due to increased conductor permissible temperature;
- high-current thermal stability at short-circuit that is of a special importance when a cross-section has been chosen on the basis of short-circuit nominal current only;
- light-weight, smaller diameter and bending radius, which facilitates laying in both cable structures and underground along complicated routes;
- strong insulation provides enormous advantages at the laying over a sloping, hilly or rough terrain, i.e. along the routes with considerable level difference due to absence of mass dulling effect;
- absence of liquids (oils) under pressure, and consequently, no need for costly refilling equipment, that results in considerable saving in operational costs, simplification of installation equipment, cutting time and cost of cable laying, as well as installation;
- feasibility of prompt repair in case of fault;
- absence of leakages and, therefore, no risks of environmental pollution in case of damage.



Design

110-220 kV XLPE cable consists of a round copper or aluminum stranded conductor, a semiconductive layer over the conductor, a cross-linked polyethylene insulation, a semiconductive layer on the insulation, a semiconductive tape, a screen of cooper wires and a copper band, a semiconductive tape, a polyethylene sheathing, or PVC plasticate sheathing.

The conductor is covered with an extrudable screen of semiconducting material, insulation and a semiconducting screen over the insulation binded together. Insulation thickness depends upon the conductor diameter.

Metallic screen consists of copper wires and a spirally applied over them a copper band. Screen cross-section is chosen on the basis of short-circuit current flow.

In order to provide longitudinal sealing in cables indexed «F», a layer of water-swellable material is used. Contacting with water it swells thus forming a longitudinal barrier, preventing in this way moisture propagation, should damage of outside sheathing occur.

Cables indexed «FL» are provided with an alumo-polymer tape sheath welded to the polyethylene or PVC sheath apart from having longitudinal sealing. Such a design creates an effective diffusion barrier stopping ingress of water vapors; and an outside sheath of black polyethylene provides protection against mechanical damage.

Reinforced polyethylene stiffened sheath.

Cables have a sheath of black polyethylene. Cables indexed «2Y» are provided with reinforced polyethylene longitudinally stiffened sheath that is designed for preventing the sheath damage while cabling at complicated sections of cable routes.

On request of customer 110-220 kV cables can be produced with optic fiber inserted for temperature measurements along the entire length of the cable and for transmitting any signals.

110 kV XLPE cable specification

Nominal cross-section	mm²	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section[1]	mm²	35	35	35	35	35	35	35	35	35	50	50	50	50
Insulation thickness	mm	16,0	16,0	16,0	16,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0
Sheath thickness	mm	3,0	3,0	3,2	3,4	3,4	3,4	3,6	3,6	3,8	4,0	4,0	4,0	4,0
D outside	mm	64	66	69	70	70	73	77	81	85	91	95,8	98,1	104,6
Weight approx.[2]														
Al conductor	kg/km	3400	3700	4000	4230	4290	4830	5410	6140	7316	8422	8900	9600	11100
Cu conductor	kg/km	4560	5180	5870	6390	6760	7930	9310	11090	13699	16081	17600	19600	23600
Min. bending ra-dius	cm	95	99	104	105	105	109	116	122	128	137	144	148	157
Permissible pull-ing force														
Al conductor	kN	5,55	7,20	9,00	10,5	12,0	15,0	18,9	24,0	30,0	36,0	42,0	48,0	60,0
Cu conductor	kN	9,25	12,00	15,00	17,5	20,00	25,0	31,5	40,0	50,0	60,0	70,0	80,0	100,0
DC resistance														
Cu conductor	Ω/km	0,0991	0,0754	0,0601	0,0543	0,0470	0,0366	0,0280	0,0221	0,0176	0,0151	0,0129	0,0113	0,0090
Al conductor	Ω/km	0,1640	0,1250	0,1000	0,0890	0,0778	0,0605	0,0460	0,0367	0,0291	0,0247	0,0212	0,0186	0,0149
Inductance[3]	mH/km	0,4627	0,4439	0,4289	0,4209	0,4057	0,39	0,3781	0,363	0,351	0,339	0,334	0,330	0,317
Capacitance	µF/km	0,1364	0,1468	0,1575	0,1639	0,179	0,1936	0,209	0,2296	0,25	0,27	0,29	0,30	0,33
Continuous permis. earth current[4]														
Cu	A	500	575	650	715	755	840	935	1030	1121	1184	1248	1298	1364
Al	A	395	455	515	560	600	675	760	850	935	1009	1059	1114	1204
Continuous permis. earth current														
Cu	A	451	507	556	581	611	667	724	777	869	927	960	982	1014
Al	A	366	416	461	486	514	572	631	690	782	838	877	906	951
Continuous permis. air current[5]														
Cu	A	600	690	755	835	895	995	1115	1245	1452	1494	1598	1666	1796
Al	A	480	555	630	680	735	825	948	1060	1253	1317	1408	1483	1629
Continuous permis. air current[6]														
Cu	A	624	725	820	871	938	1065	1204	1352	1485	1533	1629	1692	1814
Al	A	494	576	656	702	758	872	999	1139	1275	1344	1446	1516	1655

1 Screen cross-section is calculated on the basis of the short-circuit current and thus can be increased. .

2 Weight is shown for cables having a polyethylene sheath and basic cross-section of the screen.

3 Calculation was performed in cabling with cables in triangle formation with immediate adjacency and earthing from both sides.

4 Currents are calculated to be buried at the depth of 1,5 m with soil specific thermal resistance of 1,20 K•m/W, and load coefficient, $K_H = 0,8$

5 Currents are calculated for installation in air with cables in triangle formation, clear interphase distance shall be equal to cable diameter, no solar radiation, and earthing from both sides.

6 Currents are calculated for installation in air with cables in flat formation, clear interphase distance shall be equal to cable diameter, no solar radiation, and earthing from both sides.

220 kV XLPE cable specification

Nominal cross-section	mm²	400	500	630	800	1000	1200	1400	1600	2000	2500
Screen cross-section[1]	mm²	265	265	265	265	265	265	265	265	265	265
Insulation thickness	mm	24,0	24,0	24,0	24,0	22,0	22,0	22,0	22,0	22,0	22,0
Sheath thickness	mm	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0
D outside	mm	92,3	95,3	98,9	105,4	106,1	108,9	110,6	119,7	122,7	126,2
Weight approx.[2]											
Al conductor	kg/km	9158	9739	10463	11630	11999	12834	13000	14960	16352	33000
Cu conductor		11685	12899	14445	16670	18269	20934	21800	25074	28899	33000
Min. bending radius	cm	138	142	148	158	159	163	166	179	184	190
Permissible pulling force											
Al conductor	kN	12,0	15,0	18,9	24,0	30,0	36,0	42,0	48,0	60,0	75,0
Cu conductor		20,0	25,0	31,5	40,0	50,0	60,0	70,0	80,0	100,0	125,0
DC resistance											
Cu conductor	Ω/km	0,047	0,0366	0,028	0,0221	0,0176	0,0151	0,0129	0,0113	0,009	0,0072
Al conductor		0,0778	0,0605	0,464	0,0367	0,0291	0,0247	0,0212	0,0186	0,0149	0,0119
Inductance[3]	mH/km	0,254	0,236	0,219	0,203	0,18	0,167	0,155	0,152	0,139	0,126
Capacitance	µF/km	0,133	0,143	0,154	0,174	0,119	0,220	0,220	0,240	0,230	0,270
Continuous permis. earth current[4]											
Cu	A	638	711	785	868	938	986	1038	1072	1133	1149
Al		519	585	657	731	803	858	914	948	1018	1068
Continuous permis. earth current											
Cu	A	620	670	725	774	812	862	892	910	940	960
Al		521	572	631	686	734	782	816	841	883	915
Continuous permis. air current[5]											
Cu	A	800	908	1031	1160	1281	1380	1471	1547	1669	1720
Al		641	734	841	955	1071	1174	1260	1339	1464	1550
Continuous permis. air current[6]											
Cu	A	796	884	977	1063	1136	1232	1297	1327	1393	1481
Al		658	743	836	927	1013	1101	1166	1211	1295	1395

1 Screen cross-section is calculated on the basis of the short-circuit current and thus can be increased. .

2 Weight is shown for cables having a polyethylene sheath and basic cross-section of the screen.

3 Calculation was performed in cabling with cables in triangle formation with immediate adjacency and earthing from both sides.

4 Currents are calculated to be buried at the depth of 1,5 m with soil specific thermal resistance of 1,20 K•m/W, and load coefficient, $K_H = 0,8$

5 Currents are calculated for installation in air with cables in triangle formation, clear interphase distance shall be equal to cable diameter, no solar radiation, and earthing from both sides.

6 Currents are calculated for installation in air with cables in flat formation, clear interphase distance shall be equal to cable diameter, no solar radiation, and earthing from both sides.

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Load capacity

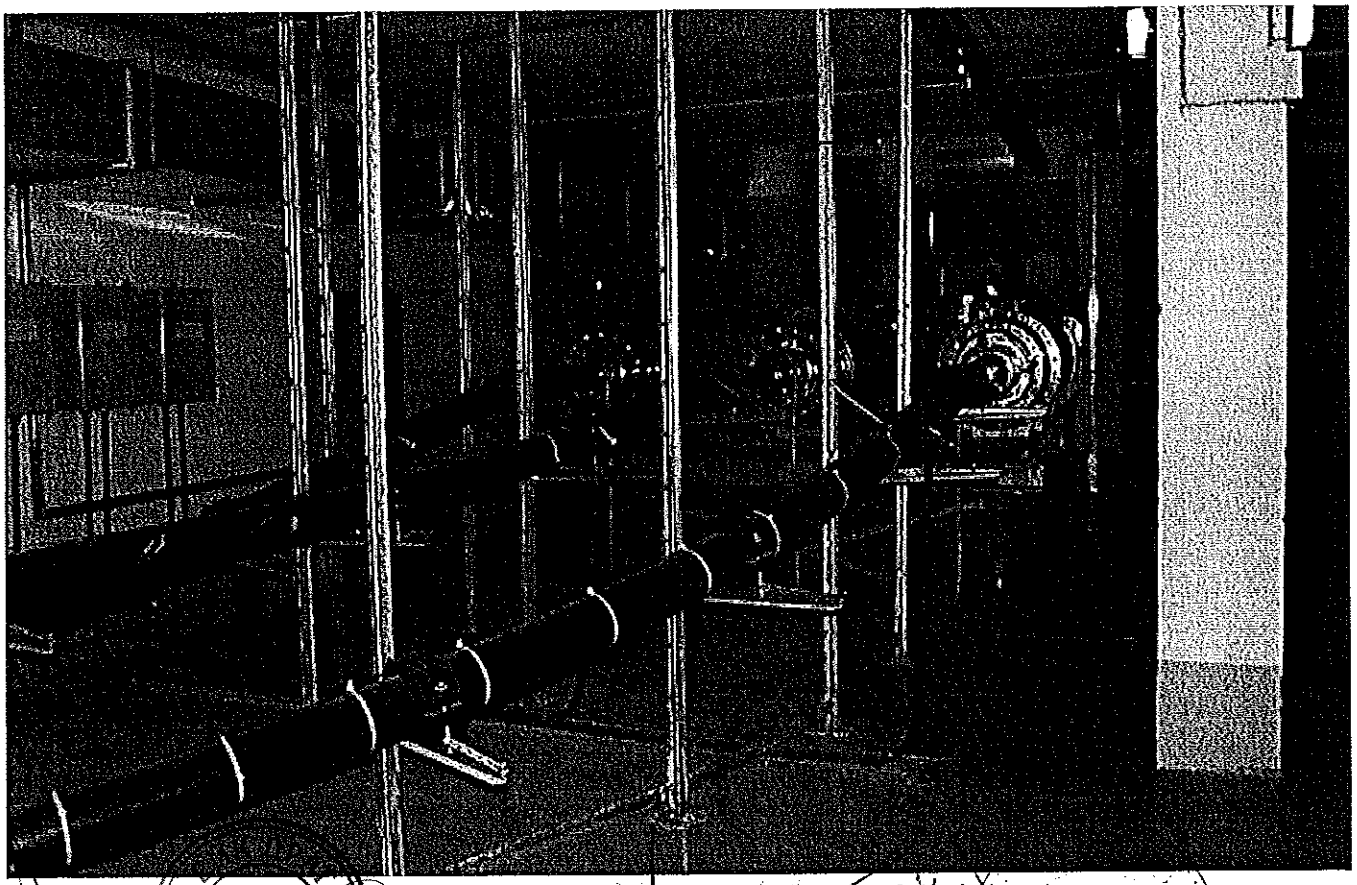
Load capacity of high voltage cables is calculated under the following conditions.

Laid in ground:		**Laid in air:**	
load factor	0,8	load factor	1,0
depth of cable laying	1,5 m	ambient temperature, t°	25°C
soil thermal resistance	1,2 K•m/W	conductor temperature, t°	90°C
ambient temperature, t°	15°C	screen earthing	from both sides
conductor temperature, t°	90°C		

For underground installation and with triangle arrangement, cables shall be positioned in immediate adjacency. For overhead lines and triangle arrangement of cables the clear distance between cables is recommended be equal to 25 sm. With flat arrangement of cables, recommended clear distance between cables shall be cable diameter.

Correction factor on laying depth

Laying depth, m	0,8	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4
Correction factor	1,08	1,05	1,03	1,01	1,0	0,98	0,97	0,96	0,94



Short-circuit currents

Short-circuit current for all types of cables are calculated on the basis of the following preconditions:

Conductor temperature	
before short-circuit	90°C
after short-circuit	250°C

Screen temperature	
before short-circuit	70°C
after short-circuit	350°C

XLPE cable can be subjected to overloads with temperatures above 90°C. In this regard, emergency overloads do not considerably affect cable service life.

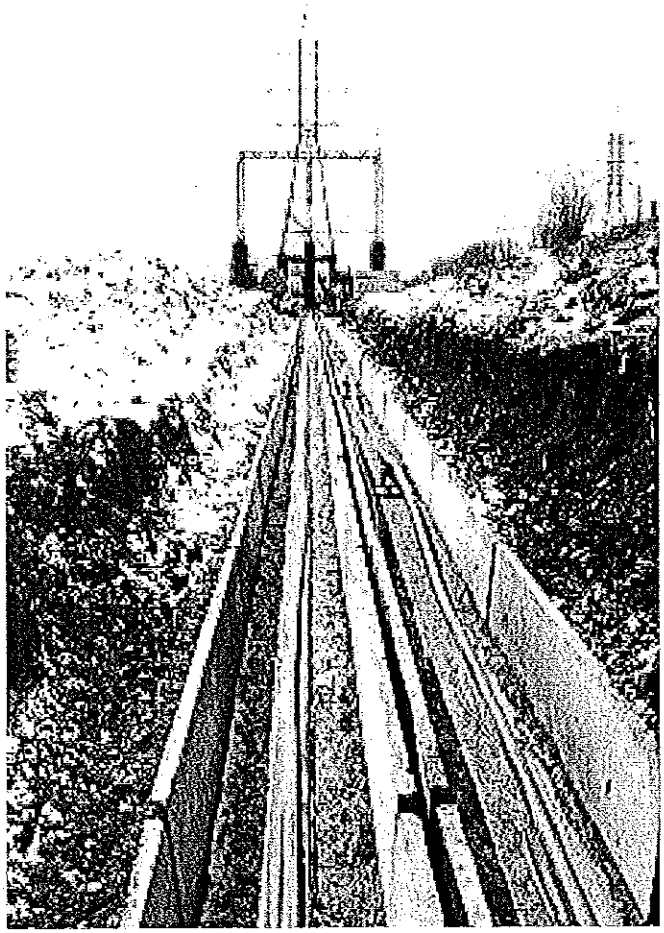
One-second long permissible short-circuit currents along the conductor and through the screen shall not exceed the figures presented in the Tables.

1 sec. permissible short-circuit current in the conductor												
Conductor cross-section, mm²	185	240	300	350	400	500	630	800	1000	1200	1600	2000
copper conductor	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	14	172,8	230	288
aluminum conductor	17,5	22,7	28,2	33,1	37,6	47	59,2	75,2	93, 1	14,3	152	190

1 sec. permissible short-circuit current the screen										
Screen cross-section, mm²	35	50	70	95	120	150	185	210	240	265
Screen 1-sec. short-circuit current, KA	7,1	10,15	14,21	19,29	24,36	30,45	37,56	42,63	48,72	53,8

In the case of short-circuit, apart from the heating, the dynamic forces originated between cable phases shall be also taken into consideration; their values can be significant. They shall be taken into account while choosing design of cable fixing means.

Cable laying conditions and testing after high voltage cable laying



During XLPE 110-220 kV cable laying the bending radius shall be at least 15xD, where D — outside cable diameter. When cables accessories installation is carried out with the use of a special template and with preheating, minimal bending radius shall also be at least 15xD.

When installing with the use of a cable sleeve or taking by the conductor, pulling force shall not exceed the following figures

F=Sx50 N/ mm^2 — for copper conductor,
F=Sx30 N/ mm^2 — for aluminum conductor

where S — conductor area of the cross section, mm^2.

Ambient temperature during laying shall not be lower than -5°C. With preheating, cable laying can be carried out at the following temperatures:

-15°C – for cables with PVC-plasticate sheath;
-20°C – for cables with polyethylene sheath.

Following cable installation, testing of completed cable line together with all the cable accessories shall be conducted.

Having completed a cable line and prior to its commissioning, each phase of the cable and its accessories shall be tested by increased AC voltage of 128 kV during one hour with frequency of 20 to 300 Hz. As agreed between manufacturing company and customer, it is permitted to conduct testing by nominal working AC voltage of 64 kV during 24 hours at no load, instead of the test by increased AC voltage. The test by increased DC is feasible, but not recommended, and only as agreed between manufacturing company and customer.

Cable sheath shall be tested by DC of 10 kV, applied between a metallic screen and earthing for one minute.

During Estralin HVC cable laying the requirements of "Maintenance of XLPE cable laying 110-500 kV, №ТИ/01-12" should be met.

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Estralin
High Voltage Cables Plant

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web-site: www.estralin.com

Information:

We reserve the right to introduce to the present catalogue technical alterations or corrections without notice. When ordering equipment, only mutually agreed data shall be valid.

Estralin HVC shall not be responsible for any potential misprints of losses of information in the catalogue.

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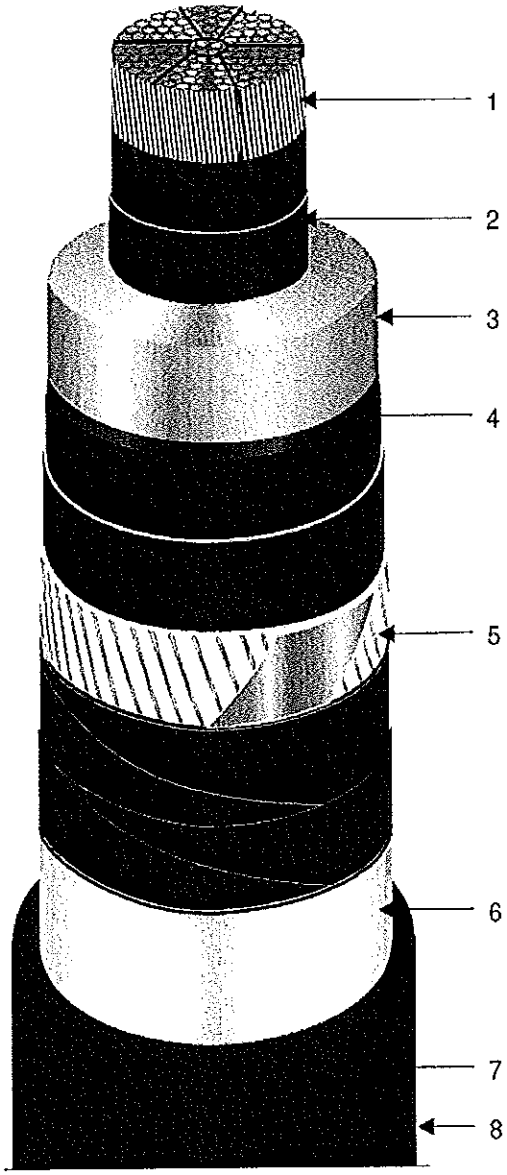
Design of a cable

A2XS(FL)2Y 1x1600RMS/110 – 64/110 kV



Standard: IEC 60840

1.Conductor

Material:	Aluminum
Cross section:	1600 mm²
Diameter of conductor:	49,6 mm
Type of conductor:	circular, stranded, segmented
Longitudinal water-tight:	water swelling tape

2.Conductor screen

Material:	semi-conductive PE
Wall thickness:approx.	1,5 mm *
Type:	extruded PE

3.Insulation

Material:	XLPE
Nominal Wall Thickness:	15,0 mm
Voltage level $U_o/U_n/U_m$:	64 / 110 / 123 kV

4.Insulation screen

Material:	semi-conductive PE
Type:	extruded PE

5.Screen/metallic sheath

Material:	Copper wire and copper tape
Cross section:	110 mm²
Longitudinal water-tight :	semi-conductive water blocking tape

6.Radial water barrier

Material:	Aluminium
Wall thickness:	0,2 mm

7.Outer sheath

Material:	HDPE
Nominal thickness:	3,8 mm
Overall diameter:	approx.101,6 mm

8.Special components

Conductive layer:	no
Weight:	approx. 11,0 kg/m;
Min bending radius:	1,524 m.
Max pulling force:	48 kN.

* All data's are computed values. The exact value will be submitted at the beginning of manufacturing.

