

NA2XS(F)2Y / N2XS(F)2Y – 8.7/15 kV Cables

1. Applications

This specification covers high-voltage cables, suitable for use in distribution systems, having a working voltage of 8.7/15 kV.

The cables covered by this specification are designed for outdoor and indoor installation, for direct burial and for buried duct installation.

They may also be used in conjunction with overhead transmission lines.

2. Reference Standards and documents

The cables covered by this specification are manufactured and tested as per the following references:

2.1	SI 1516-2	כבלי כוח בעלי בידוד משוחל ואביזרים למתח נקוב מ-1 ק"ו (1.2 ק"ו) עד 30 ק"ו (36 ק"ו): ($U_m = 1$ ק"ו) עד 30 ק"ו (7.2 ק"ו) ($U_m = 1$ ק"ו).
2.2	IEC 60502-2	Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) – Part 2: Cables for rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)
2.3	HD 620	Distribution cables with extruded insulation for rated voltages from 3,6/6(7.2) kV up to 20.8/36(42) kV
2.3	IEC 60183	Guidance for the selection of high-voltage A.C. cable systems
2.4	IEC 60228	Conductors of insulated cables
2.5	IEC 60986	Short-circuit temperature limits of electric cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)
2.6	IEC 60811 series	Common test methods for insulation and sheathing materials of electrical and optical cables
2.7	HD 605	Electric Cables – Additional test methods

3. Medium-Voltage Cables Construction

3.1 Conductor

Conductors used in Medium-Voltage Cables construction are stranded from aluminum or copper wires. Conductors have a cross-sectional area up to and including 800 mm² and are class 2, compact-round stranded.

3.2 Conductor screen

An extruded layer of semi-conductive, cross-linked polymer, firmly bonded to the insulation, is applied over the conductor.

3.3 Insulation

An extruded layer of extra-clean XLPE (cross-linked polyethylene) is subsequently applied.

3.4 Insulation screen

An extruded layer of semi-conductive, cross-linked polymer firmly bonded to the insulation.
Note: Conductor screen, insulation and insulation screen are extruded in a single operation.

3.5 **Metal screen**

A semi-conductive tape is helically applied around the completed insulated core, as bedding between insulation screen and metal screen components.

Metal screen is built from copper round wires and copper equalizing tape.

3.6 **Longitudinal water-blocking barrier**

A semi-conductive and swelling tape is helically applied around the screened core.

Metal screen is built from copper round wires and copper equalizing tape.

3.7 **Outer protective sheath**

An UV resistant black polymeric sheath (complying with the designation ST7, as per IEC 60502-2 standard) is extruded overall.

3.8 **Constructive options**

Conductor: water-blocked conductor, available as option;

Metal Screen: Other cross-sectional area than those listed in this specification, available as option;

Radial water-blocking barrier: Aluminum foil – Polymer laminate, longitudinal applied, available as option;

Outer protective sheath: Extruded, thermoplastic HFFR, instead ST7, available as option;

Typical Drawing of Medium-Voltage Cable





NA2XS(F)2Y 8.7/15 (17.5) kV/ ALUMINUM CONDUCTOR

Construction and Dimensional Data

Item P/N	Conductor Cross-Sectional Area	Conductor dc resistance at 20°C (max.)	Conductor Diameter (Approx.)	Insulation Thickness (Nom.)	Metal Screen Cross-Sectional Area	Outer Protective Sheath Thickness (Nom.)	Overall Diameter (approx.)	Min. Bending Radius - Static (1)	Min. Bending Radius - Dynamic (2), (3)	Completed Cable Weight (approx.)
	mm ²	Ω/km	mm	mm	mm ²	mm	mm	mm	mm	kg/km
1682A050D	50	0.641	8.3	4.5	16	1.7	26.5	400	665	650
1682A070D	70	0.443	9.9	4.5	16	1.8	28.5	430	715	765
1682A095D	95	0.320	11.7	4.5	16	1.8	30.0	450	750	860
1682A120D	120	0.253	13.2	4.5	16	1.9	32.0	480	800	970
1682A150D	150	0.206	14.5	4.5	25	1.9	33.0	495	825	1,160
1682A185D	185	0.164	16.3	4.5	25	2.0	35.5	535	890	1,310
1682A240D	240	0.125	18.6	4.5	25	2.1	38.0	570	950	1,535
1682A300D	300	0.100	20.9	4.5	25	2.1	40.0	600	1,000	1,750
1682A400D	400	0.0778	24.0	4.5	35	2.3	44.5	670	1,115	2,220
1682A500D	500	0.0605	26.8	4.5	35	2.4	47.5	715	1,190	2,590
1682A630D	630	0.0469	31.0	4.5	35	2.5	52.0	780	1,300	3,085
1682A800D	800	0.0367	35.0	4.5	35	2.6	56.5	850	1,415	3,695

