

Low Voltage

Power and Control Cables



Technical Catalogue



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General Information

Introduction

Low voltage power and control cables are used for electricity supply in low voltage installation systems. They are usually employed in various indoor and outdoor applications in power plants, industrial and infrastructure projects, and in the distribution of electricity to various residential and commercial loads.

As one of the leaders in the cable industry in the Middle East, we offer an extensive range of cables and cabling systems to raise industrial productivity, improve business performance, enhance security, enrich the quality of life, and assure long-term network reliability. **alfanar** supplies cables solutions for structures of all types: from small residences to public and office buildings and big industrial complexes.

Product Range

The scope of this catalogue is to provide an in depth view of the technical information of **alfanar**'s Low Voltage Power and Control Cables. This catalogue covers the following product ranges:

1. IEC 60502-1 Cables Range

The low voltage power and control cables described in this part are 0.6/1.0 kV rated. These cables are presented in single-core or multi-core constructions, copper or aluminum conductors, Polyvinyl Chloride (PVC) or Cross-linked Polyethylene (XLPE) insulation, shielded or unshielded, armoured or unarmoured designs, and PVC outer sheath. Technical information for bare grounding conductors and single-core non-sheathed cables with thermoplastic PVC insulation are included as well.

2. BS 7889 and BS 5467 Cables Range

The low voltage cables described in this part are 600/1000 V rated. These cables are presented in copper conductors with single-core or multi-core constructions, Cross-linked Polyethylene (XLPE) insulation, armoured or unarmoured designs, and PVC outer sheath.

3. Cables Range for Special Applications

To meet all the requirements of our customers for cables used in special applications, additional designs are available on request with the following constructions and characteristics:

- Lead sheathed power and control cables
- Aluminium tape armour for single-core cables
- Low smoke halogen free power and control cables
- Fire resistant cables (CWZ) with MGT/XLPE insulation
- Flame retardant cables to IEC 60332-3, categories A, B, C or D
- Copper wires armoured (CWA) single-core power cables (KAHRAMAA Specs.)
- Armoured (Tinned CWA + SWA) multi-core power cables (KAHRAMAA Specs.)

Cable Marking

The external surface of all cables covered by this catalogue will be legibly marked with the below elements, at intervals not exceeding one meter. Any additional marking can be provided by agreement between **alfanar** and the purchaser.

- Manufacturer's identification "**alfanar**"
- Number of cores and nominal area of conductors (e.g. 4 X 50 mm²)
- Voltage designation (e.g. 0.6/1.0 kV)
- "ELECTRIC CABLE"
- Short cable description (e.g. Cu/XLPE/SWA/PVC)
- Year of manufacture (e.g. 2015)
- Continuous length marking every meter (i.e. meter marking)

General Information

Production and Delivery Tolerances

Weights and dimensions data are approximate and subjected to manufacturing tolerance. We reserve the right to change as a result of product development and/or changes in standard.

The standard delivery length tolerance is $\pm 5\%$. However, customized tolerance can be provided by agreement between **alfanar** and the purchaser.

Applicable Standards

The cables described in this catalogue are all standard types, and their performance has been proved in operation. All cable designs, constructions, materials and tests outlined in this catalogue are covered mainly by one of the below IEC or BS publications, where applicable. Moreover, cables in accordance with any other national (e.g. SEC, NGSA, KAHRAMAA, DEWA, ADWEA, and SEWA) or international standards (e.g. NEMA, ICEA, and VDE) are available and can be manufactured upon customer's request.

IEC 60502	:	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).
IEC 60227	:	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V.
IEC 60228	:	Conductors of insulated cables.
IEC 60811	:	Electric and optical fibre cables - Test methods for non-metallic materials.
IEC 60287	:	Electric cables - Calculation of the current rating.
IEC 60332	:	Tests on electric and optical fibre cables under fire conditions.
BS 7889	:	Electric cables - Thermosetting insulated, non-armoured cables with a voltage of 600/1 000 V, for fixed installations.
BS 5467	:	Electric cables - Thermosetting insulated, armoured cables for voltages of 600/1000 V and 1900/3300 V.
BS 7655	:	Specification for insulating and sheathing materials for cables.
BS EN 50525	:	Electric cables - Low voltage energy cables of rated voltages up to and including 450/750 V.
BS EN 60228	:	Conductors of insulated cables.
BS EN 60811	:	Electric and optical fibre cables - Test methods for non-metallic materials.
BS EN 60332	:	Tests on electric and optical fibre cables under fire conditions.

Voltage Designation

Cables normally designated by the voltages U_0 , U & U_m expressed in the form $U_0/U (U_m)$.

U_0	:	The rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed.
U	:	The rated power frequency voltage between conductors for which the cable is designed.
U_m	:	The maximum value of the "highest system voltage" for which the equipment may be used.

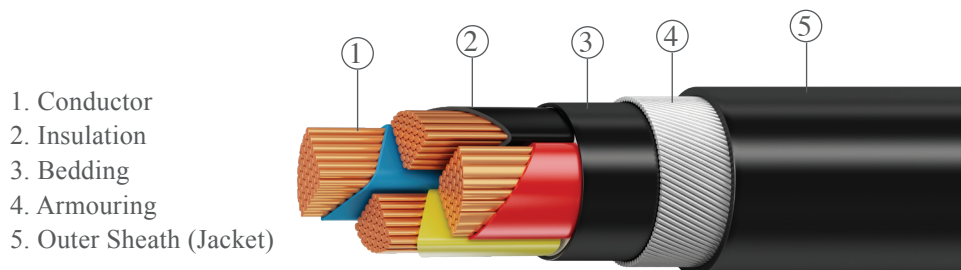
The products specified in this catalogue are intended to be used for the supply of electrical energy up to rated voltage of 0.6/1 (1.2) kV, within a nominal power frequency range of 49 Hz to 61 Hz . These ratings should not be exceeded.

Technical Information

Low Voltage Cable Structure

The following structure applies to low voltage power and control cables with Polyvinyl Chloride (PVC) or Cross-linked Polyethylene (XLPE) insulation of rated voltage 0.6/1.0 kV. This structure represents our standard models of low voltage power and control cables, however any other models as per customer's standard are also available.

The structure of low voltage power and control cables will, in most cases, involve the following items:



1. Conductor

The task of the conductor is to transmit the current with the lowest possible losses. The decisive properties for this function result in the first place from the conductor material and design. The conductor also plays a decisive part in the mechanical tensile strength and bending ability of the cable.

The conductor shall consist of copper (plain or tin coated) or aluminium. The most important properties of the two conductor materials are compared in table here below.

Property	Unit	Copper	Aluminum
Density	g/cm ³	8.89	2.703
Resistivity	Ω.mm ² /m	0.017241	0.028264
Tensile strength	N/mm ²	200 ... 300	70 ... 90

The conductor structure should comply with the requirements of IEC 60228 or BS EN 60228 standards, which cover conductors from 0.5 mm² to 2500 mm², and specify the nominal cross-sectional areas for conductors, the maximum d.c. resistance values and the minimum number of wires in the conductor.

Depending on the cable construction, stranded conductors may be circular non-compacted, circular compacted or shaped conductors.

2. Insulation

It is a material having good dielectric properties, and it is used to isolate cable conductors from their surroundings. The insulation materials used are as follows:

1. **PVC** (Polyvinyl Chloride) rated 70 °C, meeting the requirements of type (PVC/A) to IEC 60502-1
2. **XLPE** (Cross-linked Polyethylene) rated 90 °C, meeting the requirements of IEC 60502-1 or the requirements of type GP8 to BS 7655-1.3, where applicable.

2.1 Core Identification

Core Identification or Colour Coding is used to identify conductors/cores for point-to-point wiring and for circuit diagrams. The standard colours used for core identification in the Saudi Arabian Distribution Network, which applies to our standard range of low voltage cables to IEC 60502-1 of this catalogue, are described in Table-1. The New Harmonized colours for core identification to (HD 308 S2) or IEC 60445 are described in Table-1 as well. Any other colours for core identification can be offered to our customers upon their request.











Technical Information

Table-1: Identification of conductors - National and Harmonized Colour Codes

Function (1)	KSA Colour Code	New Harmonized Colour Code	
		HD 308 S2	IEC 60445
Phase of single-phase circuit (L)	Red	Brown	Black
Neutral of single- or three-phase circuit (N)	Black	Blue	Blue
Phase 1 of three-phase a.c. circuit (L1)	Red	Brown	Black
Phase 2 of three-phase a.c. circuit (L2)	Yellow	Black	Brown
Phase 3 of three-phase a.c. circuit (L3)	Blue	Grey	Grey
Protective conductors (PE)	Green-and-yellow	Green-and-yellow	Green-and-yellow

(1) Function in a.c. Power circuits include lighting circuits.

Example for cables with Standard Colour Coding and cables with Harmonized Colour Coding to (HD 308 S2)

KSA Colour Code	New Harmonized Colour Code to (HD 308 S2)				
	Without (PE)		With (PE)		
Two-core Red, Black		Two-core Brown, Blue			
Three-core Red, Yellow, Blue		Three-core Brown, Black, Grey		or Brown, Blue, G/Y	
Four-core Red, Yellow, Blue, Black		Four-core Blue, Brown, Black, Grey		or G/Y, Brown, Black, Grey	
Five-core Red, Yellow, Blue, Black, G/Y				G/Y, Blue, Brown, Black, Grey Five-core	

3. Core Assembly / Laying-up

The cores of cables having two-, three-, four- or five-cores are laid-up with a right-hand or right-and-left-hand alternating direction of lay. For control cables, the direction of lay is alternate for each successive layer.

If necessary, the formation of a compact and reasonably circular cable can be achieved by extruding a filling layer directly over the laid-up cores, or by the application of synthetic fillers, usually non-hygroscopic polypropylene filler, and binder tape.

4. Bedding

The bedding, which also called inner covering, consists of an extruded layer of polymeric material, such as Polyvinyl Chloride (PVC), compatible with the operating temperature of the cable. The bedding or inner covering must be applied under any supplementary elements such as armour, metallic shield or lead sheath to serve as a cushion under the applied metallic layer to protect the laid-up cores against humidity and mechanical loads.

Technical Information

5. Metallic Armour

Metallic armour is used to provide a mechanical protection for the cable, in applications where there is a risk of mechanical damage and/or mechanical stresses. Materials used for armour are aluminium (non-magnetic) and galvanized steel for single-core and multi-core cables respectively. The armour types included in this catalogue are:

a. Round wire armour (AWA or SWA)

Single layer applied helically over the bedding. Wire armour is recommended for cables that will be subjected to horizontal mechanical stresses (parallel to the cable axis), e.g. high-rise building installations.

b. Double tape armour (ATA or STA)

Two tapes applied helically over the bedding in two layers so that the outer tape is approximately central over the gap of the inner tape. The gap between the adjacent turns of each tape shall not exceed 50 % of the width of the tape. Tape armour is recommended for cables that will be subjected to a vertical mechanical stresses (perpendicular to the cable axis), e.g. underground (i.e. direct burial) or roadcrossing installations.

Single-core cables in single- or three-phase a.c. systems are not armoured as a rule, in order to avoid additional losses. An armour of non-magnetic material (e.g. aluminium), however, has to be provided wherever mechanical damage or higher tensile stresses are to be expected during or after laying of the cable.

6. Outer Sheath (Jacket)

The outer sheath or the Jacket provides a certain amount of protection to the cable against mechanical or physical abuse such as abrasion, scoring and impact and sidewall bearing pressures that occur during handling and installation. In addition, experience has shown that the metallic layers of un-jacketed cables will corrode in many types of soil. The application of a jacket can greatly reduce this corrosion.

The Jacket consists of an extruded layer of thermoplastic material, such as Polyvinyl Chloride (PVC), compatible with the operating temperature of the cable. The jackets are normally Black and the used PVC material is properly formulated and compounded to provide good resistance to deterioration from outdoor exposure to light.

Technical Information

alfanar's Technical Services and Support

alfanar's extensive technical resources ensure that all cables will be designed to meet the exact needs of the customers. Our standard range of cables may contain a cable that will do the required job, but alfanar's commitment is to ensure that a cable's capabilities meet the precise requirements of the application and installation as well. This means that standard cables may need to be modified for optimum performance or have a new feature added - this is a normal part of alfanar service.

alfanar's technical support does not finish with the successful design and production of the cable. In addition, a comprehensive cable advisory service is also offered. Technical staff is available to assist in providing expert solutions to all types of cable problems and inquiries.

Information to be provided with enquiry or order

To provide the best technical service to our valued customers, and to make sure that the offered cables are the most appropriate for the intended applications, the following information should be given with an enquiry or order:

- a. the required design standard, if important;
- b. length of cable required and individual drum lengths, if important;
- c. voltage designation;
- d. number of cores;
- e. size of conductor;
- f. conductor material (i.e. copper or aluminium);
- g. type of conductor (i.e. stranded or solid, circular or shaped);
- h. whether cable is liable to be exposed to any potentially aggressive environments (e.g. water, oil or acid);
- i. type of armour, if required (i.e. wire armour or tape armour);
- j. other special conditions or specific requirements.

General Criteria for Cables Selection

It is of vital importance that the type of cable ordered is suitable for its intended use. It is essential to consider the specific system and installation conditions, relevant local regulations, and the performance characteristics of appropriate cable types to be able to select the right cable.

It is therefore impossible to provide a conclusive guide to cable selection, however, the following factors should be taken into account when selecting a suitable cable:

- Maximum operating voltage
- System frequency
- Insulation level
- Length of line
- Voltage drop
- Load characteristics, i.e. type, magnitude, duration, etc.
- Mode of installation, i.e. in air, in underground or in ducts, etc.
- Chemical and physical properties of soil
- National legislation and regulations
- Specific requirements to be met

We would advise you to contact our technical support team for our specialist advice on suitable designs to meet your specific cable needs.

Bare Stranded Soft-Drawn Copper Conductors (SDC)

APPLICATIONS

Bare stranded soft-drawn (annealed) copper conductor is suitable for uninsulated hook up, jumpers and grounding conductors in electrical construction, where high conductivity and flexibility are required.

CONDUCTOR CHARACTERISTICS

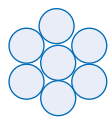
Highest conductivity per unit area of all common commercial metals. Excellent corrosion resistance. Flexible; easily worked and formed into place. Delivered on non-returnable wooden reels for easy transportation to job sites and to provide adequate lengths for mass installations. Good fatigue-resistance; not subject to breaks due to nicks or cuts when terminating.

APPLICABLE STANDARDS

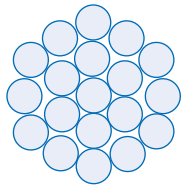
alfanar Bare stranded soft-drawn copper conductors are designed and tested to meet or exceed the requirements of IEC 60228 / BS EN 60228 standards. However, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CONDUCTOR CONSTRUCTION

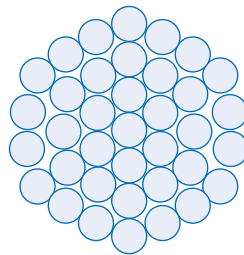
Bare stranded soft-drawn (annealed) copper conductor is a concentric-lay-stranded conductor consisting of annealed copper wires available in both single layer and multi-layer constructions up to 61 wires.



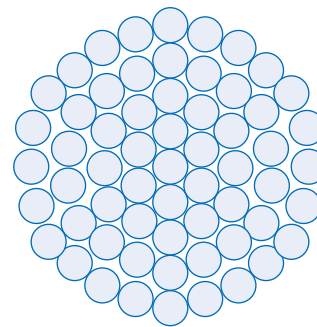
7 Wires



19 Wires

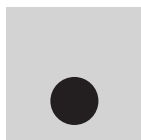


37 Wires



61 Wires

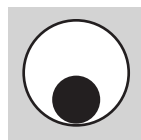
CONDUCTOR INSTALLATION



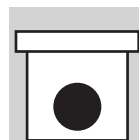
In ground



In free air
Ladders / Trays



In duct



In trench



Internal / external
cabling

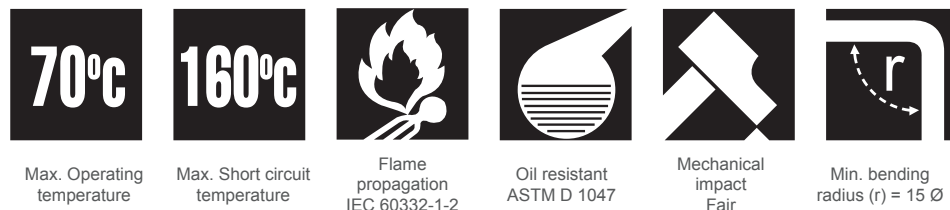
Nominal cross sectional area	Conductor construction	Approx. overall diameter	Approx. overall weight	Max. DC Resistance at 20 °C	Conductor Code
mm ²	No. x Ø (mm)	mm	kg / km	Ω / km	
1.5	7 x 0.52	1.56	13.5	12.1000	C020000070IMX
2.5	7 x 0.67	2.01	22.4	7.41000	C020100070IMX
4	7 x 0.85	2.55	36.0	4.61000	C020200070IMX
6	7 x 1.04	3.12	54.0	3.08000	C020300070IMX
10	7 x 1.34	4.02	87.0	1.83000	C020400070IMX
16	7 x 1.68	5.04	138.0	1.15000	C020700070IMX
25	7 x 2.14	6.42	220.0	0.72700	C021400070IMX
35	7 x 2.52	7.56	305.0	0.52400	C022000070IMX
50	19 x 1.80	8.90	413.0	0.38700	C022700190IMX
70	19 x 2.14	10.70	601.0	0.26800	C023700190IMX
95	19 x 2.52	12.50	832.0	0.19300	C024600190IMX
120	37 x 2.03	14.21	1050.0	0.15300	C025500370IMX
150	37 x 2.25	15.75	1290.0	0.12400	C026200370IMX
185	37 x 2.52	17.50	1615.0	0.09910	C027300370IMX
240	61 x 2.25	20.25	2120.0	0.07540	C028300610IMX
300	61 x 2.52	22.50	2660.0	0.06010	C029200610IMX
400	61 x 2.92	26.10	3420.0	0.04700	C02A900610IMX
500	61 x 3.25	29.00	4460.0	0.03660	C02B800610IMX

Single-Core Non-sheathed Cables, with Solid, Stranded or Flexible Copper Conductors and PVC Insulated

APPLICATIONS

Suitable for fixed and protected installations in a metallic, non-metallic or embedded conduits, ducts or trunks or similar closed systems. It can be used in/on lighting fittings, switch and control devices, control panels, inside appliances and similar applications.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar PVC insulated, single-core, non-sheathed cables are designed and tested to meet or exceed the requirements of IEC 60227-3 and BS EN 50525-2-31⁽¹⁾ standards.

However, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

Note (1): BS EN 50525-2-31:2011 standard for Single core non-sheathed cables with thermoplastic PVC insulation rated 450/750 V (U0/U) replaces BS 6004:2000 standard.

CONDUCTOR CONSTRUCTION

Conductor

Plain annealed solid (Class 1), stranded (Class 2) or flexible (Class 5) circular copper conductor.

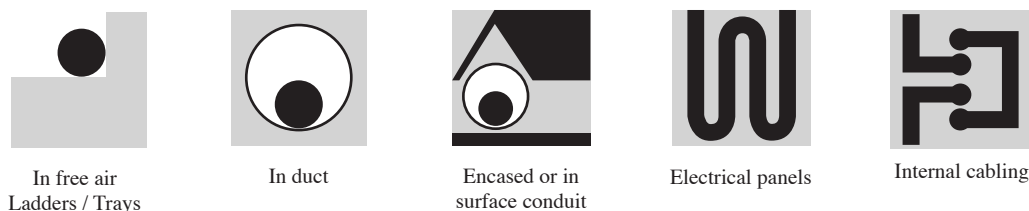
Insulation

Extruded layer of Polyvinyl chloride (PVC) compound.

Core Identification

In addition to the standard core identification colours, other colours are available on request.

CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings (@ 40° C)							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	2 loaded conductors (Single-Phase circuit)			3 loaded conductors (Three-Phase circuit)						
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A			

a. Solid Conductors

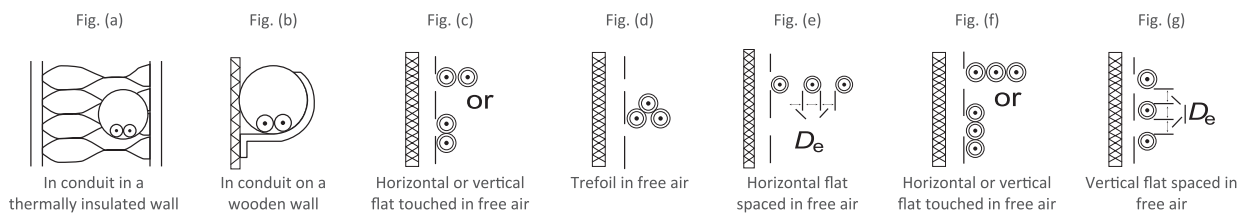
1.5	12.1000	14.4777	13	15	-	-	-	-	-	2.8	25	C108PB101000X000XX
2.5	7.4100	8.8661	17	21	-	-	-	-	-	3.4	35	C110PB101000X000XX
4	4.6100	5.5159	23	28	-	-	-	-	-	3.9	50	C112PB101000X000XX
6	3.0800	3.6853	30	36	-	-	-	-	-	4.4	70	C113PB101000X000XX
10	1.8300	2.1897	40	50	-	-	-	-	-	5.6	115	C114PB101000X000XX

b. Stranded Conductors

1.5	12.1000	14.4777	13	15	-	-	-	-	-	3.0	25	C208PB101000X000XX
2.5	7.4100	8.8661	17	21	-	-	-	-	-	3.6	35	C210PB101000X000XX
4	4.6100	5.5159	23	28	-	-	-	-	-	4.2	55	C212PB101000X000XX
6	3.0800	3.6853	30	36	-	-	-	-	-	4.7	70	C213PB101000X000XX
10	1.8300	2.1898	40	50	-	-	-	-	-	5.7	110	C314PB101000X000XX
16	1.1500	1.3763	53	66	-	-	-	-	-	6.7	170	C315PB101000X000XX
25	0.7270	0.8703	70	88	114	96	127	99	113	8.3	260	C316PB101000X000XX
35	0.5240	0.6276	86	109	141	119	157	124	141	9.3	350	C317PB101000X000XX
50	0.3870	0.4639	103	131	170	145	190	151	171	10.9	475	C318PB101000X000XX
70	0.2680	0.3220	131	167	218	188	244	196	221	12.5	675	C319PB101000X000XX
95	0.1930	0.2328	158	202	264	230	297	239	270	14.5	925	C345PB101000X000XX
120	0.1530	0.1856	183	234	306	268	344	279	315	15.8	1160	C346PB101000X000XX
150	0.1240	0.1514	209	-	353	310	397	323	364	17.7	1425	C347PB101000X000XX
185	0.0991	0.1224	237	-	403	356	453	371	417	19.8	1785	C348PB101000X000XX
240	0.0754	0.0952	279	-	475	422	535	441	495	22.5	2335	C349PB101000X000XX
300	0.0601	0.0780	319	-	547	488	617	510	573	25.3	2905	C350PB101000X000XX
400	0.0471	0.0638	-	-	656	570	741	599	691	28.3	3745	C351PB101000X000XX
500	0.0366	0.0531	-	-	755	651	854	686	800	32.1	4830	C352PB101000X000XX
630	0.0283	0.0450	-	-	874	743	990	787	930	35.7	6105	C353PB101000X000XX

c. Flexible Conductors

1.5	13.3000	15.9135	13	15	-	-	-	-	-	3.0	25	C508PB101000X000XX
2.5	7.9800	9.5481	17	21	-	-	-	-	-	3.7	35	C510PB101000X000XX
4	4.9500	5.9227	23	28	-	-	-	-	-	4.1	50	C512PB101000X000XX
6	3.3000	3.9485	30	36	-	-	-	-	-	4.6	70	C513PB101000X000XX
10	1.9100	2.2855	40	50	-	-	-	-	-	6.0	120	C514PB101000X000XX
16	1.2100	1.4480	53	66	-	-	-	-	-	7.6	185	C515PB101000X000XX
25	0.7800	0.9337	70	88	114	96	127	99	113	9.5	285	C516PB101000X000XX
35	0.5540	0.6635	86	109	141	119	157	124	141	11.0	385	C517PB101000X000XX
50	0.3860	0.4628	103	131	170	145	190	151	171	12.6	550	C518PB101000X000XX
70	0.2720	0.3269	131	167	218	188	244	196	221	14.6	740	C519PB101000X000XX
95	0.2060	0.2484	158	202	264	230	297	239	270	17.0	1000	C545PB101000X000XX
120	0.1610	0.1952	183	234	306	268	344	279	315	18.9	1255	C546PB101000X000XX
150	0.1290	0.1575	209	-	353	310	397	323	364	21.2	1565	C547PB101000X000XX
185	0.1060	0.1306	237	-	403	356	453	371	417	23.4	1915	C548PB101000X000XX
240	0.0801	0.1008	279	-	475	422	535	441	495	26.9	2515	C549PB101000X000XX



Laying Conditions: Ambient air temperature of 40 °C. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Copper Conductors, PVC Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



Max. Operating temperature



Max. Short circuit temperature



Flame propagation IEC 60332-1-2



Oil resistant ASTM D 1047



Mechanical impact Fair



UV Resistant



Min. bending radius (r) = 15 Ø

APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular or circular compacted copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

Red

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).

CABLE INSTALLATION



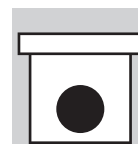
Buried with protection



In free air Ladders / Trays



In duct



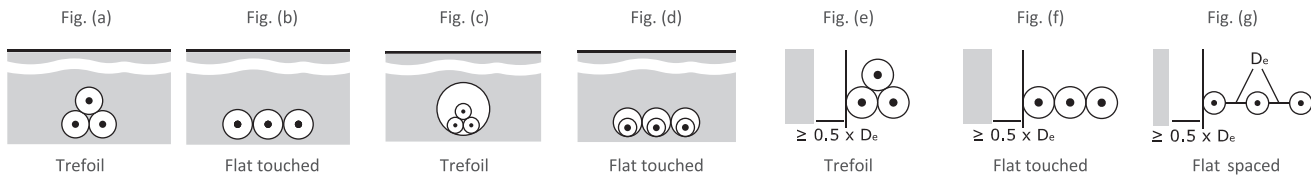
In trench



Internal cabling



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings						Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 70 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
1.5	12.1000	14.4777	22	22	16	18	17	17	23	6.0	55	C208PA10100CB51IMR
2.5	7.4100	8.8661	29	29	21	24	23	23	30	6.4	70	C210PA10100CB51IMR
4	4.6100	5.5159	37	37	28	31	30	31	40	7.4	100	C212PA10100CB51IMR
6	3.0800	3.6853	46	46	34	39	38	39	50	7.9	125	C213PA10100CB51IMR
10	1.8300	2.1897	61	61	46	51	52	53	68	8.5	160	C314PA10100CB51IMR
16	1.1500	1.3762	79	79	60	66	69	70	90	9.5	225	C315PA10100CB51IMR
25	0.7270	0.8702	101	101	78	86	92	94	119	11.1	330	C316PA10100CB51IMR
35	0.5240	0.6274	121	121	94	104	113	116	147	12.1	425	C317PA10100CB51IMR
50	0.3870	0.4637	143	143	114	124	138	142	178	13.7	560	C318PA10100CB51IMR
70	0.2680	0.3217	175	175	141	152	175	180	225	15.3	770	C319PA10100CB51IMR
95	0.1930	0.2324	209	209	172	185	216	223	276	17.5	1045	C345PA10100CB51IMR
120	0.1530	0.1850	236	237	197	211	251	258	320	18.8	1285	C346PA10100CB51IMR
150	0.1240	0.1508	265	266	224	238	289	298	367	20.9	1580	C347PA10100CB51IMR
185	0.0991	0.1216	300	300	256	272	335	345	423	23.2	1970	C348PA10100CB51IMR
240	0.0754	0.0942	346	346	300	318	398	410	502	26.1	2555	C349PA10100CB51IMR
300	0.0601	0.0769	389	389	341	362	460	474	581	29.1	3165	C350PA10100CB51IMR
400	0.0470	0.0625	437	437	389	409	532	548	674	32.3	4050	C351PA10100CB51IMF
500	0.0366	0.0515	490	490	442	473	614	632	785	36.3	5190	C352PA10100CB51IMF
630	0.0283	0.0433	544	548	496	537	700	722	910	40.1	6520	C353PA10100CB51IMF
800	0.0221	0.0374	596	596	549	600	787	812	1042	44.0	8310	C354PA10100CB51IMF
1000	0.0176	0.0333	652	655	608	680	909	941	1229	52.8	10465	C255PA10100CB51IMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Aluminium Conductors, PVC Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Stranded circular or circular compacted aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

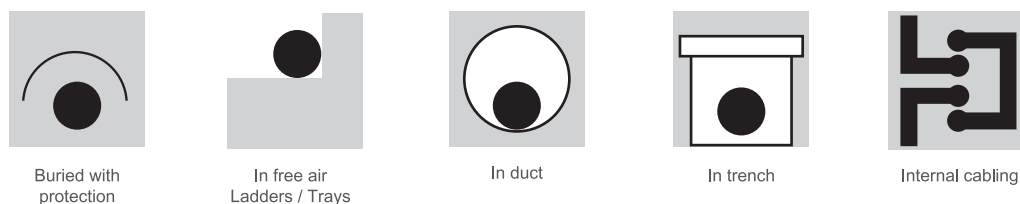
○ Red

Outer Jacket

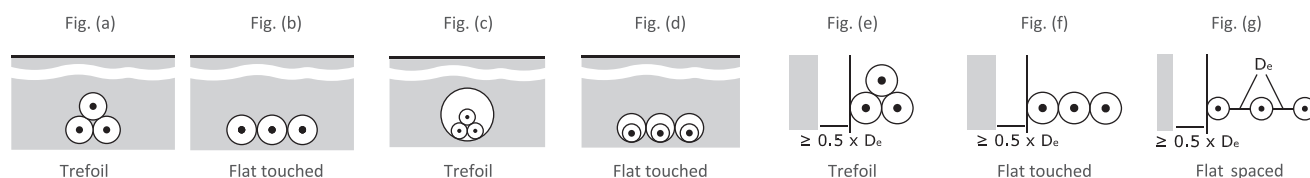
Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).

CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
10	3.0800	3.7007	48	49	36	41	41	42	54	8.5	100	A314PA10100CB51IMR
16	1.9100	2.2950	61	61	46	51	53	55	70	9.5	130	A315PA10100CB51IMR
25	1.2000	1.4420	78	78	61	67	71	73	93	11.1	180	A316PA10100CB51IMR
35	0.8680	1.0432	94	94	73	80	88	90	114	12.1	215	A317PA10100CB51IMR
50	0.6410	0.7706	111	111	88	96	107	110	138	13.7	275	A318PA10100CB51IMR
70	0.4430	0.5329	136	136	110	118	136	140	174	15.3	350	A319PA10100CB51IMR
95	0.3200	0.3854	162	163	133	143	168	173	214	17.5	470	A345PA10100CB51IMR
120	0.2530	0.3052	184	185	153	164	195	201	249	18.8	555	A346PA10100CB51IMR
150	0.2060	0.2490	206	207	174	185	225	232	285	20.9	680	A347PA10100CB51IMR
185	0.1640	0.1989	235	234	200	212	262	270	329	23.2	845	A348PA10100CB51IMR
240	0.1250	0.1527	272	272	235	248	313	322	392	26.1	1075	A349PA10100CB51IMR
300	0.1000	0.1233	307	307	270	283	363	375	454	29.1	1330	A350PA10100CB51IMR
400	0.0778	0.0975	350	350	311	327	426	439	531	32.3	1665	A351PA10100CB51IMF
500	0.0605	0.0779	398	399	359	378	499	514	625	36.3	2095	A352PA10100CB51IMF
630	0.0469	0.0630	451	451	411	435	580	598	733	40.1	2595	A353PA10100CB51IMF
800	0.0367	0.0524	503	503	464	494	665	686	852	44.1	3220	A354PA10100CB51IMF
1000	0.0291	0.0450	561	563	523	569	782	809	1022	52.8	4080	A255PA10100CB51IMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, PVC Insulated, Double PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together.

Filling

Extruded layer of Polyvinyl Chloride (PVC) .

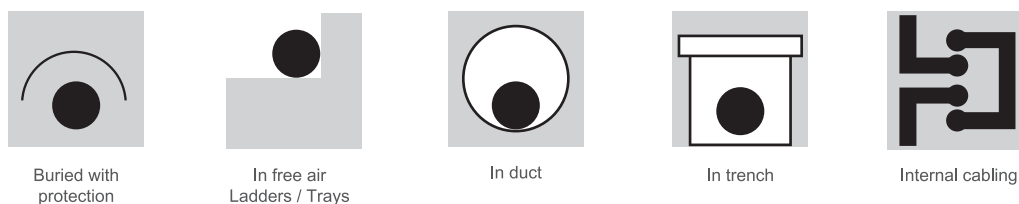
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
1.5	rm	12.1000	14.4777	27	19	21	11.9	200	C208PA10200CB012MR		
2.5	rm	7.4100	8.8661	36	24	28	12.8	245	C210PA10200CB012MR		
4	rm	4.6100	5.5159	47	32	38	14.7	330	C212PA10200CB012MR		
6	rm	3.0800	3.6853	58	40	48	15.8	405	C213PA10200CB012MR		
10	rm	1.8300	2.1898	76	53	65	17.0	500	C314PA10200CB012MR		
16	rm	1.1500	1.3763	98	70	86	19.0	675	C315PA10200CB012MR		
25	rm	0.7270	0.8703	127	92	116	22.1	960	C316PA10200CB012MR		
35	rm	0.5240	0.6276	152	111	142	24.2	1220	C317PA10200CB012MR		
Three Core Cables											
1.5	rm	12.1000	14.4777	23	15	18	12.4	230	C208PA10300CB042MR		
2.5	rm	7.4100	8.8661	29	20	23	13.4	280	C210PA10300CB042MR		
4	rm	4.6100	5.5159	38	26	32	15.4	390	C212PA10300CB042MR		
6	rm	3.0800	3.6853	48	33	40	16.7	480	C213PA10300CB042MR		
10	rm	1.8300	2.1898	63	43	55	18.4	580	C314PA10300CB042MR		
16	rm	1.1500	1.3763	81	57	72	20.6	790	C315PA10300CB042MR		
25	rm	0.7270	0.8703	105	75	98	23.6	1120	C316PA10300CB042MR		
35	sm	0.5240	0.6276	117	85	107	23.2	1360	C417PA10300CB042MR		
50	sm	0.3870	0.4639	139	103	131	26.6	1785	C418PA10300CB042MR		
70	sm	0.2680	0.3220	170	128	166	30.3	2485	C419PA10300CB042MR		
95	sm	0.1930	0.2328	204	156	204	34.5	3345	C445PA10300CB042MR		
120	sm	0.1530	0.1856	231	178	235	36.4	4090	C446PA10300CB042MF		
Four Core Cables											
1.5	rm	12.1000	14.4777	23	15	18	13.3	265	C208PA10400CB082MR		
2.5	rm	7.4100	8.8661	29	20	23	14.3	330	C210PA10400CB082MR		
4	rm	4.6100	5.5159	38	26	32	16.6	465	C212PA10400CB082MR		
6	rm	3.0800	3.6853	48	33	40	18.0	585	C213PA10400CB082MR		
10	rm	1.8300	2.1898	63	43	55	19.9	725	C314PA10400CB082MR		
16	rm	1.1500	1.3763	81	57	72	22.3	985	C315PA10400CB082MR		
25	rm	0.7270	0.8703	105	75	98	26.1	1430	C316PA10400CB082MR		
35	sm	0.5240	0.6276	117	85	107	26.5	1765	C417PA10400CB082MR		
50	sm	0.3870	0.4639	139	103	131	31.1	2375	C418PA10400CB082MR		
70	sm	0.2680	0.3220	170	128	166	34.9	3250	C419PA10400CB082MR		
95	sm	0.1930	0.2328	204	156	204	38.6	4375	C445PA10400CB082MR		
120	sm	0.1530	0.1856	231	178	235	42.6	5445	C446PA10400CB082MF		
150	sm	0.1240	0.1514	259	203	270	47.1	6660	C447PA10400CB082MF		
185	sm	0.0991	0.1224	292	232	311	52.5	8310	C448PA10400CB082MF		
240	sm	0.0754	0.0952	338	272	370	58.8	10705	C449PA10400CB082MS		
300	sm	0.0601	0.0780	381	310	426	64.9	13320	C450PA10400CB082MS		
400	sm	0.0470	0.0638	431	357	495	73.9	17050	C451PA10400CB082MS		
500	sm	0.0366	0.0531	484	405	568	81.4	21815	C452PA10400CB082MS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.8703 / 1.3763	105	75	98	25.1	1335	C334PA10400CB082MR
35	sm	16	rm	0.5240 / 1.1500	0.6276 / 1.3763	117	85	107	26.5	1610	C435PA10400CB082MR
50	sm	25	rm	0.3870 / 0.7270	0.4639 / 0.8703	139	103	131	30.7	2155	C436PA10400CB082MR
70	sm	35	sm	0.2680 / 0.5240	0.3220 / 0.6276	170	128	166	33.3	2945	C437PA10400CB082MR
95	sm	50	sm	0.1930 / 0.3870	0.2328 / 0.4639	204	156	204	37.1	3935	C438PA10400CB082MR
120	sm	70	sm	0.1530 / 0.2680	0.1856 / 0.3220	231	178	235	40.9	4965	C439PA10400CB082MF
150	sm	70	sm	0.1240 / 0.2680	0.1514 / 0.3220	259	203	270	44.7	5905	C440PA10400CB082MF
185	sm	95	sm	0.0991 / 0.1930	0.1224 / 0.2328	292	232	311	49.6	7390	C441PA10400CB082MF
240	sm	120	sm	0.0754 / 0.1530	0.0952 / 0.1856	338	272	370	56.0	9510	C442PA10400CB082MS
300	sm	150	sm	0.0601 / 0.1240	0.0780 / 0.1514	381	310	426	61.8	11800	C443PA10400CB082MS
400	sm	185	sm	0.0470 / 0.0991	0.0638 / 0.1224	431	357	495	69.9	14980	C444PA10400CB082MS
500	sm	240	sm	0.0366 / 0.0754	0.0531 / 0.0952	484	405	568	77.3	18155	C466PA10400CB082MS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, XLPE Insulated, Double PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together.

Filling

Extruded layer of Polyvinyl Chloride (PVC) .

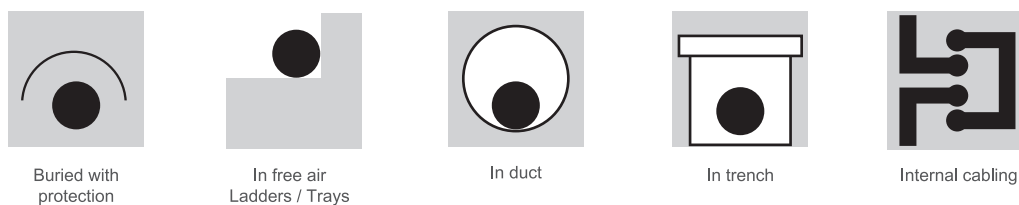
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST2) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
1.5	rm	12.1000	15.4287	33	22	28	11.5	185	C208XA10200MB012MR		
2.5	rm	7.4100	9.4485	43	29	36	12.4	225	C210XA10200MB012MR		
4	rm	4.6100	5.8783	56	38	48	13.5	280	C212XA10200MB012MR		
6	rm	3.0800	3.9274	69	48	61	14.6	345	C213XA10200MB012MR		
10	rm	1.8300	2.3336	91	63	82	15.8	440	C314XA10200MB012MR		
16	rm	1.1500	1.4667	118	83	110	17.8	605	C315XA10200MB012MR		
25	rm	0.7270	0.9275	153	110	149	20.9	875	C316XA10200MB012MR		
35	rm	0.5240	0.6688	183	133	183	23.0	1120	C317XA10200MB012MR		
Three Core Cables											
1.5	rm	12.1000	15.4287	27	18	23	12.0	205	C208XA10300MB042MR		
2.5	rm	7.4100	9.4485	35	24	30	13.0	255	C210XA10300MB042MR		
4	rm	4.6100	5.8783	46	31	40	14.1	325	C212XA10300MB042MR		
6	rm	3.0800	3.9274	57	39	51	15.4	410	C213XA10300MB042MR		
10	rm	1.8300	2.3336	75	53	70	17.1	520	C314XA10300MB042MR		
16	rm	1.1500	1.4667	97	69	93	19.3	720	C315XA10300MB042MR		
25	rm	0.7270	0.9275	126	92	126	22.6	1035	C316XA10300MB042MR		
35	sm	0.5240	0.6688	144	105	141	22.0	1265	C417XA10300MB042MR		
50	sm	0.3870	0.4944	171	127	173	25.0	1650	C418XA10300MB042MR		
70	sm	0.2680	0.3431	209	159	220	28.9	2330	C419XA10300MB042MR		
95	sm	0.1930	0.2481	251	193	271	32.3	3115	C445XA10300MB042MR		
120	sm	0.1530	0.1976	286	223	317	35.6	3875	C446XA10300MB042MF		
Four Core Cables											
1.5	rm	12.1000	15.4287	27	18	23	12.8	235	C208XA10400MB082MR		
2.5	rm	7.4100	9.4485	35	24	30	13.9	300	C210XA10400MB082MR		
4	rm	4.6100	5.8783	46	31	40	15.2	385	C212XA10400MB082MR		
6	rm	3.0800	3.9274	57	39	51	16.5	495	C213XA10400MB082MR		
10	rm	1.8300	2.3336	75	53	70	18.4	650	C314XA10400MB082MR		
16	rm	1.1500	1.4667	97	69	93	20.9	900	C315XA10400MB082MR		
25	rm	0.7270	0.9275	126	92	126	24.6	1315	C316XA10400MB082MR		
35	sm	0.5240	0.6688	144	105	141	25.0	1640	C417XA10400MB082MR		
50	sm	0.3870	0.4944	171	127	173	28.7	2160	C418XA10400MB082MR		
70	sm	0.2680	0.3431	209	159	220	33.2	3045	C419XA10400MB082MR		
95	sm	0.1930	0.2481	251	193	271	35.9	4065	C445XA10400MB082MR		
120	sm	0.1530	0.1976	286	223	317	40.4	5130	C446XA10400MB082MF		
150	sm	0.1240	0.1612	319	252	360	44.9	6290	C447XA10400MB082MF		
185	sm	0.0991	0.1302	361	288	416	49.9	7815	C448XA10400MB082MF		
240	sm	0.0754	0.1012	417	339	495	56.1	10125	C449XA10400MB082MS		
300	sm	0.0601	0.0829	470	386	570	61.7	12595	C450XA10400MB082MS		
400	sm	0.0470	0.0676	533	444	665	70.7	16170	C451XA10400MB082MS		
500	sm	0.0366	0.0561	598	505	764	78.2	20775	C452XA10400MB082MS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.9275 / 1.4667	126	92	126	23.7	1230	C334XA10400MB082MR
35	sm	16	rm	0.5240 / 1.1500	0.6688 / 1.4667	144	105	141	25.0	1485	C435XA10400MB082MR
50	sm	25	rm	0.3870 / 0.7270	0.4944 / 0.9275	171	127	173	28.5	1960	C436XA10400MB082MR
70	sm	35	sm	0.2680 / 0.5240	0.3431 / 0.6688	209	159	220	31.6	2735	C437XA10400MB082MR
95	sm	50	sm	0.1930 / 0.3870	0.2481 / 0.4944	251	193	271	35.4	3645	C438XA10400MB082MR
120	sm	70	sm	0.1530 / 0.2680	0.1976 / 0.3431	286	223	317	38.3	4605	C439XA10400MB082MF
150	sm	70	sm	0.1240 / 0.2680	0.1612 / 0.3431	319	252	360	42.5	5545	C440XA10400MB082MF
185	sm	95	sm	0.0991 / 0.1930	0.1302 / 0.2481	361	288	416	47.4	6950	C441XA10400MB082MF
240	sm	120	sm	0.0754 / 0.1530	0.1012 / 0.1976	417	339	495	53.3	8965	C442XA10400MB082MS
300	sm	150	sm	0.0601 / 0.1240	0.0829 / 0.1612	470	386	570	58.6	11110	C443XA10400MB082MS
400	sm	185	sm	0.0470 / 0.0991	0.0676 / 0.1302	533	444	665	66.3	14055	C444XA10400MB082MS
500	sm	240	sm	0.0366 / 0.0754	0.0561 / 0.1012	598	505	764	74.1	17695	C466XA10400MB082MS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, PVC Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION




Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

-  Red, Black
-  Red, Yellow, Blue
-  Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

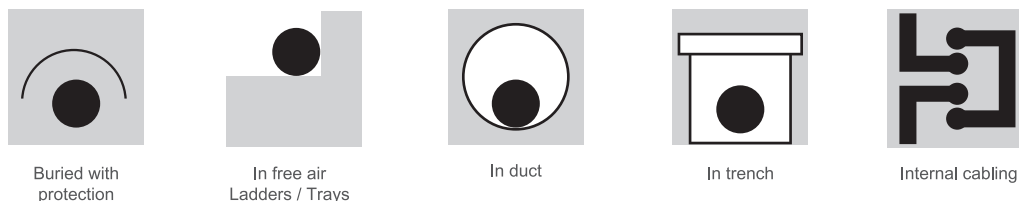
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
1.5	rm	12.1000	14.4777	27	19	21	9.9	145	C208PA10200CB01IMR		
2.5	rm	7.4100	8.8661	36	24	28	10.8	185	C210PA10200CB01IMR		
4	rm	4.6100	5.5159	47	32	38	12.7	260	C212PA10200CB01IMR		
6	rm	3.0800	3.6853	58	40	48	13.8	330	C213PA10200CB01IMR		
10	rm	1.8300	2.1898	76	53	65	15.0	420	C314PA10200CB01IMR		
16	rm	1.1500	1.3763	98	70	86	17.0	580	C315PA10200CB01IMR		
25	rm	0.7270	0.8703	127	92	116	20.1	855	C316PA10200CB01IMR		
35	rm	0.5240	0.6276	152	111	142	22.2	1100	C317PA10200CB01IMR		
Three Core Cables											
1.5	rm	12.1000	14.4777	23	15	18	10.4	170	C208PA10300CB04IMR		
2.5	rm	7.4100	8.8661	29	20	23	11.4	220	C210PA10300CB04IMR		
4	rm	4.6100	5.5159	38	26	32	13.4	315	C212PA10300CB04IMR		
6	rm	3.0800	3.6853	48	33	40	14.7	400	C213PA10300CB04IMR		
10	rm	1.8300	2.1898	63	43	55	16.4	500	C314PA10300CB04IMR		
16	rm	1.1500	1.3763	81	57	72	18.6	720	C315PA10300CB04IMR		
25	rm	0.7270	0.8703	105	75	98	21.9	1020	C316PA10300CB04IMR		
35	sm	0.5240	0.6276	117	85	107	21.2	1310	C417PA10300CB04IMR		
50	sm	0.3870	0.4639	139	103	131	24.6	1715	C418PA10300CB04IMR		
70	sm	0.2680	0.3220	170	128	166	27.7	2355	C419PA10300CB04IMR		
95	sm	0.1930	0.2328	204	156	204	32.1	3205	C445PA10300CB04IMR		
120	sm	0.1530	0.1856	231	178	235	34.0	3940	C446PA10300CB04IMF		
Four Core Cables											
1.5	rm	12.1000	14.4777	23	15	18	11.3	205	C208PA10400CB08IMR		
2.5	rm	7.4100	8.8661	29	20	23	12.3	265	C210PA10400CB08IMR		
4	rm	4.6100	5.5159	38	26	32	14.6	385	C212PA10400CB08IMR		
6	rm	3.0800	3.6853	48	33	40	16.0	500	C213PA10400CB08IMR		
10	rm	1.8300	2.1898	63	43	55	17.9	670	C314PA10400CB08IMR		
16	rm	1.1500	1.3763	81	57	72	20.3	920	C315PA10400CB08IMR		
25	rm	0.7270	0.8703	105	75	98	24.1	1295	C316PA10400CB08IMR		
35	sm	0.5240	0.6276	117	85	107	24.5	1665	C417PA10400CB08IMR		
50	sm	0.3870	0.4639	139	103	131	28.7	2220	C418PA10400CB08IMR		
70	sm	0.2680	0.3220	170	128	166	32.3	3055	C419PA10400CB08IMR		
95	sm	0.1930	0.2328	204	156	204	36.2	4200	C445PA10400CB08IMR		
120	sm	0.1530	0.1856	231	178	235	39.6	5185	C446PA10400CB08IMF		
150	sm	0.1240	0.1514	259	203	270	44.3	6390	C447PA10400CB08IMF		
185	sm	0.0991	0.1224	292	232	311	49.1	7905	C448PA10400CB08IMF		
240	sm	0.0754	0.0952	338	272	370	55.6	10280	C449PA10400CB08IMS		
300	sm	0.0601	0.0780	381	310	426	61.7	12840	C450PA10400CB08IMS		
400	sm	0.0470	0.0638	431	357	495	70.3	16455	C451PA10400CB08IMS		
500	sm	0.0366	0.0531	484	405	568	77.8	21170	C452PA10400CB08IMS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.8703 / 1.3763	105	75	98	23.1	1215	C334PA10400CB08IMR
35	sm	16	rm	0.5240 / 1.1500	0.6276 / 1.3763	117	85	107	24.5	1480	C435PA10400CB08IMR
50	sm	25	rm	0.3870 / 0.7270	0.4639 / 0.8703	139	103	131	28.7	2005	C436PA10400CB08IMR
70	sm	35	sm	0.2680 / 0.5240	0.3220 / 0.6276	170	128	166	32.3	2745	C437PA10400CB08IMR
95	sm	50	sm	0.1930 / 0.3870	0.2328 / 0.4639	204	156	204	36.2	3700	C438PA10400CB08IMR
120	sm	70	sm	0.1530 / 0.2680	0.1856 / 0.3220	231	178	235	39.6	4665	C439PA10400CB08IMF
150	sm	70	sm	0.1240 / 0.2680	0.1514 / 0.3220	259	203	270	44.3	5605	C440PA10400CB08IMF
185	sm	95	sm	0.0991 / 0.1930	0.1224 / 0.2328	292	232	311	49.1	7035	C441PA10400CB08IMF
240	sm	120	sm	0.0754 / 0.1530	0.0952 / 0.1856	338	272	370	55.6	9045	C442PA10400CB08IMS
300	sm	150	sm	0.0601 / 0.1240	0.0780 / 0.1514	381	310	426	61.7	11290	C443PA10400CB08IMS
400	sm	185	sm	0.0470 / 0.0991	0.0638 / 0.1224	431	357	495	70.3	14375	C444PA10400CB08IMS
500	sm	240	sm	0.0366 / 0.0754	0.0531 / 0.0952	484	405	568	77.8	18415	C466PA10400CB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Aluminum Conductors, PVC Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION




Conductor

Stranded circular (rm) or sector shaped (sm) aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

-  Red, Black
-  Red, Yellow, Blue
-  Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

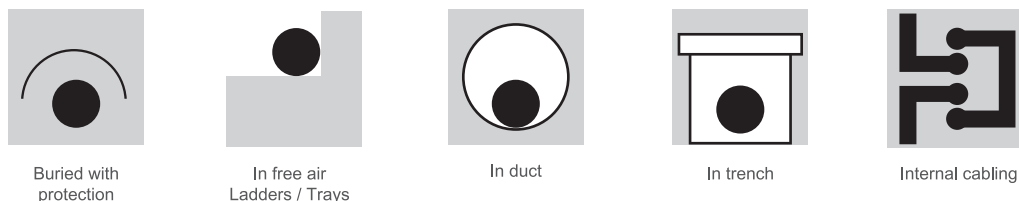
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code	
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
10	rm	3.0800	3.7007	59	41	50	15.0	300	A314PA10200CB01MR
16	rm	1.9100	2.2950	76	54	66	17.0	390	A315PA10200CB01MR
25	rm	1.2000	1.4421	99	71	90	19.6	535	A316PA10200CB01MR
35	rm	0.8680	1.0433	118	86	110	22.2	680	A317PA10200CB01MR
Three Core Cables									
10	rm	3.0800	3.7007	48	33	42	16.4	320	A314PA10300CB04IMR
16	rm	1.9100	2.2950	63	44	56	18.6	430	A315PA10300CB04IMR
25	rm	1.2000	1.4421	81	58	76	21.3	555	A316PA10300CB04IMR
35	sm	0.8680	1.0433	90	66	83	21.2	670	A417PA10300CB04IMR
50	sm	0.6410	0.7707	108	80	102	24.6	1715	A418PA10300CB04IMR
70	sm	0.4430	0.5331	132	99	129	27.7	2355	A419PA10300CB04IMR
95	sm	0.3200	0.3856	158	121	159	32.1	3205	A445PA10300CB04IMR
120	sm	0.2530	0.3055	180	138	183	34.0	3940	A446PA10300CB04IMF
Four Core Cables									
10	rm	3.0800	3.7007	48	33	42	17.9	435	A314PA10400CB08IMR
16	rm	1.9100	2.2950	63	44	56	20.3	535	A315PA10400CB08IMR
25	rm	1.2000	1.4421	81	58	76	23.4	675	A316PA10400CB08IMR
35	sm	0.8680	1.0433	90	66	83	24.5	815	A417PA10400CB08IMR
50	sm	0.6410	0.7707	108	80	102	28.7	1075	A418PA10400CB08IMR
70	sm	0.4430	0.5331	132	99	129	32.3	1380	A419PA10400CB08IMR
95	sm	0.3200	0.3856	158	121	159	36.2	1890	A445PA10400CB08IMR
120	sm	0.2530	0.3055	180	138	183	39.6	2270	A446PA10400CB08IMF
150	sm	0.2060	0.2494	202	158	210	44.3	2785	A447PA10400CB08IMF
185	sm	0.1640	0.1994	229	181	243	49.1	3395	A448PA10400CB08IMF
240	sm	0.1250	0.1533	265	214	290	55.6	4390	A449PA10400CB08IMS
300	sm	0.1000	0.1240	300	244	336	61.7	5375	A450PA10400CB08IMS
400	sm	0.0778	0.0984	344	285	396	70.3	6900	A451PA10400CB08IMS
500	sm	0.0605	0.0789	392	328	460	77.8	8640	A452PA10400CB08IMS
Four Core Cables with Reduced Neutral									
50 sm	25 rm	0.6410 / 1.2000	0.7707 / 1.4421	108	80	102	28.7	995	A436PA10400CB08IMR
70 sm	35 sm	0.4430 / 0.8680	0.5331 / 1.0433	132	99	129	30.9	1275	A437PA10400CB08IMR
95 sm	50 sm	0.3200 / 0.6410	0.3856 / 0.7707	158	121	159	34.5	1680	A438PA10400CB08IMR
120 sm	70 sm	0.2530 / 0.4430	0.3055 / 0.5331	180	138	183	37.9	2060	A439PA10400CB08IMF
150 sm	70 sm	0.2060 / 0.4430	0.2494 / 0.5331	202	158	210	41.9	2485	A440PA10400CB08IMF
185 sm	95 sm	0.1640 / 0.3200	0.1994 / 0.3856	229	181	243	46.6	3070	A441PA10400CB08IMF
240 sm	120 sm	0.1250 / 0.2530	0.1533 / 0.3055	265	214	290	52.6	3900	A442PA10400CB08IMS
300 sm	150 sm	0.1000 / 0.2060	0.1240 / 0.2494	300	244	336	58.4	4790	A443PA10400CB08IMS
400 sm	185 sm	0.0778 / 0.1640	0.0984 / 0.1994	344	285	396	66.3	6085	A444PA10400CB08IMS
500 sm	240 sm	0.0605 / 0.1250	0.0789 / 0.1533	392	328	460	73.5	7545	A466PA10400CB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Copper Conductors, PVC Insulated, Aluminium Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular or circular compacted copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

 Red

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Single layer of round non-magnetic (aluminium) wires.

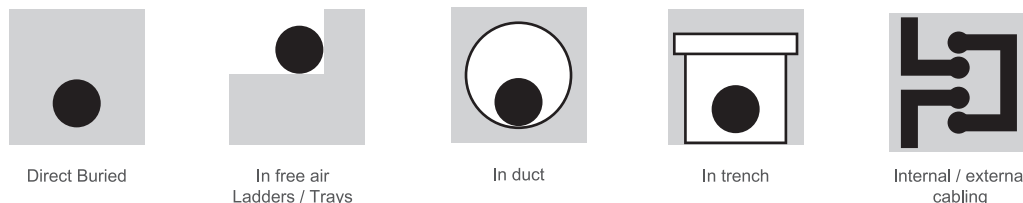
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

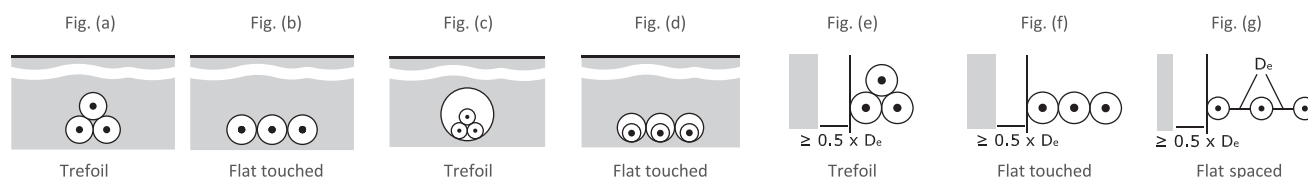
Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
6	3.0800	3.6853	48	48	40	44	45	46	56	13.6	280	C213PA1010ACB51IMR
10	1.8300	2.1897	63	63	53	58	60	62	75	14.2	330	C314PA1010ACB51IMR
16	1.1500	1.3761	81	81	68	74	79	81	99	15.2	410	C315PA1010ACB51IMR
25	0.7270	0.8701	104	104	87	95	104	106	129	16.8	540	C316PA1010ACB51IMR
35	0.5240	0.6273	124	123	104	113	127	129	156	18.0	665	C317PA1010ACB51IMR
50	0.3870	0.4635	146	145	123	132	153	155	185	19.6	825	C318PA1010ACB51IMR
70	0.2680	0.3214	177	176	151	161	190	193	229	21.4	1065	C319PA1010ACB51IMR
95	0.1930	0.2320	209	208	181	189	232	233	272	23.4	1370	C345PA1010ACB51IMR
120	0.1530	0.1844	236	233	205	212	266	265	307	24.9	1640	C346PA1010ACB51IMR
150	0.1240	0.1501	263	259	229	234	302	299	340	26.8	1960	C347PA1010ACB51IMR
185	0.0991	0.1208	293	287	258	258	345	337	379	29.1	2380	C348PA1010ACB51IMR
240	0.0754	0.0933	333	324	296	287	402	386	425	32.0	3010	C349PA1010ACB51IMR
300	0.0601	0.0757	363	349	325	303	452	422	454	35.8	3755	C350PA1010ACB51IMR
400	0.0470	0.0611	397	380	360	326	508	464	493	39.4	4740	C351PA1010ACB51IMR
500	0.0366	0.0499	432	410	395	348	568	507	535	43.4	5965	C352PA1010ACB51IMF
630	0.0283	0.0415	465	438	429	368	627	547	574	47.4	7395	C353PA1010ACB51IMF
800	0.0221	0.0352	477	452	444	382	664	572	613	52.7	9480	C354PA1010ACB51IMF
1000	0.0176	0.0312	503	476	475	408	729	623	678	61.5	11840	C255PA1010ACB51IMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Aluminum Conductors, PVC Insulated, Aluminium Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Stranded circular or circular compacted aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

 Red

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Single layer of round non-magnetic (aluminium) wires.

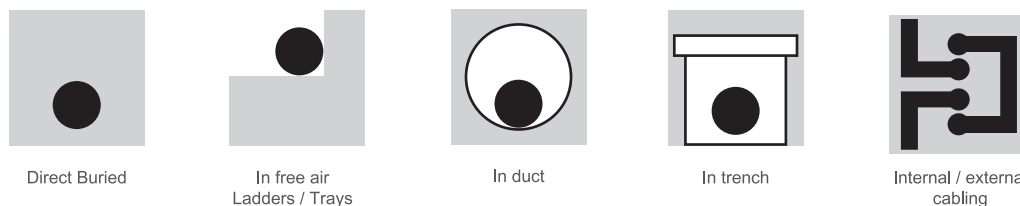
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

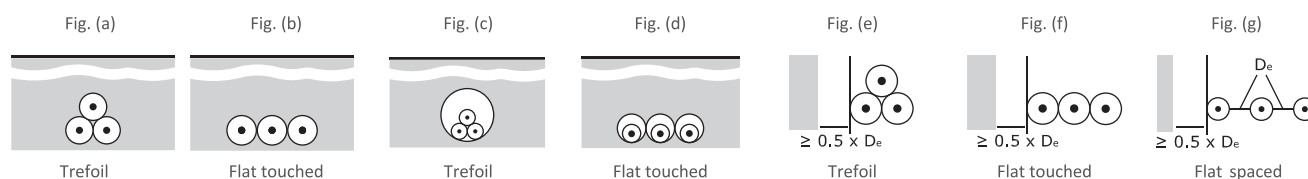
Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
10	3.0800	3.7007	50	50	42	46	48	49	60	14.2	270	A314PA1010ACB51IMR
16	1.9100	2.2949	63	63	52	58	61	63	77	15.2	315	A315PA1010ACB51IMR
25	1.2000	1.4419	81	81	68	74	81	83	101	16.8	390	A316PA1010ACB51IMR
35	0.8680	1.0431	96	96	81	88	99	101	122	18.0	455	A317PA1010ACB51IMR
50	0.6410	0.7704	113	113	96	104	119	121	146	19.6	540	A318PA1010ACB51IMR
70	0.4430	0.5327	138	138	118	126	149	151	181	21.4	650	A319PA1010ACB51IMR
95	0.3200	0.3851	164	163	141	150	181	184	217	23.4	790	A345PA1010ACB51IMR
120	0.2530	0.3048	185	184	161	169	209	211	247	24.9	910	A346PA1010ACB51IMR
150	0.2060	0.2486	207	205	181	188	238	238	277	26.8	1060	A347PA1010ACB51IMR
185	0.1640	0.1984	233	230	205	210	273	272	312	29.1	1255	A348PA1010ACB51IMR
240	0.1250	0.1521	267	262	237	239	321	316	357	32.0	1535	A349PA1010ACB51IMR
300	0.1000	0.1225	296	288	265	258	367	353	390	35.8	1920	A350PA1010ACB51IMR
400	0.0778	0.0966	330	320	299	283	420	397	432	39.4	2355	A351PA1010ACB51IMR
500	0.0605	0.0768	367	353	335	309	479	444	478	43.4	2870	A352PA1010ACB51IMF
630	0.0469	0.0617	403	385	372	334	541	490	523	47.4	3470	A353PA1010ACB51IMF
800	0.0367	0.0506	426	408	397	353	589	525	569	52.8	4390	A354PA1010ACB51IMF
1000	0.0291	0.0431	458	438	432	383	660	581	637	61.5	5455	A255PA1010ACB51IMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, PVC Insulated, Steel Tape Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Double layers of galvanized steel tapes.