ЗАД „ЕИК ДРАГАЛЕВЦИ" Пловдив

ВЯРНО С ОРИГИНАЛА

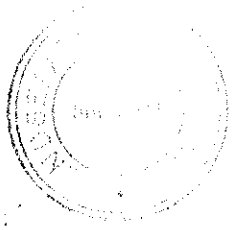
ТИЖЕРКОМПАНИ ДООД * ПЛОВДИВ *

Mechanical characteristics	
Cable weight, approximately, kg/m	11,0
Outer diameter, mm	101,6
Maximum pulling force, kN	48,0
Minimal bending radius, m	1,524
Electrical parameters	
DC resistance of the conductor at 20°C, Ω/km	0,0186
AC resistance of the conductor. at 90°C, Ω/km	0,0247
Capacitance per phase, uF/km	0,31
Inductance between the conductor and screen, mH/km	0,12
Capacitive charging current, per phase, A/km	6,16
One second short circuit current on the conductor, kA	152,3
One second short circuit current on the screen, kA	20,6

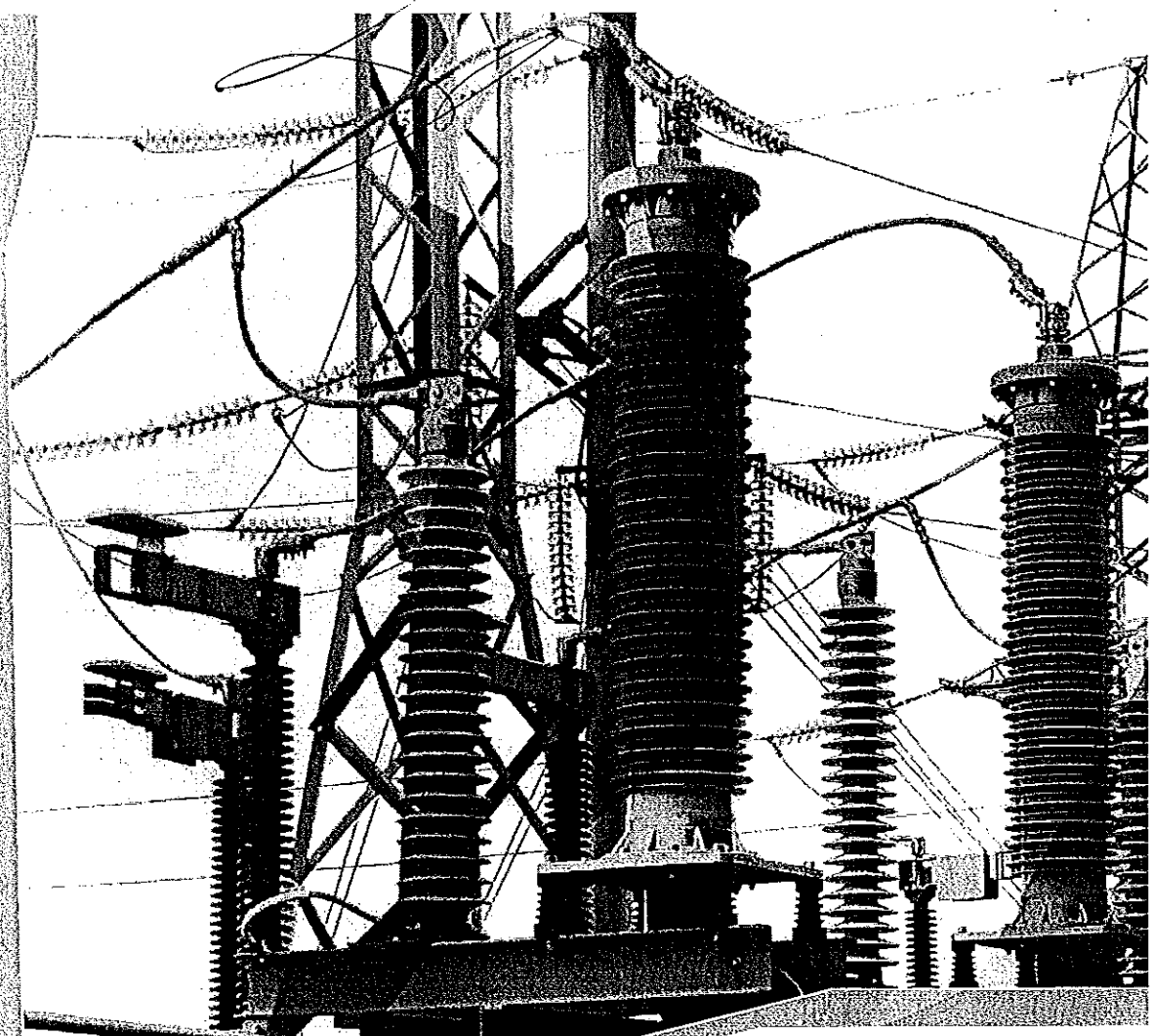
ПЗЗП „ЕИК ДРАГАЛЕВСКИ" Пловдив

ВЯРНО С ОРИГИНАЛА

ИНТЕРКОМПЛЕКС ООД * ПЛОВДИВ *



Arkasil

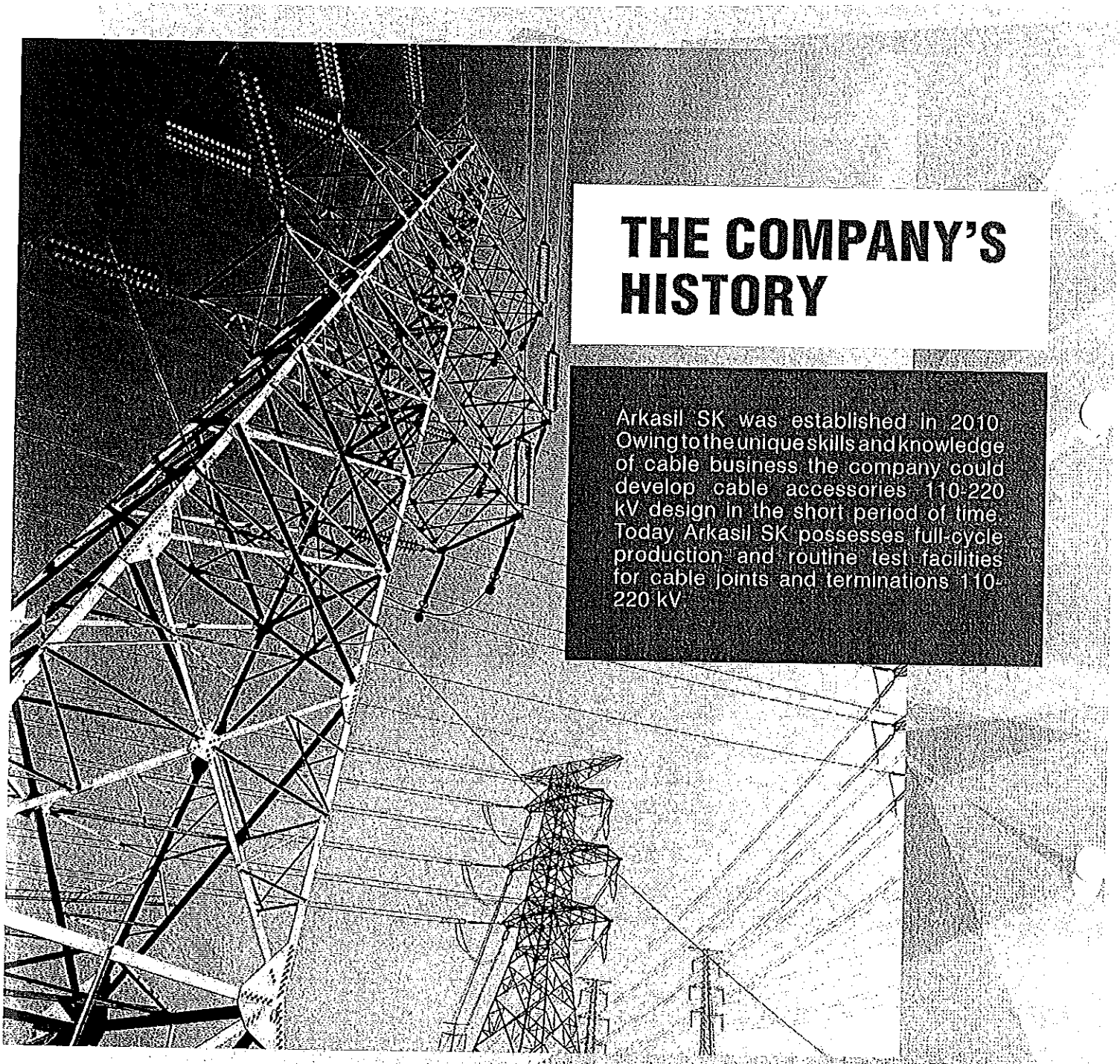


CABLE ACCESSORIES

110-220 kV

www.arkasil.com

Arkasil



THE COMPANY'S HISTORY

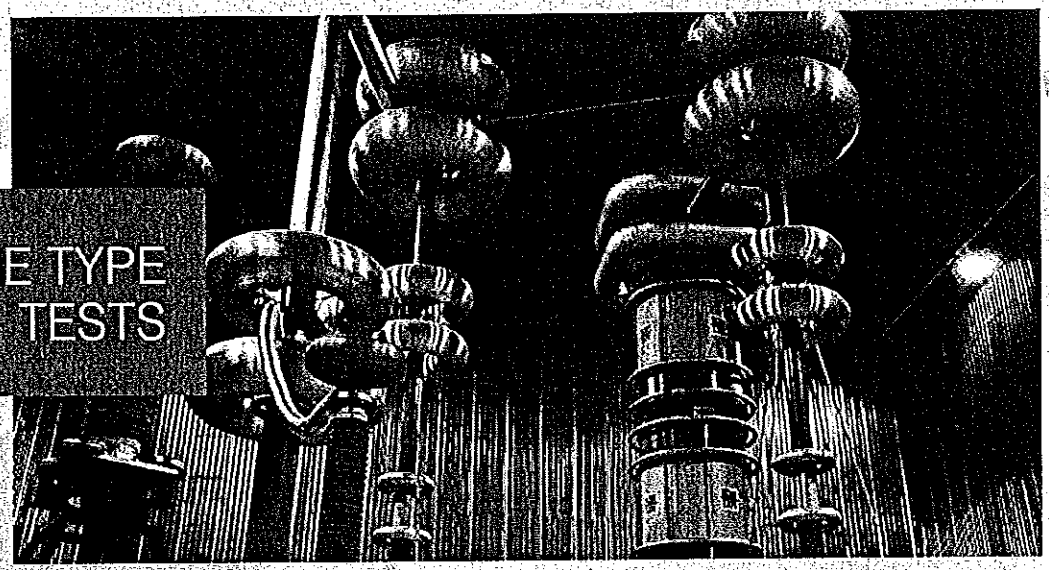
Arkasil SK was established in 2010. Owing to the unique skills and knowledge of cable business the company could develop cable accessories 110-220 kV design in the short period of time. Today Arkasil SK possesses full-cycle production and routine test facilities for cable joints and terminations 110-220 kV.

THE MAIN INFORMATION

Long terms of cable accessories delivery very often could be a big problem for cable lines establishing. That is why there is a great demand of cable accessories for HV cables in the market, with high quality and minimum terms of delivery for the reasonable price. Arkasil SK sets the goal to hold a strong position in the cable business.

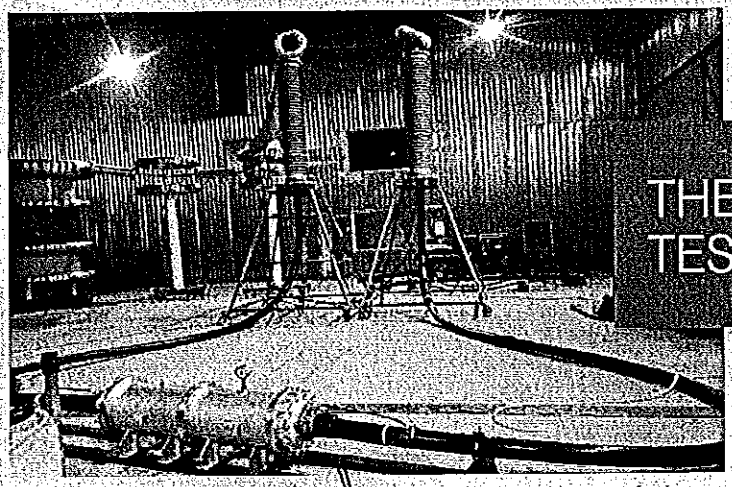
The main activity of Arkasil is HV accessories 110-220 kV production and delivery, and also related products such as tools, heat-shrinkable components and other products for cable line construction.

Arkasil



THE TYPE TESTS

At the beginning of 2011 the type tests of the cable accessories 110 (126) kV were successfully carried out together with CESI (the leader among the tests and certificates). Another type tests of cable accessories of Arkasil SK were carried out in 2011. Tests were made according to the program of the harmonized European standard HD 632 S2, part 1, analogue of IEC 60840 edition 3 (2004), in the test laboratory of KEMA (Netherlands). Also the company has KEMA type tests report for 132 (145) kV in 2013. In 2013 type tests of the cable accessories 220 (252) kV of Arkasil production were successfully passed under CESI supervision. In 2014 the company started type tests of GIS termination 220 (252) kV.

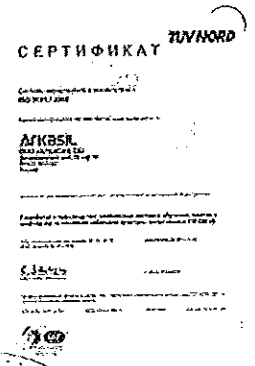


THE LONG-TERM TESTS

In 2013 the company started long-term tests of the cable system 220 kV, including a cable 2500 mm² and cable accessories 220 kV of Arkasil.

ISO 9001: 2008

Arkasil SK LLC applies a management system in line with ISO 9001 : 2008 standard for XLPE cable accessories 110-220 kV, design, production, training, installation and supervision.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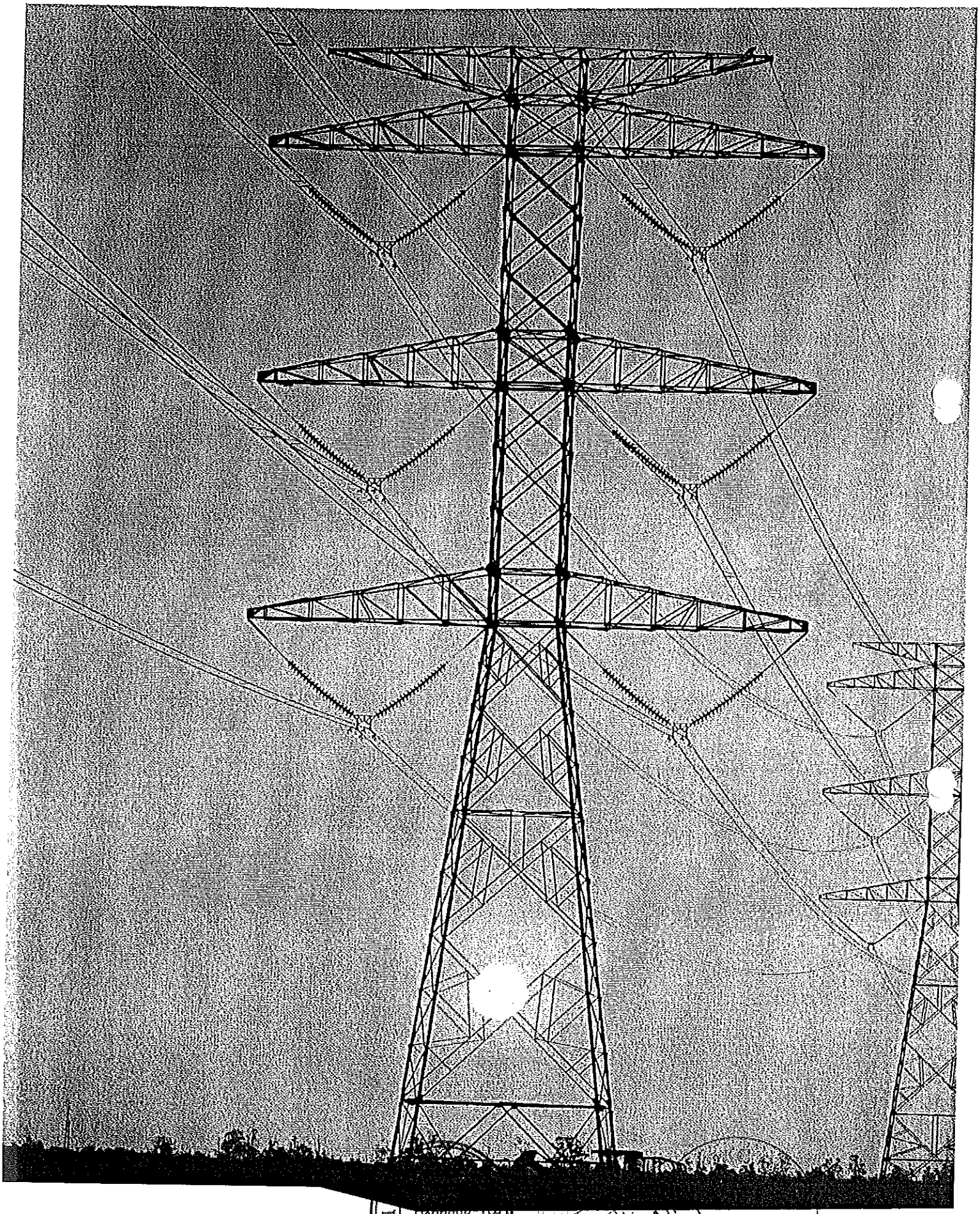
Arkasil

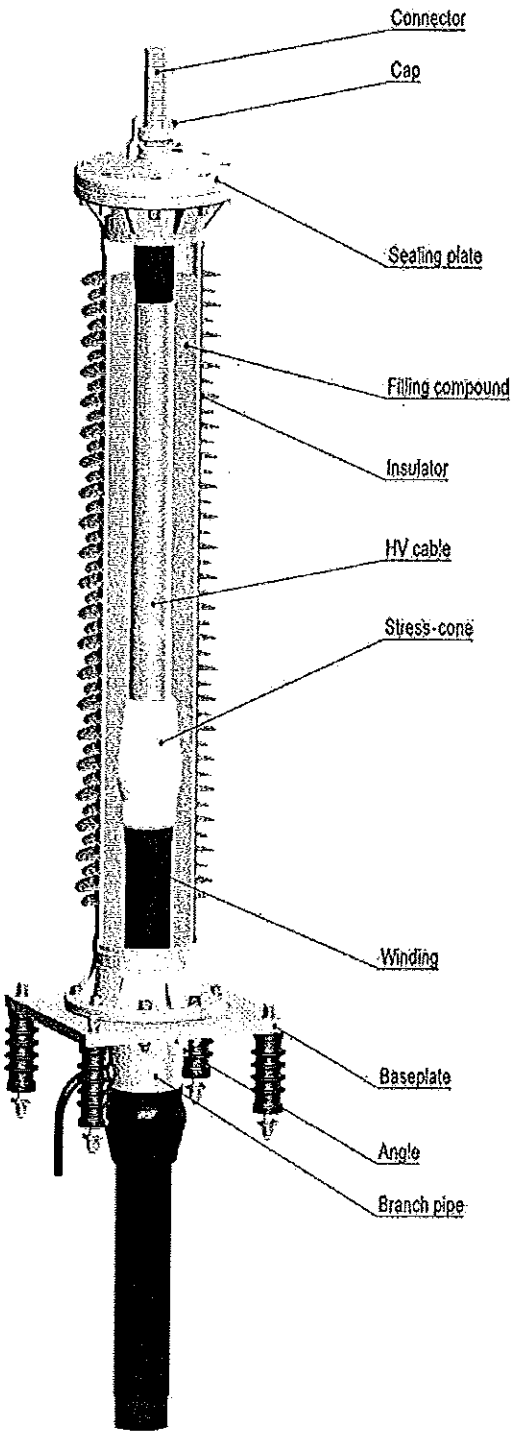
Arkasil



ARKASIL

LIST OF CONTENT

110 kV (126 kV)
Terminations MKB 126



Arkasil termination with composite type insulator is used for cable line connection to other elements of power-supply systems. Termination MKB 126 is used for outdoor and indoor installation, for XLPE cables 64/110 kV with the conductor cross-section up to 2000 mm².

Basic components

Insulator:

- composite type insulator with glass fiber reinforced epoxy resin tube and silicone rubber sheds;
- sheds color–light gray;
- top and bottom flanges glued and sealed to the composite insulator.

Cable end:

- pre-moulded and factory-tested silicone stress cone;
- cable end;
- base plate;
- branch pipe with flange;
- support insulators;
- seals and fixing materials;
- unpressurised synthetic oil as an insulating compound;
- optic fiber outlet.

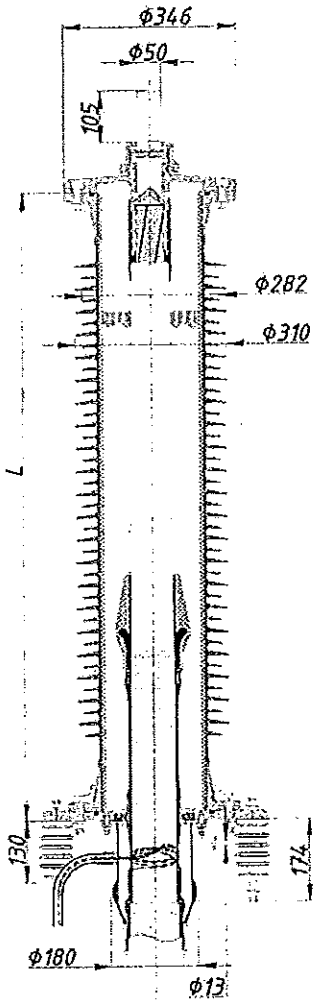
Area of application

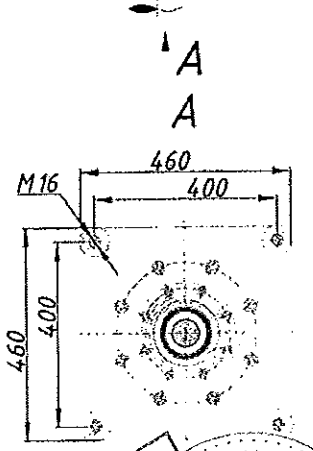
Type		MKB 126
Phase voltage	kV	64
Line voltage	kV	110
Maximum system voltage	kV	126
Cable conductor cross section range	mm²	185 ÷ 2000
Maximum cable sheath diameter	mm	115
Maximum cable insulation diameter	mm	91

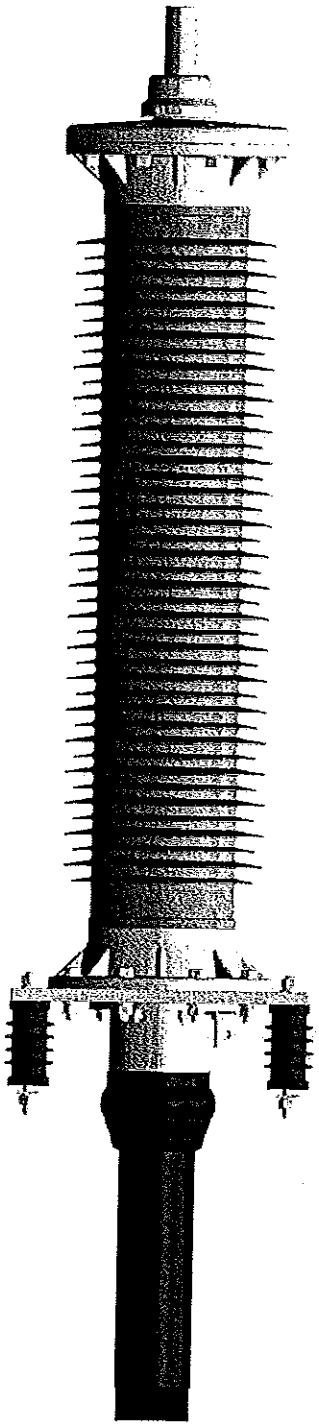
Installation options:

On support	+
On high-voltage power transmission line	+
On support at an angle	+

Installation can be simplified by assembling the termination horizontally on the ground before lifting it into place.







