

Company Profile

SIMCO (p. j. s .c.)

Company type: Private Joint Stock Company

Incorporation year: 1968

Managing director: Parviz Hourfar

Head office: 19 Bahar Shiraz St.
Tehran 1565839331 Iran

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E – Mail: info@simcocable.com

Factory : Rasht 4198917849 Iran

Tel: +98 131 666 90 71

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Facilities:

Head office – Tehran 1,000 m² total land
800 m² indoor

Factory – Rasht: 150,000 m² total land
30,000 m² indoor

Warehouse - Tehran-Karaj Rd: 4,500 m² total land
3,000 m² indoor

Staff organization:

Total employees in Tehran: 30

Total employees in Rasht: 217

Max Short Circuit Current for PVC-Insulated Cables (0.6/1) with Copper Conductor in kilo Amps(kA)

70° C is to be considered as Conductor temperature at the start of short circuit

Copper Conductor Cross Section Area	Short Circuit Time (sec)										
	0.1	0.2	0.3	0.4	0.5	1s	1.5	2	3	4	5
mm ²	kA										
10	3.64	2.57	2.10	1.82	1.63	1.15	0.94	0.81	0.66	0.58	0.51
16	5.82	4.11	3.36	2.91	2.60	1.84	1.50	1.30	1.06	0.92	0.82
25	9.09	6.43	5.25	4.55	4.07	2.88	2.35	2.03	1.66	1.44	1.29
35	12.73	9.00	7.35	6.36	5.69	4.03	3.29	2.58	2.32	2.01	1.80
50	18.18	12.86	10.50	9.09	8.13	5.75	4.69	4.07	3.32	2.88	2.57
70	25.46	25.46	14.70	12.73	11.38	8.05	6.57	5.69	4.65	4.03	3.60
95	34.55	24.43	19.95	17.27	15.45	10.9	8.92	7.73	6.31	5.46	4.89
120	43.64	30.86	25.20	21.82	19.52	13.8	11.27	9.76	7.97	6.90	6.17
150	54.55	38.57	31.49	27.27	24.40	17.2	14.08	12.20	9.96	8.63	7.71
185	67.28	47.57	38.84	33.64	30.09	21.3	17.37	15.04	12.28	10.64	9.51
240	87.28	61.72	50.39	43.64	39.03	27.60	22.54	19.52	15.93	13.80	12.34
300	109.10	77.14	62.99	54.55	48.79	34.50	28.17	24.40	19.92	17.25	15.43
400	130.29	92.13	75.22	65.14	58.27	41.20	33.64	29.13	23.79	20.60	18.43
500	162.86	115.16	94.04	81.43	72.83	51.50	42.05	36.42	29.73	25.75	23.03
630	205.20	145.10	118.47	102.60	91.77	64.89	52.98	48.88	37.46	32.45	29.02
800	260.57	184.25	150.44	130.29	116.53	82.40	67.28	58.27	47.57	41.20	36.85
1000	325.71	230.32	188.05	162.86	145.66	103.00	84.10	72.83	59.47	51.50	46.0
1200	390.83	276.38	255.66	195.43	174.80	123.60	100.92	87.40	71.36	61.80	55.28

XLPE material 1

The basic material for all types of XLPE cables is Low Density(LD)polyethylene. Polyethylene(PE)has been widely used for a long time as cable insulating and sheath material owing to its excellent electrical and mechanical properties, its lightness, good low-temperature flexibility and good resistance to moisture, chemicals, ozone etc, as well as its comparatively low price.

LD polyethylene, however, has properties which limit its use as cable insulation. Being a thermoplastic its softening temperature 105-115°C. Another disadvantage is its tendency to stress cracking when in contact with certain surface active agents.

By means of a process reminiscent of the vulcanization of rubber the PE molecules can be cross-linked, thus greatly improving the thermal and mechanical properties of the material, while its electrical properties are retained largely unchanged. This product, cross-linked polyethylene is therefore no longer a thermoplastic. It softens at the crystalline melting point of PE(105-115°C)and assumes an elastic, rubber consistency, a property which it retains during a further rise of temperature after which it becomes carbonized without melting at about 300°C. The tendency to stress cracking has entirely disappeared and the material has also acquired a very good resistance to ageing in hot air. The original method of chemical cross-linking of the molecular chains of PE was developed in the fifties and has since been considerably improved in order to utilize the good insulation properties of the material in cable production for increasingly high voltages.