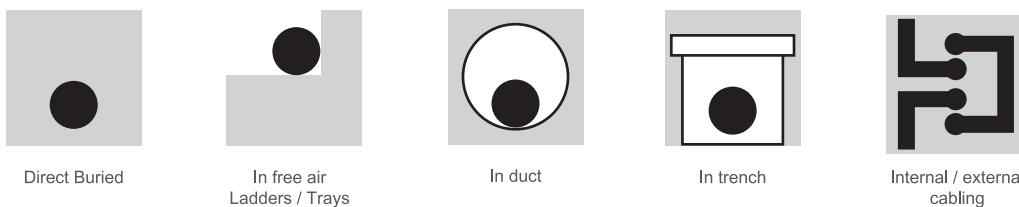
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification color(s) shown above is/are the most common. However, any other color can be provided upon a customer's request.(e.g. to HD 308 S2 or IEC 60445)



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
6	rm	3.0800	3.6853	56	41	49	16.6	495	C213PA1020GCB01IMR		
10	rm	1.8300	2.1898	74	54	65	17.8	600	C314PA1020GCB01IMR		
16	rm	1.1500	1.3763	95	71	86	19.8	785	C315PA1020GCB01IMR		
25	rm	0.7270	0.8703	123	93	115	22.9	1095	C316PA1020GCB01IMR		
35	rm	0.5240	0.6276	147	112	140	25.0	1365	C317PA1020GCB01IMR		
Three Core Cables											
6	rm	3.0800	3.6853	46	33	41	17.5	575	C213PA1030GCB04IMR		
10	rm	1.8300	2.1898	61	44	55	19.2	685	C314PA1030GCB04IMR		
16	rm	1.1500	1.3763	79	58	72	21.4	910	C315PA1030GCB04IMR		
25	rm	0.7270	0.8703	102	75	97	24.7	1265	C316PA1030GCB04IMR		
35	sm	0.5240	0.6276	114	86	106	24.0	1500	C417PA1030GCB04IMR		
50	sm	0.3870	0.4639	135	103	130	27.6	1960	C418PA1030GCB04IMR		
70	sm	0.2680	0.3220	165	128	162	31.1	2665	C419PA1030GCB04IMR		
95	sm	0.1930	0.2328	199	157	202	36.7	3900	C445PA1030GCB04IMF		
120	sm	0.1530	0.1856	225	178	231	38.6	4675	C446PA1030GCB04IMF		
Four Core Cables											
4	rm	4.6100	5.5159	37	27	32	17.4	560	C212PA1040GCB08IMR		
6	rm	3.0800	3.6853	46	33	41	18.8	690	C213PA1040GCB08IMR		
10	rm	1.8300	2.1898	61	44	55	20.7	840	C314PA1040GCB08IMR		
16	rm	1.1500	1.3763	79	58	72	23.1	1115	C315PA1040GCB08IMR		
25	rm	0.7270	0.8703	102	75	97	26.9	1590	C316PA1040GCB08IMR		
35	sm	0.5240	0.6276	114	86	106	27.3	1925	C417PA1040GCB08IMR		
50	sm	0.3870	0.4639	135	103	130	32.1	2580	C418PA1040GCB08IMR		
70	sm	0.2680	0.3220	165	128	162	36.9	3790	C419PA1040GCB08IMR		
95	sm	0.1930	0.2328	199	157	202	40.8	5000	C445PA1040GCB08IMF		
120	sm	0.1530	0.1856	225	178	231	44.6	6105	C446PA1040GCB08IMF		
150	sm	0.1240	0.1514	252	203	264	49.3	7420	C447PA1040GCB08IMF		
185	sm	0.0991	0.1224	284	231	303	54.5	9130	C448PA1040GCB08IMS		
240	sm	0.0754	0.0952	327	270	356	61.0	11655	C449PA1040GCB08IMS		
300	sm	0.0601	0.0780	366	305	407	67.1	14370	C450PA1040GCB08IMS		
400	sm	0.0470	0.0638	414	350	471	76.1	18245	C451PA1040GCB08IMS		
500	sm	0.0366	0.0531	462	394	535	85.0	23960	C452PA1040GCB08IMS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.8703 / 1.3763	102	75	97	25.9	1485	C334PA1040GCB08IMR
35	sm	16	rm	0.5240 / 1.1500	0.6276 / 1.3763	114	86	106	27.3	1770	C435PA1040GCB08IMR
50	sm	25	rm	0.3870 / 0.7270	0.4639 / 0.8703	135	103	130	31.5	2340	C436PA1040GCB08IMR
70	sm	35	sm	0.2680 / 0.5240	0.3220 / 0.6276	165	128	162	34.1	3110	C437PA1040GCB08IMR
95	sm	50	sm	0.1930 / 0.3870	0.2328 / 0.4639	199	157	202	39.1	4475	C438PA1040GCB08IMF
120	sm	70	sm	0.1530 / 0.2680	0.1856 / 0.3220	225	178	231	42.9	5565	C439PA1040GCB08IMF
150	sm	70	sm	0.1240 / 0.2680	0.1514 / 0.3220	252	203	264	46.9	6565	C440PA1040GCB08IMF
185	sm	95	sm	0.0991 / 0.1930	0.1224 / 0.2328	284	231	303	51.6	8100	C441PA1040GCB08IMF
240	sm	120	sm	0.0754 / 0.1530	0.0952 / 0.1856	327	270	356	58.0	10295	C442PA1040GCB08IMS
300	sm	150	sm	0.0601 / 0.1240	0.0780 / 0.1514	366	305	407	63.8	12680	C443PA1040GCB08IMS
400	sm	185	sm	0.0470 / 0.0991	0.0638 / 0.1224	414	350	471	72.1	16075	C444PA1040GCB08IMS
500	sm	240	sm	0.0366 / 0.0754	0.0531 / 0.0952	462	394	535	80.7	21085	C466PA1040GCB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Aluminium Conductors, PVC Insulated, Steel Tape Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Stranded circular (rm) or sector shaped (sm) aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Double layers of galvanized steel tapes.

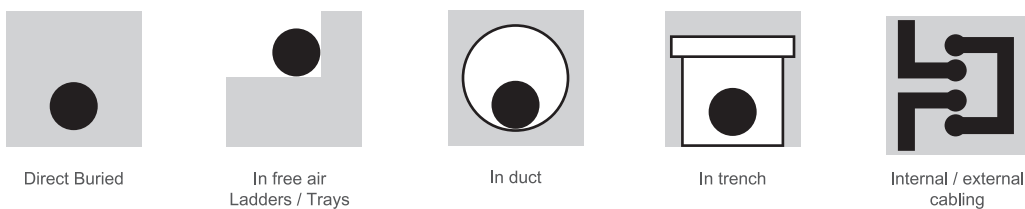
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
10	rm	3.0800	3.7007	57	42	50	17.8	480	A314PA1020GCB01IMR
16	rm	1.9100	2.2950	74	55	67	19.8	590	A315PA1020GCB01IMR
25	rm	1.2000	1.4421	96	72	89	22.4	765	A316PA1020GCB01IMR
35	rm	0.8680	1.0433	114	87	109	25.0	945	A317PA1020GCB01IMR
Three Core Cables									
10	rm	3.0800	3.7007	47	34	42	19.2	505	A314PA1030GCB04IMR
16	rm	1.9100	2.2950	61	45	56	21.4	625	A315PA1030GCB04IMR
25	rm	1.2000	1.4421	79	59	75	24.1	795	A316PA1030GCB04IMR
35	sm	0.8680	1.0433	88	66	82	24.0	865	A417PA1030GCB04IMR
50	sm	0.6410	0.7707	105	80	101	27.6	1100	A418PA1030GCB04IMR
70	sm	0.4430	0.5331	128	100	126	31.1	1410	A419PA1030GCB04IMR
95	sm	0.3200	0.3856	155	122	157	36.7	2165	A445PA1030GCB04IMF
120	sm	0.2530	0.3055	175	139	180	38.6	2490	A446PA1030GCB04IMF
Four Core Cables									
10	rm	3.0800	3.7007	47	34	42	20.7	605	A314PA1040GCB08IMR
16	rm	1.9100	2.2950	61	45	56	23.1	735	A315PA1040GCB08IMR
25	rm	1.2000	1.4421	79	59	75	26.2	960	A316PA1040GCB08IMR
35	sm	0.8680	1.0433	88	66	82	27.3	1080	A417PA1040GCB08IMR
50	sm	0.6410	0.7707	105	80	101	32.1	1435	A418PA1040GCB08IMR
70	sm	0.4430	0.5331	128	100	126	36.9	2115	A419PA1040GCB08IMR
95	sm	0.3200	0.3856	155	122	157	40.8	2685	A445PA1040GCB08IMF
120	sm	0.2530	0.3055	175	139	180	44.6	3190	A446PA1040GCB08IMF
150	sm	0.2060	0.2494	196	158	206	49.3	3820	A447PA1040GCB08IMF
185	sm	0.1640	0.1994	222	181	237	54.5	4615	A448PA1040GCB08IMS
240	sm	0.1250	0.1533	257	212	281	61.0	5770	A449PA1040GCB08IMS
300	sm	0.1000	0.1240	290	242	323	67.1	6905	A450PA1040GCB08IMS
400	sm	0.0778	0.0984	333	281	378	76.1	8695	A451PA1040GCB08IMS
500	sm	0.0605	0.0789	377	322	436	85.0	11430	A452PA1040GCB08IMS
Four Core Cables with Reduced Neutral									
50 sm	25 rm	0.6410 / 1.2000	0.7707 / 1.4421	105	80	101	31.5	1330	A436PA1040GCB08IMR
70 sm	35 sm	0.4430 / 0.8680	0.5331 / 1.0433	128	100	126	34.1	1640	A437PA1040GCB08IMR
95 sm	50 sm	0.3200 / 0.6410	0.3856 / 0.7707	155	122	157	39.1	2455	A438PA1040GCB08IMR
120 sm	70 sm	0.2530 / 0.4430	0.3055 / 0.5331	175	139	180	42.9	2960	A439PA1040GCB08IMF
150 sm	70 sm	0.2060 / 0.4430	0.2494 / 0.5331	196	158	206	46.9	3445	A440PA1040GCB08IMF
185 sm	95 sm	0.1640 / 0.3200	0.1994 / 0.3856	222	181	237	51.6	4140	A441PA1040GCB08IMF
240 sm	120 sm	0.1250 / 0.2530	0.1533 / 0.3055	257	212	281	58.0	5150	A442PA1040GCB08IMS
300 sm	150 sm	0.1000 / 0.2060	0.1240 / 0.2494	290	242	323	63.8	6185	A443PA1040GCB08IMS
400 sm	185 sm	0.0778 / 0.1640	0.0984 / 0.1994	333	281	378	72.1	7790	A444PA1040GCB08IMS
500 sm	240 sm	0.0605 / 0.1250	0.0789 / 0.1533	377	322	436	80.7	10220	A466PA1040GCB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, PVC Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Single layer of round galvanized steel wires.

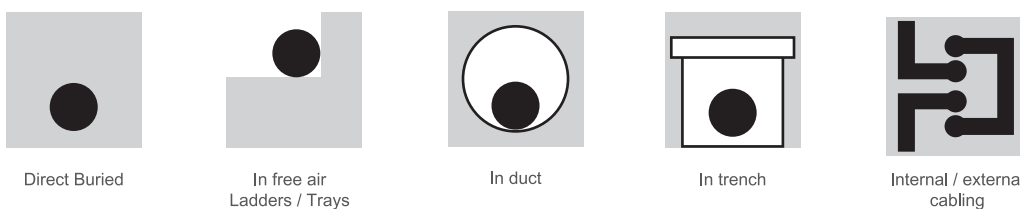
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code			
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
1.5	rm	12.1000	14.4777	27	20	23	13.5	365	C208PA1020WCB01IMR		
2.5	rm	7.4100	8.8661	35	25	30	14.4	420	C210PA1020WCB01IMR		
4	rm	4.6100	5.5159	46	34	40	16.3	535	C212PA1020WCB01IMR		
6	rm	3.0800	3.6853	57	42	51	18.3	750	C213PA1020WCB01IMR		
10	rm	1.8300	2.1898	75	56	68	19.5	870	C314PA1020WCB01IMR		
16	rm	1.1500	1.3763	97	72	89	21.5	1095	C315PA1020WCB01IMR		
25	rm	0.7270	0.8703	125	95	120	25.3	1605	C316PA1020WCB01IMR		
35	rm	0.5240	0.6276	149	115	146	27.4	1910	C317PA1020WCB01IMR		
Three Core Cables											
1.5	rm	12.1000	14.4777	22	16	19	14.0	400	C208PA1030WCB04IMR		
2.5	rm	7.4100	8.8661	29	21	25	15.0	470	C210PA1030WCB04IMR		
4	rm	4.6100	5.5159	38	27	34	17.9	725	C212PA1030WCB04IMR		
6	rm	3.0800	3.6853	47	34	42	19.2	840	C213PA1030WCB04IMR		
10	rm	1.8300	2.1898	62	45	57	20.9	980	C314PA1030WCB04IMR		
16	rm	1.1500	1.3763	80	59	75	23.1	1240	C315PA1030WCB04IMR		
25	rm	0.7270	0.8703	104	78	101	27.1	1815	C316PA1030WCB04IMR		
35	sm	0.5240	0.6276	115	88	110	26.4	2020	C417PA1030WCB04IMR		
50	sm	0.3870	0.4639	137	106	134	30.2	2595	C418PA1030WCB04IMR		
70	sm	0.2680	0.3220	167	131	168	34.5	3605	C419PA1030WCB04IMR		
95	sm	0.1930	0.2328	200	159	205	38.7	4630	C445PA1030WCB04IMF		
120	sm	0.1530	0.1856	226	180	235	40.6	5435	C446PA1030WCB04IMF		
Four Core Cables											
1.5	rm	12.1000	14.4777	22	16	19	14.9	450	C208PA1040WCB08IMR		
2.5	rm	7.4100	8.8661	29	21	25	15.9	530	C210PA1040WCB08IMR		
4	rm	4.6100	5.5159	38	27	34	19.1	820	C212PA1040WCB08IMR		
6	rm	3.0800	3.6853	47	34	42	20.5	970	C213PA1040WCB08IMR		
10	rm	1.8300	2.1898	62	45	57	22.4	1165	C314PA1040WCB08IMR		
16	rm	1.1500	1.3763	80	59	75	25.5	1630	C315PA1040WCB08IMR		
25	rm	0.7270	0.8703	104	78	101	29.3	2190	C316PA1040WCB08IMR		
35	sm	0.5240	0.6276	115	88	110	29.9	2545	C417PA1040WCB08IMR		
50	sm	0.3870	0.4639	137	106	134	35.5	3540	C418PA1040WCB08IMR		
70	sm	0.2680	0.3220	167	131	168	39.1	4535	C419PA1040WCB08IMR		
95	sm	0.1930	0.2328	200	159	205	44.0	6220	C445PA1040WCB08IMF		
120	sm	0.1530	0.1856	226	180	235	47.8	7440	C446PA1040WCB08IMF		
150	sm	0.1240	0.1514	252	205	268	52.5	8855	C447PA1040WCB08IMF		
185	sm	0.0991	0.1224	283	232	306	57.9	10765	C448PA1040WCB08IMS		
240	sm	0.0754	0.0952	325	269	358	64.2	13470	C449PA1040WCB08IMS		
300	sm	0.0601	0.0780	362	303	406	70.3	16340	C450PA1040WCB08IMS		
400	sm	0.0470	0.0638	402	342	465	80.6	21420	C451PA1040WCB08IMS		
500	sm	0.0366	0.0531	442	379	521	88.3	26650	C452PA1040WCB08IMS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.8703 / 1.3763	104	78	101	28.3	2065	C334PA1040WCB08IMR
35	sm	16	rm	0.5240 / 1.1500	0.6276 / 1.3763	115	88	110	29.9	2385	C435PA1040WCB08IMR
50	sm	25	rm	0.3870 / 0.7270	0.4639 / 0.8703	137	106	134	35.5	3300	C436PA1040WCB08IMR
70	sm	35	sm	0.2680 / 0.5240	0.3220 / 0.6276	167	131	168	39.1	4135	C437PA1040WCB08IMR
95	sm	50	sm	0.1930 / 0.3870	0.2328 / 0.4639	200	159	205	44.0	5270	C438PA1040WCB08IMF
120	sm	70	sm	0.1530 / 0.2680	0.1856 / 0.3220	226	180	235	47.8	6860	C439PA1040WCB08IMF
150	sm	70	sm	0.1240 / 0.2680	0.1514 / 0.3220	252	205	268	52.5	7945	C440PA1040WCB08IMF
185	sm	95	sm	0.0991 / 0.1930	0.1224 / 0.2328	283	232	306	57.9	9625	C441PA1040WCB08IMF
240	sm	120	sm	0.0754 / 0.1530	0.0952 / 0.1856	325	269	358	64.2	12020	C442PA1040WCB08IMS
300	sm	150	sm	0.0601 / 0.1240	0.0780 / 0.1514	362	303	406	70.3	14575	C443PA1040WCB08IMS
400	sm	185	sm	0.0470 / 0.0991	0.0638 / 0.1224	402	342	465	80.6	19105	C444PA1040WCB08IMS
500	sm	240	sm	0.0366 / 0.0754	0.0531 / 0.0952	442	379	521	88.3	23670	C466PA1040WCB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Aluminium Conductors, PVC Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Stranded circular (rm) or sector shaped (sm) aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Single layer of round galvanized steel wires.

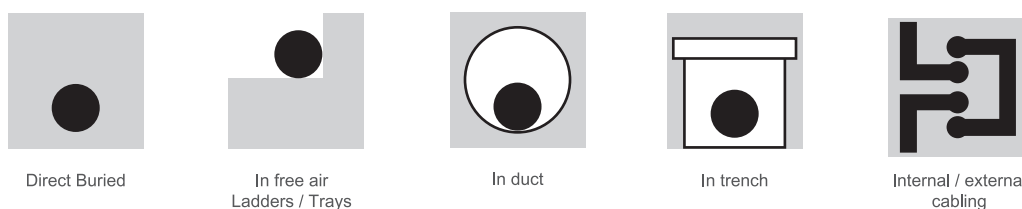
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
10	rm	3.0800	3.7007	58	43	52	19.5	750	A314PA1020WCB01IMR
16	rm	1.9100	2.2950	75	56	69	21.5	900	A315PA1020WCB01IMR
25	rm	1.2000	1.4421	97	74	93	24.8	1265	A316PA1020WCB01IMR
35	rm	0.8680	1.0433	116	89	113	27.4	1490	A317PA1020WCB01IMR
Three Core Cables									
10	rm	3.0800	3.7007	48	35	44	20.9	800	A314PA1030WCB04IMR
16	rm	1.9100	2.2950	62	46	58	23.1	955	A315PA1030WCB04IMR
25	rm	1.2000	1.4421	81	60	78	26.5	1335	A316PA1030WCB04IMR
35	sm	0.8680	1.0433	89	68	85	26.4	1385	A417PA1030WCB04IMR
50	sm	0.6410	0.7707	106	82	104	30.2	1735	A418PA1030WCB04IMR
70	sm	0.4430	0.5331	130	102	130	34.5	2350	A419PA1030WCB04IMR
95	sm	0.3200	0.3856	156	124	160	38.7	2900	A445PA1030WCB04IMF
120	sm	0.2530	0.3055	176	141	183	40.6	3250	A446PA1030WCB04IMF
Four Core Cables									
10	rm	3.0800	3.7007	48	35	44	22.4	930	A314PA1040WCB08IMR
16	rm	1.9100	2.2950	62	46	58	25.5	1245	A315PA1040WCB08IMR
25	rm	1.2000	1.4421	81	60	78	28.6	1535	A316PA1040WCB08IMR
35	sm	0.8680	1.0433	89	68	85	29.9	1695	A417PA1040WCB08IMR
50	sm	0.6410	0.7707	106	82	104	35.5	2395	A418PA1040WCB08IMR
70	sm	0.4430	0.5331	130	102	130	39.1	2860	A419PA1040WCB08IMR
95	sm	0.3200	0.3856	156	124	160	44.0	3905	A445PA1040WCB08IMF
120	sm	0.2530	0.3055	176	141	183	47.8	4525	A446PA1040WCB08IMF
150	sm	0.2060	0.2494	197	160	210	52.5	5255	A447PA1040WCB08IMF
185	sm	0.1640	0.1994	223	183	241	57.9	6255	A448PA1040WCB08IMS
240	sm	0.1250	0.1533	257	214	283	64.2	7580	A449PA1040WCB08IMS
300	sm	0.1000	0.1240	289	242	324	70.3	8885	A450PA1040WCB08IMS
400	sm	0.0778	0.0984	327	278	378	80.6	11870	A451PA1040WCB08IMS
500	sm	0.0605	0.0789	367	315	431	88.3	14120	A452PA1040WCB08IMS
Four Core Cables with Reduced Neutral									
50 sm	25 rm	0.6410 / 1.2000	0.7707 / 1.4421	106	82	104	34.9	2290	A436PA1040WCB08IMR
70 sm	35 sm	0.4430 / 0.8680	0.5331 / 1.0433	130	102	130	37.5	2665	A437PA1040WCB08IMR
95 sm	50 sm	0.3200 / 0.6410	0.3856 / 0.7707	156	124	160	41.3	3250	A438PA1040WCB08IMR
120 sm	70 sm	0.2530 / 0.4430	0.3055 / 0.5331	176	141	183	46.3	4255	A439PA1040WCB08IMF
150 sm	70 sm	0.2060 / 0.4430	0.2494 / 0.5331	197	160	210	50.1	4825	A440PA1040WCB08IMF
185 sm	95 sm	0.1640 / 0.3200	0.1994 / 0.3856	223	183	241	54.8	5660	A441PA1040WCB08IMF
240 sm	120 sm	0.1250 / 0.2530	0.1533 / 0.3055	257	214	283	61.2	6875	A442PA1040WCB08IMF
300 sm	150 sm	0.1000 / 0.2060	0.1240 / 0.2494	289	242	324	67.0	8075	A443PA1040WCB08IMS
400 sm	185 sm	0.0778 / 0.1640	0.0984 / 0.1994	327	278	378	76.6	10815	A444PA1040WCB08IMS
500 sm	240 sm	0.0605 / 0.1250	0.0789 / 0.1533	367	315	431	84.0	12800	A466PA1040WCB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Copper Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular or circular compacted copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

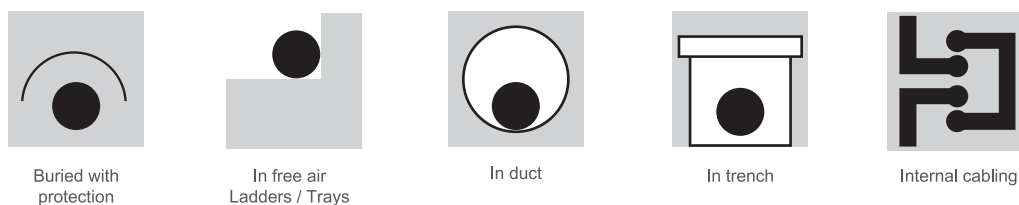
Red

Outer Jacket

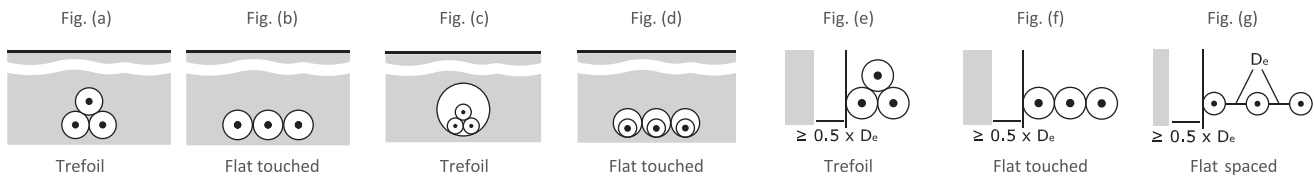
Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).

CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
1.5	12.1000	15.4287	27	28	20	23	23	23	31	5.8	50	C208XA10100MB51IMR
2.5	7.4100	9.4485	36	36	26	30	30	31	40	6.2	65	C210XA10100MB51IMR
4	4.6100	5.8782	46	46	34	38	40	41	53	6.8	85	C212XA10100MB51IMR
6	3.0800	3.9274	57	57	42	48	50	52	68	7.3	105	C213XA10100MB51IMR
10	1.8300	2.3335	75	75	56	63	68	70	91	7.9	140	C314XA10100MB51IMR
16	1.1500	1.4665	97	97	73	82	91	93	121	8.9	205	C315XA10100MB51IMR
25	0.7270	0.9273	124	124	96	106	122	125	161	10.5	300	C316XA10100MB51IMR
35	0.5240	0.6686	149	149	117	128	150	154	198	11.5	395	C317XA10100MB51IMR
50	0.3870	0.4941	175	176	140	153	183	189	240	12.9	520	C318XA10100MB51IMR
70	0.2680	0.3428	214	215	174	188	233	240	304	14.7	725	C319XA10100MB51IMR
95	0.1930	0.2476	257	256	212	227	288	297	374	16.5	980	C345XA10100MB51IMR
120	0.1530	0.1970	291	292	243	260	335	346	434	18.0	1220	C346XA10100MB51IMR
150	0.1240	0.1605	327	327	277	295	388	400	499	20.1	1500	C347XA10100MB51IMR
185	0.0991	0.1294	369	369	316	336	450	464	577	22.2	1860	C348XA10100MB51IMR
240	0.0754	0.1002	425	426	371	393	536	553	688	24.9	2415	C349XA10100MB51IMR
300	0.0601	0.0817	479	473	422	447	620	641	797	27.7	2990	C350XA10100MB51IMR
400	0.0470	0.0663	539	540	482	512	720	743	928	30.9	3845	C351XA10100MB51IMR
500	0.0366	0.0545	604	606	549	587	834	862	1084	34.9	4950	C352XA10100MB51IMF
630	0.0283	0.0454	674	673	619	668	955	986	1257	39.3	6295	C353XA10100MB51IMF
800	0.0221	0.0390	739	741	688	750	1078	1116	1440	43.6	8090	C354XA10100MB51IMF
1000	0.0176	0.0346	807	808	766	841	1234	1276	1674	52.2	10150	C255XA10100MB51IMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Aluminium Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Stranded circular or circular compacted aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

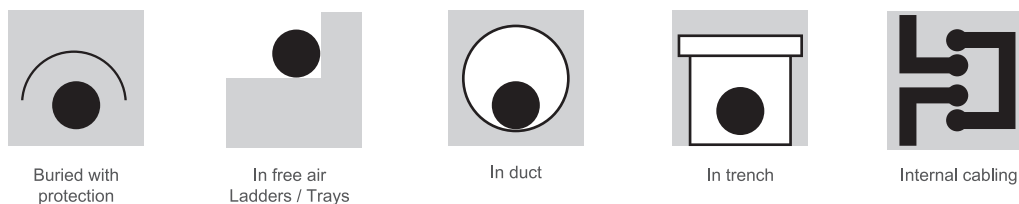
○ Red

Outer Jacket

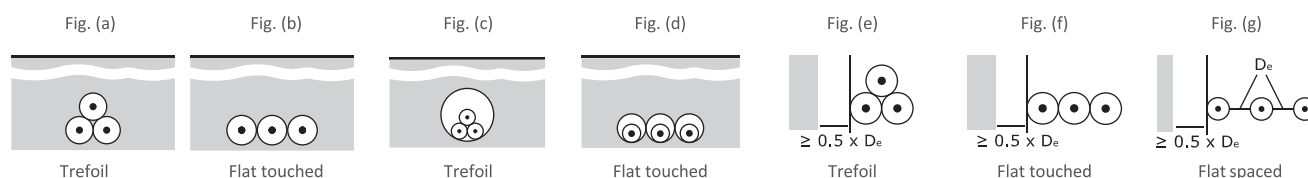
Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).

CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
10	3.0800	3.9489	60	60	45	50	54	55	72	7.9	85	A314XA10100MB51MR
16	1.9100	2.4489	75	75	57	63	70	72	94	8.9	105	A315XA10100MB51MR
25	1.2000	1.5387	96	96	75	83	94	97	125	10.5	150	A316XA10100MB51MR
35	0.8680	1.1131	116	116	90	99	116	120	153	11.5	185	A317XA10100MB51MR
50	0.6410	0.8222	136	136	109	118	142	146	186	12.9	230	A318XA10100MB51MR
70	0.4430	0.5686	166	167	135	146	181	186	236	14.7	310	A319XA10100MB51MR
95	0.3200	0.4112	199	199	164	176	224	230	290	16.5	400	A345XA10100MB51MR
120	0.2530	0.3255	226	227	189	202	261	269	337	18.0	490	A346XA10100MB51MR
150	0.2060	0.2656	254	254	215	229	301	311	387	20.1	600	A347XA10100MB51MR
185	0.1640	0.2121	288	288	247	261	351	362	449	22.2	735	A348XA10100MB51MR
240	0.1250	0.1627	333	335	291	307	421	434	536	24.9	935	A349XA10100MB51MR
300	0.1000	0.1314	378	378	333	350	489	505	622	27.7	1155	A350XA10100MB51MR
400	0.0778	0.1038	430	431	385	404	575	594	730	30.9	1465	A351XA10100MB51MR
500	0.0605	0.0828	490	492	445	468	676	699	861	34.9	1850	A352XA10100MB51MF
630	0.0469	0.0666	557	556	511	539	789	815	1008	39.3	2370	A353XA10100MB51MF
800	0.0367	0.0551	622	623	579	614	907	938	1171	43.7	2995	A354XA10100MB51MF
1000	0.0291	0.0471	692	693	657	702	1058	1094	1386	52.2	3765	A255XA10100MB51MF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION




Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

	Red, Black
	Red, Yellow, Blue
	Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

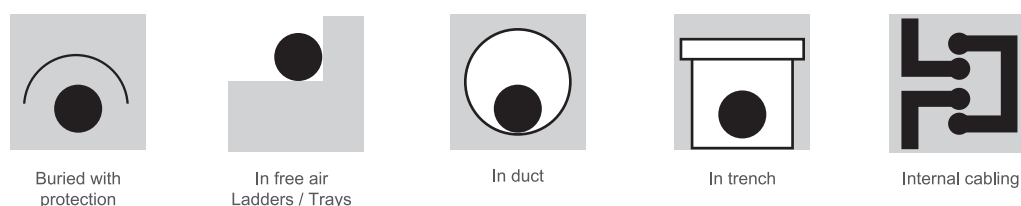
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
1.5	rm	12.1000	15.4287	33	22	28	9.5	130	C208XA10200MB01IMR		
2.5	rm	7.4100	9.4485	43	29	36	10.4	165	C210XA10200MB01IMR		
4	rm	4.6100	5.8783	56	38	48	11.5	215	C212XA10200MB01IMR		
6	rm	3.0800	3.9274	69	48	61	12.6	275	C213XA10200MB01IMR		
10	rm	1.8300	2.3336	91	63	82	13.8	365	C314XA10200MB01IMR		
16	rm	1.1500	1.4667	118	83	110	15.8	520	C315XA10200MB01IMR		
25	rm	0.7270	0.9275	153	110	149	18.9	775	C316XA10200MB01IMR		
35	rm	0.5240	0.6688	183	133	183	21.0	1010	C317XA10200MB01IMR		
Three Core Cables											
1.5	rm	12.1000	15.4287	27	18	23	10.1	150	C208XA10300MB04IMR		
2.5	rm	7.4100	9.4485	35	24	30	11.0	195	C210XA10300MB04IMR		
4	rm	4.6100	5.8783	46	31	40	12.1	260	C212XA10300MB04IMR		
6	rm	3.0800	3.9274	57	39	51	13.4	340	C213XA10300MB04IMR		
10	rm	1.8300	2.3336	75	53	70	15.1	445	C314XA10300MB04IMR		
16	rm	1.1500	1.4667	97	69	93	17.3	660	C315XA10300MB04IMR		
25	rm	0.7270	0.9275	126	92	126	20.6	940	C316XA10300MB04IMR		
35	sm	0.5240	0.6688	144	105	141	20.0	1210	C417XA10300MB04IMR		
50	sm	0.3870	0.4944	171	127	173	23.0	1580	C418XA10300MB04IMR		
70	sm	0.2680	0.3431	209	159	220	26.5	2210	C419XA10300MB04IMR		
95	sm	0.1930	0.2481	251	193	271	29.9	2970	C445XA10300MB04IMR		
120	sm	0.1530	0.1976	286	223	317	33.2	3710	C446XA10300MB04IMF		
Four Core Cables											
1.5	rm	12.1000	15.4287	27	18	23	10.8	175	C208XA10400MB08IMR		
2.5	rm	7.4100	9.4485	35	24	30	11.9	235	C210XA10400MB08IMR		
4	rm	4.6100	5.8783	46	31	40	13.2	315	C212XA10400MB08IMR		
6	rm	3.0800	3.9274	57	39	51	14.5	420	C213XA10400MB08IMR		
10	rm	1.8300	2.3336	75	53	70	16.4	600	C314XA10400MB08IMR		
16	rm	1.1500	1.4667	97	69	93	18.9	840	C315XA10400MB08IMR		
25	rm	0.7270	0.9275	126	92	126	22.6	1190	C316XA10400MB08IMR		
35	sm	0.5240	0.6688	144	105	141	23.0	1535	C417XA10400MB08IMR		
50	sm	0.3870	0.4944	171	127	173	26.5	2020	C418XA10400MB08IMR		
70	sm	0.2680	0.3431	209	159	220	30.8	2865	C419XA10400MB08IMR		
95	sm	0.1930	0.2481	251	193	271	33.5	3890	C445XA10400MB08IMR		
120	sm	0.1530	0.1976	286	223	317	37.6	4890	C446XA10400MB08IMF		
150	sm	0.1240	0.1612	319	252	360	42.1	6010	C447XA10400MB08IMF		
185	sm	0.0991	0.1302	361	288	416	47.1	7475	C448XA10400MB08IMF		
240	sm	0.0754	0.1012	417	339	495	52.9	9685	C449XA10400MB08IMS		
300	sm	0.0601	0.0829	470	386	570	58.5	12100	C450XA10400MB08IMS		
400	sm	0.0470	0.0676	533	444	665	67.1	15550	C451XA10400MB08IMS		
500	sm	0.0366	0.0561	598	505	764	74.6	20100	C452XA10400MB08IMS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.9275 / 1.4667	126	92	126	21.7	1115	C334XA10400MB08IMR
35	sm	16	rm	0.5240 / 1.1500	0.6688 / 1.4667	144	105	141	23.0	1365	C435XA10400MB08IMR
50	sm	25	rm	0.3870 / 0.7270	0.4944 / 0.9275	171	127	173	26.5	1825	C436XA10400MB08IMR
70	sm	35	sm	0.2680 / 0.5240	0.3431 / 0.6688	209	159	220	29.2	2545	C437XA10400MB08IMR
95	sm	50	sm	0.1930 / 0.3870	0.2481 / 0.4944	251	193	271	33.0	3440	C438XA10400MB08IMR
120	sm	70	sm	0.1530 / 0.2680	0.1976 / 0.3431	286	223	317	35.9	4380	C439XA10400MB08IMF
150	sm	70	sm	0.1240 / 0.2680	0.1612 / 0.3431	319	252	360	39.7	5260	C440XA10400MB08IMF
185	sm	95	sm	0.0991 / 0.1930	0.1302 / 0.2481	361	288	416	44.6	6630	C441XA10400MB08IMF
240	sm	120	sm	0.0754 / 0.1530	0.1012 / 0.1976	417	339	495	49.9	8525	C442XA10400MB08IMS
300	sm	150	sm	0.0601 / 0.1240	0.0829 / 0.1612	470	386	570	55.2	10630	C443XA10400MB08IMS
400	sm	185	sm	0.0470 / 0.0991	0.0676 / 0.1302	533	444	665	63.1	13545	C444XA10400MB08IMS
500	sm	240	sm	0.0366 / 0.0754	0.0561 / 0.1012	598	505	764	70.3	17465	C466XA10400MB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Aluminium Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION




Conductor

Stranded circular (rm) or sector shaped (sm) aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

-  Red, Black
-  Red, Yellow, Blue
-  Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

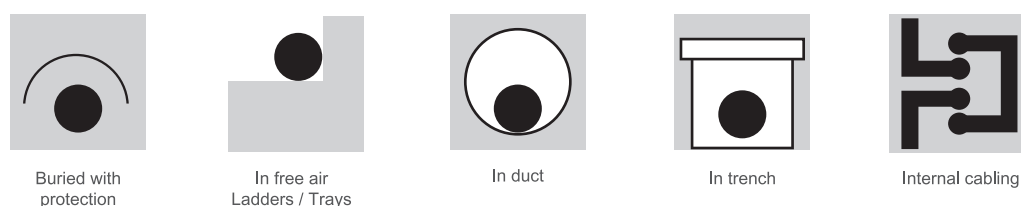
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code	
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
10	rm	3.0800	3.9490	70	49	63	13.8	250	A314XA10200MB01IMR
16	rm	1.9100	2.4490	91	64	85	15.8	325	A315XA10200MB01IMR
25	rm	1.2000	1.5388	118	85	116	18.4	455	A316XA10200MB01IMR
35	rm	0.8680	1.1133	142	103	142	21.0	590	A317XA10200MB01IMR
Three Core Cables									
10	rm	3.0800	3.9490	58	41	53	15.1	265	A314XA10300MB04IMR
16	rm	1.9100	2.4490	75	54	72	17.3	370	A315XA10300MB04IMR
25	rm	1.2000	1.5388	98	71	98	20.0	475	A316XA10300MB04IMR
35	sm	0.8680	1.1133	111	82	109	20.0	575	A417XA10300MB04IMR
50	sm	0.6410	0.8224	133	99	134	23.0	720	A418XA10300MB04IMR
70	sm	0.4430	0.5688	163	123	171	26.5	955	A419XA10300MB04IMR
95	sm	0.3200	0.4115	195	150	210	29.9	1235	A445XA10300MB04IMR
120	sm	0.2530	0.3259	222	173	246	33.2	1525	A446XA10300MB04IMF
Four Core Cables									
10	rm	3.0800	3.9490	58	41	53	16.4	365	A314XA10400MB08IMR
16	rm	1.9100	2.4490	75	54	72	18.9	455	A315XA10400MB08IMR
25	rm	1.2000	1.5388	98	71	98	22.0	575	A316XA10400MB08IMR
35	sm	0.8680	1.1133	111	82	109	23.0	685	A417XA10400MB08IMR
50	sm	0.6410	0.8224	133	99	134	26.5	880	A418XA10400MB08IMR
70	sm	0.4430	0.5688	163	123	171	30.8	1190	A419XA10400MB08IMR
95	sm	0.3200	0.4115	195	150	210	33.5	1580	A445XA10400MB08IMR
120	sm	0.2530	0.3259	222	173	246	37.6	1970	A446XA10400MB08IMF
150	sm	0.2060	0.2660	248	196	280	42.1	2410	A447XA10400MB08IMF
185	sm	0.1640	0.2126	282	225	325	47.1	2960	A448XA10400MB08IMF
240	sm	0.1250	0.1634	327	265	388	52.9	3795	A449XA10400MB08IMS
300	sm	0.1000	0.1321	370	304	449	58.5	4635	A450XA10400MB08IMS
400	sm	0.0778	0.1047	424	354	530	67.1	6000	A451XA10400MB08IMS
500	sm	0.0605	0.0838	484	408	618	74.6	7570	A452XA10400MB08IMS
Four Core Cables with Reduced Neutral									
50 sm	25 rm	0.6410 / 1.2000	0.8224 / 1.5388	133	99	134	26.5	815	A436XA10400MB08IMR
70 sm	35 sm	0.4430 / 0.8680	0.5688 / 1.1133	163	123	171	29.2	1080	A437XA10400MB08IMR
95 sm	50 sm	0.3200 / 0.6410	0.4115 / 0.8224	195	150	210	33.0	1420	A438XA10400MB08IMR
120 sm	70 sm	0.2530 / 0.4430	0.3259 / 0.5688	222	173	246	35.9	1775	A439XA10400MB08IMF
150 sm	70 sm	0.2060 / 0.4430	0.2660 / 0.5688	248	196	280	39.7	2140	A440XA10400MB08IMF
185 sm	95 sm	0.1640 / 0.3200	0.2126 / 0.4115	282	225	325	44.6	2670	A441XA10400MB08IMF
240 sm	120 sm	0.1250 / 0.2530	0.1634 / 0.3259	327	265	388	49.9	3380	A442XA10400MB08IMS
300 sm	150 sm	0.1000 / 0.2060	0.1321 / 0.2660	370	304	449	55.2	4130	A443XA10400MB08IMS
400 sm	185 sm	0.0778 / 0.1640	0.1047 / 0.2126	424	354	530	63.1	5255	A444XA10400MB08IMS
500 sm	240 sm	0.0605 / 0.1250	0.0838 / 0.1634	484	408	618	70.3	6600	A466XA10400MB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Copper Conductors, XLPE Insulated, Aluminium Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular or circular compacted copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

 Red

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Single layer of round non-magnetic (aluminium) wires.

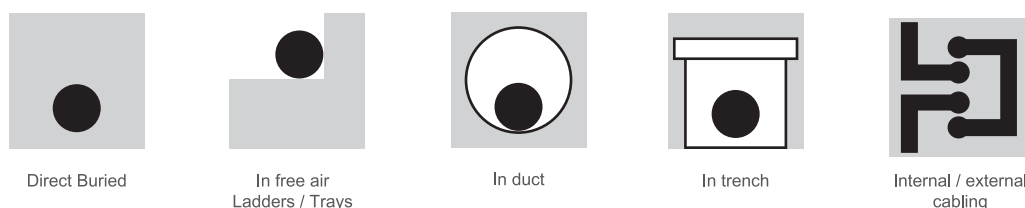
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

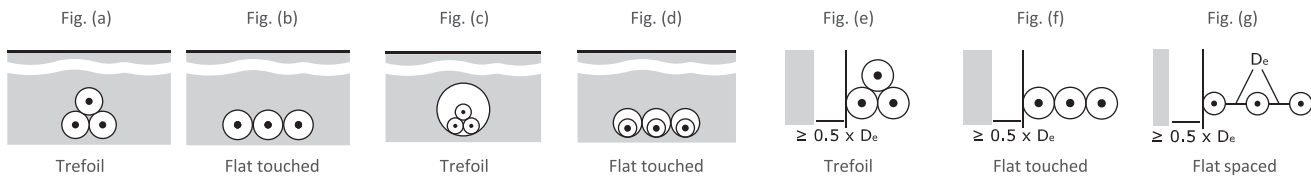
Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
6	3.0800	3.9273	59	59	49	54	60	61	75	13.0	255	C213XA1010AMB51MR
10	1.8300	2.3335	78	78	65	71	80	82	100	13.6	300	C314XA1010AMB51MR
16	1.1500	1.4665	99	99	83	91	105	107	132	14.6	380	C315XA1010AMB51MR
25	0.7270	0.9272	127	127	107	117	138	141	172	16.2	500	C316XA1010AMB51MR
35	0.5240	0.6685	151	151	128	139	168	171	208	17.2	615	C317XA1010AMB51MR
50	0.3870	0.4939	178	178	152	163	202	206	249	18.8	765	C318XA1010AMB51MR
70	0.2680	0.3424	217	215	189	198	253	257	307	20.6	1000	C319XA1010AMB51MR
95	0.1930	0.2471	257	255	223	234	308	310	366	22.4	1285	C345XA1010AMB51MR
120	0.1530	0.1964	290	287	253	263	354	354	413	24.1	1560	C346XA1010AMB51MR
150	0.1240	0.1598	323	318	284	291	403	400	461	26.0	1860	C347XA1010AMB51MR
185	0.0991	0.1286	361	354	320	322	461	453	512	28.3	2270	C348XA1010AMB51MR
240	0.0754	0.0991	411	401	367	360	539	521	579	31.0	2870	C349XA1010AMB51MR
300	0.0601	0.0805	456	440	410	391	612	583	637	33.6	3475	C350XA1010AMB51MR
400	0.0470	0.0647	494	472	450	410	685	628	672	38.2	4535	C351XA1010AMB51MR
500	0.0366	0.0527	539	511	497	439	770	691	729	42.2	5715	C352XA1010AMB51MF
630	0.0283	0.0436	582	547	541	465	854	749	783	46.4	7130	C353XA1010AMB51MF
800	0.0221	0.0367	599	565	564	481	908	781	829	52.3	9240	C354XA1010AMB51MF
1000	0.0176	0.0324	629	595	601	513	996	849	915	61.1	11550	C255XA1010AMB51MF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Aluminium Conductors, XLPE Insulated, Aluminium Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Stranded circular or circular compacted aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

○ Red

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Single layer of round non-magnetic (aluminium) wires.