Technical data

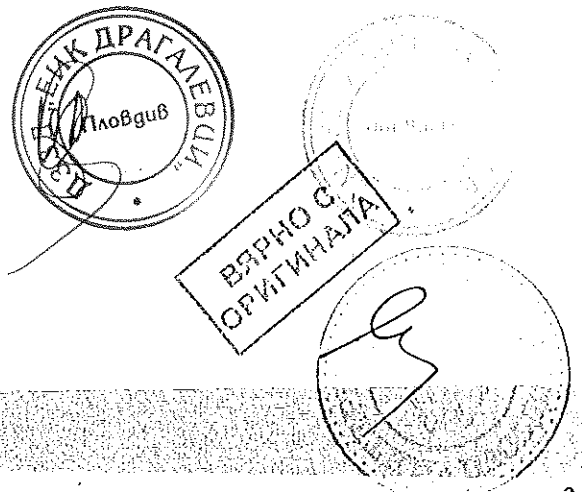
Electrical parameters:	
AC voltage withstand test	160 kV for 30 min
Partial discharges	<5 pC at 96 kV
Impulse voltage (10+/10- impulses)	550 kV

Climatic characteristics:	
Temperature	-50°C / +45°C

Nominal operating current:
limited by cable specification

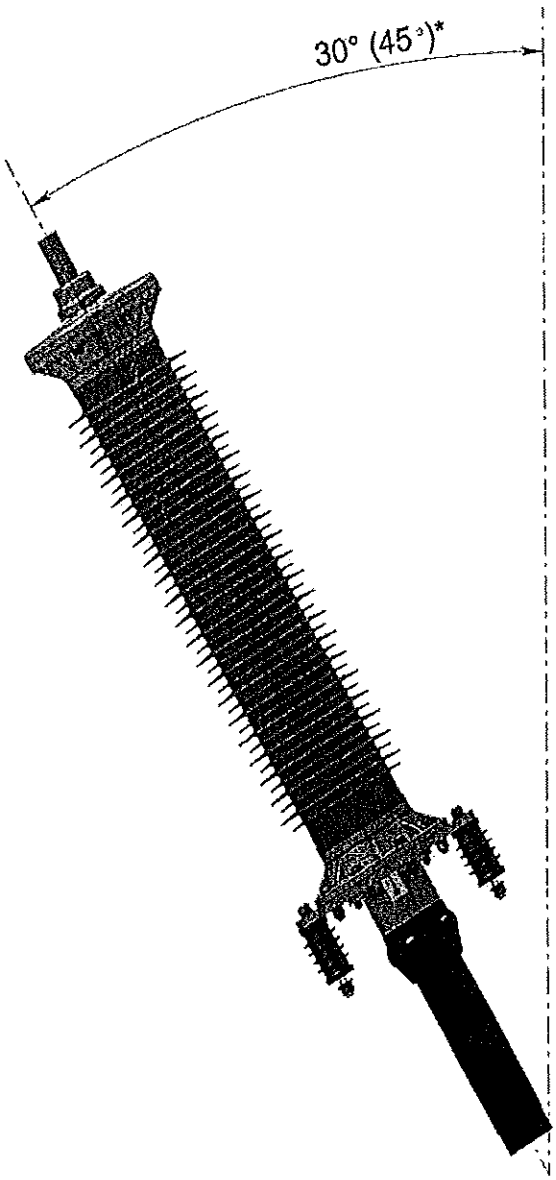
Stress-cone routine tests for MKB 126:	
AC voltage withstand test	160 kV for 30 min
Partial discharges	<5pC at 96 kV

Support insulator withstand voltage:	
AC voltage	10 kV
DC voltage	20 kV



Type		MKB 126		
Cable conductor cross section range	mm²	185÷2000		
Maximum allowed inclination angle		30°(45°)*		
Termination length, L	mm	1540	1863	1875
Creepage distance length	mm	3670	4300	4820
Pollution level in accordance with IEC 60137		III	IV	IV+
Volume compound	l	28	32	38
Weight	kg	104	108	113
Maximum allowed force on top connector	kN	3,5	3,5	3,5

Maximum allowed inclination angle up to 45° is only offer approval.



ДЗЗД „ЕИК ДРАГАНОВ" Пловдив

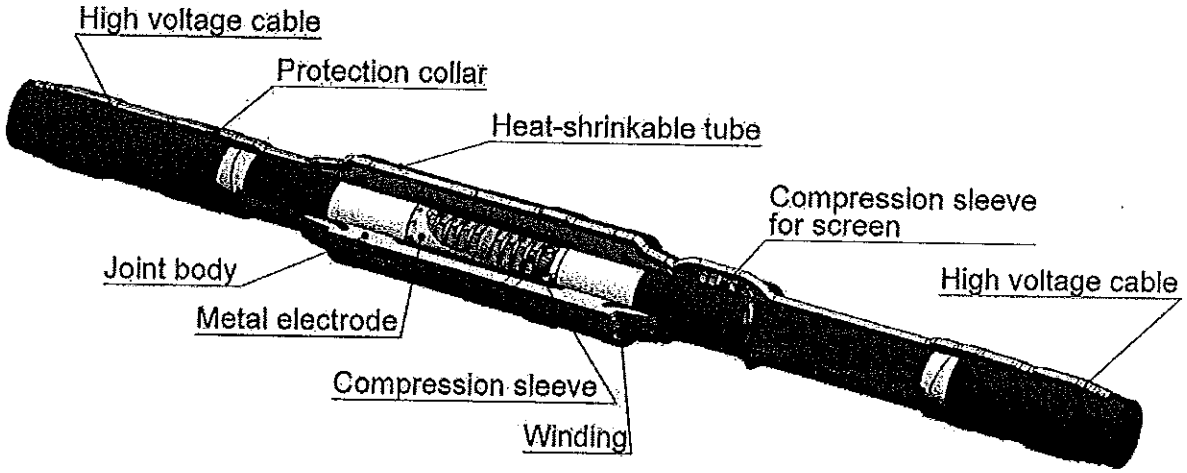
ВЯРНО С ОРИГИНАЛА

110 kV (126 kV)
Joints MCB 126

Arkasil joint is designed to connect two extruded high-voltage cables XLPE 64/110 kV. Joint MCB 126 could be produced in different designs: with screen wires direct connection, cross-bonding connection of different cable phase wires screen (screen cross-bonding), wires screen connection with optical fibers in the metal tubes.

Main components:

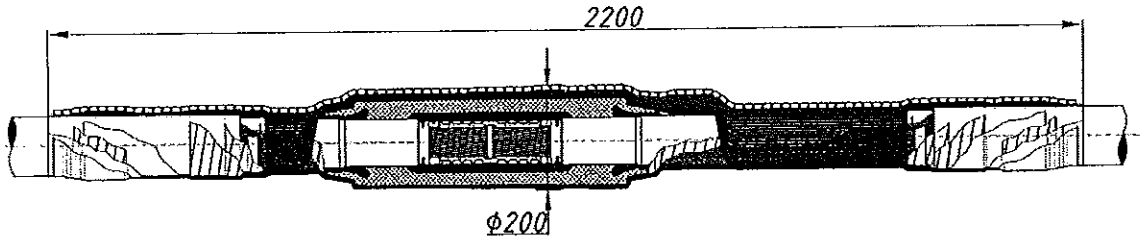
- pressed or screwed connection sleeves for cooper or aluminum conductors;
- insulator (silicone pre-molded joint body with elements for electrical field stress control);
- special tapes for different purposes;
- protective covering by shrinkable tubes and sleeves;
- cooper case protection;
- coffin box protection.



Area of application

Type		MCB 126
Phase voltage	kV	64
Line voltage	kV	110
Maximum system voltage	kV	126
Cable conductor cross section range	mm²	185 ÷ 2000
Maximum cable sheath diameter	mm	115
Maximum cable insulation diameter	mm	91
Nominal minimum insulation thickness	mm	10,5

Installation	
In the ground	+
On the air	+
Outdoor and indoor	+



Technical data

Electrical parameters:	
AC voltage withstand test	160 kV for 30 min
Partial discharges	<5 pC at 96 kV
Impulse voltage (10+/10- impulses)	550 kV

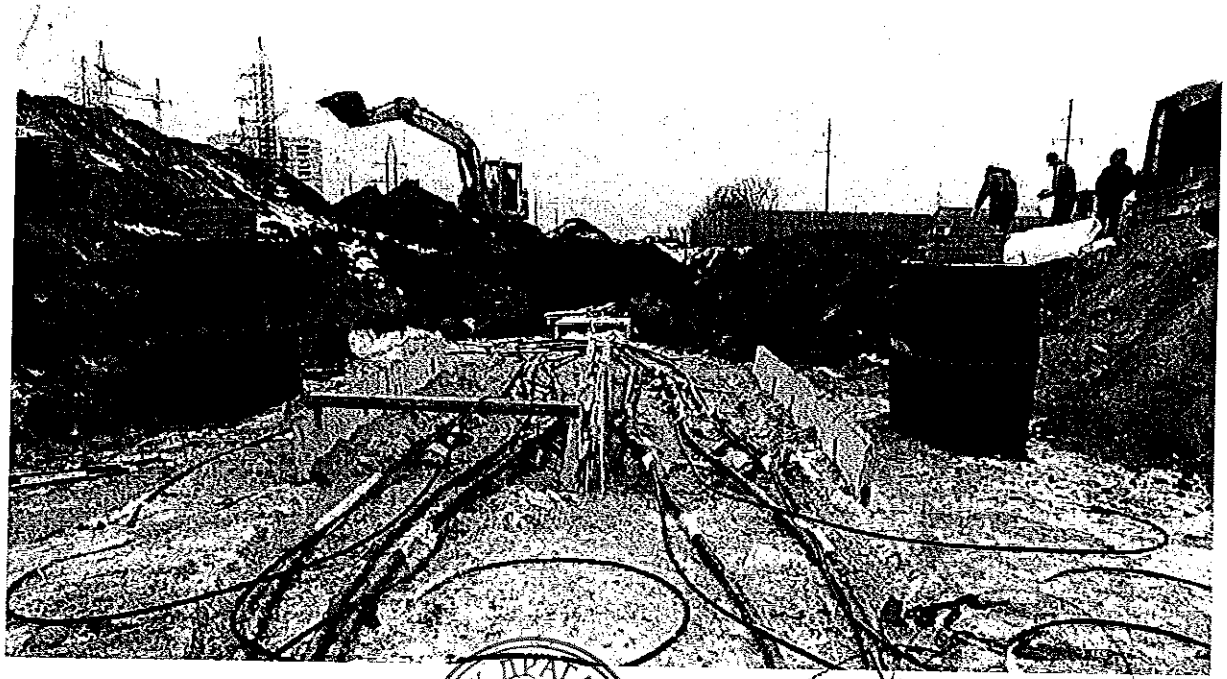
Current load rating:	
Rated operational current:	limited by cable specification
Short circuit current:	limited by cable specification

Climatic characteristics:	
Temperature	-50°C / +45°C

Stress-cone routine tests:	
AC voltage withstand test	160 kV for 30 min
Partial discharges	<5pC at 96 kV

Cable sheath test voltage:	
AC voltage	10 kV within 1 min
DC voltage	20 kV within 1 min

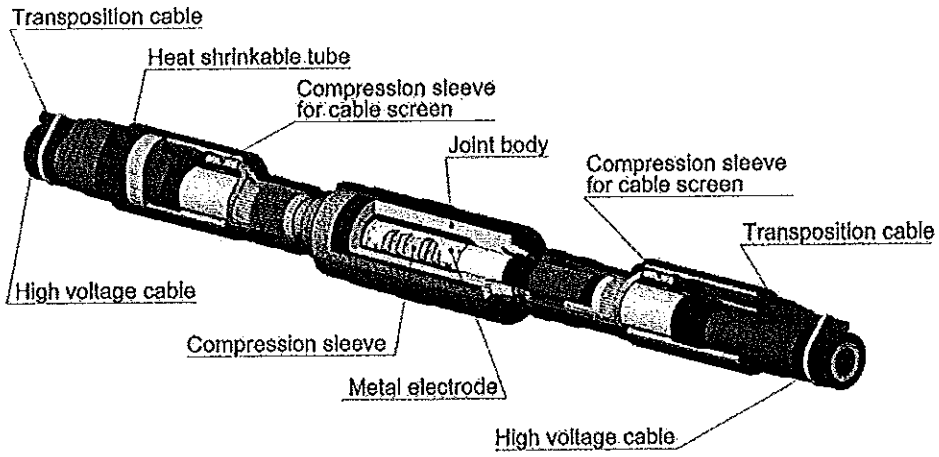
Mechanical characteristics:	
Approximate weight, kg	35

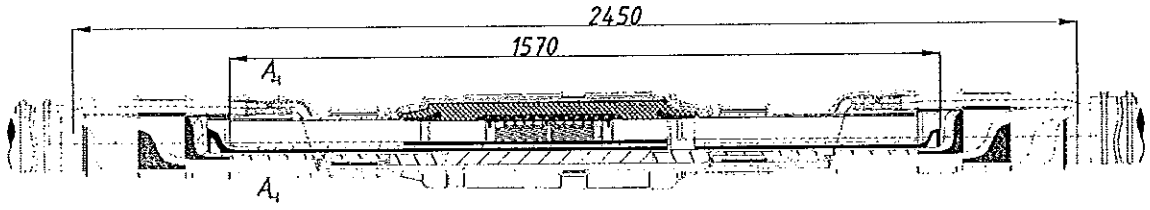


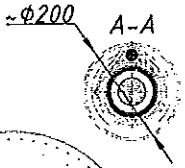
110 kV (126 kV)

Cross-bonding joints MCB 126 X

The cross-bonding joint MCB 126 X is designed to connect two extruded high-voltage cables XLPE 64/110 kV with cross connection of wire screens. Screen outlet from both sides is provided by cross-bonding cable. There is the dielectric insertion in the joint for screen interruption.





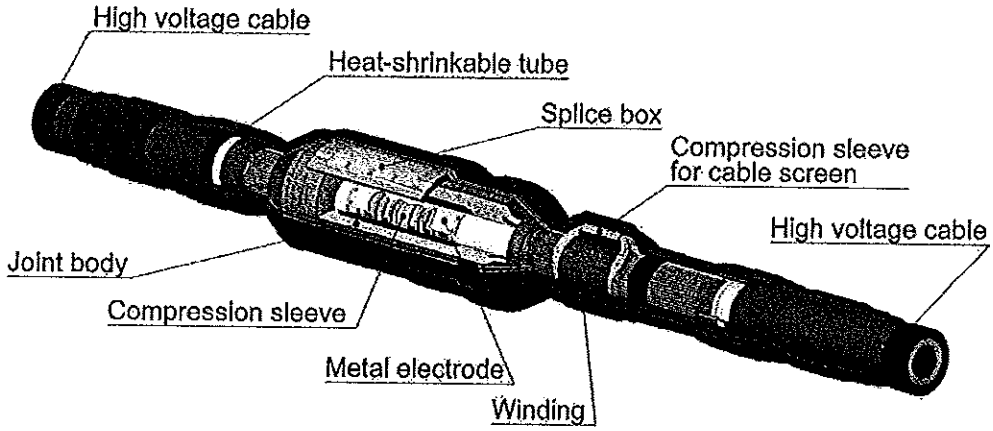


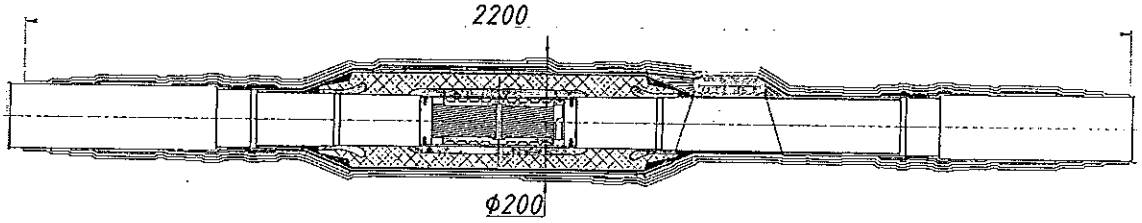
110 kV (126 kV)

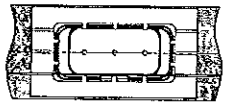
Joints with optic fiber connection MCB 126 O

The joint with opric fiber connection MCB 126 O is designed to connect two extruded high-voltage cables XLPE 64/110 kV with connection of wire screens including optical module.

The design of joint includes splice box for connection of fiber-optical modules embended in the high-voltage cables screens.

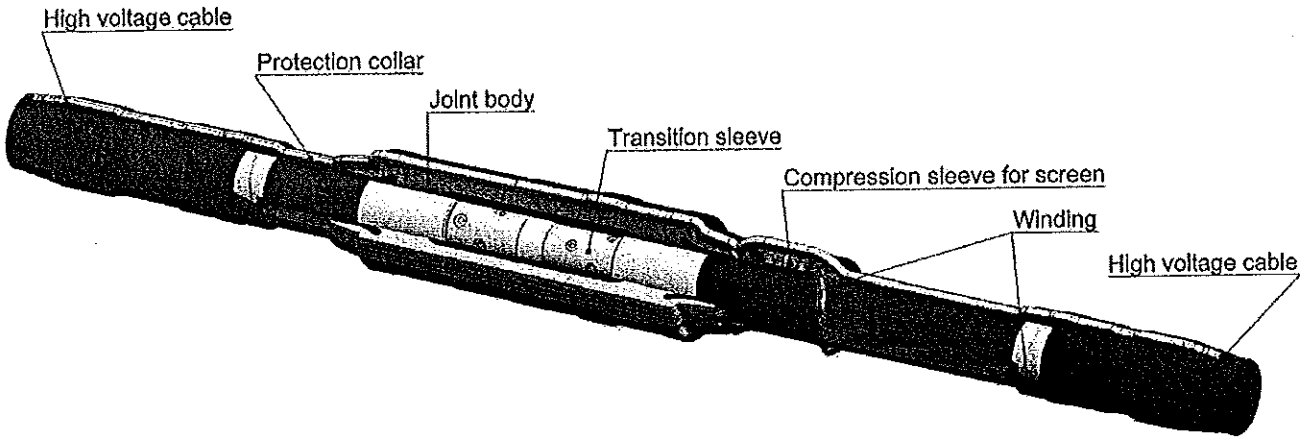


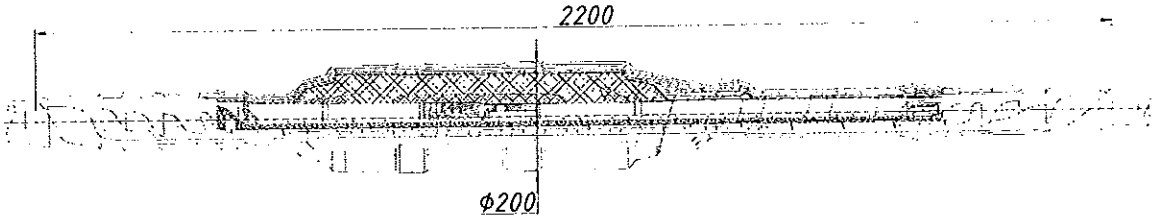




110 kV (126 kV)
Transition joints MCB 126 T

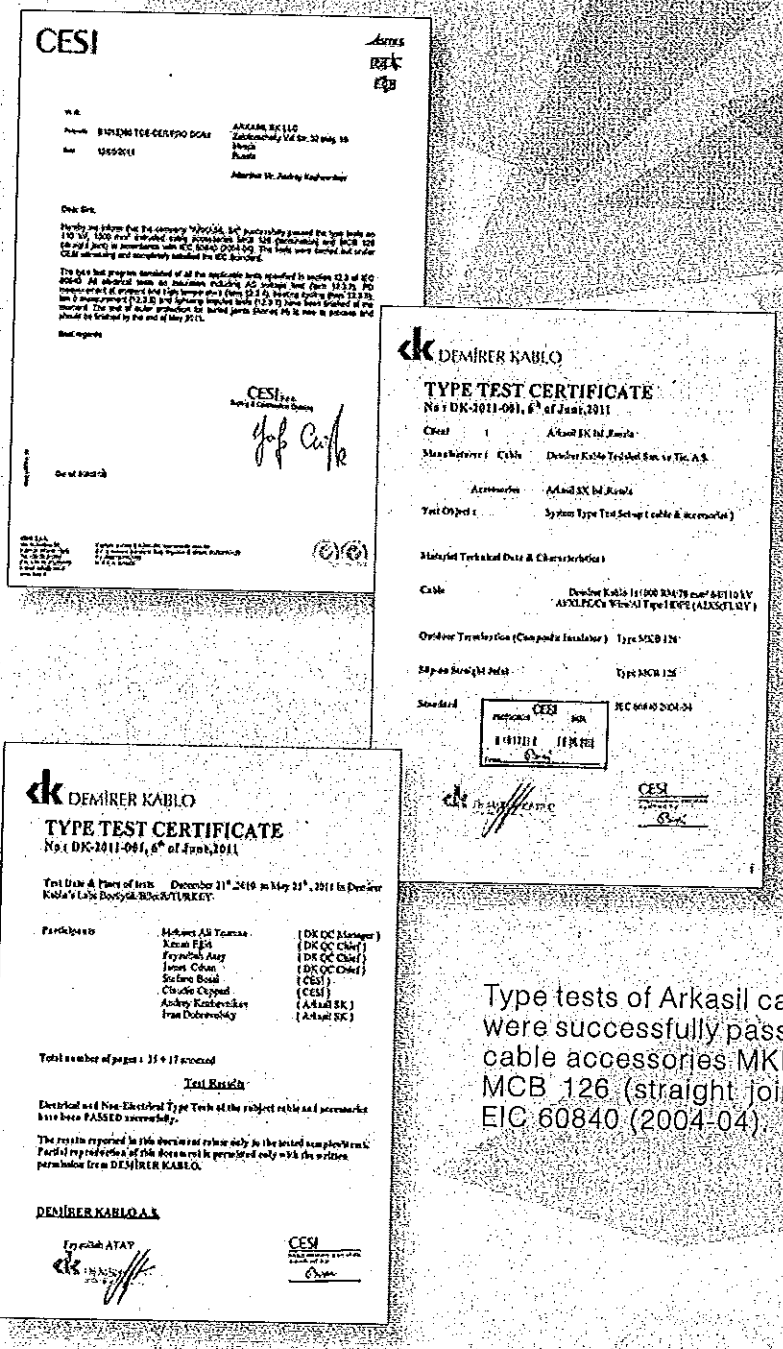
The transition joint MCB 126 T is designed to connect two extruded high-voltage cables XLPE 64/110 kV. Transition joints MCB 126 T are designed to connect cables with different conductors cross-sections including solid conductors connection and different insulation thickness.