Remarks:

(1)– Minimum bending radius for permanent training;

(2)– Minimum bending radius for pulling in duct;

(3) – The sidewall pressure shall be kept below the value of 1000 daN/m (10 kN/m).

NA2XS(F)2Y 8.7/15 (17.5) kV/ ALUMINUM CONDUCTOR (...continued...)

Continuous current ratings

Item P/N	Conductor/ Metal screen Cross- Sectional Area	Direct Buried, Touching- Trefoil (1), (4), (7)	Direct Buried, Spaced Flat- Parallel (1), (5), (7)	Buried in Ducts, Spaced Flat- Parallel (2), (6), (7)	In Free Air (3), (4), (7)	In Free Air (3), (5), (7)
	mm ²	A	A	A	A	A
1682A050D	50/16	151	158	151	188	223
1682A070D	70/16	184	193	183	234	278
1682A095D	95/16	220	230	217	285	339
1682A120D	120/16	250	261	246	330	391
1682A150D	150/25	279	288	269	373	441
1682A185D	185/25	315	325	302	430	507
1682A240D	240/25	364	374	356	508	597
1682A300D	300/25	410	420	396	584	683
1682A400D	400/35	466	468	434	683	784
1682A500D	500/35	529	525	484	791	900
1682A630D	630/35	600	591	541	923	1042
1682A800D	800/35	671	646	586	1059	1185

Remarks:

- (1)– Direct Buried, burial depth = 0.8 m, native soil thermal resistivity = 1.5 K*m/w, soil ambient temperature = 20°C;
 (2)– Buried in single way ducts, burial depth = 0.8 m, native soil thermal resistivity = 1.5 K*m/w, soil ambient temperature = 20°C;
 (3) – In Free Air, protected against direct sun radiation, ambient air temperature = 30°C
 (4)– Touching-trefoil formation;
 (5) – Flat-parallel formation, inter-axial spacing = 2 x D of cable;
 (6) – Flat-parallel formation, inter-axial spacing = 2 x D of duct;
 (7) – Conductor continuous working temperature = 90°C, metal screens bonded in multiple points.

NA2XS(F)2Y 8.7/15 (17.5) kV/ ALUMINUM CONDUCTOR (...continued)

Electrical parameters (Capacitance and Sequence Impedances)

Item P/N	Conductor/ Metal screen Cross- Sectional Area	Electrostatic Capacitance (Nom.)	Touching Trefoil Formation (1)				Flat-Parallel Formation (1), (2)			
			R1	X1	R0	X0	R1	X1	R0	X0
	mm ²	μF/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km
1682A050D	50/16	0.207	0.824	0.132	1.755	0.678	0.826	0.189	1.711	0.679
1682A070D	70/16	0.234	0.570	0.124	1.499	0.675	0.573	0.182	1.456	0.676
1682A095D	95/16	0.262	0.413	0.118	1.337	0.672	0.417	0.176	1.296	0.672
1682A120D	120/16	0.286	0.327	0.114	1.249	0.671	0.332	0.171	1.208	0.671
1682A150D	150/25	0.307	0.268	0.112	0.991	0.368	0.277	0.167	0.969	0.374
1682A185D	185/25	0.336	0.214	0.108	0.937	0.367	0.223	0.163	0.914	0.373
1682A240D	240/25	0.372	0.165	0.104	0.886	0.366	0.174	0.160	0.864	0.371
1682A300D	300/25	0.410	0.133	0.100	0.853	0.365	0.142	0.156	0.830	0.370
1682A400D	400/35	0.466	0.106	0.0977	0.667	0.226	0.119	0.153	0.654	0.231
1682A500D	500/35	0.509	0.0841	0.0950	0.645	0.225	0.0973	0.149	0.632	0.230
1682A630D	630/35	0.574	0.0672	0.0914	0.628	0.224	0.0784	0.141	0.615	0.229
1682A800D	800/35	0.639	0.0547	0.0881	0.615	0.223	0.0675	0.144	0.601	0.229

