

NATIONAL
CABLES
INDUSTRY

NCI

الوطنية
لصناعة
الكابلات

Committed Quality for our Customers

LOW VOLTAGE CABLES

INNOVATIVE

PROCESSES AND
TECHNOLOGY STRATEGIES



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INTRODUCTION

This catalog contains information on National Cables Industry low voltage cables with PVC and XLPE insulation, Copper/ Aluminium Conductors, Armoured and Un-armoured designs, single and multicore constructions along with a different range of sheathing options. Cables are categorized by insulation and armouring. Each section contains appropriate technical details and constructional data.

PRODUCT SPECIFICATION

All cable designs outlined in this catalog use constructions covered by IEC 60502, BS 6346, BS 5467 and BS 6724. National Cable Industry can also supply a range of alternative designs to meet more specialized customer needs including enhanced fire performance and added environmental protection. Cables can also be supplied with alternative sheathing materials and colors, or can be made to individual customer specifications or other recognized standards both National & International.

CABLE SELECTION

It is essential that the type of cable ordered is suitable for its intended use. Cable choice will be based on a whole range of factors including installation specifications, relevant local regulations and the performance of appropriate cable types. It is therefore impossible to provide a conclusive guide to cable selection and we would advice on suitable designs to meet your specific cable needs.

CONDUCTORS

Conductors shall be of Copper or Aluminium, circular stranded (Non-compacted or Compacted) or Shaped, Class 2 to IEC 60228, BS EN 60228. The number of wires for each conductor size mentioned in the tables is for standard construction. However, the minimum number of wires mentioned in IEC 60228/ BS EN 60228 shall hold precedence during manufacture. For smaller sizes, a solid circular conductor, Class 1 as per IEC 60228, BS EN 60228 can also be supplied upon request.

INSULATION

XLPE material and thickness shall be as per IEC 60502/BS 5467/BS 6724 rated for 90°C continues operation. PVC material and thickness shall be as per IEC 60502 or BS 6346. PVC insulation Material shall be Type A as per IEC 60502 or T11 as per BS 7655.

ASSEMBLY

For multicore cables, two, three or four insulated conductors are laid-up together with non-hygroscopic fillers compatible with the insulation material and the assembly is bedded with an extruded layer of PVC. In case of non-armoured cables, this layer may be omitted if the outer shape of the cable remains practically circular.

Standard COLOR CODE

Single Core	:	Red or Black
Two Cores	:	Red, Black
Three Cores	:	Red, Yellow, Blue
Four Cores	:	Red, Yellow, Blue, Black
Five Cores	:	Red, Yellow, Blue, Black, Green/ Yellow
Above Five Cores:	:	White numerals printed on black core insulation.

Cables with special colour code are also available based on special request.

Single Core	:	Brown or Blue
Two Cores	:	Brown, Blue
Three Cores	:	Green/Yellow, Blue, Brown
Four Cores	:	Blue, Brown, Black, Grey
Five Cores	:	Green/Yellow, Blue, Brown, Black, Grey
Above Five Cores:	:	Black Numerals printed on White core insulation.



INTRODUCTION

ARMOUR

Galvanized Steel Wires applied helically over bedding as per IEC 60502, BS 5467, BS 6346, BS 6724. (Single core cables shall be with Aluminium wire armour). Cables with Double steel tapes applied helically over the bedding of multi-core cables as per IEC 60502 are also available on request.

OUTER SHEATH

PVC type ST2 as per IEC 60502, Type 9 as per BS 7655 or LSZH Type ST8/LTS1 coloured Black. Low voltage cables can also be supplied with polyethylene outer sheath based on special request. Polyethylene offers the advantage of much greater impermeability to moisture compared to PVC and can also offer much greater abrasion resistance. These can be important factors when selecting cables for use in hostile environments.

All sheaths are designed with easy strip characteristics to reduce the time and cost of cable preparation during installation. In addition, finished cable are marked on the outer sheath to aid cable identification at site.

FIRE PERFORMANCE OF CABLE SHEATHS

Cables with special flame retardant PVC outer sheath to comply with the flame test requirements of IEC 60332-3-22, IEC 60332-3-23, IEC 60332-3-24 can also be supplied based on special request. Cables as per BS 6724 shall meet the requirements of low corrosive and low toxic gas emission as per BS 6724.