Arkasil

TYPE TESTS OF CABLE SYSTEM 110 kV


CESI

DEMİRER KABLO

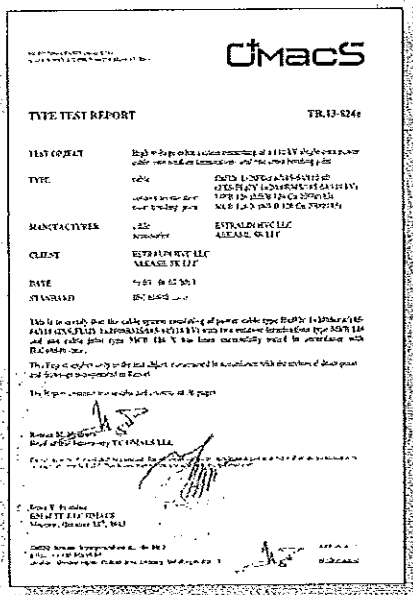
TYPE TEST CERTIFICATE

DEMİRER KABLO

TYPE TEST CERTIFICATE

CESI, Italy

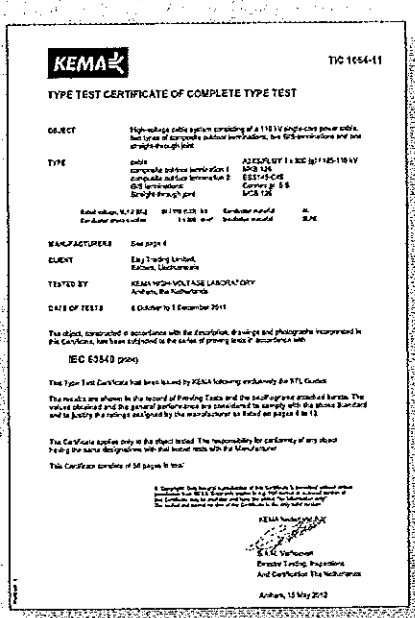
Type tests of Arkasil cable accessories 110 kV were successfully passed, 1000 mm² extruded cable accessories MKB 126 (termination) and MCB 126 (straight joint) in accordance with EIC 60840 (2004-04).



TYPE TEST REPORT TR.13-524r

OMACS, Russia

Type tests according to IEC 60840-2011 (OMACS, Russia)



TYPE TEST CERTIFICATE OF COMPLETE TYPE TEST

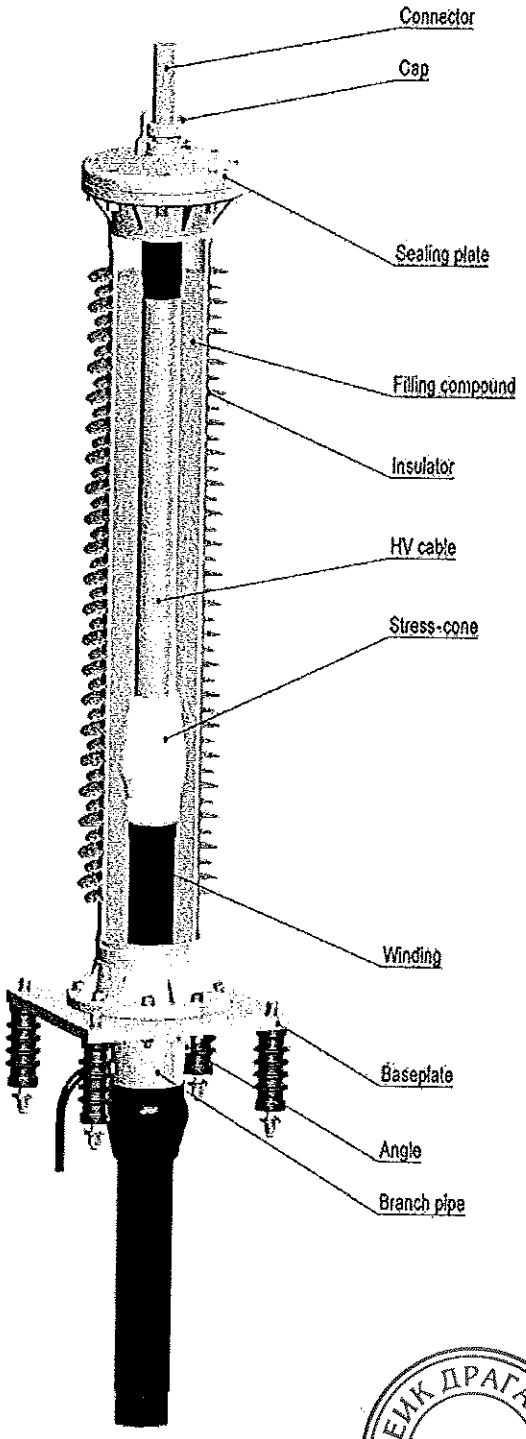
TYC 1054-11

KEMA, The Netherlands

Tests were made according to the program of the harmonized European standard HD 632 S2, part 10 analogue of IEC 60840 edition 3 (2004), in the test laboratory of KEMA (Netherlands).

325

132 kV (145 kV)
Terminations MKB 145



Arkasil termination with composite type insulator is used for cable line connection to other elements of power-supply systems. Termination MKB 145 is used for outdoor and indoor installation, for XLPE cables 76/132 kV with the conductor cross-section up to 2000 mm².

Basic components

Insulator:

- composite type insulator with glass fiber reinforced epoxy resin tube and silicone rubber sheads;
- sheds color–light gray;
- top and bottom flanges glued and sealed to the composite insulator.

Cable end:

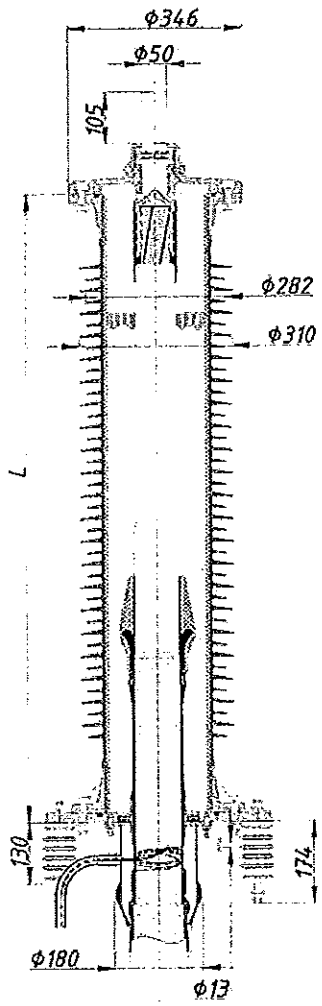
- pre-moulded and factory-tested silicone stress cone;
- cable end;
- base plate;
- branch pipe with flange;
- support insulators;
- seals and fixing materials;
- unpressurised synthetic oil as an insulating compound;
- optic fiber outlet.

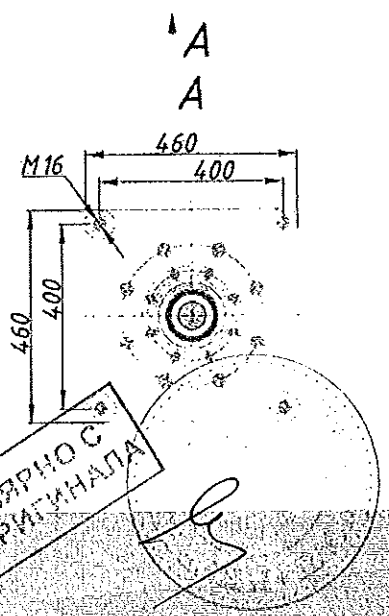
Area of application

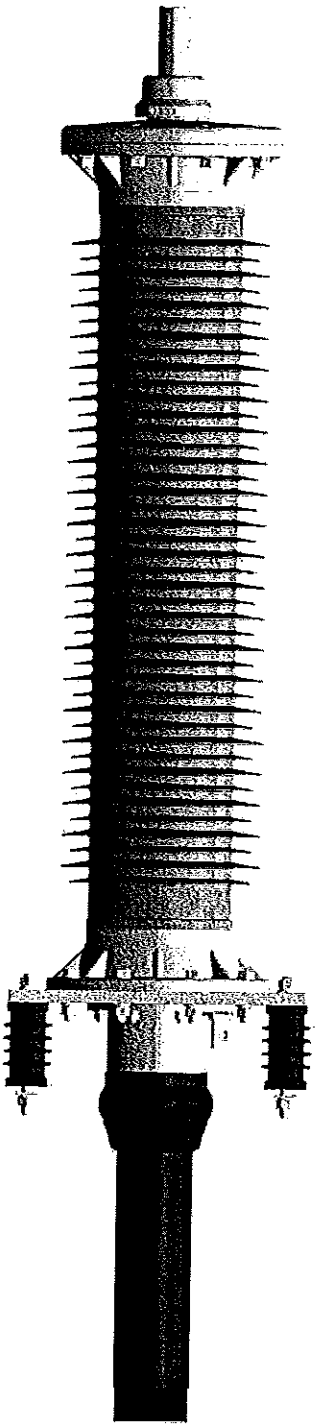
Type		MKB 145
Phase voltage	kV	76
Line voltage	kV	132
Maximum system voltage	kV	145
Cable conductor cross section range	mm²	185 ÷ 2000
Maximum cable sheath diameter	mm	115
Maximum cable insulation diameter	mm	91

Installation options:	
On support	+
On high-voltage power transmission line	+
On support at an angle	+

Installation can be simplified by assembling the termination horizontally on the ground before lifting it into place.







Technical data

Electrical parameters:	
AC voltage withstand test	190 kV for 30 min
Partial discharges	<5 pC at 114 kV
Impulse voltage (10+/10- impulses)	650 kV

Climatic characteristics:	
Temperature	-50°C / +45°C

Nominal operating current:
limited by cable specification

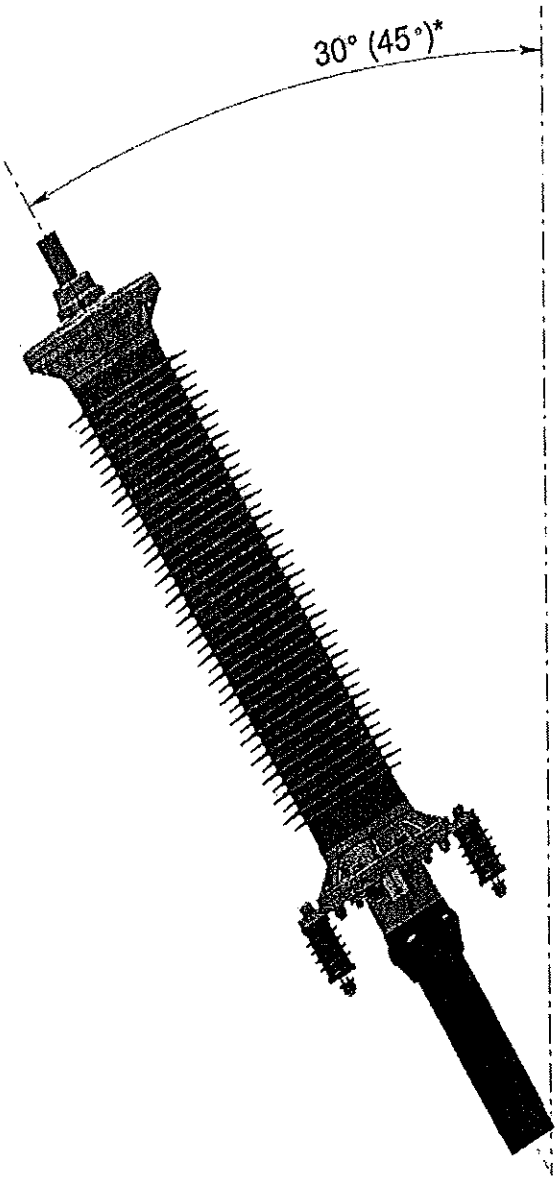
Stress-cone routine tests for MKB 145:	
AC voltage withstand test	190 kV for 30 min
Partial discharges	<5pC at 114 kV

Cable sheath test voltage:	
AC voltage	10 kV within 1 min
DC voltage	20 kV within 1 min

ЕИК ДРАГАЛЕВСКИ
Пловдив
ВЯРНО С ОРИГИНАЛА

Type		MKB 145	
Cable conductor cross section range	mm²	185÷1600	
Maximum allowed inclination angle		30°(45°)*	
Termination length, L	mm	1863	1875
Creepage distance length	mm	4300	4820
Pollution level in accordance with IEC 60137		III	IV
Volume compound	l	32	38
Weight	kg	108	113
Maximum allowed force on top connector	kN	3,5	3,5

Maximum allowed inclination angle up to 45° is only offer approval.



ЗЗД „ЕИК ДРАГАЛЕВ" Пловдив

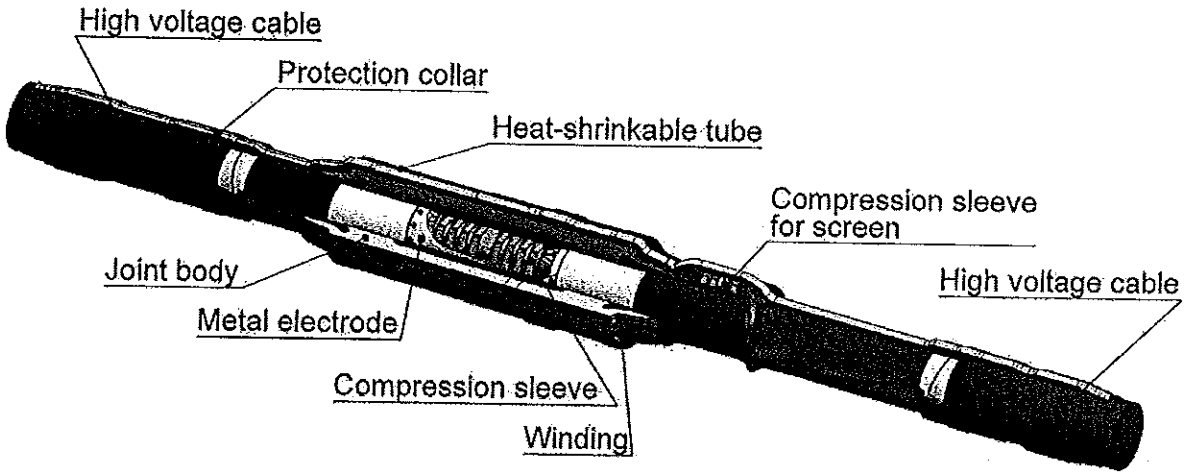
ВЯРНО С ОРИГИНАЛА

132 kV (145 kV)
Joints MCB 145

Arkasil joint is designed to connect two extruded high-voltage cables XLPE 76/132 kV. Joint MCB 145 could be produced in different designs: with screen wires direct connection, cross-bonding connection of different cable phase wires screen (screen cross-bonding), wires screen connection with optical fibers in the metal tubes.

Main components:

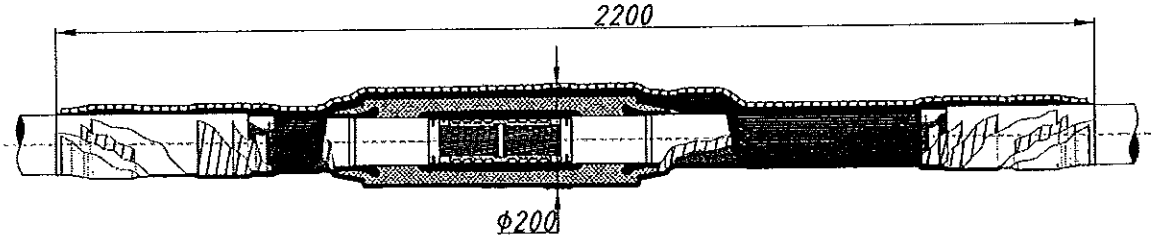
- pressed or screwed connection sleeves for cooper or aluminum conductor;
- insulator (silicone pre-molded joint body with elements for electrical field stress control);
- special tapes for different purposes;
- protective covering by shrinkable tubes and sleeves;
- cooper case protection;
- coffin box protection.



Area of application

Type		MCB 145
Phase voltage	kV	76
Line voltage	kV	132
Maximum system voltage	kV	145
Cable conductor cross section range	mm²	185÷2000
Maximum cable sheath diameter	mm	115
Maximum cable insulation diameter	mm	91
Nominal minimum insulation thickness	mm	14

Installation:	
In the ground	+
On the air	+
Outdoor and indoor	+



Technical data

Electrical parameters:

AC voltage withstand test	190 kV for 30 min
Partial discharges	<5 pC at 114 kV
Impulse voltage (10+/10- impulses)	650 kV

Current load rating:

Rated operational current	limited by cable specification
Short circuit current	limited by cable specification

Climatic characteristics:

Temperature	-50°C / +45°C

Stress cone routine tests:

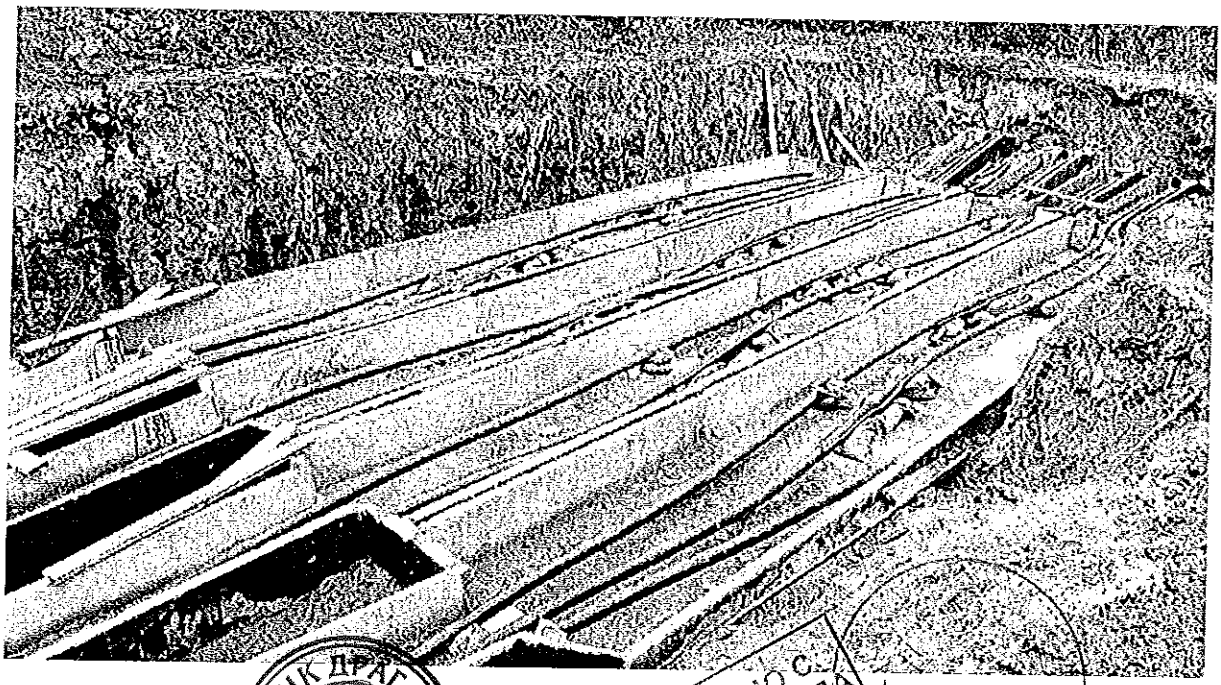
AC voltage withstand test	190 kV for 30 min
Partial discharges	<5pC at 114 kV

Cable sheath test voltage:

AC voltage	10 kV within 1 min
DC voltage	20 kV within 1 min

Mechanical characteristics:

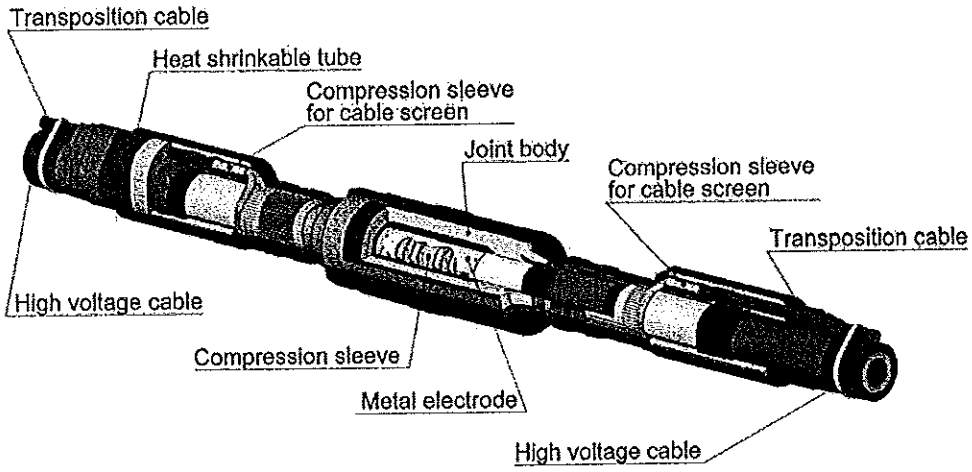
Approximate weight, kg	35

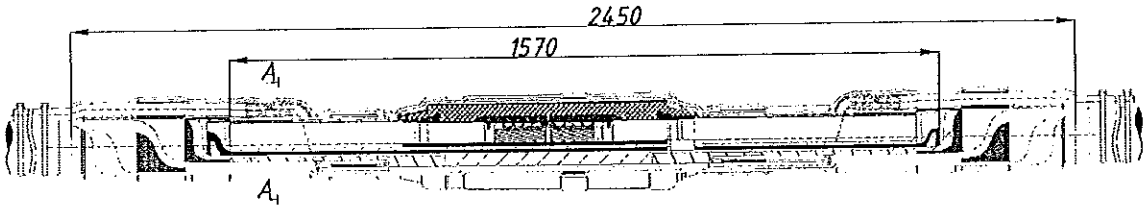


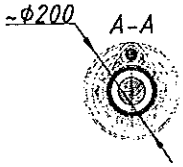
132 kV (145 kV)

Cross-bonding joints MCB 145 X

The cross-bonding joint MCB 145 X is designed to connect two extruded high-voltage cables XLPE 76/132 kV with cross-connection of wire screens. Screen outlet from both sides is provided by cross-bonding cable. There is the dielectric insertion in the joint for screen interruption.