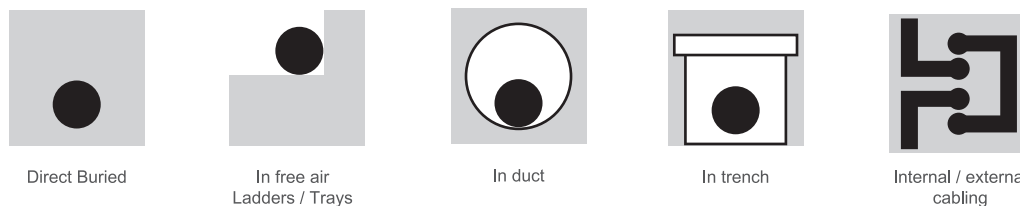
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

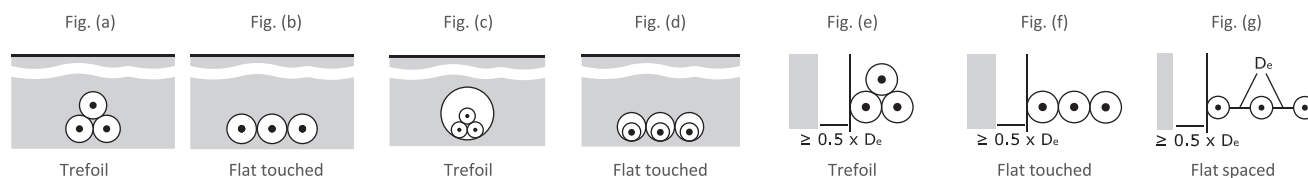
Note: The core identification colour shown above is the most common. However, any other colour can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
10	3.0800	3.9489	62	62	51	57	63	65	80	13.6	240	A314XA1010AMB51MR
16	1.9100	2.4489	77	77	65	71	81	83	102	14.6	285	A315XA1010AMB51MR
25	1.2000	1.5386	99	99	83	91	107	110	134	16.2	350	A316XA1010AMB51MR
35	0.8680	1.1130	118	118	100	108	130	133	163	17.2	405	A317XA1010AMB51MR
50	0.6410	0.8221	139	139	118	128	157	161	195	18.8	480	A318XA1010AMB51MR
70	0.4430	0.5684	169	169	145	156	197	201	242	20.6	585	A319XA1010AMB51MR
95	0.3200	0.4109	201	200	174	185	240	244	292	22.4	705	A345XA1010AMB51MR
120	0.2530	0.3252	228	226	198	209	278	281	332	24.1	830	A346XA1010AMB51MR
150	0.2060	0.2651	254	252	223	232	317	319	373	26.0	965	A347XA1010AMB51MR
185	0.1640	0.2116	286	282	253	260	365	364	421	28.3	1150	A348XA1010AMB51MR
240	0.1250	0.1621	328	323	293	297	430	425	483	31.0	1390	A349XA1010AMB51MR
300	0.1000	0.1306	368	359	330	328	492	481	539	33.6	1640	A350XA1010AMB51MR
400	0.0778	0.1028	408	395	372	354	564	536	587	38.2	2150	A351XA1010AMB51MR
500	0.0605	0.0816	455	437	418	387	647	602	650	42.2	2620	A352XA1010AMB51MF
630	0.0469	0.0653	501	478	466	421	733	668	711	46.4	3205	A353XA1010AMB51MF
800	0.0367	0.0533	531	507	500	443	802	714	767	52.4	4150	A354XA1010AMB51MF
1000	0.0291	0.0452	570	545	545	480	898	789	858	61.1	5165	A255XA1010AMB51MF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, XLPE Insulated, Steel Tape Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS

						
Max. Operating temperature	Max. Short circuit temperature	Flame propagation IEC 60332-1-2	Oil resistant ASTM D 1047	Mechanical impact Very Good	UV Resistant	Min. bending radius (r) = 12 Ø

APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION




Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

-  Red, Black
-  Red, Yellow, Blue
-  Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Double layers of galvanized steel tapes.



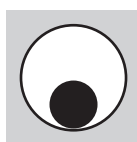
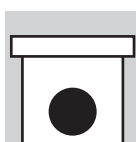

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION

				
Direct Buried	In free air Ladders / Trays	In duct	In trench	Internal / external cabling

Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
6	rm	3.0800	3.9274	67	49	62	15.4	430	C213XA1020GMB01IMR		
10	rm	1.8300	2.3336	89	65	83	16.6	530	C314XA1020GMB01IMR		
16	rm	1.1500	1.4667	114	84	110	18.6	705	C315XA1020GMB01IMR		
25	rm	0.7270	0.9275	148	111	148	21.7	1000	C316XA1020GMB01IMR		
35	rm	0.5240	0.6688	177	134	180	23.8	1260	C317XA1020GMB01IMR		
Three Core Cables											
6	rm	3.0800	3.9274	55	40	52	16.2	500	C213XA1030GMB04IMR		
10	rm	1.8300	2.3336	74	54	70	17.9	615	C314XA1030GMB04IMR		
16	rm	1.1500	1.4667	95	70	93	20.1	835	C315XA1030GMB04IMR		
25	rm	0.7270	0.9275	123	92	124	23.4	1170	C316XA1030GMB04IMR		
35	sm	0.5240	0.6688	140	106	140	22.8	1390	C417XA1030GMB04IMR		
50	sm	0.3870	0.4944	166	128	171	25.8	1790	C418XA1030GMB04IMR		
70	sm	0.2680	0.3431	203	159	215	29.7	2495	C419XA1030GMB04IMR		
95	sm	0.1930	0.2481	243	193	263	33.3	3310	C445XA1030GMB04IMF		
120	sm	0.1530	0.1976	278	224	310	37.8	4430	C446XA1030GMB04IMF		
Four Core Cables											
4	rm	4.6100	5.8783	45	32	41	16.0	480	C212XA1040GMB08IMR		
6	rm	3.0800	3.9274	55	40	52	17.3	590	C213XA1040GMB08IMR		
10	rm	1.8300	2.3336	74	54	70	19.2	755	C314XA1040GMB08IMR		
16	rm	1.1500	1.4667	95	70	93	21.7	1020	C315XA1040GMB08IMR		
25	rm	0.7270	0.9275	123	92	124	25.4	1465	C316XA1040GMB08IMR		
35	sm	0.5240	0.6688	140	106	140	25.8	1780	C417XA1040GMB08IMR		
50	sm	0.3870	0.4944	166	128	171	29.5	2320	C418XA1040GMB08IMR		
70	sm	0.2680	0.3431	203	159	215	34.0	3235	C419XA1040GMB08IMR		
95	sm	0.1930	0.2481	243	193	263	38.1	4630	C445XA1040GMB08IMF		
120	sm	0.1530	0.1976	278	224	310	42.6	5760	C446XA1040GMB08IMF		
150	sm	0.1240	0.1612	310	252	349	47.1	6990	C447XA1040GMB08IMF		
185	sm	0.0991	0.1302	349	287	402	52.1	8590	C448XA1040GMB08IMS		
240	sm	0.0754	0.1012	402	335	473	58.3	10995	C449XA1040GMB08IMS		
300	sm	0.0601	0.0829	452	380	541	63.9	13550	C450XA1040GMB08IMS		
400	sm	0.0470	0.0676	511	435	627	72.9	17260	C451XA1040GMB08IMS		
500	sm	0.0366	0.0561	570	491	713	81.8	22775	C452XA1040GMB08IMS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.9275 / 1.4667	123	92	124	24.5	1370	C334XA1040GMB08IMR
35	sm	16	rm	0.5240 / 1.1500	0.6688 / 1.4667	140	106	140	25.8	1635	C435XA1040GMB08IMR
50	sm	25	rm	0.3870 / 0.7270	0.4944 / 0.9275	166	128	171	29.3	2135	C436XA1040GMB08IMR
70	sm	35	sm	0.2680 / 0.5240	0.3431 / 0.6688	203	159	215	32.6	2905	C437XA1040GMB08IMR
95	sm	50	sm	0.1930 / 0.3870	0.2481 / 0.4944	243	193	263	37.4	4160	C438XA1040GMB08IMF
120	sm	70	sm	0.1530 / 0.2680	0.1976 / 0.3431	278	224	310	40.5	5185	C439XA1040GMB08IMF
150	sm	70	sm	0.1240 / 0.2680	0.1612 / 0.3431	310	252	349	44.7	6165	C440XA1040GMB08IMF
185	sm	95	sm	0.0991 / 0.1930	0.1302 / 0.2481	349	287	402	49.6	7650	C441XA1040GMB08IMF
240	sm	120	sm	0.0754 / 0.1530	0.1012 / 0.1976	402	335	473	55.5	9735	C442XA1040GMB08IMS
300	sm	150	sm	0.0601 / 0.1240	0.0829 / 0.1612	452	380	541	60.6	11940	C443XA1040GMB08IMS
400	sm	185	sm	0.0470 / 0.0991	0.0676 / 0.1302	511	435	627	68.5	15100	C444XA1040GMB08IMS
500	sm	240	sm	0.0366 / 0.0754	0.0561 / 0.1012	570	491	713	76.1	19270	C466XA1040GMB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Aluminium Conductors, XLPE Insulated, Steel Tape Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS

						
Max. Operating temperature	Max. Short circuit temperature	Flame propagation IEC 60332-1-2	Oil resistant ASTM D 1047	Mechanical impact Very Good	UV Resistant	Min. bending radius (r) = 12 Ø

APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION










Conductor

Stranded circular (rm) or sector shaped (sm) aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

-   Red, Black
-    Red, Yellow, Blue
-     Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Double layers of galvanized steel tapes.




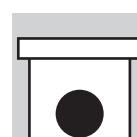

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION

				
Direct Buried	In free air Ladders / Trays	In duct	In trench	Internal / external cabling

Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
10	rm	3.0800	3.9490	68	50	64	16.6	410	A314XA1020GMB01IMR
16	rm	1.9100	2.4490	89	65	85	18.6	515	A315XA1020GMB01IMR
25	rm	1.2000	1.5388	115	86	115	21.2	675	A316XA1020GMB01IMR
35	rm	0.8680	1.1133	138	104	140	23.8	840	A317XA1020GMB01IMR
Three Core Cables									
10	rm	3.0800	3.9490	57	41	54	17.9	440	A314XA1030GMB04IMR
16	rm	1.9100	2.4490	73	54	72	20.1	545	A315XA1030GMB04IMR
25	rm	1.2000	1.5388	95	72	97	22.8	700	A316XA1030GMB04IMR
35	sm	0.8680	1.1133	108	82	108	22.8	750	A417XA1030GMB04IMR
50	sm	0.6410	0.8224	129	99	132	25.8	930	A418XA1030GMB04IMR
70	sm	0.4430	0.5688	158	124	167	29.7	1235	A419XA1030GMB04IMR
95	sm	0.3200	0.4115	189	150	204	33.3	1575	A445XA1030GMB04IMF
120	sm	0.2530	0.3259	217	174	241	37.8	2245	A446XA1030GMB04IMF
Four Core Cables									
10	rm	3.0800	3.9490	57	41	54	19.2	515	A314XA1040GMB08IMR
16	rm	1.9100	2.4490	73	54	72	21.7	640	A315XA1040GMB08IMR
25	rm	1.2000	1.5388	95	72	97	24.8	845	A316XA1040GMB08IMR
35	sm	0.8680	1.1133	108	82	108	25.8	930	A417XA1040GMB08IMR
50	sm	0.6410	0.8224	129	99	132	29.5	1180	A418XA1040GMB08IMR
70	sm	0.4430	0.5688	158	124	167	34.0	1560	A419XA1040GMB08IMR
95	sm	0.3200	0.4115	189	150	204	38.1	2315	A445XA1040GMB08IMF
120	sm	0.2530	0.3259	217	174	241	42.6	2845	A446XA1040GMB08IMF
150	sm	0.2060	0.2660	241	196	272	47.1	3390	A447XA1040GMB08IMF
185	sm	0.1640	0.2126	274	255	314	52.1	4075	A448XA1040GMB08IMS
240	sm	0.1250	0.1634	317	264	372	58.3	5105	A449XA1040GMB08IMS
300	sm	0.1000	0.1321	357	301	428	63.9	6085	A450XA1040GMB08IMS
400	sm	0.0778	0.1047	410	349	503	72.9	7705	A451XA1040GMB08IMS
500	sm	0.0605	0.0838	464	400	580	81.8	10245	A452XA1040GMB08IMS
Four Core Cables with Reduced Neutral									
50 sm	25 rm	0.6410 / 1.2000	0.8224 / 1.5388	129	99	132	29.3	1125	A436XA1040GMB08IMR
70 sm	35 sm	0.4430 / 0.8680	0.5688 / 1.1133	158	124	167	32.6	1435	A437XA1040GMB08IMR
95 sm	50 sm	0.3200 / 0.6410	0.4115 / 0.8224	189	150	204	37.4	2140	A438XA1040GMB08IMR
120 sm	70 sm	0.2530 / 0.4430	0.3259 / 0.5688	217	174	241	40.5	2580	A439XA1040GMB08IMF
150 sm	70 sm	0.2060 / 0.4430	0.2660 / 0.5688	241	196	272	44.7	3045	A440XA1040GMB08IMF
185 sm	95 sm	0.1640 / 0.3200	0.2126 / 0.4115	274	255	314	49.6	3690	A441XA1040GMB08IMF
240 sm	120 sm	0.1250 / 0.2530	0.1634 / 0.3259	317	264	372	55.5	4590	A442XA1040GMB08IMS
300 sm	150 sm	0.1000 / 0.2060	0.1321 / 0.2660	357	301	428	60.6	5445	A443XA1040GMB08IMS
400 sm	185 sm	0.0778 / 0.1640	0.1047 / 0.2126	410	349	503	68.5	6805	A444XA1040GMB08IMS
500 sm	240 sm	0.0605 / 0.1250	0.0838 / 0.1634	464	400	580	76.1	8405	A466XA1040GMB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, XLPE Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS

						
Max. Operating temperature	Max. Short circuit temperature	Flame propagation IEC 60332-1-2	Oil resistant ASTM D 1047	Mechanical impact Very Good	UV Resistant	Min. bending radius (r) = 12 Ø

APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

- ● Red, Black
- ● Red, Yellow, Blue
- ● ● Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Single layer of round galvanized steel wires.



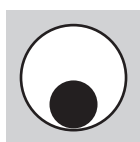
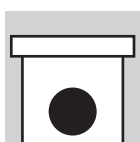

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION

				
Direct Buried	In free air Ladders / Trays	In duct	In trench	Internal / external cabling

Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code		
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight				
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air						
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km				
Two Core Cables											
1.5	rm	12.1000	15.4287	33	24	29	13.1	340	C208XA1020WMB01IMR		
2.5	rm	7.4100	9.4485	42	31	38	14.0	395	C210XA1020WMB01IMR		
4	rm	4.6100	5.8783	55	40	51	15.1	465	C212XA1020WMB01IMR		
6	rm	3.0800	3.9274	68	50	64	16.2	550	C213XA1020WMB01IMR		
10	rm	1.8300	2.3336	90	67	87	18.3	775	C314XA1020WMB01IMR		
16	rm	1.1500	1.4667	116	87	114	20.3	990	C315XA1020WMB01IMR		
25	rm	0.7270	0.9275	151	114	154	24.1	1465	C316XA1020WMB01IMR		
35	rm	0.5240	0.6688	180	138	188	26.2	1780	C317XA1020WMB01IMR		
Three Core Cables											
1.5	rm	12.1000	15.4287	27	19	24	13.6	365	C208XA1030WMB04IMR		
2.5	rm	7.4100	9.4485	35	25	32	14.6	435	C210XA1030WMB04IMR		
4	rm	4.6100	5.8783	45	33	42	15.7	520	C212XA1030WMB04IMR		
6	rm	3.0800	3.9274	56	41	53	17.0	630	C213XA1030WMB04IMR		
10	rm	1.8300	2.3336	75	56	73	19.6	885	C314XA1030WMB04IMR		
16	rm	1.1500	1.4667	96	72	96	21.8	1140	C315XA1030WMB04IMR		
25	rm	0.7270	0.9275	125	95	130	25.8	1675	C316XA1030WMB04IMR		
35	sm	0.5240	0.6688	142	109	145	25.2	1880	C417XA1030WMB04IMR		
50	sm	0.3870	0.4944	169	132	177	28.4	2385	C418XA1030WMB04IMR		
70	sm	0.2680	0.3431	206	163	222	33.1	3385	C419XA1030WMB04IMR		
95	sm	0.1930	0.2481	246	197	271	36.7	4320	C445XA1030WMB04IMF		
120	sm	0.1530	0.1976	279	226	314	40.0	5190	C446XA1030WMB04IMF		
Four Core Cables											
1.5	rm	12.1000	15.4287	27	19	24	14.4	410	C208XA1040WMB08IMR		
2.5	rm	7.4100	9.4485	35	25	32	15.5	490	C210XA1040WMB08IMR		
4	rm	4.6100	5.8783	45	33	42	16.8	600	C212XA1040WMB08IMR		
6	rm	3.0800	3.9274	56	41	53	19.0	855	C213XA1040WMB08IMR		
10	rm	1.8300	2.3336	75	56	73	20.9	1045	C314XA1040WMB08IMR		
16	rm	1.1500	1.4667	96	72	96	24.1	1490	C315XA1040WMB08IMR		
25	rm	0.7270	0.9275	125	95	130	27.8	2025	C316XA1040WMB08IMR		
35	sm	0.5240	0.6688	142	109	145	28.4	2370	C417XA1040WMB08IMR		
50	sm	0.3870	0.4944	169	132	177	32.1	3000	C418XA1040WMB08IMR		
70	sm	0.2680	0.3431	206	163	222	37.6	4285	C419XA1040WMB08IMR		
95	sm	0.1930	0.2481	246	197	271	40.3	5410	C445XA1040WMB08IMF		
120	sm	0.1530	0.1976	279	226	314	45.8	7000	C446XA1040WMB08IMF		
150	sm	0.1240	0.1612	311	255	356	50.3	8370	C447XA1040WMB08IMF		
185	sm	0.0991	0.1302	349	290	407	55.3	10110	C448XA1040WMB08IMS		
240	sm	0.0754	0.1012	400	336	470	61.5	12720	C449XA1040WMB08IMS		
300	sm	0.0601	0.0829	446	378	541	67.1	15450	C450XA1040WMB08IMS		
400	sm	0.0470	0.0676	499	427	620	77.4	20280	C451XA1040WMB08IMS		
500	sm	0.0366	0.0561	546	474	695	85.1	25405	C452XA1040WMB08IMS		
Four Core Cables with Reduced Neutral											
25	rm	16	rm	0.7270 / 1.1500	0.9275 / 1.4667	125	95	130	26.9	1905	C334XA1040WMB08IMR
35	sm	16	rm	0.5240 / 1.1500	0.6688 / 1.4667	142	109	145	28.2	2210	C435XA1040WMB08IMR
50	sm	25	rm	0.3870 / 0.7270	0.4944 / 0.9275	169	132	177	31.9	2810	C436XA1040WMB08IMR
70	sm	35	sm	0.2680 / 0.5240	0.3431 / 0.6688	206	163	222	36.0	3890	C437XA1040WMB08IMR
95	sm	50	sm	0.1930 / 0.3870	0.2481 / 0.4944	246	197	271	39.6	4925	C438XA1040WMB08IMF
120	sm	70	sm	0.1530 / 0.2680	0.1976 / 0.3431	279	226	314	42.7	6015	C439XA1040WMB08IMF
150	sm	70	sm	0.1240 / 0.2680	0.1612 / 0.3431	311	255	356	47.9	7495	C440XA1040WMB08IMF
185	sm	95	sm	0.0991 / 0.1930	0.1302 / 0.2481	349	290	407	52.8	9120	C441XA1040WMB08IMF
240	sm	120	sm	0.0754 / 0.1530	0.1012 / 0.1976	400	336	470	58.7	11375	C442XA1040WMB08IMS
300	sm	150	sm	0.0601 / 0.1240	0.0829 / 0.1612	446	378	541	63.8	13755	C443XA1040WMB08IMS
400	sm	185	sm	0.0470 / 0.0991	0.0676 / 0.1302	499	427	620	73.0	17975	C444XA1040WMB08IMS
500	sm	240	sm	0.0366 / 0.0754	0.0561 / 0.1012	546	474	695	80.8	22485	C466XA1040WMB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Aluminum Conductors, XLPE Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS

						
Max. Operating temperature	Max. Short circuit temperature	Flame propagation IEC 60332-1-2	Oil resistant ASTM D 1047	Mechanical impact Very Good	UV Resistant	Min. bending radius (r) = 12 Ø

APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION










Conductor

Stranded circular (rm) or sector shaped (sm) aluminium conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

-   Red, Black
-    Red, Yellow, Blue
-     Red, Yellow, Blue, Black

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Single layer of round galvanized steel wires.




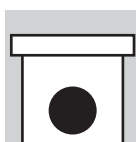

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Note: The core identification colours shown above are the most common. However, any other colours can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).



CABLE INSTALLATION

				
Direct Buried	In free air Ladders / Trays	In duct	In trench	Internal / external cabling

Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
10	rm	3.0800	3.9490	69	51	67	18.3	660	A314XA1020WMB01MR
16	rm	1.9100	2.4490	90	67	88	20.3	800	A315XA1020WMB01MR
25	rm	1.2000	1.5388	117	89	120	23.6	1130	A316XA1020WMB01MR
35	rm	0.8680	1.1133	140	107	146	26.2	1360	A317XA1020WMB01MR
Three Core Cables									
10	rm	3.0800	3.9490	57	43	56	19.6	705	A314XA1030WMB04IMR
16	rm	1.9100	2.4490	74	56	74	21.8	855	A315XA1030WMB04IMR
25	rm	1.2000	1.5388	97	74	101	25.2	1195	A316XA1030WMB04IMR
35	sm	0.8680	1.1133	110	85	113	25.2	1245	A417XA1030WMB04IMR
50	sm	0.6410	0.8224	131	102	137	28.4	1525	A418XA1030WMB04IMR
70	sm	0.4430	0.5688	160	127	173	33.1	2125	A419XA1030WMB04IMR
95	sm	0.3200	0.4115	191	153	211	36.7	2585	A445XA1030WMB04IMF
120	sm	0.2530	0.3259	218	176	245	40.0	3005	A446XA1030WMB04IMF
Four Core Cables									
10	rm	3.0800	3.9490	57	43	56	20.9	810	A314XA1040WMB08IMR
16	rm	1.9100	2.4490	74	56	74	24.1	1105	A315XA1040WMB08IMR
25	rm	1.2000	1.5388	97	74	101	27.2	1395	A316XA1040WMB08IMR
35	sm	0.8680	1.1133	110	85	113	28.4	1525	A417XA1040WMB08IMR
50	sm	0.6410	0.8224	131	102	137	32.1	1855	A418XA1040WMB08IMR
70	sm	0.4430	0.5688	160	127	173	37.6	2605	A419XA1040WMB08IMR
95	sm	0.3200	0.4115	191	153	211	40.3	3100	A445XA1040WMB08IMF
120	sm	0.2530	0.3259	218	176	245	45.8	4085	A446XA1040WMB08IMF
150	sm	0.2060	0.2660	243	199	278	50.3	4770	A447XA1040WMB08IMF
185	sm	0.1640	0.2126	274	228	320	55.3	5600	A448XA1040WMB08IMS
240	sm	0.1250	0.1634	317	265	376	61.5	6835	A449XA1040WMB08IMS
300	sm	0.1000	0.1321	356	301	430	67.1	7985	A450XA1040WMB08IMS
400	sm	0.0778	0.1047	404	346	501	77.4	10730	A451XA1040WMB08IMS
500	sm	0.0605	0.0838	452	393	574	85.1	12875	A452XA1040WMB08IMS
Four Core Cables with Reduced Neutral									
50 sm	25 rm	0.6410 / 1.2000	0.8224 / 1.5388	131	102	137	31.9	1800	A436XA1040WMB08IMR
70 sm	35 sm	0.4430 / 0.8680	0.5688 / 1.1133	160	127	173	36.0	2420	A437XA1040WMB08IMR
95 sm	50 sm	0.3200 / 0.6410	0.4115 / 0.8224	191	153	211	39.6	2905	A438XA1040WMB08IMR
120 sm	70 sm	0.2530 / 0.4430	0.3259 / 0.5688	218	176	245	42.7	3410	A439XA1040WMB08IMF
150 sm	70 sm	0.2060 / 0.4430	0.2660 / 0.5688	243	199	278	47.9	4375	A440XA1040WMB08IMF
185 sm	95 sm	0.1640 / 0.3200	0.2126 / 0.4115	274	228	320	52.8	5160	A441XA1040WMB08IMF
240 sm	120 sm	0.1250 / 0.2530	0.1634 / 0.3259	317	265	376	58.7	6230	A442XA1040WMB08IMF
300 sm	150 sm	0.1000 / 0.2060	0.1321 / 0.2660	356	301	430	63.8	7255	A443XA1040WMB08IMS
400 sm	185 sm	0.0778 / 0.1640	0.1047 / 0.2126	404	346	501	73.0	9685	A444XA1040WMB08IMS
500 sm	240 sm	0.0605 / 0.1250	0.0838 / 0.1634	452	393	574	80.8	11615	A466XA1040WMB08IMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Control Cables, with Stranded Copper Conductors, PVC Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. They are normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage control cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- Black + Printed numbers

Assembly

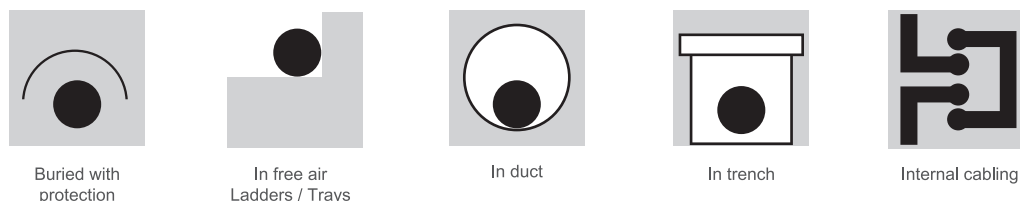
Cores are assembled together using Non-hygroscopic filler, if needed.