The cross-linking process may be explained as follows. PE is made up of long molecular chains. By cross-linking of these chains a network of strong bonds is created, the PE is converted into cross-linked polyethylene, XLPE. The cross-Linking can be achieved by different methods. For cable insulation the cross-linking is usually effected chemically using organic peroxides.

A relatively new method of cross-linking PE using Silan have been used on medium voltage cables by some manufacturers. Because the Cross-linking process should be in humid & high temperature media(sauna) the system has not yet been found as reliable as the conventional way with CCV-lines and Peroxide.

Thermal properties

Owing to the cross-linking, XLPE is a very heat resistant material. It cannot melt like polyethylene but decomposes and carbonizes if exposed for long periods to temperatures above 300° C.

The permissible conductor temperature at a short-circuit current for 1 second has therefore been but at 250° C and, at continuous load, conductors with XLPE insulation may have a temperature of 90° C. These temperatures are specified both in international standards.

XLPE, like PE retains its low temperature flexibility down to -40° C, which implies great advantages for the laying of the cables.

XLPE material 2

Electrical properties

The good electrical properties of PE remain largely unchanged during the cross-linking process. XLPE therefore, like PE, has a very small and only insignificantly temperature dependent loss factor ($\tan \delta$) and dielectric constant. (ϵ)

As a result the dielectric losses of XLPE cables are small in comparison with those of PVC and paper-insulated cables. XLPE cables are specially adapted for long cable routes and high voltages in which case the dielectric losses are of great significance.

Mechanical properties

Polyethylene has good mechanical properties. It is interesting that at normal temperature PE can resist local stresses better than PVC. In this respect XLPE has the same advantages as PE and owing to their good mechanical properties. XLPE cables are likely in the future to have a greater number of applications than those for traditional types of cable today, as for example high voltage buried and aerial cables.

Chemical properties

Owing to the cross-linking of the molecules XLPE has better resistance than PE to most chemicals such as ordinary acids, bases and oil.

Environmental pollution and cables

From the environmental aspect both PVC and oil-impregnated paper insulated cables have distinct disadvantages. PVC cables, if it burns, gives off corrosive gases, and a leaking oil-filled cable may cause severe damage to water supplies.

The disadvantage of XLPE is its low resistance to fire. It is however shown that the insulation properties of XPLE in an early stage of a fire are better than all thermoplastic materials including PVC.

XLPE-insulated cables for voltages from 6kV up to and including 170 kV are designed to meet specifications in different countries and by different customers. They are also designed to have good handling properties and to have long life. The following text presents the most common design elements in our standard manufacturing program and some of the most frequent cable types. Upon request, other design elements, cross sections, screen areas and insulation thicknesses may be offered XLPE-insulated cables up to 36kV are single-core or three-core cables. Cables >36 kV are single core cables.

Design elements:

Conductor

Stranded, compacted round aluminum or copper conductor, on request water sealed by a swelling powder which in contact with water effectively blocks the longitudinal water penetration in the conductor.

XLPE material 3

Conductor screen

A conductive compound extruded directly over the conductor to give a smooth surface to the insulation. The conductor screen is firmly bonded to the XLPE-insulation in the triple extrusion process.

Insulation

The XLPE – insulation material is a peroxide cross-linkable material which is extruded in a triple extrusion process at the same time as conductor screen and insulation screen. The cross-linking is a dry curing process made in CCV-lines.

Insulation screen

For cables up to 36 kV the insulation screen can be either strippable or firmly bonded to the insulation. On cables over 36 kV the insulation screen is bonded to the insulation. We do recommend the use of a bonded insulation screen on submarine-cables and cables where heavy mechanical stresses are to be expected as the bonded insulation screen have better mechanical properties. The insulation screen(conducting material)is extruded in the triple extrusion process to give a smooth surface to the insulation. Since it first use in 1974, the normal strippable insulation screen as used on 12-24 kV cables has proven to have excellent properties.

Metallic screen

The metallic screen consists of copper wires helically laid round the cable body, with or without counter helix, or of longitudinally wave formed copper wires bedded in a corrosion protecting conducting material. The screen can also consist copper tapes or prefabricated tapes of copper wires embedded in a conducting material.

Water sealing

Radial water sealing can be made with a metal-PE laminate. Longitudinal water sealing can be made with a swelling tape applied under the screen threads.

Armoring

Steel wire armoring are made when both a good mechanical protection as well as protection against pulling forces are needed.(Submarine-cables).Steel tape armoring are made when a good mechanical protection is needed.