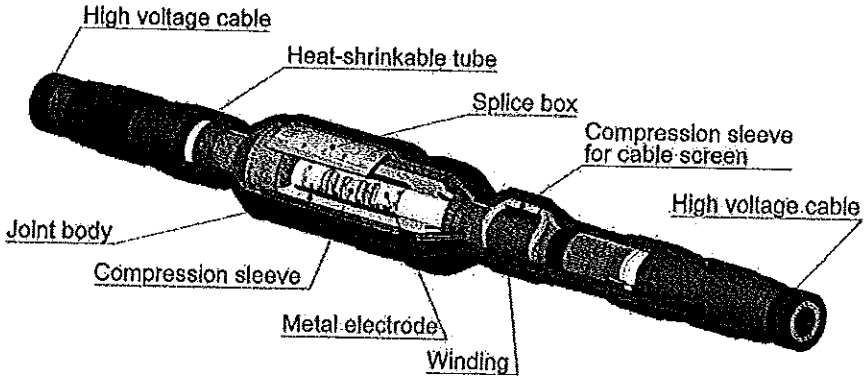


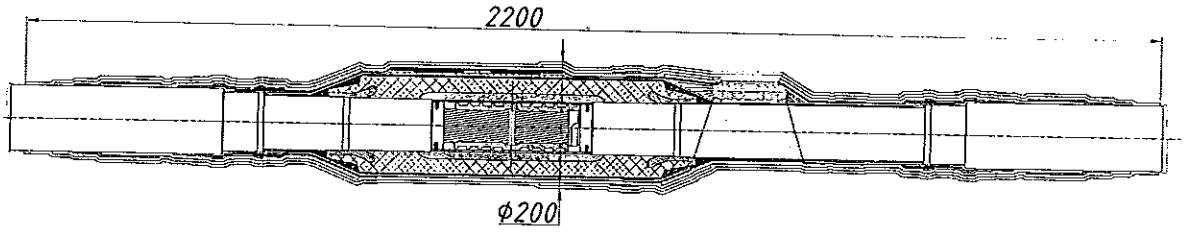
132 kV (145 kV)

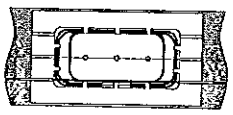
Joints with optic fiber connection MCB 145 O

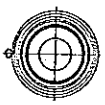
The joint with opric fiber connection MCB 145 O is designed to connect two extruded high-voltage cables XLPE 76/132 kV with connection of wire screens including optical module.

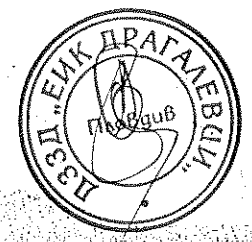
The design of joint includes splice box for connection of fiber-optical modules embended in the high-voltage cables screens. .

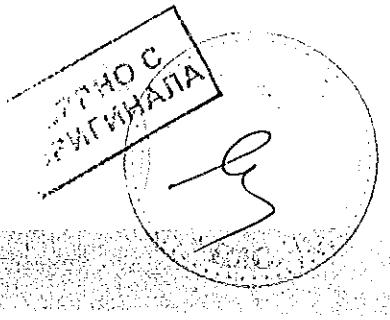




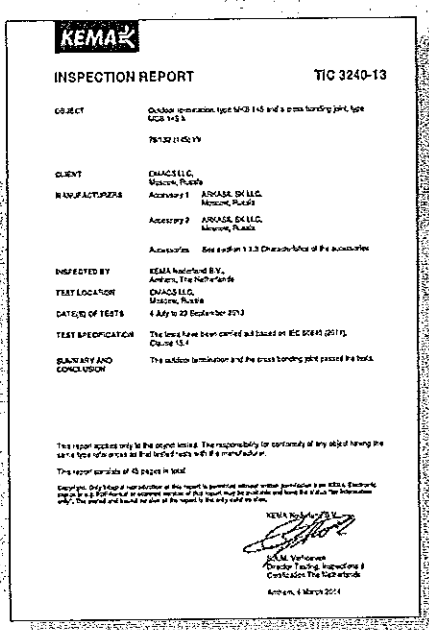








TYPE TESTS OF CABLE SYSTEM 132 kV



KEMA

INSPECTION REPORT TIC 3240-13

OBJECT Outdoor termination, type MCB 145 and a cross bonding joint, type CCB 145 X

132 kV (145 kV)

CLIENT OMACS LLC, Moscow, Russia

MANUFACTURER Accessory 1 ARKASIL SK LLC, Moscow, Russia

Accessory 2 ARKASIL SK LLC, Moscow, Russia

Accessories See section 1.3.3 Characteristics of the accessories

INSPECTED BY KEMA Nederland B.V., Arnhem, The Netherlands

TEST LOCATION OMACS LLC, Moscow, Russia

DATE(S) OF TESTS 4 July to 20 September 2013

TEST SPECIFICATION The tests have been carried out based on IEC 60840 (2011), Clause 13.4

SUMMARY AND CONCLUSION The outdoor termination and the cross bonding joint passed the tests.

This report applies only to the object tested. The responsibility for conformity of any object having the same type designation as the tested object rests with the manufacturer.

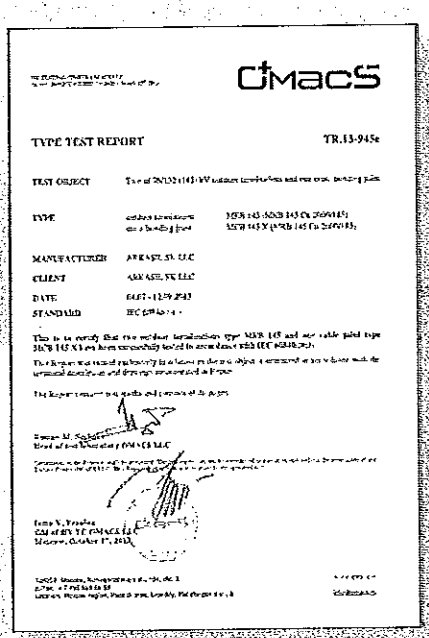
This report consists of 45 pages in total.

Signature

A.M. Verhoeven
Director Testing, Inspections & Certification The Netherlands

Arnhem, 4 March 2014

KEMA, The Neatherlands



OMACS

TYPE TEST REPORT TR.13-945e

TEST OBJECT Type of 132(145) kV outdoor termination and cross bonding joint

TYPE outdoor termination MCB 145 (MCB 145 Cu 2500/185); cross bonding joint MCB 145 X (MCB 145 Cu 2500/185);

MANUFACTURER ARKASIL SK LLC

CLIENT ARKASIL SK LLC

DATE 04.07 - 12.09.2013

STANDARD IEC 60840:11 +

This is to certify that the outdoor termination type MCB 145 and one cable joint type MCB 145 X have been successfully tested in accordance with IEC (IEC 60840:2011).

The Report was issued exclusively for the above mentioned object. Conformity of any other object with the mentioned description and drawings is not stated in the Report.

The Report consists on 45 pages and 1 annex of 26 pages.

Signature

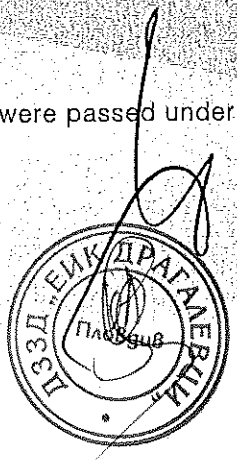
Head of test laboratory OMACS LLC

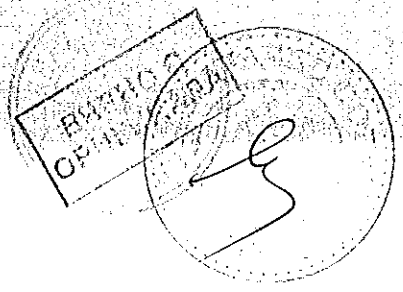
Signature

Irina V. Vasilieva
CEO of SEV TC OMACS LLC
Moscow, October 1st, 2013

OMACS, Russia

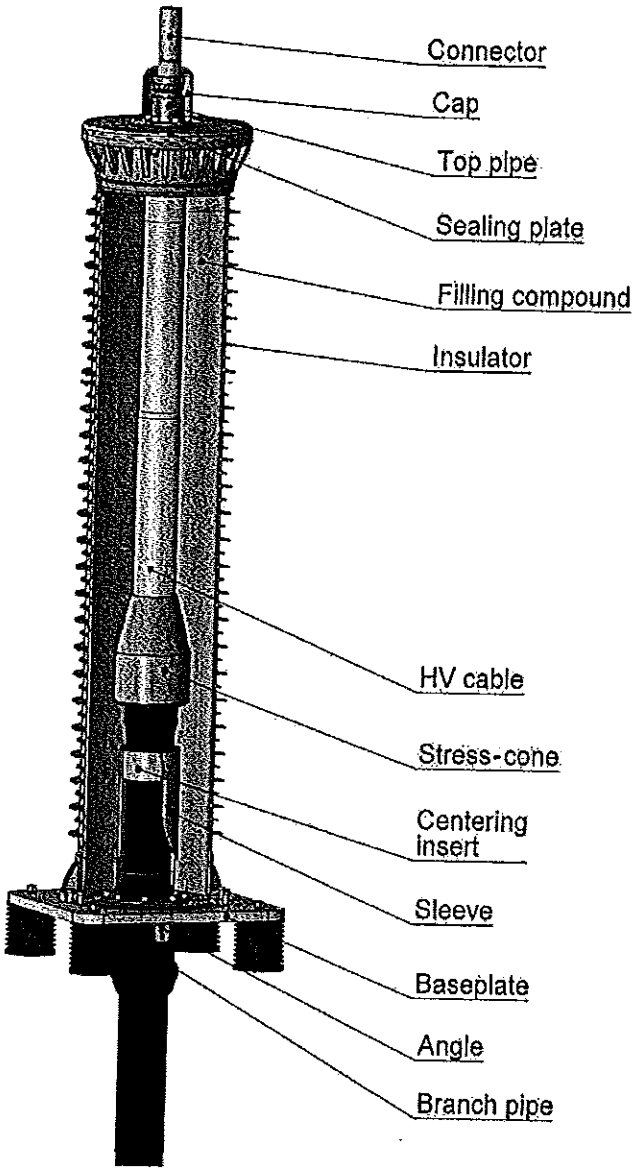
Tests were passed under KEMA supervision.





335

220 kV (252 kV)
Terminations MKB 252



Arkasil termination with composite type insulator is used for cable line joints with other elements of power-supply systems. Termination MKB 252 is used for outdoor and indoor installation, for XLPE cables 127/220 kV with the conductor cross section up to 2500 mm².

Basic components

Insulator:

- composite type insulator with glass fiber reinforced epoxy resin tube and silicone rubber sheds;
- sheds color--light gray;
- top and bottom flanges glued and sealed to the composite insulator.

Cable end:

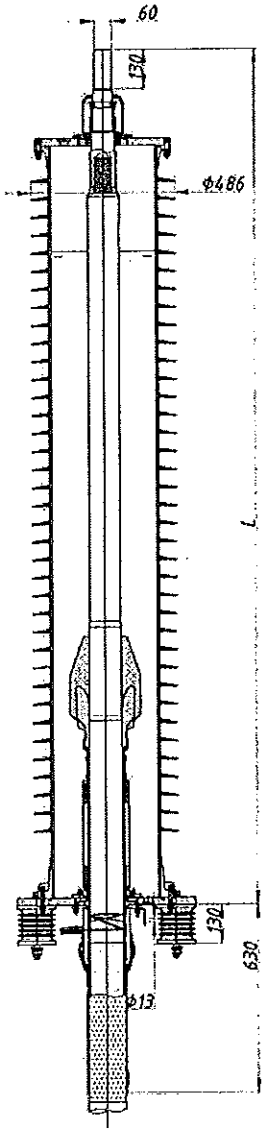
- pre-moulded and factory-tested silicon stress-cone;
- cable end;
- base plate;
- branch pipe with flange;
- support insulators;
- seals and fixing materials;
- unpressurised synthetic oil as an insulating compound;
- optic fiber outlet.

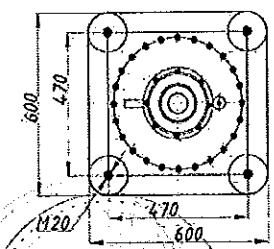
Area of application

Type		MKB 252
Phase voltage	kV	127
Line voltage	kV	220
Maximum system voltage	kV	252
Cable conductor cross section range	mm²	400÷2500
Maximum cable sheath diameter	mm	150
Maximum cable insulation diameter	mm	108

Installation	
On support	+
On high-voltage power transmission line	+
On support at an angle	+

Installation can be simplified by assembling the termination horizontally on the ground before lifting it into place.





Technical data

Electrical parameters:	
AC voltage withstand test	318 kV for 30 min
Partial discharges	<5 pC at 190 kV
Impulse voltage (10+/10- impulses)	1050 kV

Climatic characteristics:	
Temperature	-50°C / +45°C

Nominal operating current:	
Rated operational current	limited by cable specification
Short circuit current	limited by cable specification

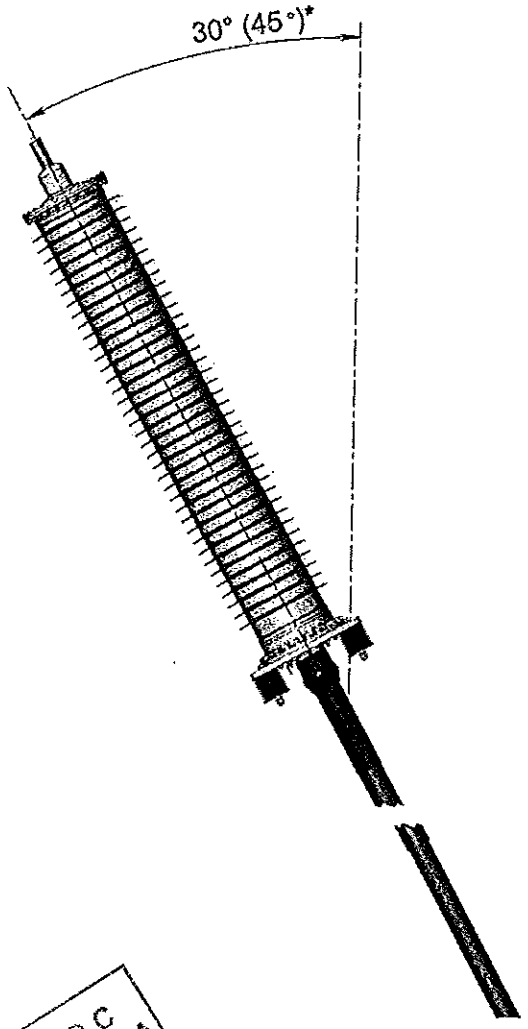
Type		MKB 252
Creepage distance length	mm	6190, 7636, 8058, 8903, 9959, 10382
Pollution level in accordance with IEC 60137; GOST 9920-89		II,III, IV

Stress-cone routine tests for MKB 252:	
AC voltage withstand test	318 kV for 30 min
Partial discharges	<5pC at 190 kV

Cable sheath test voltage:	
AC voltage	10 kV
DC voltage	20 kV

Mechanical characteristics:	
Maximum allowed inclination angle	30° (45°)
Approximate weight, kg	350
Maximum allowed force on top connector, H	5000

Type tests according to IEC 62067.

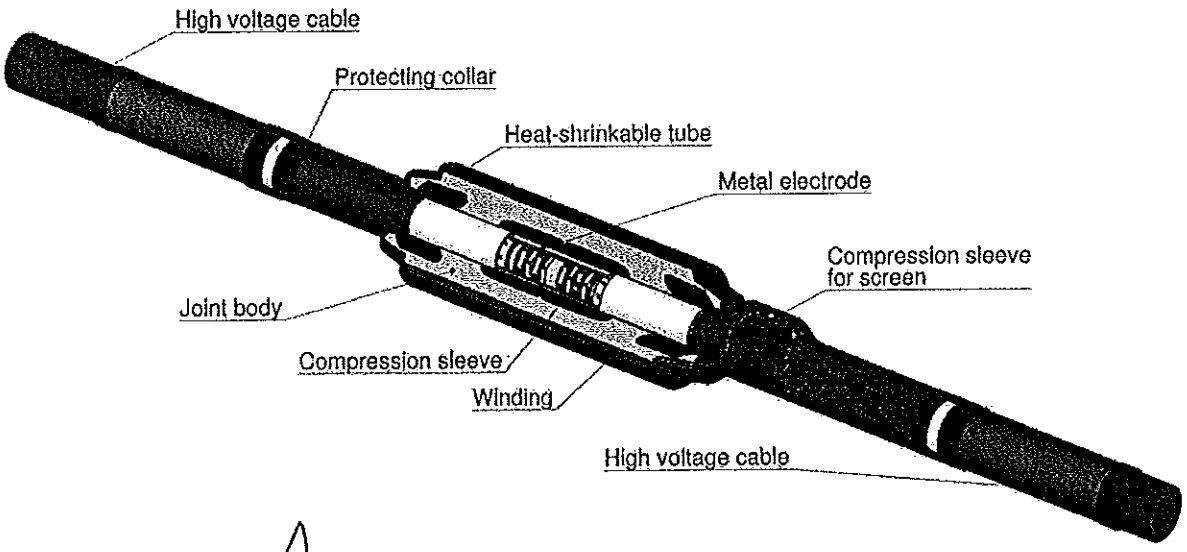


220 kV (252 kV)
Joints MCB 252

Arkasil joint is designed to connect two extruded high-voltage cables XLPE 127/220 kV. Joint MCB 252 could be produced in different designs: with screen wires direct connection, cross-bonding connection of different cable phase wires screen (screen cross-bonding), wires screen connection with optical fibers in the metal tubes.

Main components:

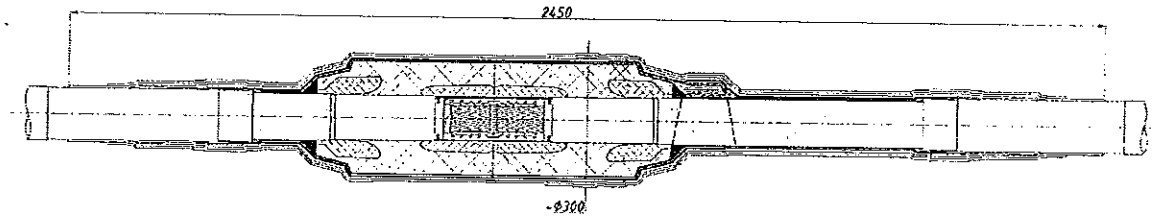
- pressed or screwed connection sleeves for cooper or aluminum conductors;
- insulator (silicone pre-molded joint body with elements for electrical field stress control);
- special tapes for different purposes;
- protective covering by shrinkable tubes and sleeves;
- cooper case protection;
- coffin box protection.



Area of application

Type		MCB 252
Phase voltage	kV	127
Line voltage	kV	220
Maximum system voltage	kV	252
Cable conductor cross section range	mm²	400÷2500
Maximum cable sheath diameter	mm	150
Maximum cable insulation diameter	mm	108

Installation	
In the ground	+
On the air	+
Outdoor and indoor	+



Technical data

Electrical parameters:	
AC voltage withstand test	318 kV for 30 min
Partial discharges	<5 pC at 190 kV
Impulse voltage (10+/10- impulses)	1050 kV

Climatic characteristics:	
Temperature	-50°C / +45°C

Current load rating:	
Rated operational current	limited by cable specification
Short circuit current	limited by cable specification

Stress-cone routine tests:	
AC voltage withstand test	318 kV for 30 min
Partial discharges	<5pC at 190 kV

Cable sheath test voltage:	
AC voltage	10 kV within 1 min
DC voltage	20 kV within 1 min

Mechanical characteristics:	
Approximate weight, kg	80

Type tests according to IEC 62067.