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

*Note: **alfanar** is using the latest techniques in core identification for Control Cables, as per ICEA/NEMA-E.3.4 Method 4. However, any other core identification method can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).*

CABLE INSTALLATION



No. of cores X Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air			
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km	
1.5 mm²								
2 X 1.5	12.1000	14.4777	27	19	21	9.9	145	C208PA10200CB21IMR
3 X 1.5	12.1000	14.4777	23	15	18	10.4	170	C208PA10300CB21IMR
4 X 1.5	12.1000	14.4777	23	15	18	11.3	205	C208PA10400CB21IMR
5 X 1.5	12.1000	14.4777	17	12	14	12.6	220	C208PA10500CB21IMR
7 X 1.5	12.1000	14.4777	15	10	12	13.7	275	C208PA10700CB21IMR
10 X 1.5	12.1000	14.4777	13	9	11	16.9	375	C208PA11000CB21IMR
12 X 1.5	12.1000	14.4777	12	8	10	17.4	425	C208PA11200CB21IMR
14 X 1.5	12.1000	14.4777	11	8	10	18.2	480	C208PA11400CB21IMR
16 X 1.5	12.1000	14.4777	11	8	10	19.4	545	C208PA11600CB21IMR
19 X 1.5	12.1000	14.4777	10	7	9	20.4	620	C208PA11900CB21IMR
24 X 1.5	12.1000	14.4777	9	7	9	23.6	765	C208PA12400CB21IMR
30 X 1.5	12.1000	14.4777	8	6	8	24.9	920	C208PA13000CB21IMR
37 X 1.5	12.1000	14.4777	7	6	7	27.1	1105	C208PA13700CB21IMR
40 X 1.5	12.1000	14.4777	7	5	7	28.2	1195	C208PA14000CB21IMR
48 X 1.5	12.1000	14.4777	7	5	7	31.0	1410	C208PA14800CB21IMR
2.5 mm²								
2 X 2.5	7.4100	8.8661	36	24	28	10.8	185	C210PA10200CB21IMR
3 X 2.5	7.4100	8.8661	29	20	23	11.4	220	C210PA10300CB21IMR
4 X 2.5	7.4100	8.8661	29	20	23	12.3	265	C210PA10400CB21IMR
5 X 2.5	7.4100	8.8661	22	15	18	13.9	290	C210PA10500CB21IMR
7 X 2.5	7.4100	8.8661	19	13	16	14.9	360	C210PA10700CB21IMR
10 X 2.5	7.4100	8.8661	17	12	15	18.5	495	C210PA11000CB21IMR
12 X 2.5	7.4100	8.8661	16	11	14	19.1	570	C210PA11200CB21IMR
14 X 2.5	7.4100	8.8661	15	10	13	20.0	645	C210PA11400CB21IMR
16 X 2.5	7.4100	8.8661	14	10	13	21.3	735	C210PA11600CB21IMR
19 X 2.5	7.4100	8.8661	13	9	12	22.4	840	C210PA11900CB21IMR
24 X 2.5	7.4100	8.8661	12	9	11	26.0	1045	C210PA12400CB21IMR
30 X 2.5	7.4100	8.8661	11	8	10	27.5	1260	C210PA13000CB21IMR
37 X 2.5	7.4100	8.8661	10	7	10	29.9	1525	C210PA13700CB21IMR
40 X 2.5	7.4100	8.8661	9	7	10	31.3	1660	C210PA14000CB21IMR
48 X 2.5	7.4100	8.8661	9	7	9	34.5	1975	C210PA14800CB21IMR
4.0 mm²								
2 X 4.0	4.6100	5.5159	47	32	38	12.7	260	C212PA10200CB21IMR
3 X 4.0	4.6100	5.5159	38	26	32	13.4	315	C212PA10300CB21IMR
4 X 4.0	4.6100	5.5159	38	26	32	14.6	385	C212PA10400CB21IMR
5 X 4.0	4.6100	5.5159	29	21	25	16.4	420	C212PA10500CB21IMR
7 X 4.0	4.6100	5.5159	25	18	22	17.9	535	C212PA10700CB21IMR
10 X 4.0	4.6100	5.5159	22	16	20	22.5	740	C212PA11000CB21IMR
12 X 4.0	4.6100	5.5159	20	15	19	23.2	860	C212PA11200CB21IMR
14 X 4.0	4.6100	5.5159	19	14	18	24.4	980	C212PA11400CB21IMR
16 X 4.0	4.6100	5.5159	18	13	17	26.0	1120	C212PA11600CB21IMR
19 X 4.0	4.6100	5.5159	17	12	16	27.4	1285	C212PA11900CB21IMR
24 X 4.0	4.6100	5.5159	15	12	16	32.2	1620	C212PA12400CB21IMR
30 X 4.0	4.6100	5.5159	14	11	14	34.3	1990	C212PA13000CB21IMR
37 X 4.0	4.6100	5.5159	13	10	13	37.5	2430	C212PA13700CB21IMR
40 X 4.0	4.6100	5.5159	12	9	13	39.0	2620	C212PA14000CB21IMR
48 X 4.0	4.6100	5.5159	11	9	13	43.0	3115	C212PA14800CB21IMR

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Control Cables, with Stranded Copper Conductors, PVC Insulated, Copper Tape Shielded and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. They are normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage control cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- Black + Printed numbers

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Shielding

Single copper tape applied helically with suitable overlap.

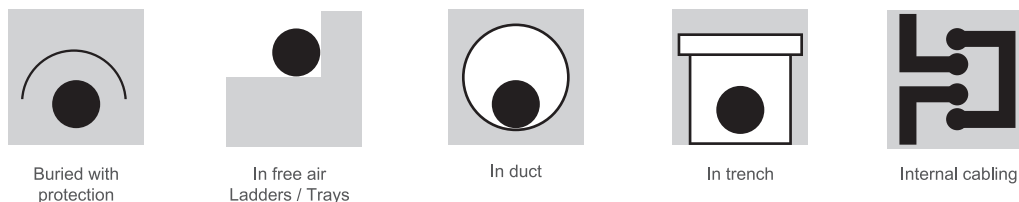
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

*Note: **alfanar** is using the latest techniques in core identification for Control Cables, as per ICEA/NEMA-E.3.4 Method 4. However, any other core identification method can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).*



CABLE INSTALLATION



No. of cores X Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air			
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km	
1.5 mm²								
2 X 1.5	12.1000	14.4777	27	19	22	12.2	225	C208PA102N0CB21IMR
3 X 1.5	12.1000	14.4777	22	15	18	12.8	255	C208PA103N0CB21IMR
4 X 1.5	12.1000	14.4777	22	15	18	13.6	290	C208PA104N0CB21IMR
5 X 1.5	12.1000	14.4777	16	12	14	15.0	315	C208PA105N0CB21IMR
7 X 1.5	12.1000	14.4777	14	10	12	16.0	380	C208PA107N0CB21IMR
10 X 1.5	12.1000	14.4777	13	9	11	19.2	500	C208PA110N0CB21IMR
12 X 1.5	12.1000	14.4777	12	9	10	19.7	555	C208PA112N0CB21IMR
14 X 1.5	12.1000	14.4777	11	8	10	20.5	615	C208PA114N0CB21IMR
16 X 1.5	12.1000	14.4777	10	8	9	21.7	690	C208PA116N0CB21IMR
19 X 1.5	12.1000	14.4777	10	7	9	22.7	770	C208PA119N0CB21IMR
24 X 1.5	12.1000	14.4777	9	7	8	25.9	940	C208PA124N0CB21IMR
30 X 1.5	12.1000	14.4777	8	6	8	27.2	1105	C208PA130N0CB21IMR
37 X 1.5	12.1000	14.4777	7	5	7	29.4	1305	C208PA137N0CB21IMR
40 X 1.5	12.1000	14.4777	7	5	7	30.5	1405	C208PA140N0CB21IMR
48 X 1.5	12.1000	14.4777	7	5	7	33.3	1645	C208PA148N0CB21IMR
2.5 mm²								
2 X 2.5	7.4100	8.8661	35	25	29	13.1	270	C210PA102N0CB21IMR
3 X 2.5	7.4100	8.8661	29	20	24	13.7	310	C210PA103N0CB21IMR
4 X 2.5	7.4100	8.8661	29	20	24	14.7	360	C210PA104N0CB21IMR
5 X 2.5	7.4100	8.8661	21	16	18	16.1	385	C210PA105N0CB21IMR
7 X 2.5	7.4100	8.8661	19	14	16	17.2	475	C210PA107N0CB21IMR
10 X 2.5	7.4100	8.8661	16	12	15	20.8	635	C210PA110N0CB21IMR
12 X 2.5	7.4100	8.8661	15	11	14	21.4	715	C210PA112N0CB21IMR
14 X 2.5	7.4100	8.8661	14	10	13	22.3	795	C210PA114N0CB21IMR
16 X 2.5	7.4100	8.8661	13	10	13	23.6	895	C210PA116N0CB21IMR
19 X 2.5	7.4100	8.8661	12	9	12	24.7	1005	C210PA119N0CB21IMR
24 X 2.5	7.4100	8.8661	11	9	11	28.3	1245	C210PA124N0CB21IMR
30 X 2.5	7.4100	8.8661	10	8	10	29.8	1465	C210PA130N0CB21IMR
37 X 2.5	7.4100	8.8661	9	7	10	32.4	1765	C210PA137N0CB21IMR
40 X 2.5	7.4100	8.8661	9	7	9	33.6	1895	C210PA140N0CB21IMR
48 X 2.5	7.4100	8.8661	8	7	9	37.2	2265	C210PA148N0CB21IMR
4.0 mm²								
2 X 4.0	4.6100	5.5159	45	33	39	15.0	360	C212PA102N0CB21IMR
3 X 4.0	4.6100	5.5159	37	27	32	15.8	420	C212PA103N0CB21IMR
4 X 4.0	4.6100	5.5159	37	27	32	16.9	500	C212PA104N0CB21IMR
5 X 4.0	4.6100	5.5159	28	21	25	18.8	535	C212PA105N0CB21IMR
7 X 4.0	4.6100	5.5159	24	18	22	20.2	670	C212PA107N0CB21IMR
10 X 4.0	4.6100	5.5159	21	16	20	24.8	910	C212PA110N0CB21IMR
12 X 4.0	4.6100	5.5159	20	15	19	25.5	1035	C212PA112N0CB21IMR
14 X 4.0	4.6100	5.5159	19	14	18	26.7	1165	C212PA114N0CB21IMR
16 X 4.0	4.6100	5.5159	18	13	17	28.3	1315	C212PA116N0CB21IMR
19 X 4.0	4.6100	5.5159	16	12	16	29.7	1490	C212PA119N0CB21IMR
24 X 4.0	4.6100	5.5159	15	12	15	34.9	1895	C212PA124N0CB21IMR
30 X 4.0	4.6100	5.5159	13	11	14	37.0	2280	C212PA130N0CB21IMR
37 X 4.0	4.6100	5.5159	12	10	13	39.5	2695	C212PA137N0CB21IMR
40 X 4.0	4.6100	5.5159	12	9	13	41.7	2950	C212PA140N0CB21IMR
48 X 4.0	4.6100	5.5159	11	9	12	45.9	3500	C212PA148N0CB21IMR

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Control Cables, with Stranded Copper Conductors, PVC Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. They are normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage control cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Polyvinyl Chloride (PVC) - Type (PVC/A) to IEC 60502-1.

Core Identification

- Black + Printed numbers

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

Armouring

Single layer of round galvanized steel wires.

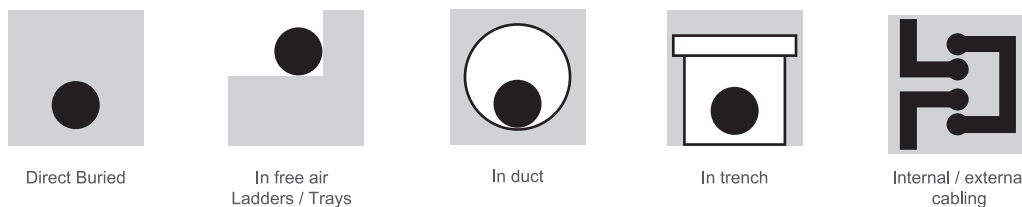
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₁) to IEC 60502-1.

*Note: **alfanar** is using the latest techniques in core identification for Control Cables, as per ICEA/ NEMA-E.3.4 Method 4. However, any other core identification method can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).*



CABLE INSTALLATION



No. of cores X Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 70 °C	Laid in ground	Laid in ducts	Laid in free air			
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km	
1.5 mm²								
2 X 1.5	12.1000	14.4777	27	20	23	13.5	365	C208PA1020WCB21IMR
3 X 1.5	12.1000	14.4777	22	16	19	14.0	400	C208PA1030WCB21IMR
4 X 1.5	12.1000	14.4777	22	16	19	14.9	450	C208PA1040WCB21IMR
5 X 1.5	12.1000	14.4777	17	12	14	16.2	495	C208PA1050WCB21IMR
7 X 1.5	12.1000	14.4777	15	11	13	17.3	575	C208PA1070WCB21IMR
10 X 1.5	12.1000	14.4777	13	10	12	21.9	870	C208PA1100WCB21IMR
12 X 1.5	12.1000	14.4777	12	9	11	22.4	945	C208PA1120WCB21IMR
14 X 1.5	12.1000	14.4777	11	8	10	23.2	1015	C208PA1140WCB21IMR
16 X 1.5	12.1000	14.4777	10	8	10	24.4	1115	C208PA1160WCB21IMR
19 X 1.5	12.1000	14.4777	10	7	9	26.1	1365	C208PA1190WCB21IMR
24 X 1.5	12.1000	14.4777	9	7	9	29.3	1630	C208PA1240WCB21IMR
30 X 1.5	12.1000	14.4777	8	6	8	30.6	1820	C208PA1300WCB21IMR
37 X 1.5	12.1000	14.4777	7	6	7	33.0	2105	C208PA1370WCB21IMR
40 X 1.5	12.1000	14.4777	7	6	7	34.1	2235	C208PA1400WCB21IMR
48 X 1.5	12.1000	14.4777	7	5	7	37.2	2830	C208PA1480WCB21IMR
2.5 mm²								
2 X 2.5	7.4100	8.8661	35	25	30	14.4	420	C210PA1020WCB21IMR
3 X 2.5	7.4100	8.8661	29	21	25	15.0	470	C210PA1030WCB21IMR
4 X 2.5	7.4100	8.8661	29	21	25	15.9	530	C210PA1040WCB21IMR
5 X 2.5	7.4100	8.8661	22	16	19	17.5	590	C210PA1050WCB21IMR
7 X 2.5	7.4100	8.8661	19	14	17	19.9	805	C210PA1070WCB21IMR
10 X 2.5	7.4100	8.8661	17	12	15	23.5	1045	C210PA1100WCB21IMR
12 X 2.5	7.4100	8.8661	15	12	14	24.1	1130	C210PA1120WCB21IMR
14 X 2.5	7.4100	8.8661	14	11	14	25.7	1375	C210PA1140WCB21IMR
16 X 2.5	7.4100	8.8661	14	10	13	27.0	1520	C210PA1160WCB21IMR
19 X 2.5	7.4100	8.8661	13	10	12	28.1	1665	C210PA1190WCB21IMR
24 X 2.5	7.4100	8.8661	12	9	12	31.9	2005	C210PA1240WCB21IMR
30 X 2.5	7.4100	8.8661	10	8	11	33.4	2280	C210PA1300WCB21IMR
37 X 2.5	7.4100	8.8661	10	7	10	36.0	2645	C210PA1370WCB21IMR
40 X 2.5	7.4100	8.8661	9	7	10	37.5	3110	C210PA1400WCB21IMR
48 X 2.5	7.4100	8.8661	9	7	9	41.1	3585	C210PA1480WCB21IMR
4.0 mm²								
2 X 4.0	4.6100	5.5159	46	34	40	16.3	535	C212PA1020WCB21IMR
3 X 4.0	4.6100	5.5159	38	27	34	17.9	725	C212PA1030WCB21IMR
4 X 4.0	4.6100	5.5159	38	27	34	19.1	820	C212PA1040WCB21IMR
5 X 4.0	4.6100	5.5159	28	21	26	20.9	905	C212PA1050WCB21IMR
7 X 4.0	4.6100	5.5159	25	19	23	22.9	1070	C212PA1070WCB21IMR
10 X 4.0	4.6100	5.5159	22	17	21	28.2	1570	C212PA1100WCB21IMR
12 X 4.0	4.6100	5.5159	20	15	20	28.9	1705	C212PA1120WCB21IMR
14 X 4.0	4.6100	5.5159	19	14	19	30.1	1870	C212PA1140WCB21IMR
16 X 4.0	4.6100	5.5159	18	14	18	31.7	2065	C212PA1160WCB21IMR
19 X 4.0	4.6100	5.5159	17	13	17	33.3	2290	C212PA1190WCB21IMR
24 X 4.0	4.6100	5.5159	15	12	16	39.0	3155	C212PA1240WCB21IMR
30 X 4.0	4.6100	5.5159	14	11	14	40.9	3600	C212PA1300WCB21IMR
37 X 4.0	4.6100	5.5159	12	10	13	43.4	4100	C212PA1370WCB21IMR
40 X 4.0	4.6100	5.5159	12	10	13	45.8	4450	C212PA1400WCB21IMR
48 X 4.0	4.6100	5.5159	11	9	12	50.0	5475	C212PA1480WCB21IMR

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Control Cables, with Stranded Copper Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. They are normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage control cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

- Black + Printed numbers

Assembly

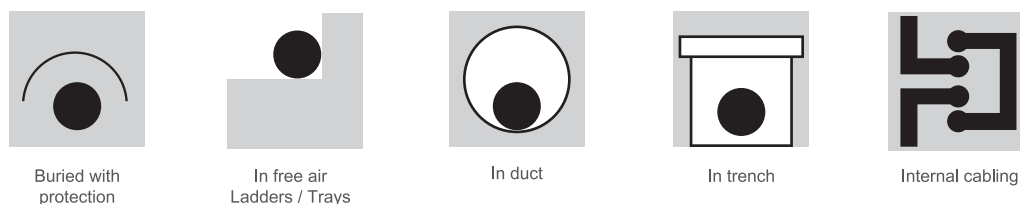
Cores are assembled together using Non-hygroscopic filler, if needed.