Remarks:

- (1) - Conductor continuous working temperature = 90°C, metal screens bonded in multiple points.
- (2) - Flat-parallel formation, inter-axial spacing = 2 x D of cable;

N2XS(F)2Y 8.7/15 (17.5) kV/ COPPER CONDUCTOR

Construction and Dimensional Data

Item P/N	Conductor Cross-Sectional Area	Conductor dc resistance at 20°C (max.)	Conductor Diameter (Approx.)	Insulation Thickness (Nom.)	Metal Screen Cross-Sectional Area	Outer Protective Sheath Thickness (Nom.)	Overall Diameter (approx.)	Min. Bending Radius - Static (1)	Min. Bending Radius - Dynamic (2), (3)	Completed Cable Weight (approx.)
	mm ²	Ω/km	mm	mm	mm ²	mm	mm	mm	mm	kg/km
1682C050D	50	0.387	8.3	4.5	16	1.7	26.5	400	665	940
1682C070D	70	0.268	9.9	4.5	16	1.8	28.5	430	715	1,170
1682C095D	95	0.193	11.7	4.5	16	1.8	30.0	450	750	1,450
1682C120D	120	0.153	13.2	4.5	16	1.9	32.0	480	800	1,695
1682C150D	150	0.124	14.5	4.5	25	1.9	33.0	495	825	2,070
1682C185D	185	0.0991	16.3	4.5	25	2.0	35.5	535	890	2,460
1682C240D	240	0.0754	18.6	4.5	25	2.1	38.0	570	950	3,025
1682C300D	300	0.0601	20.9	4.5	25	2.1	40.0	600	1,000	3,625
1682C400D	400	0.0470	23.6	4.5	35	2.3	44.0	660	1,100	4,600
1682C500D	500	0.0366	26.5	4.5	35	2.4	47.5	715	1,190	5,630
1682C630D	630	0.0283	30.8	4.5	35	2.5	52.0	780	1,300	7,065
1682C800D	800	0.0221	35.0	4.5	35	2.6	56.5	850	1,415	8,660

Remarks:

(1)– Minimum bending radius for permanent training;

(2)– Minimum bending radius for pulling in duct;

(3) – The sidewall pressure shall be kept below the value of 1000 daN/m (10 kN/m).

N2XS(F)2Y 8.7/15 (17.5) kV/ COPPER CONDUCTOR (...continued...)

Continuous current ratings

Item P/N	Conductor/ Metal screen Cross- Sectional Area	Direct Buried, Touching- Trefoil (1), (4), (7)	Direct Buried, Spaced Flat- Parallel (1), (5), (7)	Buried in Ducts, Spaced Flat- Parallel (2), (6), (7)	In Free Air (3), (4), (7)	In Free Air (3), (5), (7)
	mm ²	A	A	A	A	A
1682C050D	50/16	195	203	193	242	287
1682C070D	70/16	237	247	234	301	357
1682C095D	95/16	283	294	277	367	435
1682C120D	120/16	321	333	312	424	501
1682C150D	150/25	358	367	340	480	563
1682C185D	185/25	403	411	406	551	644
1682C240D	240/25	465	471	440	649	754
1682C300D	300/25	522	525	487	744	860
1682C400D	400/35	585	572	519	856	933
1682C500D	500/35	657	633	572	981	1094
1682C630D	630/35	734	701	631	1130	1249
1682C800D	800/35	807	763	678	1275	1400

Remarks:

- (1)– Direct Buried, burial depth = 0.8 m, native soil thermal resistivity = 1.5 K*m/w, soil ambient temperature = 20°C;
 (2)– Buried in single way ducts, burial depth = 0.8 m, native soil thermal resistivity = 1.5 K*m/w, soil ambient temperature = 20°C;
 (3) – In Free Air, protected against direct sun radiation, ambient air temperature = 30°C
 (4)– Touching-trefoil formation;
 (5) – Flat-parallel formation, inter-axial spacing = 2 x D of cable;
 (6) – Flat-parallel formation, inter-axial spacing = 2 x D of duct;
 (7) – Conductor continuous working temperature = 90°C, metal screens bonded in multiple points.