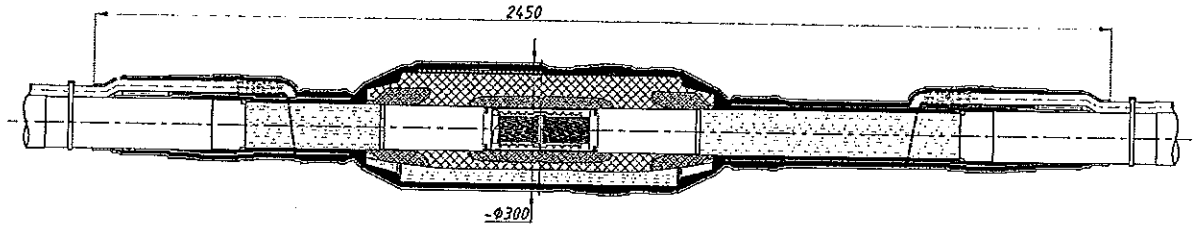
220 kV (252 kV)

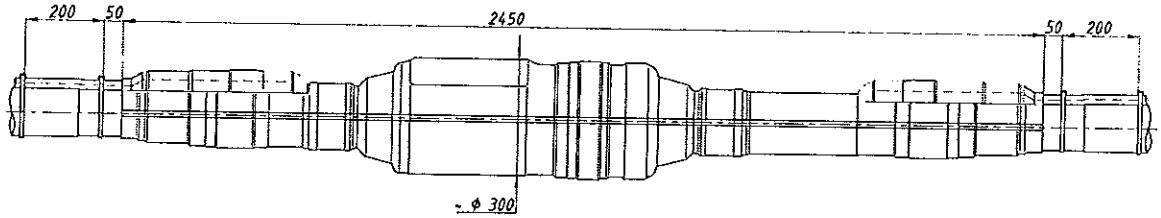
Cross-bonding joints MCB 252 X and joints with optic fiber connection MCB 252 O

The cross-bonding joint MCB 252 X is designed to connect two extruded high-voltage cables XLPE 127/220 kV with cross-connection of wire screens. Screen outlet from both sides is provided by cross-bonding cable. There is the dielectric insertion in the joint for screen interruption.

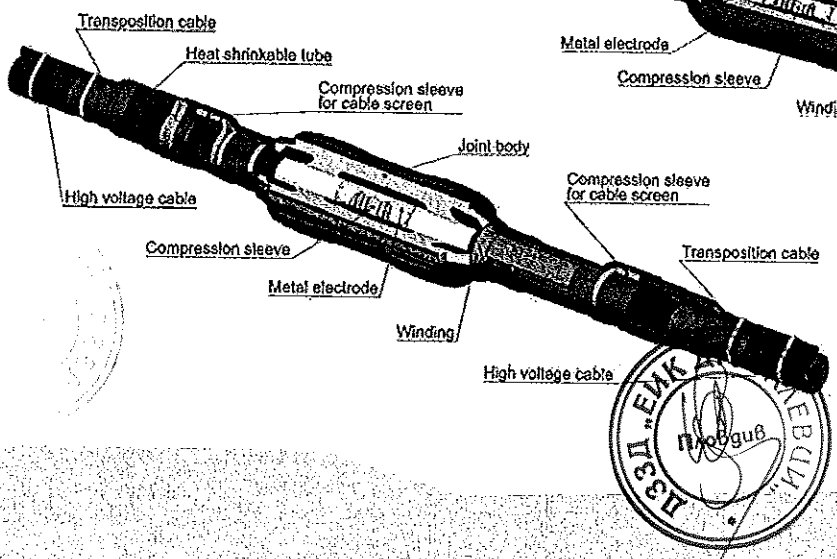
The joint with opric fiber connection MCB 252 O is designed to connect two extruded high-voltage cables XLPE 127/220 kV with connection of wire screens including optical module. The design of joint includes splice box for connection of fiber-optical modules installed in the high-voltage cables screens.

MCB 252 XO

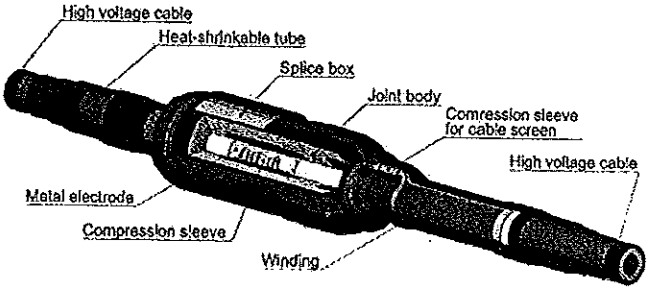




MCB 252 X

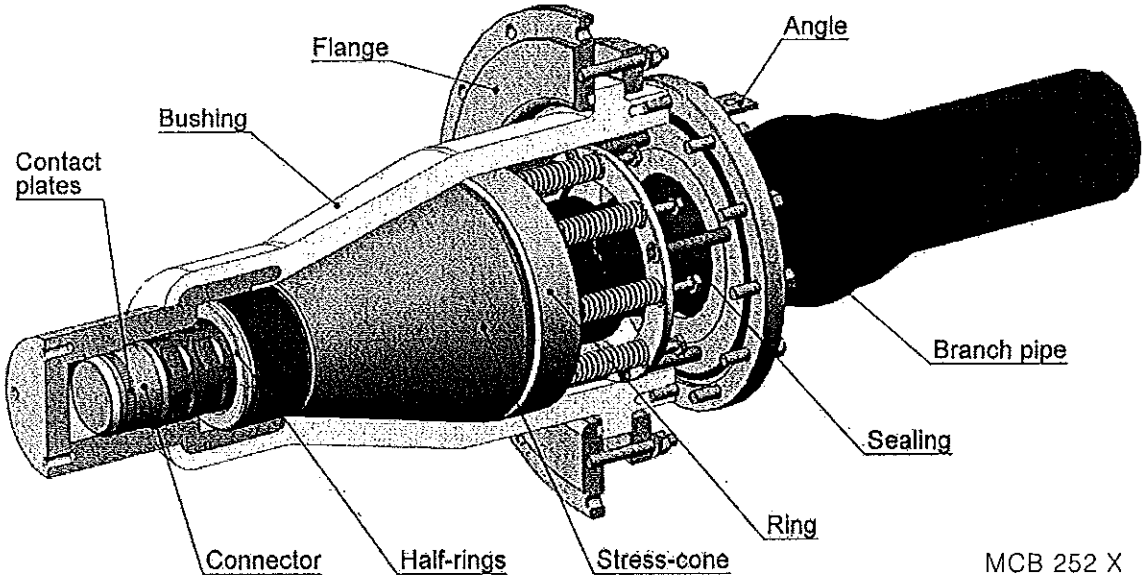


MCB 252 O



220 kV (252 kV)
GIS terminations MBB 252

Arkasil GIS terminations are designed to connect cable lines to the gas insulated switchgear. Also, they are named GIS plug-ins, GIS adaptors. GIS terminations conform to IEC 62271-209. GIS termination consists of epoxy insulator and plug-in part. Due to such design, a cable can be disconnected from the GIS and be connected again. The epoxy insulator can be delivered with GIS or with plug-in part.



MCB 252 X

Area of application

Area of application		MBB 252
Phase voltage	kV	127
Line voltage	kV	220
Maximum system voltage	kV	252
Cable conductor cross section range	mm²	400÷2500
Maximum cable sheath diameter	mm	150
Maximum cable insulation diameter	mm	112

Technical data

Electrical parameters:

AC voltage withstand test	318 kV for 30 min
Partial discharges	<5 pC at 190 kV
Impulse voltage (10+/10- impulses)	1050 kV

Climatic characteristics:

Temperature	-50°C / +45°C

Current load rating:

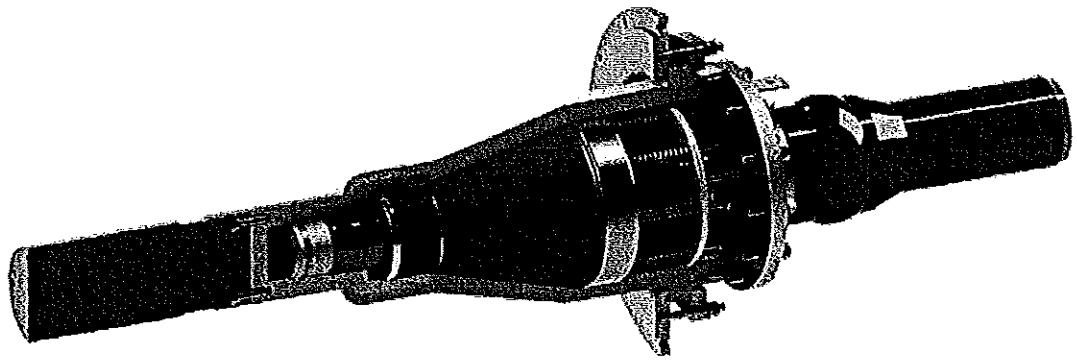
Rated operational current	limited by cable specification
Short circuit current	limited by cable specification

Stress cone routine tests for MBB 252:

AC voltage withstand test	318 kV for 30 min
Partial discharges	<5pC at 190 kV

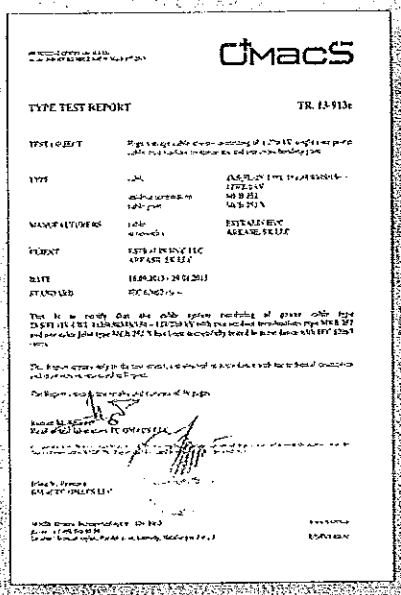
Mechanical characteristics:

Approximate weight, kg	350
Length, mm	1300



Arkasil

TYPE TESTS OF CABLE SYSTEM 220 kV

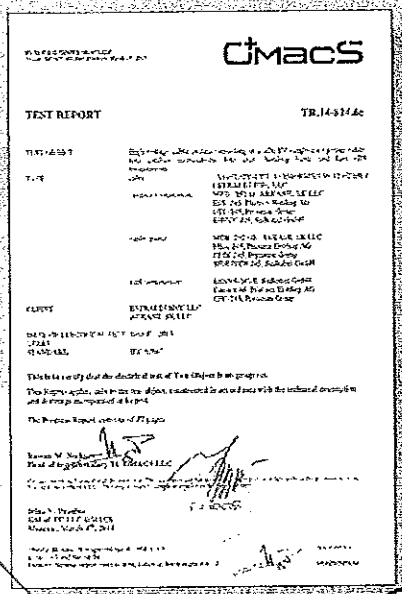


TYPE TEST REPORT TR. 13-913e

OMACS, Russia

Tests were made under CESI supervision.

PREQUALIFICATION TESTS OF CABLE SYSTEM 220 kV



TEST REPORT TR.14-914e

OMACS, Russia

The electrical test of High-voltage cable system consisting of a 220 kV single-core power cable, four outdoor terminations, four cross-bonding joints and four GIS terminations is on progress.

345

HEAT-SHRINKABLE COMPONENTS

Heat shrinkable cable end caps

Heat Shrinkable cable End Caps are used to seal the ends of all types of Cables protect from ingress of water/moisture. The caps are manufactured from high quality cross linked polyolefin material.

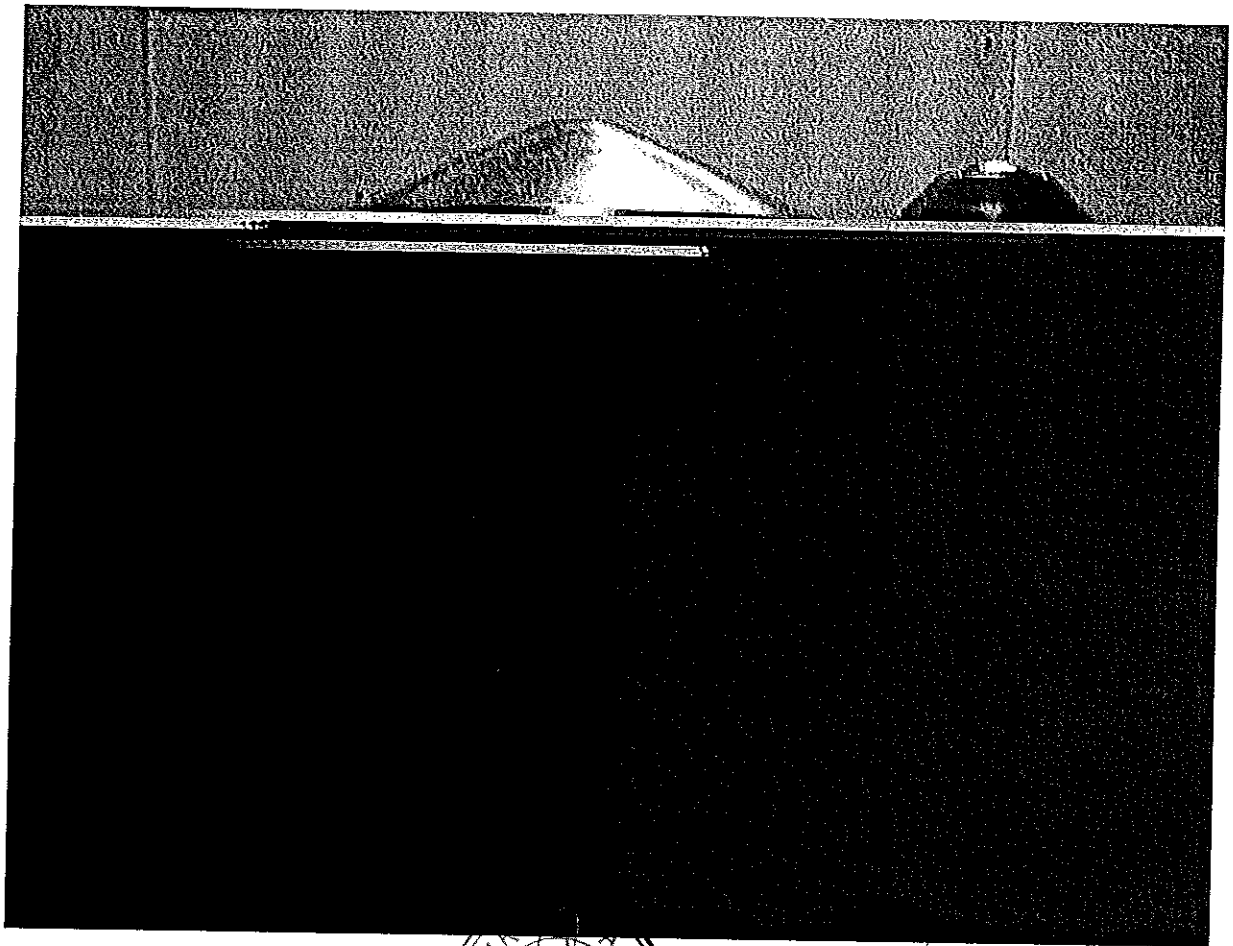
Compatible with most commonly used Cable Jackets i.e. XLPE, PVC, PILC or Rubber Sheathed Cable.

Hot Melt adhesive lining provides seal on irregular cable sheaths.

Excellent resistance to weathering, moisture, contamination and adverse environmental conditions.

Area of application:

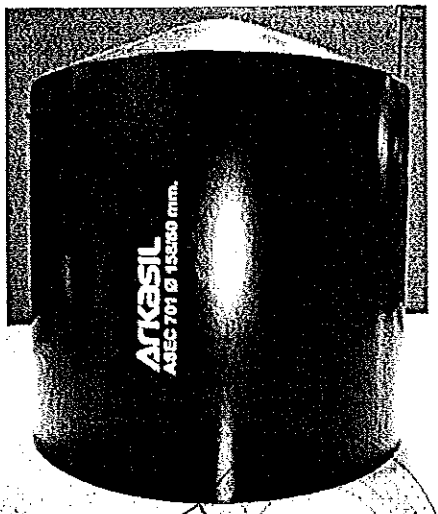
- valved end caps available for pressurized application for Telecom cables;
- special Relief valved End Caps available for degassing application in High Voltage Power cables;
- high voltage (non tracking) End Caps available for sealing live parts;
- conductive End Caps are available with conductive mastic.



Technical specification

Type		Standard
Physical properties:		
Tensile Strength	12 N/mm² (Mpa) (min.)	ASTM D638
Ultimate Elongation	350% (min)	ASTM D638
Density	1.05± 0.2	ASTM D792
Hardness	45 ±10 Shore D	ASTM D2240
Water absorption	0.2% (max.)	ASTM D570
Thermal properties:		
Accelerated ageing	(120°C for 500 hrs)	ASTM D2671
Tensile Strength	11 N/mm² (Mpa) (min.)	ASTM D638
Ultimate Elongation	300% (min.)	ASTM D638

Type		Standard
Low Temperature Flexibility:		
(-40°C for 4 hrs.)	No Cracking	ASTM D2671
Heat Shock (250°C for 30 min.)	No cracking or flowing	ESI 09-11
Shrink Temperature	125°C	IEC216
Temperature range	-40 to +100°C	IEC216
Electrical properties:		
Dielectric Strength	12 KV/mm. (min)	ASTM D149
Volume Resistivity	1X 10^{14} Ohm. cm (min)	ASTM D257
Dielectric constant	5 (max.)	ASTM D150



Code	D min (mm)	D max (mm)	T±10 (mm)	Length (min)	Cable diameter
ASEC 001S	6	2.0	2.0	25	2-4
ASEC 001	12	4.0	2.3	38	4-8
ASEC 001L	12	4.0	2.3	58	4-8
ASEC 001A	14	4.0	2.3	58	4-11
ASEC 101	20	7.5	2.3	55	8-16
ASEC 101 L	20	7.5	2.5	75	8-16
ASEC 101 A*	25	8.0	2.3	75	8-20
ASEC 102	30	11	2.5	75	12-26
ASEC 102 A	35	11	2.5	75	12-30
ASEC 201*	40	15	3.3	90	16-35
ASEC 201 L	40	15	3.3	120	16-35
ASEC 201 AL	45	15	3.3	120	16-40
ASEC 301*	55	25	3.8	122	25-47
ASEC 301 L	55	25	3.8	170	25-47
ASEC 301 AL	63	25	3.8	170	25-55
ASEC 401*	75	35	3.8	140	35-68
ASEC 401 L	75	35	4.0	180	35-68
ASEC 501 S	85	45	4.0	160	45-80
ASEC 501*	100	45	4.0	160	45-90
ASEC 501 L	100	45	4.0	200	45-90
ASEC 501 AL	120	45	4.0	200	45-110
ASEC 601*	130	60	4.6	160	64-120
ASEC 701*	154	60	4.6	165	70-145
ASEC 801	230	120	5.5	220	140-200
ASEC 901	310	120	5.5	220	140-280
ASEC 1001	400	200	6.0	220	230-380

* Widely applied

ВЯРНО С ОРИГИНАЛА

ДЗЗД „ЕИК ДРАГАЛЕВЦИ"

HEAT-SHRINKABLE COMPONENTS

Heat shrinkable tubes

Heat Shrinkable Tubes ASMW and ASHW are medium wall and heavy wall black tubes. ASMW tubes are used for environmental protection of cable termination and insulating the connectors for straight through joints/splice. ASHW tubes are used for mechanical protection and outer sealing of underground straight through cable joints / splice.

Technical specification

- these tubes are manufactured from high quality cross inked polyolefin material;
- optional hot melt adhesive lining for complete environmental protection and insulation;
- excellent resistance to weathering, UV rays, chemical and solvents;
- maximum cut length available up to 1500 mm;
- custom dimensions, thickness, length & colours available on request;
- conforms to IEC standard.

Code	D min (mm)	D max (mm)	T±10 (mm)
ASHW 12/3	12	3	2.4
ASHW 19/6	19	6	2.5
ASHW 30/8	30	8	3.0
ASHW 43/12	43	12	4.0
ASHW 51/16	51	16	4.0
ASHW 72/22	72	22	4.0
ASHW 85/25	85	25	4.0
ASHW 105/30	105	30	4.0
ASHW 120/36	120	36	4.0
ASHW 140/42	140	42	4.2
ASHW 160/50	160	50	4.3
ASHW 180/55	180	55	4.3
ASHW 200/65	200	65	4.3

Code	D min (mm)	D max (mm)	T±10 (mm)
ASMW 10/3	10	3	1.0
ASMW 12/4	2	4	1.8
ASMW 19/6	19	6	2.0
ASMW 27/8	27	8	2.5
ASMW 33/10	33	10	2.5
ASMW 40/12	40	12	2.5
ASMW 50/16	50	16	2.6
ASMW 70/22	70	22	2.7
ASMW 90/28	90	28	3.0
ASMW 115/34	115	34	3.0
ASMW 130/36	130	36	3.0
ASMW 140/42	140	42	3.0
ASMW 160/50	160	50	3.0
ASMW 180/60	180	60	3.0
ASMW 200/70	200	70	3.3

ПЗЗД „ЕИК ДРАГАНОВ" Пловдив

ВЯРНО С ОРИГИНАЛА

Type		Standard
Physical:		
Tensile Strength	12 N/mm² (Temperature range)(min.)	ASTM D638
Ultimate Elongation	350% (Min.)	ASTM D638
Longitudinal Change	-10% (Max.)	ASTM D2671
Density	1.15 ± 0.2 g/cm³	ASTM D792
Hardness	45 ± 10 Shore D	ASTM D2240
Water Absorption	0.5% (max.)	ASTM D570
Thermal:		
Accelerated Ageing	(120°C for 500 h)	ASTM D2671
Tensile Strength	11 N/mm² (Mpa) (min.)	ASTM D 638
Ultimate Elongation	300% (Min.)	ASTM D 638
Low temperature Flexibility (-40°C for 4 h.)	No Cracking	ASTM D2671
Heat Shock (250°C for 30 min.)	No Cracking or flowing	ESI 09-11
Shrink Temperature	125°C	IEC 216
Temperature range	-40°C to + 110°C	IEC 216
Electrical:		
Dielectric Strength	12 kV/mm. (Min.)	ASTM D 149
Volume Resistivity	1 x 10^{14} Ohm.cm (min.)	ASTM D257
Dielectric Constant	5 (Max.)	ASTM D150

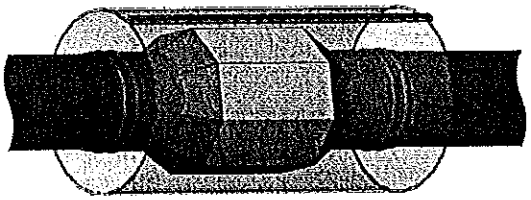
ДЗЗД „ЕМК ДРАГАЛЕВЦИ" Пловдив

ВЯРНО С ОРИГИНАЛА

HEAT-SHRINKABLE COMPONENTS

Heat shrinkable wrap around sleeve

For the protection of Cable joint

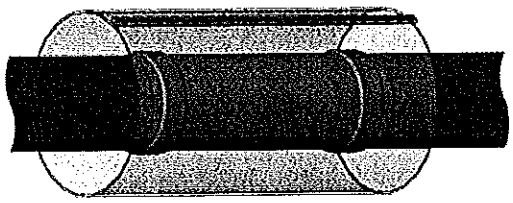


Heat Shrinkable Wrap Around Sleeve is a cross linked polyolefin tube which is folded around the cable/pipe, zipped up with a stainless steel channel and then heat shrunk.It is also called as (Cable Repair Sleeve).