QUALITY

Effective Quality Management System is maintained at NCI as a key to long term operational reliability. Stringent quality control measures are implemented during procurement, during all stages of production and during final testing. Under professional control, NCI has demonstrated competence by obtaining Quality Management System **ISO-9001:2008** from **BASEC**, Product Certification Requirements from **BASEC** for "Enhanced Quality Management System for Product Related Functions", Occupational Health and Safety Management System **OHSAS 18001:2007** from **SGS**, Emirates Mark of Conformity from **Emirates Authority for Standardization and Metrology (ESMA)**.

BASEC is a government-nominated independent non-profit making organization and a leader in product certification for more than 30 years and seeks to ensure National, European and International Manufacturers and their products in cable industry reach relevant standard.

SERVICES

National Cables Industry offers technical support for cable installation projects. Please contact our Customer Service Department for details.

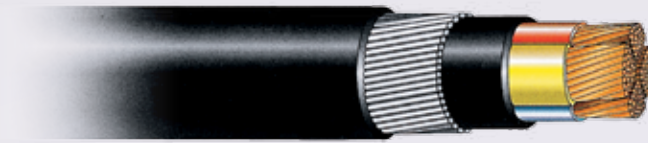


XLPE INSULATED, PVC SHEATHED CABLES

COPPER CONDUCTOR

STANDARD: BS 5467

0.6/1 kV



STEEL WIRE ARMoured CABLES

Nominal Area	No. of Wires	Approx. Conductor Diameter	Nominal Insulation Thickness	Nominal Steel Wire Diameter	Nominal Sheath Thickness	Approx. Overall Diameter	Approx. Weight	Standard Packing
mm ²	No.	mm	mm	mm	mm	mm	Kg/Km	meters
4x1.5 rm	7	1.56	0.6	0.9	1.3	13	350	1000
4x2.5 rm	7	2.01	0.7	0.9	1.4	15	450	1000
4x4 rm	7	2.55	0.7	0.9	1.4	16	550	1000
4x6 rm	7	3.12	0.7	1.25	1.5	19	775	1000
4x10 rm	7	4.01	0.7	1.25	1.5	21	1000	1000
4x16 rm	7	5.03	0.7	1.25	1.6	23	1325	1000
4x25 sm	7	-	0.9	1.6	1.7	26	1925	1000
4x35 sm	7	-	0.9	1.6	1.8	29	2390	1000
4x50 sm	19	-	1.0	1.6	1.9	32	3015	500
4x70 sm	19	-	1.1	2.0	2.1	38	4300	500
4x95 sm	19	-	1.1	2.0	2.2	42	5500	500
4x120sm	37	-	1.2	2.5	2.3	47	7035	500
4x150 sm	37	-	1.4	2.5	2.4	52	8410	500
4x185 sm	37	-	1.6	2.5	2.6	57	10150	250
4x240 sm	61	-	1.7	2.5	2.7	63	12750	250
4x300 sm	61	-	1.8	2.5	2.9	69	15440	250
4x400 sm	61	-	2.0	3.15	3.2	78	20210	250

STEEL WIRE ARMoured CABLES

5x1.5 rm	7	1.56	0.6	0.9	1.4	14	400	1000
5x2.5 rm	7	2.01	0.7	0.9	1.4	16	515	1000
5x4 rm	7	2.55	0.7	0.9	1.5	18	650	1000
5x6 rm	7	3.12	0.7	1.25	1.5	20	900	1000
5x10 rm	7	4.01	0.7	1.25	1.6	23	1190	1000
5x16 rm	7	5.03	0.7	1.6	1.7	27	1775	1000
5x25 rm	7	6.3	0.9	1.6	1.8	31	2450	1000
5x35 rm	7	7.44	0.9	1.6	1.9	35	3075	500
5x50 rmc	19	8.1	1.0	2.0	2.0	40	4040	500
5x70 rmc	19	9.7	1.1	2.0	2.2	46	5355	500

rm: Round Stranded
 rmc: Round Stranded Compacted
 sm: Sectoral Stranded

Standard Colour Code:

4 cores: Red, Yellow, Blue, Black
 5 cores: Red, Yellow, Blue, Black, Green/Yellow

Color Code based on special request

4 Cores: Blue, Brown, Black, Grey
 5 Cores: Green/Yellow, Blue, Brown, Black, Grey



ELECTRICAL PARAMETERS 0.6/1 kV

Low Voltage Single Core Cable (In Trefoil Formation)