Outer sheath

PE or PVC is used as sheathing materials. PVC where flame retardant properties are demanded and PE where better mechanical and cold handling properties are needed. The PE outer sheath can be delivered in different grades-LDPE, MDPE or HDPE. The outer sheath can also be delivered in different colors as e.g. black, red, blue, yellow or green.

Reference List

Abadan petrochemical Complex ABB (Asea Brown Boveri) Ansaldo Co Ardabil Cement Ardabil Distribution Electric Co. Ardakan peletaizing plant Azarbaijan Distribution Electric Co. Azar ghand naghadeh Azzan Bandar Imam Petrochemical Complex Chador Malou Complex Danieli East of Tehran Distribution Electric Co. Ericsson Fajr Sepahan Galvanized Steel Complex Fajr Petrochemical Co. Farab Company: Karun 1 power plant Karkheh power plant Fars Regional Electric Co. Firouza (Demag) Foulad Khorassan (steel Complex) Foulad Khouzestan (steel Complex) Foulad Mobarekeh (steel Complex) Foulad Kavir Ghaem Reza Co. Guilan Distribution Electric Co. Guilan Regional Electric Co. Guilan Telecommunication Co. Golestan Distribution Electric Co. Hirbodan Hormozgan Distribution Electric Co. Iran Khodro Iran Transfo IRIB (Islamic Republic of Iran Broadcasting) IRITEC Isfahan Distribution Electric Co. Isfahan Regional Electric Co. Jam petrochemical Co. Kalayeh Naft Tehran Karoun Cement Kerman Regional Electric Co. Kerman Telecommunication Co Khark Petrochemical Company Khorassan Distribution Electric Co. Khorassan Regional Electric Co. Khorassan Telecommunication Co	Khorassan Petrochemical Complex Kish water & electricity Mapna Company: Fars Combined Cycle Power Plant Kerman Combined Cycle Power Plant Khoj Combined Cycle Power Plant Neishaboor Combined Cycle Power Plant Rajaii Combined Cycle Power Plant Shariati Combined Cycle Power Plant Masjede Soleyman Power plant Marun Petrochemical Co. Mazandaran Distribution Electric Co. Mazandaran Regional Electric Co. Metec Company Mobin Petrochemical Co. Naft Falat gharreh IRAN Nargan Namavarar National Iranian Gaz Co. National Iranian Oil Co. North West of Tehran Distribution Electric Co. OIEC Pars Capacitor Co. Parsian Pars Khodro Pooyesh Petrochemical Co. Rahkar Sanaye Novin Razi Petrochemical Complex Safanicu Sapta SPEC Saveh Cement Co. Sazeh Tabriz Urban Railways Tadbir Niroo Co. Tavanir Co. Tehran Niroo Co. Tehran Regional Electric Co. Tondgouyan Petrochemical Co. Water & Electricity of Khouzestan West of Tehran Distribution Electric Co. Yazd Distribution Electric Co. Yazd Regional Electric Co. Zanjan Distribution Electric Co. Zob Ahan Iran (Steel Complex) Etc ...
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Permissible bending radii

When laying power cables, the radii should not be smaller than the values given in table below.

Cable	Minimum bending radius r plastic cables	
	$U_0=0.6$ kV	$U_0>0.6$ kV
Multi core	$D \times 12$	$D \times 15$
Single-core	$D \times 15$	$D \times 15$

D = Outer diameter of the cable in mm.

For single bends, e.g. in front of sealing ends, these radii may in the extreme cases be reduced by half, if proper handling-heating to approx. 30°C, bending over a former is insured.

Permissible pulling forces

When laying power cables by machine, particular attention must be paid to the permissible tensile forces. The formula for obtaining these values are given in table below.

Pulling method	Construction of cables	Tensile force
pulling head on the conductors	All types of cables	$P=A.50\text{N/mm}^2$ (cable with Cu conductor) $P=A.30\text{N/mm}^2$ (cable with Al conductor)
With pulling grip	All wire - armored cables	$P= F.D^2$ ($F= 9 \text{ N /mm}^2$)
	Cables with metal sheath, without tension - proof Armour	$P= F.D^2$ (Single- sheathed cable $F= 3 \text{ N /mm}^2$)
	Plastic cables without metal sheath Plastic cables without Armour	$P=A.50\text{N/mm}^2$ (Cu conductor) $P=A.30\text{N/mm}^2$ (Al conductor)

If there single - core cables are laid simultaneously with a common pullig grip the same max. pulling forces as they are applicable for single - core cables, are valid.