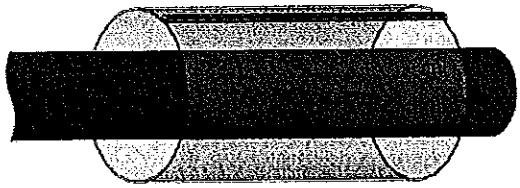
Shut down of system not required for repair

- hot melt adhesive provides complete environmental sealing and insulation;
- high resistance to UV rays, chemicals, corrosion, fungus, etc.;
- temperature sensitive paint changes colour when heat shrinking process is complete;
- maximum length available up to 1500 mm.

For Cable Repairs



For corrosion protection of Oil, Water & Gas pipeline



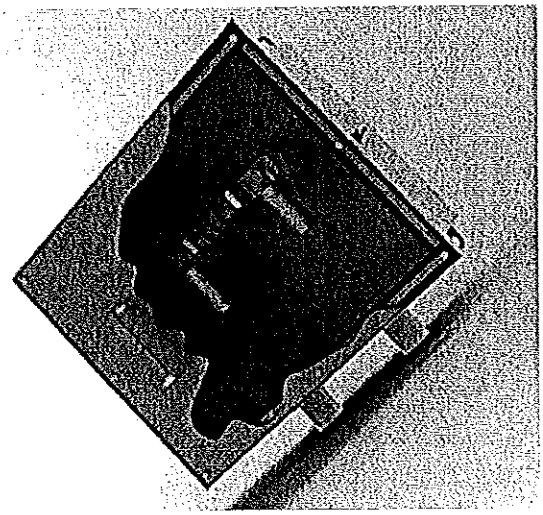
Technical specification

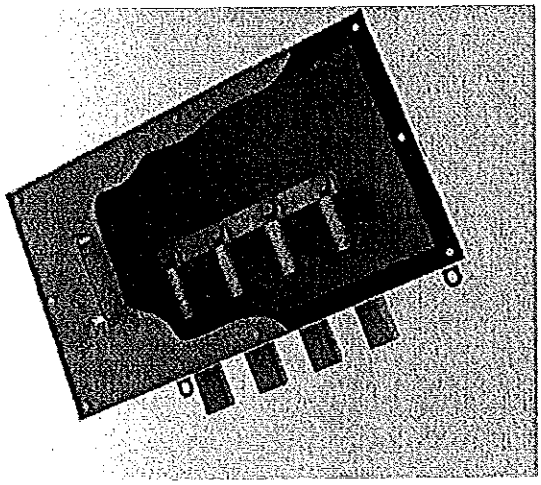
Type		Standard
Physical:		
Tensile Strength	17 N/mm² (MPa) (min)	ASTM D638
Ultimate Elongation	300% (Min.)	ASTM D638
Longitudinal Change	-10% (max.)	ASTM D2671
Water Absorption	0.2% (max.)	ASTM D570
ESCR 48 h. for 50°C	No Crack	ASTM D570
Torchability	No split	Te 201 AOL
Thermal:		
Accelerated Ageing	(120°C for 500 h)	ASTM D2671
Tensile Strength	15 N/mm² (MPa) (min.)	ASTM D 638
Ultimate Elongation	220% (Min.)	ASTM D 638
Temperature indicating Paint Conversion:		
150°C for 30 min	No Change	Visual
250°C for 5 min	Colour Cahnge	Visual
Electrical:		
Dielectric Strength	12 kV/mm. (Min.)	ASTM D149

	Diameter (D)		Thickness (±20%)	Application
Code	Supplied	Recovered	(recovered)	Cable Range
ASWS-55/8	55	8	2.7	42-8
ASWS-76/18	76	18	2.7	62-22
ASWS-105/28	105	28	2.7	92-30
ASWS-140/35	140	35	2.7	122-38
ASWS-190/46	190	46	2.7	160-50
ASWS-240/50	240	50	2.7	200-55

All dimensions in mm.
Length as per requirement (maximum 1500 mm).

EARTHING AND CROSS-BONDING BOXES





Earthing boxes

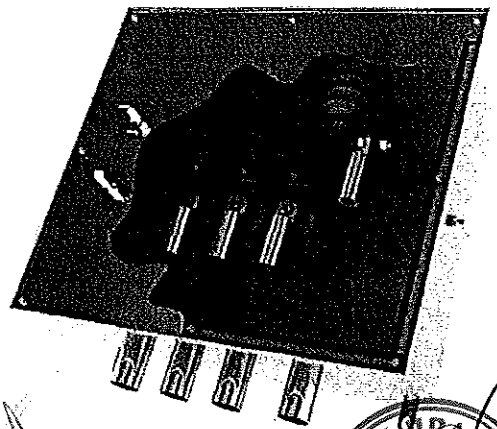
Earthing boxes are designed for earthing of cable screens when setting up 110 to 500 kV line.

Main components:

- stainless steel box with a sealed hood;
- sealed cable inputs;
- device housing earthing;
- surge arrester (standard, network, voltage 6 kV);
- insulators (standard, voltage rating 10 kV);
- copper buses for connection of insulators (for opening the circuit);
- sealed cable terminals to be crimped.

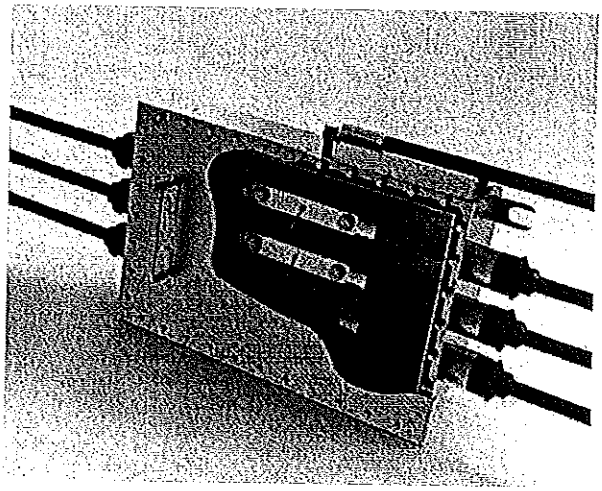
Technical specification:

- cross-bonding cable input is designed to prevent moisture from getting inside the box as well as to ensure that cable can be installed and removed from the box without taking a cable lug off;
- copper is a material of the cable conductor;
- a cable with conductor cross-section of 400 mm² is used.



Cross-bonding boxes

Cross-bonding boxes are designed for cross-connection of six single-core cables and for power transposition of HV cable screens when setting up 110 to 500 kV line.



Main components:

- stainless steel box with a sealed hood;
- sealed cable inputs;
- device housing earthing;
- surge arrester (standard, network, voltage 6 kV);
- insulators (standard, voltage rating 10 kV);
- copper buses for connection of insulators (for opening the circuit);
- sealed cable terminals to be crimped.

Calculated weight	66 kg
Protection grade	IP68

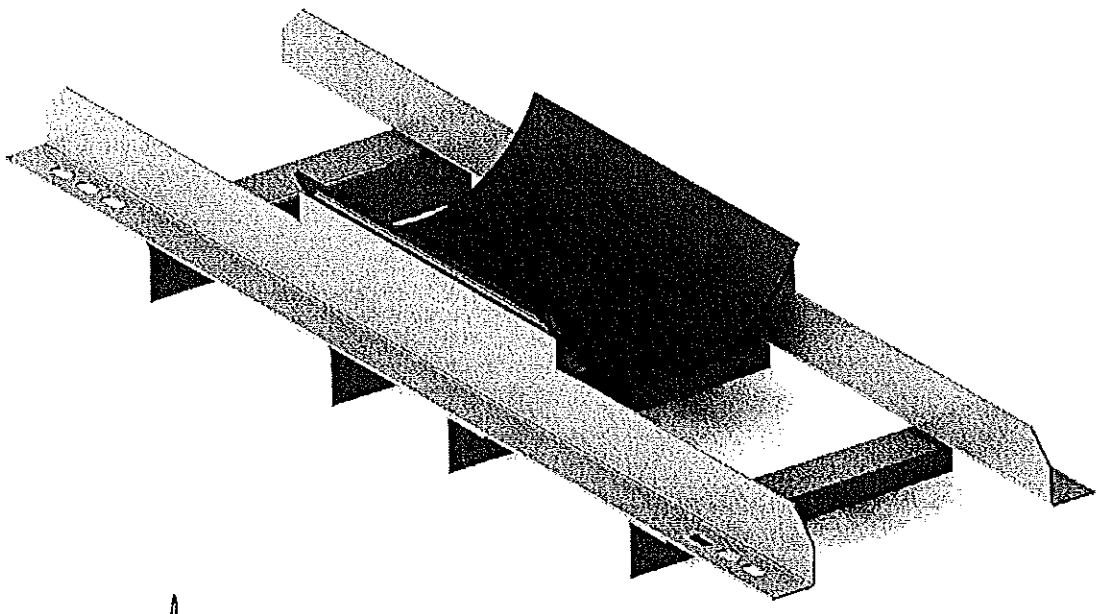
Installation:

- boxes are suitable for underground laying;
- the device design allows it to be installed both on a horizontal and vertical plane;
- the device can be fastened both directly on the floor/ wall and on a metal structure;
- the box can be fully submerged in water;
- a wire input is sealed using rubber gaskets and heat-shrinkable tubes;
- KTK construction allows to install the box in wells fitted with standard hatches per GOST 3634-89, with opening diameter D=600 mm, without dismantling the box and/or removing the hatch ring.

SUPPORT ASSEMBLY

Support assembly is designed for installation of joints.

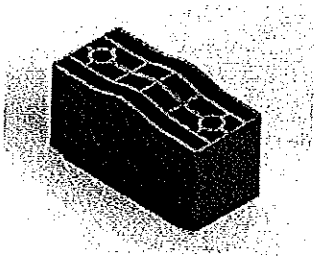
Support assembly consists of steel corners with supporting stand for installation of joints.



CABLE CLAMPS

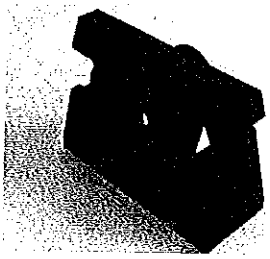
Application
Clamping of all types of medium, high and extra high voltage cables.

Cable clamps RKK series



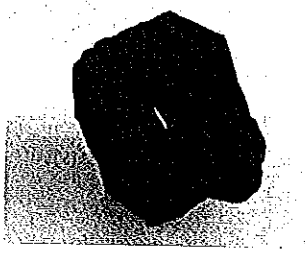
Type	Outer cable diameter
RKK-25/40	25 - 40 mm
RKK-40/60	40 - 60 mm

Cable clamps YKK3 series



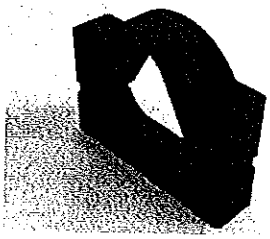
Type	Outer cable diameter
YKK-35/55	35 - 55 mm
YKK-40/70	40 - 70 mm

Cable clamps for voltage cables VKK series



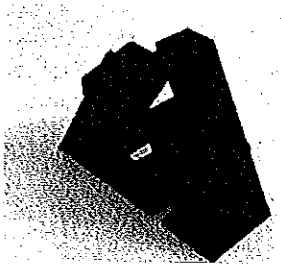
Type	Outer cable diameter
VKK-65/90	65 - 90 mm
VKK-85/105	85 - 105 mm
VKK-100/125	100 - 125 mm
VKK-125/150	125 - 150 mm
VKK-145/170	145 - 170 mm

Cable clamps for high voltage cables VKK3 series



Type	Outer cable diameter
VKK3-65/90	65 - 90 mm
VKK3-85/110	85 - 110 mm
VKK3-110/135	110 - 135 mm

YKK-60 Series

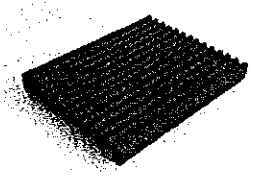


Type	Outer cable diameter
YKK-60,YKK2-60	30 - 40 mm

PST-80 (elastic inlay)

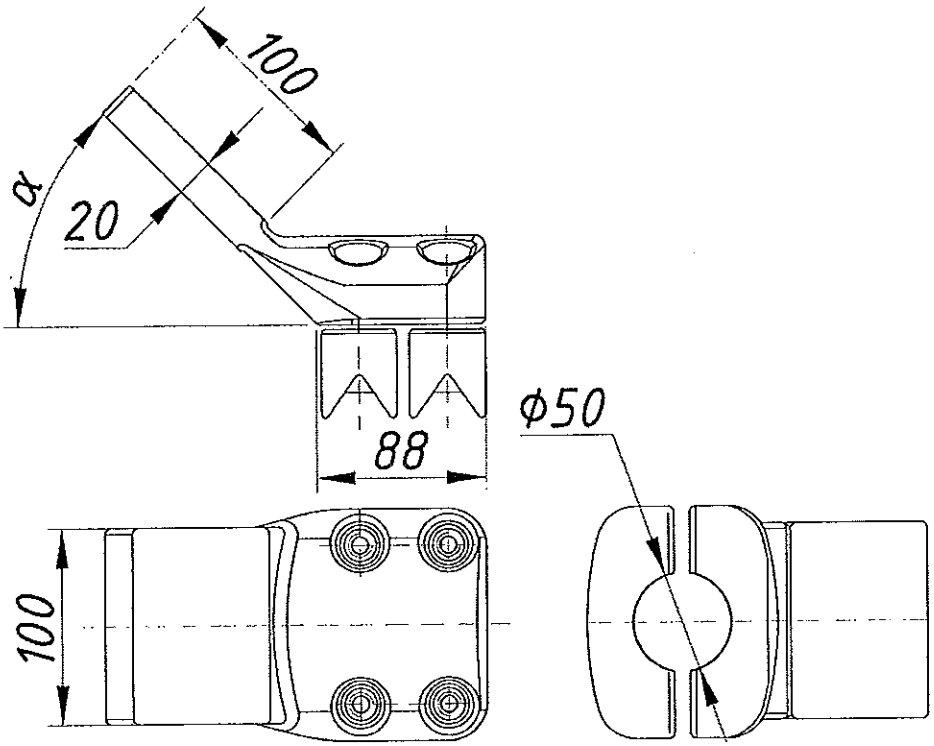
Application
Fixation of cables and support of weight in vertical installations.

Material
Silicone gasket is made of organosilicon.



CABLE CONNECTOR

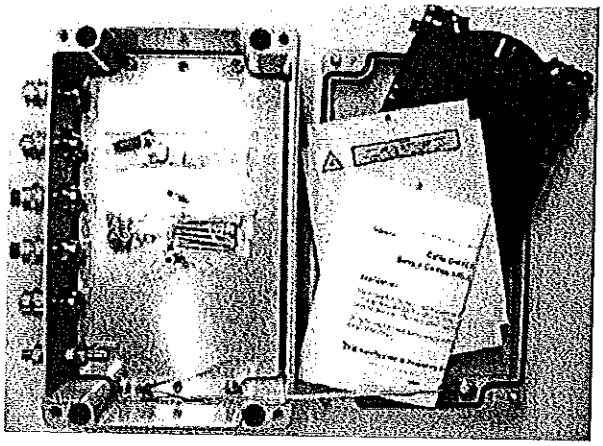
For connection of termination to cable lines it is necessary to use cable connectors. Arkasil SK delivers aluminium, bronze and bimetallic cable connectors.

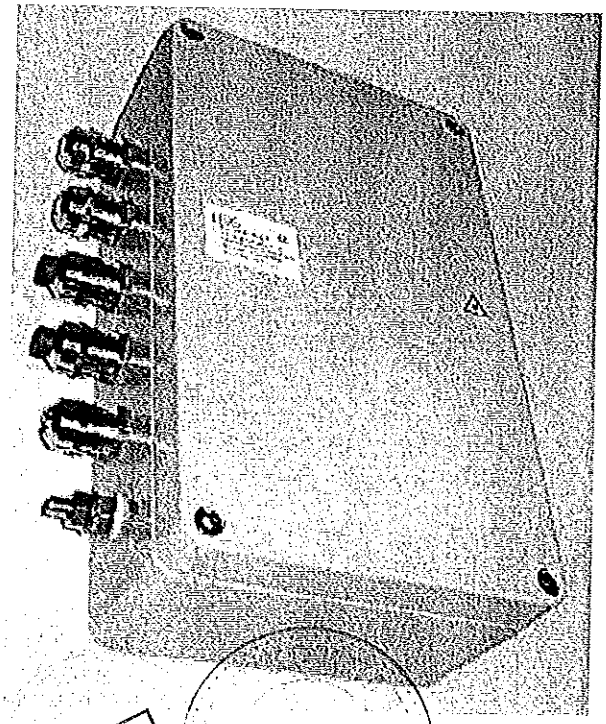


TERMINATION SPLICE BOX

It is applied for connection of fiber-optical modules installed in the high-voltage cables screens.

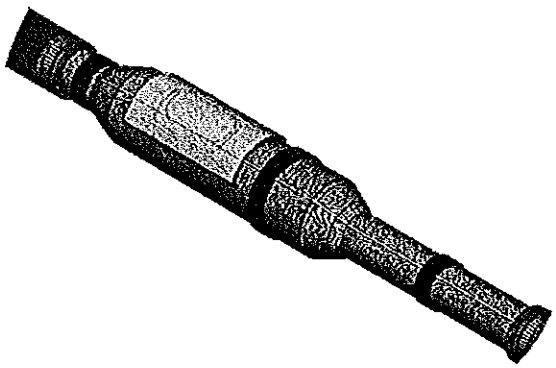
Splice box is a protective metal tray, safety class IP66, with 4 inputs for fiber-optical modules, 2,5 - 5,5 mm² in diameter. It protects the connection point and is applied to store the fiber stock necessary for repair or preventive works.

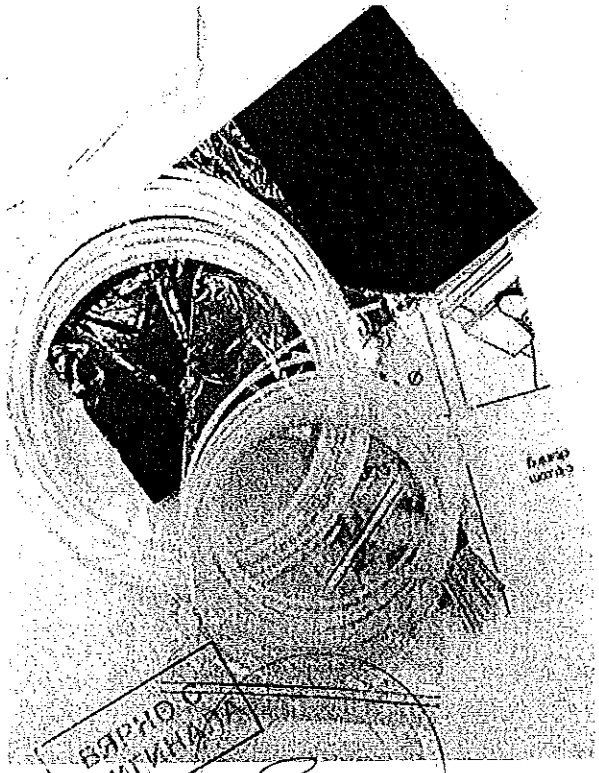




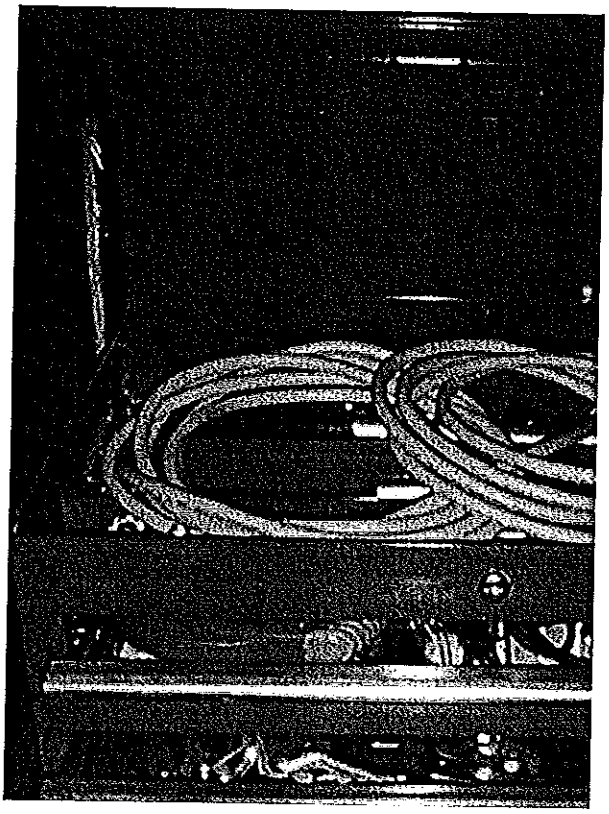
JOINT SPLICE BOX

It is applied for connection of fiber-optical modules installed in the high-voltage cables screens. A joint splice box is a protective rubber base with slots and channels for the optical fibers, it provides connection of the modules, protects the connection point. It is fixed during the joint installation. The supply complete set includes all necessary accessories for the optical modules welding.