Linear Resistance, Reactance and Voltage Drop of PVC Insulated (70°C) Copper Conductor at 50 Hertz

SIZE MM ²	R (DC) 20°C	R (DC) 70°C	R (AC) 70°C	X	Z	VD
1.5	12.1	14.47	14.47	0.197	14.47	20.25
2.5	7.41	8.86	8.86	0.186	8.86	12.47
4	4.61	5.51	5.51	0.171	5.51	7.81
6	3.08	3.68	3.68	0.162	3.68	5.27
10	1.83	2.19	2.19	0.151	2.19	3.19
16	1.15	1.37	1.37	0.140	1.38	2.04
25	0.727	0.87	0.87	0.130	0.86	1.34
35	0.524	0.627	0.627	0.123	0.64	1.00
50	0.387	0.46	0.46	0.118	0.47	0.76
70	0.268	0.321	0.321	0.112	0.34	0.56
95	0.193	0.231	0.231	0.108	0.25	0.43
120	0.153	0.183	0.184	0.104	0.21	0.36
150	0.124	0.148	0.149	0.102	0.18	0.31
185	0.0991	0.118	0.12	0.100	0.16	0.27
240	0.0754	0.0902	0.092	0.096	0.13	0.23
300	0.0601	0.0719	0.0746	0.094	0.12	0.20
400	0.0470	0.056	0.059	0.092	0.11	0.18
500	0.0366	0.043	0.0483	0.090	0.10	0.16
630	0.0283	0.033	0.039	0.087	0.10	0.14

- R (DC) 20°C :** DIRECT CURRENT RESISTANCE AT 20°C, Ohm / Km
R (DC) 70°C : DIRECT CURRENT RESISTANCE AT 70°C, Ohm / Km
R (AC) 70°C : ALTERNATING CURRENT RESISTANCE AT 70°C, Ohm / Km
X : REACTANCE, Ohm / Km
Z : IMPEDANCE, Ohm / Km
VD : VOLTAGE DROP, V / Amp. Km (Phase to Phase)



Linear Resistance, Reactance and Voltage Drop of PVC Insulated (70°C) Copper Conductor at 50 Hertz

SIZE MM ²	R (DC) 20°C	R (DC) 70°C	R (AC) 70°C	X	Z	VD
1.5	12.1	14.47	14.47	0.110	14.47	20.16
2.5	7.41	8.86	8.86	0.103	8.86	12.38
4	4.61	5.51	5.51	0.102	5.51	7.74
6	3.08	3.68	3.68	0.097	3.68	5.20
10	1.83	2.19	2.19	0.091	2.19	3.13
16	1.15	1.37	1.37	0.086	1.37	1.99
25	0.727	0.869	0.870	0.086	0.87	1.29
35	0.524	0.627	0.627	0.083	0.63	0.95
50	0.387	0.463	0.463	0.081	0.47	0.73
70	0.268	0.320	0.321	0.078	0.33	0.53
95	0.193	0.230	0.232	0.078	0.24	0.40
120	0.153	0.183	0.184	0.076	0.20	0.33
150	0.124	0.148	0.150	0.076	0.17	0.29
185	0.0991	0.118	0.121	0.076	0.14	0.25
240	0.0754	0.090	0.094	0.074	0.12	0.21
300	0.0601	0.071	0.076	0.074	0.11	0.18
400	0.047	0.056	0.062	0.074	0.10	0.16
500	0.0366	0.044	0.051	0.073	0.09	0.15
630	0.0283	0.033	0.042	0.072	0.08	0.13

R (DC) 20°C : DIRECT CURRENT RESISTANCE AT 20°C, Ohm / Km

R (DC) 70°C : DIRECT CURRENT RESISTANCE AT 70°C, Ohm / Km

R (AC) 70°C : ALTERNATING CURRENT RESISTANCE AT 70°C, Ohm / Km

X : REACTANCE, Ohm / Km

Z : IMPEDANCE, Ohm / Km

VD : VOLTAGE DROP, V / Amp. Km (Phase to Phase)



Linear Resistance, Reactance and Voltage Drop of XLPE Insulated (90°C) Copper Conductor at 50 Hertz