For 3 laid - up single - core cables the caculation of the permissible pulling forces is based on 3 cables, Where as it is based on 2 cables if the 3 single - core cables are not laid - up.

A= Total conductor cross - section in mm^2 (without screen and concentric protective conductor)

D= Outer diameter of the cable in mm.

Charging Current (A/Km) For Single Core XLPE Cables

Cross Section (mm ²)	Rated Voltage kV			
	6	10	20	30
50	0.45	0.5	0.7	0.9
70	0.50	0.6	0.8	1.0
95	0.60	0.7	0.9	1.1
120	0.65	0.7	1.0	1.1
150	0.70	0.8	1.1	1.2
185	0.70	0.8	1.2	1.3
240	0.75	0.9	1.3	1.4
300	0.80	1.0	1.4	1.6
400	0.90	1.2	1.6	1.7
500	1.1	1.3	1.7	1.9
630	1.2	1.4	1.9	2.1
800	1.3	1.6	2.1	2.3
1000	1.5	1.8	2.3	2.5
1200	1.6	2.0	2.5	2.7

Earth Fault Current (A/km)

Copper Conductor Cross-section (mm ²)	Rated Voltage U ₀ /U (U _m) KV				
	3.6/6(7.2)	6/10(12)	8.7/15(18)	12/20(24)	18/30(36)
50	0.70	1.5	1.7	2.1	2.7
70	0.75	1.7	1.9	2.4	3.0
95	0.80	2.1	2.2	2.7	3.2
120	0.90	2.1	2.2	2.9	3.4
150	0.95	2.3	2.4	3.2	3.7
185	1.00	2.5	2.7	3.5	4.0
240	1.10	2.8	3.0	3.8	4.3
300	1.20	3.1	3.3	4.1	4.7
400	1.25	3.6	3.8	4.7	5.2
500	1.25	3.9	4.1	5.2	5.6
630	1.30	4.3	4.5	5.8	6.2
800	1.40	4.8	5.0	6.4	6.8
1000	1.50	5.3	5.5	7.0	7.4
1200	1.60	6.0	6.2	7.6	8.1

Conversion of conductor resistance values for different conductor temperatures:

◆ **Copper** : $R_t = R_{20} \frac{234.5 + t}{254.5}$

◆ **Aluminum** : $R_t = R_{20} \frac{228 + t}{248}$

◆ t = Conductor temperature ($^{\circ}\text{C}$)

◆ R_{20} = Conductor resistance at 20°C (Ω/Km)

◆ R_t = Conductor resistance at $t^{\circ}\text{C}$ (Ω/Km)



Maximum Short Circuit Current for XLPE-insulated Cables (0.6/1-76/132kV) with Copper Conductors in kilo Amps (kA)

90°C is to be considered as Conductor temperature at the start of short circuit

Copper Conductor Cross Section Area	Short Circuit Time (sec)										
	0.1	0.2	0.3	0.4	0.5	1s	1.5	2	3	4	5
mm ²	kA										
10	4.52	3.20	2.61	2.26	2.02	1.43	1.17	1.01	0.83	0.72	0.64
16	7.24	5.01	4.18	3.62	3.24	2.29	1.87	1.62	1.32	1.14	1.02
25	11.31	7.99	6.53	5.65	5.06	3.58	2.92	2.53	2.06	1.79	1.60
35	15.83	11.19	9.14	7.91	7.08	5.01	4.09	3.54	2.89	2.50	2.24
50	22.61	15.99	13.05	11.31	10.11	7.15	5.84	5.06	4.13	3.58	3.20
70	31.65	21.65	18.28	15.83	14.16	10	8.17	7.08	5.78	5.01	4.48
95	42.96	30.38	24.80	21.48	19.21	13.6	11.09	9.61	7.84	6.79	6.08
120	54.26	38.37	31.33	27.13	24.27	17.2	14.01	12.13	9.91	8.58	7.76
150	67.83	47.96	39.16	33.92	30.33	21.5	17.51	15.17	12.38	10.73	9.59
185	83.66	59.16	48.30	41.83	37.41	26.5	21.60	18.71	15.27	13.23	11.83
240	108.53	76.74	62.66	54.26	48.54	34.3	28.02	24.27	19.81	17.16	15.35
300	135.66	95.93	78.32	67.83	60.67	42.9	35.03	30.33	24.77	21.45	19.19
400	180.88	127.90	104.43	90.44	80.89	57.2	46.70	40.45	33.02	28.60	25.58
500	226.10	159.88	130.54	113.05	101.12	71.5	58.38	50.56	41.28	37.75	31.98
630	284.89	201.45	164.48	142.44	127.41	90.1	73.56	63.70	52.01	45.05	40.29
800	361.76	255.81	208.86	180.88	161.79	114	93.41	80.89	66.05	57.20	51.16
1000	452.21	319.76	261.08	226.10	202.23	143	116.76	101.12	82.56	71.50	63.95
1200	543.9	384.6	314	271.95	243.2	172	140.4	121.6	99.3	86	76.9