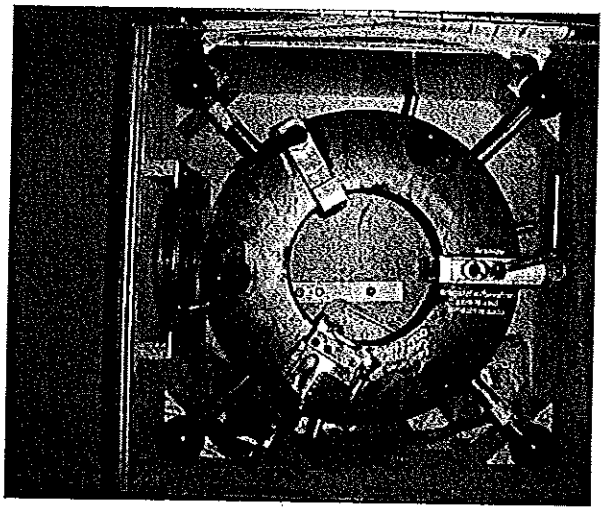


TOOLS FOR ARKASIL SK CABLE ACCESSORIES INSTALLATION



Installation Tool Kits
1010 Kit

The installation tools including all necessary items for the high-voltage cable and cable accessories preparation and installation.



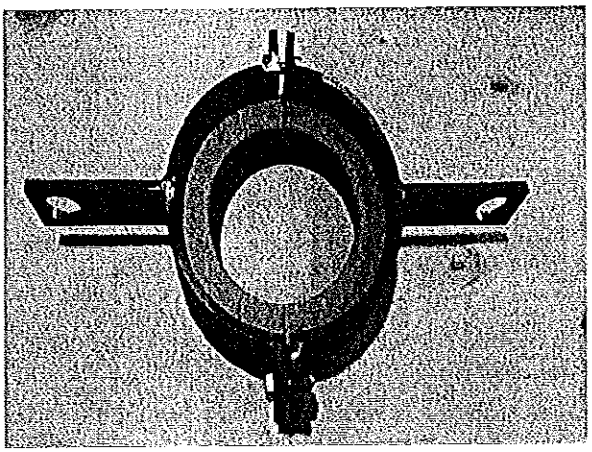
Unicut 30 Universal Cable Machine

For removal of the semi-conducting screen and insulation from the high-voltage cables, the 30mm-85mm diameter over insulation.

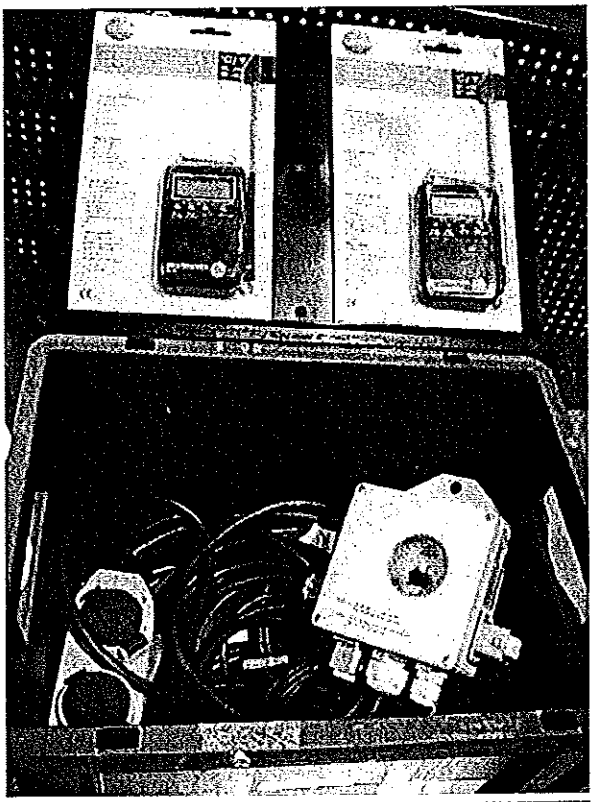
Unicut 40 Universal Cable Machine

For removal of the semi-conducting screen and insulation from the high-voltage cables, the 70mm-125mm diameter over insulation.

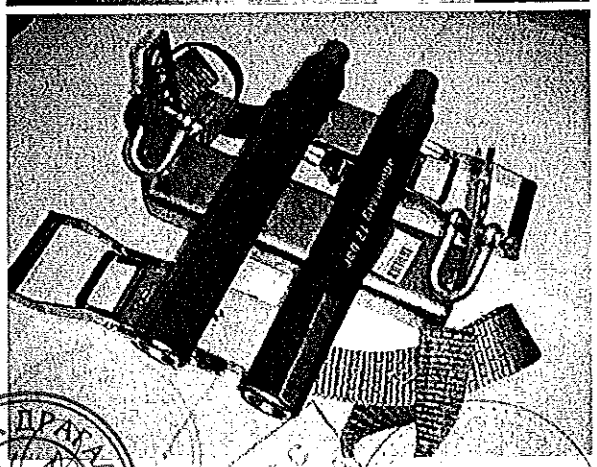
1000 kg Belt Winch
For pulling the silicon insulator on the cable.



Cable Heating Kit
1080 Kit
For the high-voltage cable heating. In addition, the kit shall include the temp and controlling instruments.



Winch-to-Cable Fixing Device
The device is fixed on the cable, and has terminals for fixing the winches.



Other Auxiliary and Installation Tools

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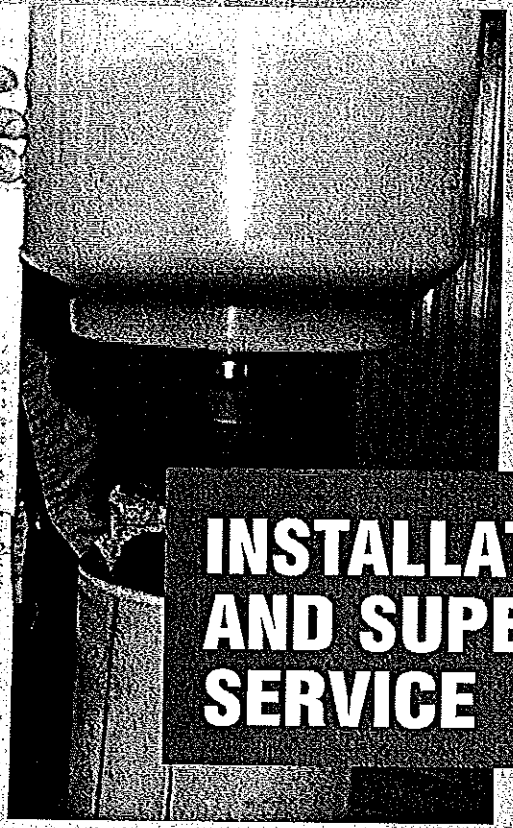


INSTALLATION AND SUPERVISION SERVICE

SUPERVISION SERVICE

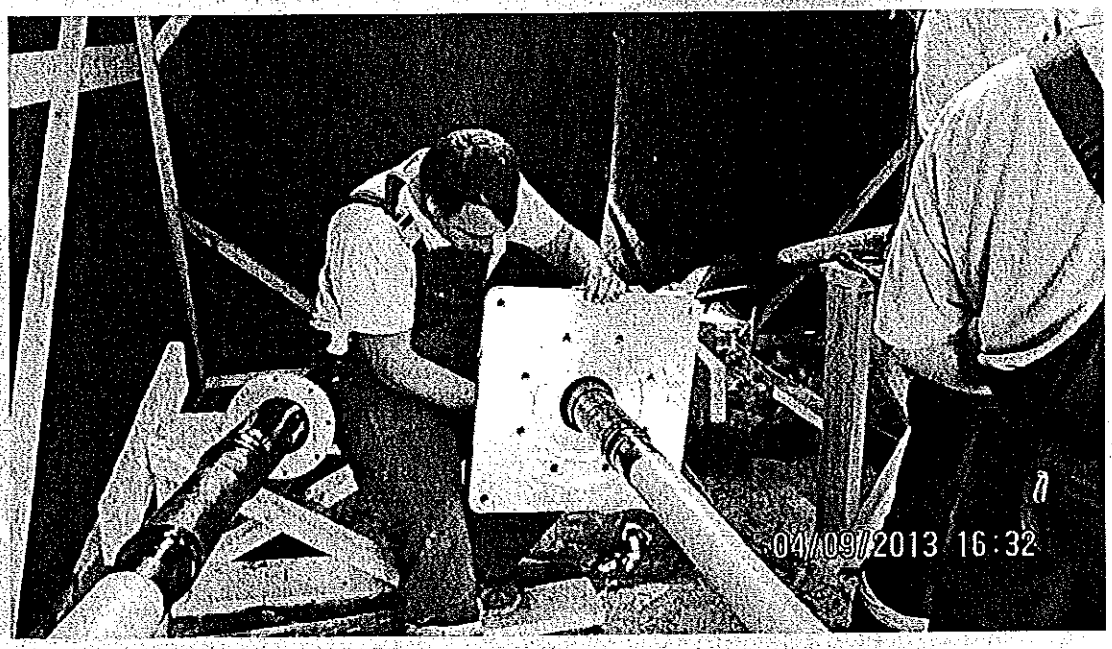
Arkasil SK renders services on installation and supervision of own high-voltage cable accessories. Our installation supervision services for the cable accessories shall mean:

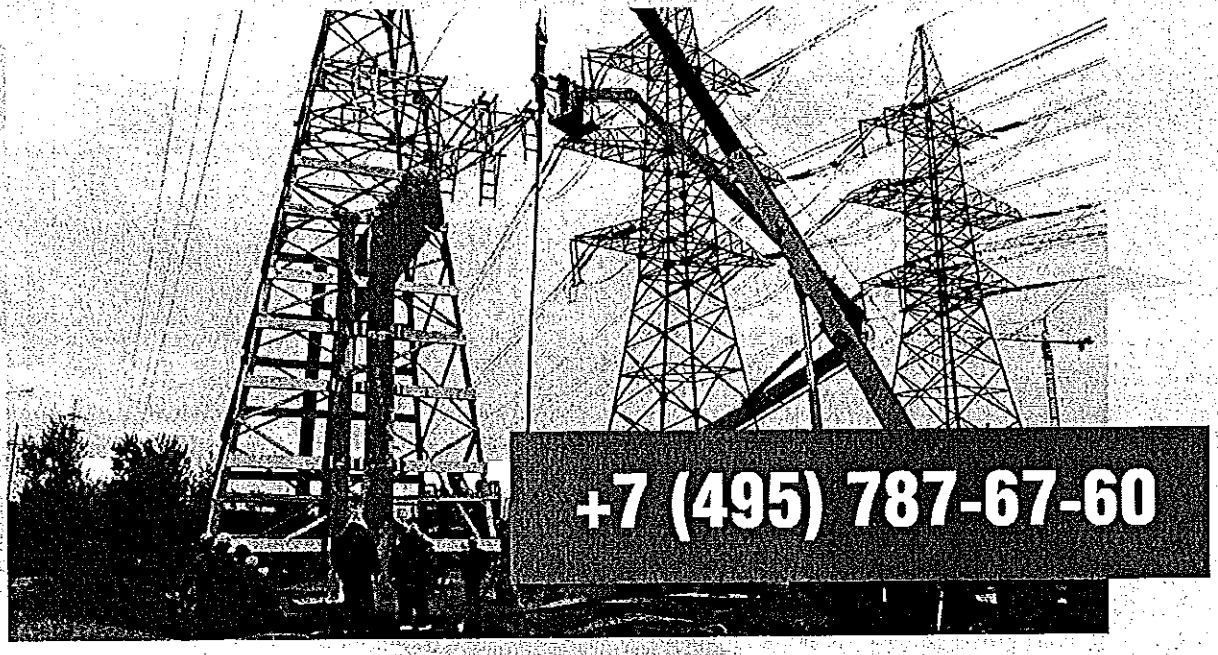
- multipurpose and process supervision;
- the works quality control of the personnel trained in Arkasil SK to installed cable accessories and who have special certificates;
- guarantee documentation on the installed Arkasil SK cable accessories;
- The Arkasil SK cable accessories related consultations;
- "Installation Supervision" in the construction standards is not defined yet. Therefore, when making an agreement, it is necessary to be governed by the normative documents, including "The Regulations For Installation/ Supervision", governing the bases for granting consulting services and the contractual relations, in general.

Arkasil

INSTALLATION SERVICE

- Installation of the Arkasil SK cable accessories by the specialists certified by Arkasil SK for these works.
- Guarantee documentation on the installed Arkasil SK cable accessories.
- The Arkasil SK cable accessories related consultations.





FOR MORE INFORMATION

on the installation and supervision provided by Arkasil SK, please call: +7 (495) 787-67-60

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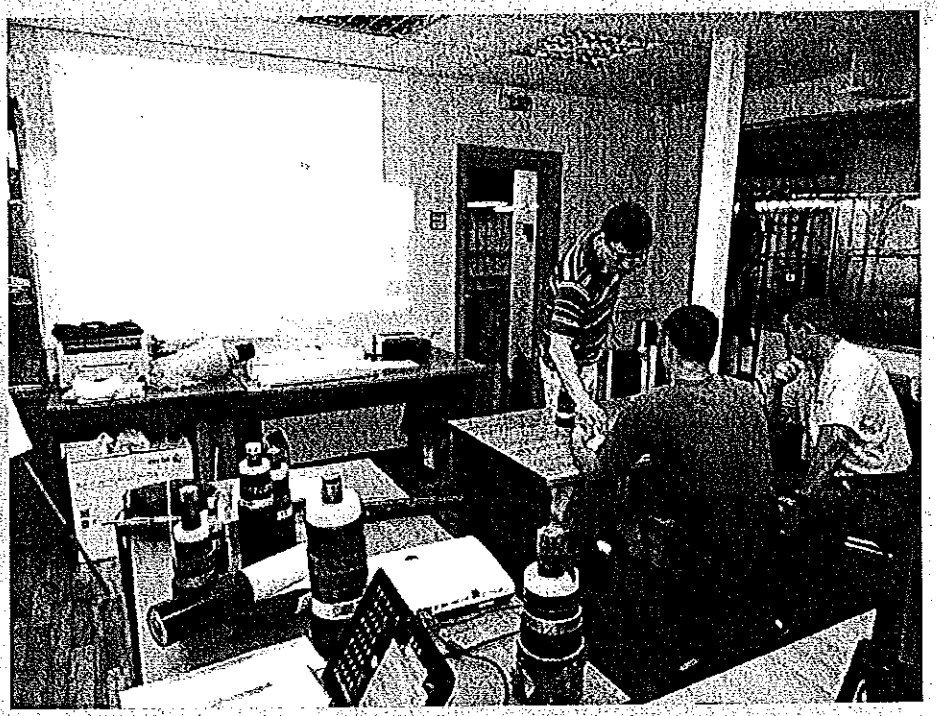
Arkasil

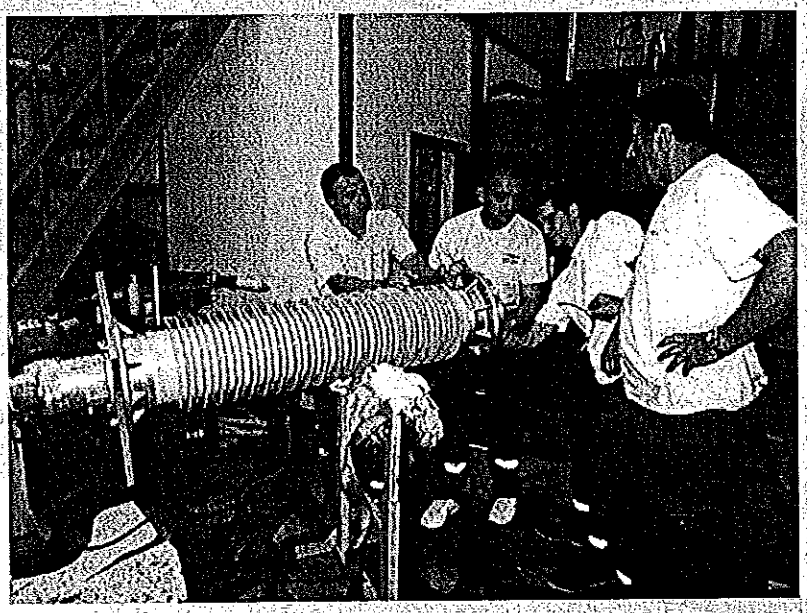
INSTALLATION TRAINING

Arkasil SK arranges training for the installation contractor specialists. The training is arranged at the training center located at the Arkasil SK production facilities. There, for optimization of the educational process, Arkasil SK renders the training service at the installation contractor production facilities.



THE TRAINING SHALL INCLUDE

- Theory training
- Practical training
- Tests
- Sample preparation for certification
- Granting certificates



By the results of examinations, the installation contractor specialists shall receive the permits for performance of installation works with the Arkasil SK cable accessories.

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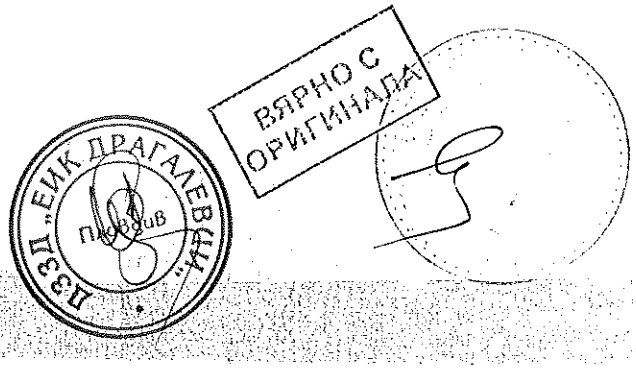
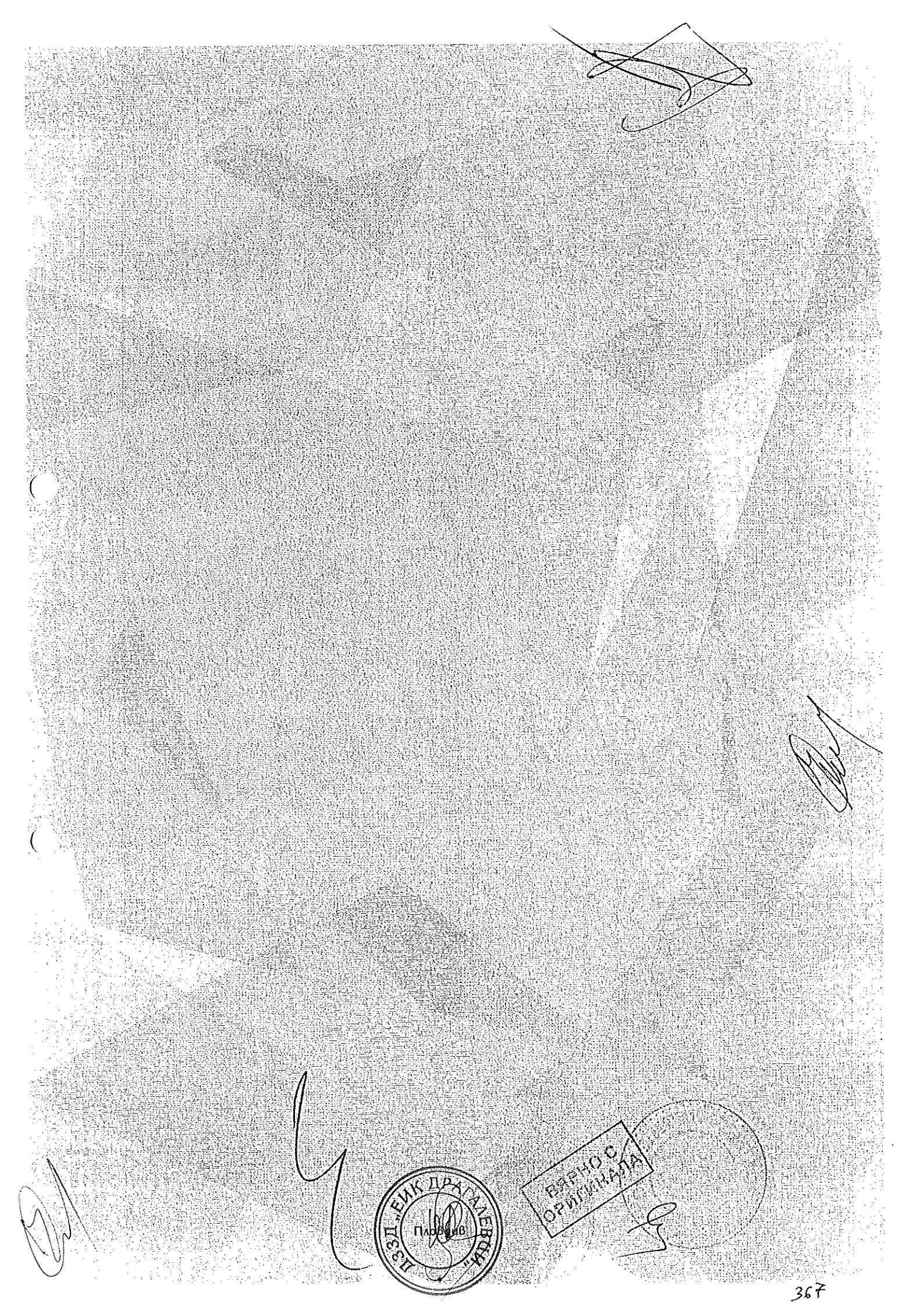
REMARKS




ЗЗП „ЕИК ДРАГАЛЕВЦИ"
Пловдив
ВЯРНО С ОРИГИНАЛА

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