SIZE MM ²	R (DC) 20°C	R (DC) 90°C	R (AC) 90°C	X	Z	VD
1.5	12.1	15.42	15.42	0.181	15.42	21.55
2.5	7.41	9.44	9.44	0.171	9.44	13.26
4	4.61	5.870	5.870	0.156	5.87	8.30
6	3.08	3.92	3.92	0.148	3.92	5.59
10	1.83	2.330	2.330	0.138	2.336	3.37
16	1.15	1.466	1.466	0.136	1.47	2.17
25	0.727	0.927	0.927	0.126	0.94	1.42
35	0.524	0.668	0.668	0.119	0.68	1.05
50	0.387	0.493	0.493	0.115	0.51	0.80
70	0.268	0.34	0.342	0.110	0.36	0.59
95	0.193	0.246	0.246	0.102	0.27	0.45
120	0.153	0.195	0.196	0.099	0.22	0.37
150	0.124	0.158	0.159	0.098	0.19	0.32
185	0.0991	0.126	0.128	0.095	0.16	0.28
240	0.0754	0.096	0.098	0.093	0.13	0.23
300	0.0601	0.076	0.079	0.090	0.12	0.20
400	0.047	0.060	0.063	0.091	0.11	0.18
500	0.0366	0.046	0.051	0.088	0.10	0.16
630	0.0283	0.036	0.042	0.086	0.10	0.15

- R (DC) 20°C** : DIRECT CURRENT RESISTANCE AT 20°C, Ohm / Km
R (DC) 90°C : DIRECT CURRENT RESISTANCE AT 90°C, Ohm / Km
R (AC) 90°C : ALTERNATING CURRENT RESISTANCE AT 90°C, Ohm / Km
X : REACTANCE, Ohm / Km
Z : IMPEDANCE, Ohm / Km
VD : VOLTAGE DROP, V / Amp. Km (Phase to Phase)



Linear Resistance, Reactance and Voltage Drop of XLPE Insulated (90°C) Copper Conductor at 50 Hertz

SIZE MM ²	R (DC) 20°C	R (DC) 90°C	R (AC) 90°C	X	Z	VD
1.5	12.1	15.42	15.42	0.106	15.42	21.48
2.5	7.41	9.44	9.44	0.099	9.4	13.18
4	4.61	5.870	5.870	0.093	5.87	8.23
6	3.08	3.920	3.920	0.089	3.92	5.52
10	1.83	2.330	2.330	0.084	2.33	3.32
16	1.15	1.466	1.466	0.081	1.47	2.12
25	0.727	0.927	0.927	0.081	0.93	1.37
35	0.524	0.668	0.668	0.079	0.67	1.01
50	0.387	0.493	0.494	0.076	0.50	0.76
70	0.268	0.341	0.342	0.075	0.35	0.55
95	0.193	0.246	0.247	0.074	0.26	0.42
120	0.153	0.195	0.196	0.072	0.21	0.35
150	0.124	0.158	0.160	0.073	0.18	0.30
185	0.0991	0.126	0.13	0.073	0.15	0.25
240	0.0754	0.096	0.099	0.072	0.12	0.21
300	0.0601	0.076	0.081	0.071	0.11	0.19
400	0.047	0.060	0.065	0.071	0.10	0.16
500	0.0366	0.046	0.053	0.071	0.09	0.15
630	0.0283	0.036	0.044	0.070	0.08	0.13

- R (DC) 20°C** : DIRECT CURRENT RESISTANCE AT 20°C, Ohm / Km
R (DC) 90°C : DIRECT CURRENT RESISTANCE AT 90°C, Ohm / Km
R (AC) 90°C : ALTERNATING CURRENT RESISTANCE AT 90°C, Ohm / Km
X : REACTANCE, Ohm / Km
Z : IMPEDANCE, Ohm / Km
VD : VOLTAGE DROP, V / Amp. Km (Phase to Phase)



Linear Resistance, Reactance and Voltage Drop of XLPE Insulated (90°C) Aluminium Conductor at 50 Hertz

SIZE MM ²	R (DC) 20°C	R (DC) 90°C	R (AC) 90°C	X	Z	VD
16	1.91	2.45	2.45	0.1048	2.45	3.48
25	1.20	1.539	1.539	0.0987	1.53	2.22
35	0.868	1.106	1.106	0.094	1.11	1.63
50	0.641	0.817	0.817	0.092	0.82	1.23
70	0.443	0.564	0.565	0.088	0.57	0.87
95	0.320	0.408	0.408	0.088	0.42	0.66
120	0.253	0.323	0.323	0.0842	0.33	0.54
150	0.206	0.262	0.263	0.0812	0.28	0.45
185	0.164	0.209	0.21	0.083	0.23	0.38
240	0.125	0.159	0.161	0.079	0.18	0.31
300	0.100	0.127	0.129	0.079	0.152	0.26
400	0.0778	0.0992	0.102	0.078	0.13	0.22
500	0.0605	0.0771	0.0809	0.076	0.11	0.19
630	0.0469	0.059	0.0643	0.077	0.10	0.17