Maximum Short Circuit Current for XLPE- Insulated Cables (0.6/1-76/132kV)with Aluminum Conductors in kilo Amps(kA)

90°C is to be considered as Conductor temperature at the start of short circuit

Aluminum Conductor Cross Section Area mm ²	Short Circuit Time (sec)										
	0.1	0.2	0.3	0.4	0.5	1s	1.5	2	3	4	5
	kA										
10	2.97	2.10	1.72	1.49	1.33	0.94	0.77	0.66	0.54	0.47	0.42
16	4.76	3.36	2.75	2.38	2.13	1.50	1.23	1.06	0.87	0.75	0.67
25	7.43	5.25	4.29	3.72	3.32	2.35	1.92	1.66	1.36	1.18	1.05
35	10.40	7.36	6.01	5.20	4.65	3.31	2.69	2.33	1.90	1.65	1.47
50	14.86	10.51	8.58	7.43	6.65	4.72	3.84	3.32	2.71	2.35	2.10
70	20.81	20.81	12.01	10.40	9.31	6.61	5.37	4.65	3.80	3.29	2.94
95	28.24	19.97	16.30	14.12	12.63	8.98	7.29	6.31	5.16	4.47	3.99
120	35.67	25.22	20.59	17.84	15.95	11.3	9.21	7.98	6.51	5.64	5.04
150	44.59	31.53	25.74	22.29	19.94	14.2	11.51	9.97	8.14	7.05	6.31
185	54.99	38.98	31.75	27.50	24.59	17.5	14.20	12.30	10.04	8.70	7.78
240	71.34	50.45	41.19	35.67	31.90	22.7	18.42	15.95	13.03	11.28	10.09
300	89.18	63.06	51.49	44.59	39.88	28.3	23.03	19.94	16.28	14.10	12.61
400	118.90	84.08	68.65	59.45	53.17	37.8	30.70	26.59	21.71	18.80	16.82
500	148.63	105.10	85.81	74.31	66.47	47.2	38.38	33.23	27.14	23.50	21.02
630	187.27	132.42	108.12	93.64	83.75	59.5	48.35	41.87	34.19	29.61	26.48
800	237.80	168.15	137.30	118.90	106.35	75.6	61.40	53.17	43.42	37.60	33.63
1000	297.25	210.19	171.62	148.63	132.94	94.5	76.75	66.47	54.27	47.00	42.04
1200	356.70	252.23	205.94	178.35	159.52	113	92.10	79.76	65.13	56.40	50.45

Short Circuit Current ratings for copper screen of XLPE - insulated cables

Copper Screen Area	Short Circuit Time (sec)										
	0.1	0.2	0.3	0.4	0.5	1s	1.5	2	3	4	5
mm ²	kA										
16	10.46	7.4	6.04	5.23	4.68	3.3	2.69	2.33	1.9	1.65	1.47
25	16.12	11.4	9.31	8.06	7.21	5.1	4.16	3.6	2.94	2.55	2.28
35	22.45	15.87	12.96	11.22	10.04	7.1	5.79	5.02	4.09	3.55	3.17
50	33.20	23.48	19.17	16.60	14.85	10.50	8.57	7.42	6.06	5.25	4.70
70	46.49	32.87	26.84	23.24	20.79	14.70	12.00	10.39	8.49	7.35	6.57
95	63.09	44.61	36.42	31.54	28.21	19.95	16.29	14.11	11.52	9.98	8.92
120	79.69	56.35	46.01	39.84	35.64	25.20	20.58	17.82	14.55	12.60	11.27
150	99.61	70.44	57.51	49.81	44.55	31.50	25.72	22.27	18.19	15.75	14.09

*The screen size can be increased for MV cables at your request