N2XS(F)2Y 8.7/15 (17.5) kV/ COPPER CONDUCTOR (...continued)

Electrical parameters (Capacitance and Sequence Impedances)

Item P/N	Conductor/ Metal screen Cross- Sectional Area	Electrostatic Capacitance (Nom.)	Touching Trefoil Formation (1)				Flat-Parallel Formation (1), (2)			
			R1	X1	R0	X0	R1	X1	R0	X0
	mm ²	μF/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km	Ω/km
1682C050D	50/16	0.207	0.496	0.132	1.427	0.678	0.500	0.189	1.385	0.679
1682C070D	70/16	0.234	0.344	0.124	1.273	0.675	0.394	0.182	1.232	0.676
1682C095D	95/16	0.262	0.249	0.118	1.174	0.672	0.261	0.208	1.113	0.680
1682C120D	120/16	0.286	0.198	0.114	1.121	0.671	0.203	0.171	1.080	0.672
1682C150D	150/25	0.307	0.163	0.112	0.885	0.368	0.172	0.167	0.864	0.374
1682C185D	185/25	0.336	0.131	0.108	0.854	0.367	0.140	0.163	0.832	0.373
1682C240D	240/25	0.372	0.101	0.104	0.822	0.366	0.111	0.160	0.800	0.372
1682C300D	300/25	0.410	0.0822	0.100	0.802	0.365	0.0914	0.156	0.780	0.371
1682C400D	400/35	0.459	0.0674	0.0979	0.629	0.226	0.0804	0.153	0.616	0.232
1682C500D	500/35	0.505	0.0551	0.0957	0.616	0.225	0.0676	0.150	0.603	0.231
1682C630D	630/35	0.571	0.0455	0.0918	0.606	0.224	0.0574	0.146	0.592	0.230
1682C800D	800/35	0.635	0.0386	0.0881	0.599	0.223	0.0502	0.144	0.584	0.229

Remarks:

- (1) - Conductor continuous working temperature = 90°C, metal screens bonded in multiple points;
- (2) - Flat-parallel formation, inter-axial spacing = 2 x D of cable;

SHORT-CIRCUIT LIMITS

During the short-circuit working, the current-carrying components of the cable may reach a high temperature which could endanger the polymeric materials used for insulation.

In order to prevent this, the fault-current and/or fault-duration shall be limited to the values specified in the following tables:

SHORT-CIRCUIT CURRENT IN CONDUCTOR

Conductor Cross- Sectional Area	COPPER CONDUCTORS				ALUMINUM CONDUCTORS			
	Fault duration (s)				Fault duration (s)			
	0.5	1	1.5	2	0.5	1	1.5	2
	Fault-Current (max.)				Fault-Current (max.)			
mm ²	kA	kA	kA	kA	kA	kA	kA	kA
50	10	7	6	5.0	6.5	4.5	4	3.5
70	14	10	8	7.0	9.5	6.5	5.5	4.5
95	19	13.5	11	9.5	12.5	9	7.5	6.5
120	24.5	17	14	12.0	16	11.5	9.5	8
150	30.5	21.5	17.5	15.0	20	14	11.5	10
185	37.5	26.5	21.5	18.5	24.5	17.5	14.5	12.5
240	49	34.5	28	24.5	32	22.4	18.5	16
300	61	43	35	30.5	40	28.4	23	20
400	80.5	57	46.5	40	54	38	31	27
500	100.5	71	58	51	67	47	38.5	33.5
630	127.5	90	73.5	64	84	60	49	42
800	161	114	93	81	107	76	62	54

Remark:

- Maximum fault-current calculated considering adiabatic heating of the conductor from 90°C up to 250°C.

SHORT-CIRCUIT CURRENT IN METAL SCREEN

Metal screen Cross- Sectional Area	Fault duration (s)			
	0.5	1	1.5	2
	Fault-Current			
mm ²	kA	kA	kA	kA
16	2.9	2.1	1.7	1.5
25	4.5	3.2	2.6	2.3
35	6.4	4.5	3.7	3.2

Remark:

- Maximum fault-current calculated considering adiabatic heating of the metal screen from 80°C up to 200°C.