Low Voltage Cable (Multi Core) Linear Resistance, Reactance and Voltage Drop of XLPE Insulated (90°C) Aluminium Conductor at 50 Hertz

SIZE MM ²	R (DC) 20°C	R (DC) 90°C	R (AC) 90°C	X	Z	VD
16	1.91	2.44	2.44	0.079	2.44	3.46
25	1.20	1.53	1.53	0.081	1.53	2.20
35	0.868	1.106	1.106	0.079	1.11	1.61
50	0.641	0.817	0.817	0.076	0.82	1.21
70	0.443	0.564	0.564	0.075	0.57	0.86
95	0.320	0.408	0.408	0.073	0.41	0.64
120	0.253	0.322	0.323	0.072	0.33	0.52
150	0.206	0.262	0.263	0.072	0.27	0.44
185	0.164	0.209	0.210	0.073	0.22	0.37
240	0.125	0.159	0.161	0.072	0.18	0.30
300	0.100	0.127	0.13	0.071	0.15	0.25
400	0.0778	0.099	0.102	0.070	0.12	0.21
500	0.0605	0.077	0.0816	0.071	0.11	0.19
630	0.0469	0.059	0.065	0.070	0.10	0.16

R (DC) 20: Direct Current Resistance at 20°C, Ohm / Km

R (DC) 90: Direct Current Resistance at 90°C, Ohm / Km

R (AC) 90: Alternating Current Resistance at 90°C, Ohm / Km

X : Reactance, Ohm / Km

Z : Impedance, Ohm / Km

VD : Voltage Drop (Phase to Phase), V / A / Km



GUIDELINES FOR THE SELECTION OF THE REQUIRED SIZE OF CABLE

The required sizes of cable shall be selected based on the following steps:

Ampacity: Based on the required ampacity and the installation condition, a suitable size of cable can be selected.

Voltage Drop: The suitability of the above selected size shall be cross checked with the voltage drop. If it is within the limit, the selection is ok. Otherwise, the higher size (whose voltage drop suits the requirement) shall be selected. Following is an example for the above:

Example:

150 meters of three core cable, XLPE insulated, PVC sheathed, copper cable installed under ground to carry 100 amperes load, supply voltage 380 V.three phase system 50Hz, Ground temperature 40°C, soil thermal resistivity 2.5 k.m. / W and load factor 1.

Derating Factors:

*35mm² cable ampacity =176 amps
*Soil thermal resistivity = 0.71
*Ground temperature = 0.85

Therefore derated current = 106 Amps (176 x 0.71 x 0.85)

Voltage drop(Vap) = $\frac{V_p \times 1000 \times V}{I \times L \times 100}$ V/A/KM

VP = maximum permissible voltage drop (say2.5%)
V = System voltage (Here 380V)
L = Length in meters (Here 150 meter)
Therefore, Vap = $\frac{2.5 \times 1000 \times 380}{100 \times 150 \times 100}$ V/A/KM
= 0.633V/A/KM

From table on page 52 of this catalogue, the voltage drop of 35 mm² XLPE insulated multi core cable is 1.011 V/A/km, which is much higher than the requirement of 0.633 V/A/km. The voltage drop of 70 mm² cable is 0.556 V/A/km which is with in the limit. Therefore, the suitable size is 70 mm².

Note:

* Please refer to the Low Voltage Electrical Guide N.C.I Brochure for finding the Ampacity, Soil Thermal Resistivity and Ground Temperature.



Drum Handling Instruction

National Cable Industry Cables and Conductors should be installed by trained personnel in accordance with good engineering practices, recognized codes of practice, statutory local requirements, IEE wiring regulations and where relevant, in accordance with any specific instructions issued by the company. Cables are often supplied in heavy cable reels and handling these reels can constitute a safety hazard. In particular, dangers may arise during the removal of steel binding straps and during the removal of retaining battens and timbers which may expose projecting nails.