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

*Note: **alfanar** is using the latest techniques in core identification for Control Cables, as per ICEA/NEMA-E.3.4 Method 4. However, any other core identification method can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).*

CABLE INSTALLATION



CONTROL CABLES / IEC 60502-1

CU / XLPE / PVC

0.6 / 1 kV

No. of cores X Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air			
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km	
1.5 mm²								
2 X 1.5	12.1000	15.4287	33	22	28	9.5	130	C208XA10200MB21IMR
3 X 1.5	12.1000	15.4287	27	18	23	10.1	150	C208XA10300MB21IMR
4 X 1.5	12.1000	15.4287	27	18	23	10.8	175	C208XA10400MB21IMR
5 X 1.5	12.1000	15.4287	21	15	18	12.1	190	C208XA10500MB21IMR
7 X 1.5	12.1000	15.4287	18	13	16	13.1	235	C208XA10700MB21IMR
10 X 1.5	12.1000	15.4287	16	11	15	16.1	320	C208XA11000MB21IMR
12 X 1.5	12.1000	15.4287	15	10	14	16.6	360	C208XA11200MB21IMR
14 X 1.5	12.1000	15.4287	14	10	13	17.4	405	C208XA11400MB21IMR
16 X 1.5	12.1000	15.4287	13	9	12	18.5	460	C208XA11600MB21IMR
19 X 1.5	12.1000	15.4287	12	9	12	19.4	520	C208XA11900MB21IMR
24 X 1.5	12.1000	15.4287	11	8	11	22.4	640	C208XA12400MB21IMR
30 X 1.5	12.1000	15.4287	10	7	10	23.7	765	C208XA13000MB21IMR
37 X 1.5	12.1000	15.4287	9	7	9	25.7	920	C208XA13700MB21IMR
40 X 1.5	12.1000	15.4287	9	7	9	26.7	990	C208XA14000MB21IMR
48 X 1.5	12.1000	15.4287	8	6	9	29.2	1155	C208XA14800MB21IMR
2.5 mm²								
2 X 2.5	7.4100	9.4485	43	29	36	10.4	165	C210XA10200MB21IMR
3 X 2.5	7.4100	9.4485	35	24	30	11.0	195	C210XA10300MB21IMR
4 X 2.5	7.4100	9.4485	35	24	30	11.9	235	C210XA10400MB21IMR
5 X 2.5	7.4100	9.4485	27	19	24	13.3	255	C210XA10500MB21IMR
7 X 2.5	7.4100	9.4485	24	17	21	14.3	315	C210XA10700MB21IMR
10 X 2.5	7.4100	9.4485	21	15	20	17.7	435	C210XA11000MB21IMR
12 X 2.5	7.4100	9.4485	19	14	18	18.2	505	C210XA11200MB21IMR
14 X 2.5	7.4100	9.4485	18	13	17	19.1	560	C210XA11400MB21IMR
16 X 2.5	7.4100	9.4485	17	12	17	20.4	640	C210XA11600MB21IMR
19 X 2.5	7.4100	9.4485	16	11	16	21.4	725	C210XA11900MB21IMR
24 X 2.5	7.4100	9.4485	14	11	15	24.8	900	C210XA12400MB21IMR
30 X 2.5	7.4100	9.4485	13	10	14	26.2	1085	C210XA13000MB21IMR
37 X 2.5	7.4100	9.4485	12	9	13	28.5	1310	C210XA13700MB21IMR
40 X 2.5	7.4100	9.4485	11	9	12	29.6	1415	C210XA14000MB21IMR
48 X 2.5	7.4100	9.4485	11	8	12	32.6	1680	C210XA14800MB21IMR
4.0 mm²								
2 X 4.0	4.6100	5.8783	56	38	48	11.5	215	C212XA10200MB21IMR
3 X 4.0	4.6100	5.8783	46	31	40	12.1	260	C212XA10300MB21IMR
4 X 4.0	4.6100	5.8783	46	31	40	13.2	315	C212XA10400MB21IMR
5 X 4.0	4.6100	5.8783	35	25	32	14.8	345	C212XA10500MB21IMR
7 X 4.0	4.6100	5.8783	31	22	28	16.1	440	C212XA10700MB21IMR
10 X 4.0	4.6100	5.8783	27	20	26	20.1	610	C212XA11000MB21IMR
12 X 4.0	4.6100	5.8783	25	18	24	20.7	705	C212XA11200MB21IMR
14 X 4.0	4.6100	5.8783	23	17	23	21.8	800	C212XA11400MB21IMR
16 X 4.0	4.6100	5.8783	22	16	22	23.2	915	C212XA11600MB21IMR
19 X 4.0	4.6100	5.8783	20	15	21	24.4	1050	C212XA11900MB21IMR
24 X 4.0	4.6100	5.8783	18	14	20	28.4	1305	C212XA12400MB21IMR
30 X 4.0	4.6100	5.8783	17	13	18	30.1	1590	C212XA13000MB21IMR
37 X 4.0	4.6100	5.8783	15	12	17	32.9	1940	C212XA13700MB21IMR
40 X 4.0	4.6100	5.8783	15	11	17	34.2	2095	C212XA14000MB21IMR
48 X 4.0	4.6100	5.8783	14	11	16	37.9	2510	C212XA14800MB21IMR

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Control Cables, with Stranded Copper Conductors, XLPE Insulated, Copper Tape Shielded and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. They are normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage control cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

- Black + Printed numbers

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Shielding

Single copper tape applied helically with suitable overlap.

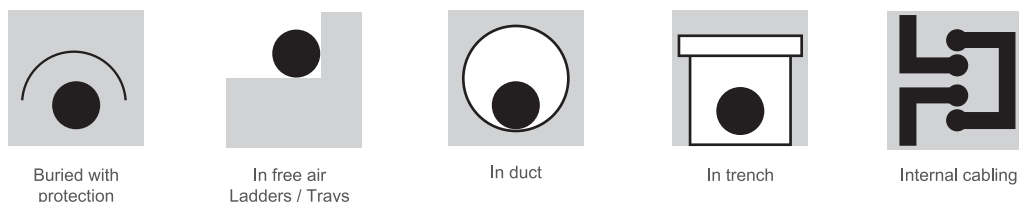
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

*Note: **alfanar** is using the latest techniques in core identification for Control Cables, as per ICEA/NEMA-E.3.4 Method 4. However, any other core identification method can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).*



CABLE INSTALLATION



No. of cores X Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air			
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km	
1.5 mm²								
2 X 1.5	12.1000	15.4287	32	23	28	11.8	210	C208XA102N0MB21IMR
3 X 1.5	12.1000	15.4287	27	19	24	12.3	230	C208XA103N0MB21IMR
4 X 1.5	12.1000	15.4287	27	19	24	13.1	265	C208XA104N0MB21IMR
5 X 1.5	12.1000	15.4287	20	15	18	14.5	285	C208XA105N0MB21IMR
7 X 1.5	12.1000	15.4287	18	13	16	15.4	335	C208XA107N0MB21IMR
10 X 1.5	12.1000	15.4287	15	11	15	18.4	440	C208XA110N0MB21IMR
12 X 1.5	12.1000	15.4287	14	11	14	18.9	485	C208XA112N0MB21IMR
14 X 1.5	12.1000	15.4287	13	10	13	19.7	545	C208XA114N0MB21IMR
16 X 1.5	12.1000	15.4287	13	9	12	20.8	600	C208XA116N0MB21IMR
19 X 1.5	12.1000	15.4287	12	9	12	21.7	665	C208XA119N0MB21IMR
24 X 1.5	12.1000	15.4287	11	8	11	24.7	810	C208XA124N0MB21IMR
30 X 1.5	12.1000	15.4287	10	7	10	26.0	945	C208XA130N0MB21IMR
37 X 1.5	12.1000	15.4287	9	7	9	28.0	1110	C208XA137N0MB21IMR
40 X 1.5	12.1000	15.4287	9	7	9	29.0	1190	C208XA140N0MB21IMR
48 X 1.5	12.1000	15.4287	8	6	9	31.5	1375	C208XA148N0MB21IMR
2.5 mm²								
2 X 2.5	7.4100	9.4485	42	30	37	12.7	250	C210XA102N0MB21IMR
3 X 2.5	7.4100	9.4485	35	25	31	13.3	285	C210XA103N0MB21IMR
4 X 2.5	7.4100	9.4485	35	25	31	14.2	330	C210XA104N0MB21IMR
5 X 2.5	7.4100	9.4485	26	20	24	15.6	350	C210XA105N0MB21IMR
7 X 2.5	7.4100	9.4485	23	17	21	16.6	425	C210XA107N0MB21IMR
10 X 2.5	7.4100	9.4485	20	15	19	20.0	565	C210XA110N0MB21IMR
12 X 2.5	7.4100	9.4485	18	14	18	20.5	640	C210XA112N0MB21IMR
14 X 2.5	7.4100	9.4485	17	13	17	21.4	705	C210XA114N0MB21IMR
16 X 2.5	7.4100	9.4485	16	12	16	22.7	790	C210XA116N0MB21IMR
19 X 2.5	7.4100	9.4485	15	11	15	23.7	885	C210XA119N0MB21IMR
24 X 2.5	7.4100	9.4485	14	11	14	27.1	1090	C210XA124N0MB21IMR
30 X 2.5	7.4100	9.4485	13	10	13	28.5	1280	C210XA130N0MB21IMR
37 X 2.5	7.4100	9.4485	11	9	12	30.8	1525	C210XA137N0MB21IMR
40 X 2.5	7.4100	9.4485	11	9	12	32.1	1650	C210XA140N0MB21IMR
48 X 2.5	7.4100	9.4485	10	8	11	35.5	1975	C210XA148N0MB21IMR
4.0 mm²								
2 X 4.0	4.6100	5.8783	54	39	49	13.8	310	C212XA102N0MB21IMR
3 X 4.0	4.6100	5.8783	45	32	41	14.5	355	C212XA103N0MB21IMR
4 X 4.0	4.6100	5.8783	45	32	41	15.5	420	C212XA104N0MB21IMR
5 X 4.0	4.6100	5.8783	34	26	32	16.7	450	C212XA105N0MB21IMR
7 X 4.0	4.6100	5.8783	30	22	28	18.4	565	C212XA107N0MB21IMR
10 X 4.0	4.6100	5.8783	26	20	26	22.4	760	C212XA110N0MB21IMR
12 X 4.0	4.6100	5.8783	24	18	24	23.0	858	C212XA112N0MB21IMR
14 X 4.0	4.6100	5.8783	22	17	23	24.1	965	C212XA114N0MB21IMR
16 X 4.0	4.6100	5.8783	21	16	22	25.5	1090	C212XA116N0MB21IMR
19 X 4.0	4.6100	5.8783	20	15	20	26.7	1230	C212XA119N0MB21IMR
24 X 4.0	4.6100	5.8783	18	14	19	30.7	1520	C212XA124N0MB21IMR
30 X 4.0	4.6100	5.8783	16	13	18	32.6	1830	C212XA130N0MB21IMR
37 X 4.0	4.6100	5.8783	15	12	16	35.1	2205	C212XA137N0MB21IMR
40 X 4.0	4.6100	5.8783	14	11	16	37.1	2405	C212XA140N0MB21IMR
48 X 4.0	4.6100	5.8783	13	11	15	40.6	2830	C212XA148N0MB21IMR

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Control Cables, with Stranded Copper Conductors, XLPE Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. They are normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage control cables are designed and tested to meet all the requirements of the latest edition of IEC 60502-1 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular copper conductor (Class 2 to IEC 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1.

Core Identification

- Black + Printed numbers

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

Armouring

Single layer of round galvanized steel wires.

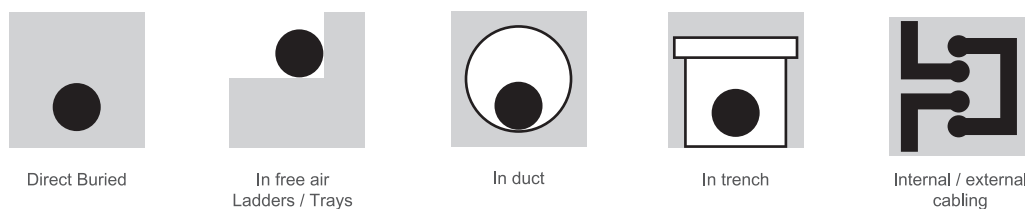
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (ST₂) to IEC 60502-1.

*Note: **alfanar** is using the latest techniques in core identification for Control Cables, as per ICEA/ NEMA-E.3.4 Method 4. However, any other core identification method can be provided upon a customer's request (e.g. to HD 308 S2 or IEC 60445).*



CABLE INSTALLATION



CONTROL CABLES / IEC 60502-1

CU / XLPE / SWA / PVC

0.6 / 1 kV

No. of cores X Nominal cross sectional area	ELECTRICAL DATA					DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air			
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km	
1.5 mm²								
2 X 1.5	12.1000	15.4287	33	24	29	13.1	340	C208XA1020WMB21IMR
3 X 1.5	12.1000	15.4287	27	19	24	13.6	365	C208XA1030WMB21IMR
4 X 1.5	12.1000	15.4287	27	19	24	14.4	410	C208XA1040WMB21IMR
5 X 1.5	12.1000	15.4287	21	15	19	15.7	455	C208XA1050WMB21IMR
7 X 1.5	12.1000	15.4287	18	13	17	17.2	520	C208XA1070WMB21IMR
10 X 1.5	12.1000	15.4287	16	12	15	21.1	805	C208XA1100WMB21IMR
12 X 1.5	12.1000	15.4287	14	11	14	21.6	860	C208XA1120WMB21IMR
14 X 1.5	12.1000	15.4287	13	10	13	22.4	925	C208XA1140WMB21IMR
16 X 1.5	12.1000	15.4287	13	10	13	23.5	1010	C208XA1160WMB21IMR
19 X 1.5	12.1000	15.4287	12	9	12	24.4	1090	C208XA1190WMB21IMR
24 X 1.5	12.1000	15.4287	11	8	11	28.1	1465	C208XA1240WMB21IMR
30 X 1.5	12.1000	15.4287	10	8	10	29.4	1630	C208XA1300WMB21IMR
37 X 1.5	12.1000	15.4287	9	7	10	31.4	1845	C208XA1370WMB21IMR
40 X 1.5	12.1000	15.4287	9	7	9	32.6	1975	C208XA1400WMB21IMR
48 X 1.5	12.1000	15.4287	8	6	9	35.1	2240	C208XA1480WMB21IMR
2.5 mm²								
2 X 2.5	7.4100	9.4485	42	31	38	14.0	395	C210XA1020WMB21IMR
3 X 2.5	7.4100	9.4485	35	25	32	14.6	435	C210XA1030WMB21IMR
4 X 2.5	7.4100	9.4485	35	25	32	15.5	490	C210XA1040WMB21IMR
5 X 2.5	7.4100	9.4485	27	20	25	16.9	545	C210XA1050WMB21IMR
7 X 2.5	7.4100	9.4485	23	18	22	19.3	750	C210XA1070WMB21IMR
10 X 2.5	7.4100	9.4485	20	15	20	22.7	955	C210XA1100WMB21IMR
12 X 2.5	7.4100	9.4485	19	14	19	23.2	1030	C210XA1120WMB21IMR
14 X 2.5	7.4100	9.4485	18	13	18	24.1	1120	C210XA1140WMB21IMR
16 X 2.5	7.4100	9.4485	17	13	17	26.1	1385	C210XA1160WMB21IMR
19 X 2.5	7.4100	9.4485	15	12	16	27.1	1515	C210XA1190WMB21IMR
24 X 2.5	7.4100	9.4485	14	11	15	30.5	1805	C210XA1240WMB21IMR
30 X 2.5	7.4100	9.4485	13	10	14	32.1	2050	C210XA1300WMB21IMR
37 X 2.5	7.4100	9.4485	12	9	13	34.4	2350	C210XA1370WMB21IMR
40 X 2.5	7.4100	9.4485	11	9	12	35.7	2515	C210XA1400WMB21IMR
48 X 2.5	7.4100	9.4485	10	8	12	39.4	3240	C210XA1480WMB21IMR
4.0 mm²								
2 X 4.0	4.6100	5.8783	55	40	51	15.1	465	C212XA1020WMB21IMR
3 X 4.0	4.6100	5.8783	45	33	42	15.7	520	C212XA1030WMB21IMR
4 X 4.0	4.6100	5.8783	45	33	42	16.8	600	C212XA1040WMB21IMR
5 X 4.0	4.6100	5.8783	35	26	34	19.3	795	C212XA1050WMB21IMR
7 X 4.0	4.6100	5.8783	30	23	30	21.1	925	C212XA1070WMB21IMR
10 X 4.0	4.6100	5.8783	26	20	27	25.8	1355	C212XA1100WMB21IMR
12 X 4.0	4.6100	5.8783	24	19	25	26.4	1470	C212XA1120WMB21IMR
14 X 4.0	4.6100	5.8783	23	18	24	27.5	1605	C212XA1140WMB21IMR
16 X 4.0	4.6100	5.8783	22	17	23	28.9	1760	C212XA1160WMB21IMR
19 X 4.0	4.6100	5.8783	20	16	21	30.1	1935	C212XA1190WMB21IMR
24 X 4.0	4.6100	5.8783	18	14	20	34.3	2350	C212XA1240WMB21IMR
30 X 4.0	4.6100	5.8783	16	13	18	36.2	2710	C212XA1300WMB21IMR
37 X 4.0	4.6100	5.8783	15	12	17	39.0	3450	C212XA1370WMB21IMR
40 X 4.0	4.6100	5.8783	14	12	17	41.0	3725	C212XA1400WMB21IMR
48 X 4.0	4.6100	5.8783	13	11	16	43.7	4215	C212XA1480WMB21IMR

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Copper Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of BS 7889 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular or circular compacted copper conductor (Class 2 to BS EN 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) - Type (GP 8) to BS 7655-1.3.

Core Identification

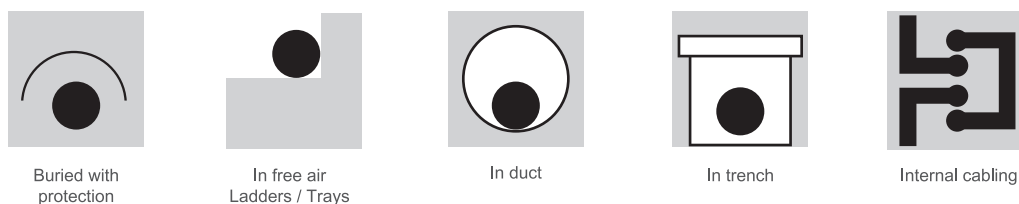
● ● Brown or Blue (Please specify at order time)

Outer Jacket

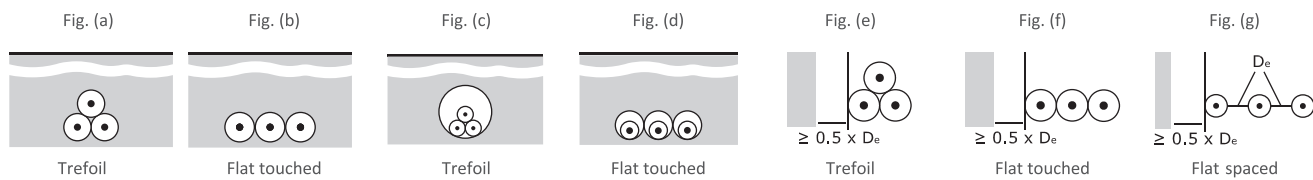
Extruded layer of Polyvinyl Chloride (PVC) - Type (9) to BS 7655-4.2.

Note: The core identification colours shown above are specified by BS 7889. However, any other colours can be provided upon a customer's request.

CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
1.5	12.1000	15.4287	27	28	20	23	23	23	31	5.8	50	C208XA10100MB54BMR
2.5	7.4100	9.4485	36	36	26	30	30	31	40	6.2	65	C210XA10100MB54BMR
4	4.6100	5.8782	46	46	34	38	40	41	53	6.8	85	C212XA10100MB54BMR
6	3.0800	3.9274	57	57	42	48	50	52	68	7.3	105	C213XA10100MB54BMR
10	1.8300	2.3335	75	75	56	63	68	70	91	7.9	140	C314XA10100MB54BMR
16	1.1500	1.4665	97	97	73	82	91	93	121	8.9	205	C315XA10100MB54BMR
25	0.7270	0.9273	124	124	96	106	122	125	161	10.5	300	C316XA10100MB54BMR
35	0.5240	0.6686	149	149	117	128	150	154	198	11.5	395	C317XA10100MB54BMR
50	0.3870	0.4941	175	176	140	153	183	189	240	12.9	520	C318XA10100MB54BMR
70	0.2680	0.3428	214	215	174	188	233	240	304	14.7	725	C319XA10100MB54BMR
95	0.1930	0.2476	257	256	212	227	288	297	374	16.5	980	C345XA10100MB54BMR
120	0.1530	0.1970	291	292	243	260	335	346	434	18.0	1220	C346XA10100MB54BMR
150	0.1240	0.1605	327	327	277	295	388	400	499	20.1	1500	C347XA10100MB54BMR
185	0.0991	0.1294	369	369	316	336	450	464	577	22.2	1860	C348XA10100MB54BMR
240	0.0754	0.1002	425	426	371	393	536	553	688	24.9	2415	C349XA10100MB54BMR
300	0.0601	0.0817	479	473	422	447	620	641	797	27.7	2990	C350XA10100MB54BMR
400	0.0470	0.0663	539	540	482	512	720	743	928	30.9	3845	C351XA10100MB54BMR
500	0.0366	0.0545	604	606	549	587	834	862	1084	34.9	4950	C352XA10100MB54BMF
630	0.0283	0.0454	674	673	619	668	955	986	1257	39.3	6295	C353XA10100MB54BMF
800	0.0221	0.0390	739	741	688	750	1078	1116	1440	43.6	8090	C354XA10100MB54BMF
1000	0.0176	0.0346	807	808	766	841	1234	1276	1674	52.2	10150	C255XA10100MB54BMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, XLPE Insulated and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of BS 7889 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION





Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to BS EN 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) - Type (GP 8) to BS 7655-1.3.

Core Identification

-  Brown, Blue
-  Brown, Black, Grey
-  Blue, Brown, Black, Grey
-  Green & Yellow, Blue, Brown, Black, Grey

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

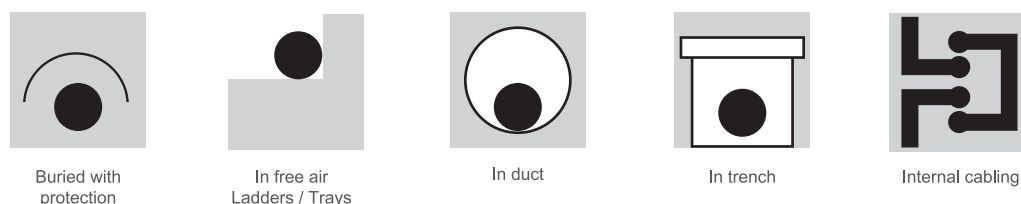
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (9) to BS 7655-4.2.

Note: The core identification colours shown above are specified by BS 7889. However, any other colours can be provided upon a customer's request.



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two Core Cables									
1.5	rm	12.1000	15.4287	33	22	28	9.5	130	C208XA10200MB03BMR
2.5	rm	7.4100	9.4485	43	29	36	10.4	165	C210XA10200MB03BMR
4	rm	4.6100	5.8783	56	38	48	11.5	215	C212XA10200MB03BMR
6	rm	3.0800	3.9274	69	48	61	12.6	275	C213XA10200MB03BMR
10	rm	1.8300	2.3336	91	63	82	13.8	365	C314XA10200MB03BMR
16	rm	1.1500	1.4667	118	83	110	15.8	520	C315XA10200MB03BMR
25	rm	0.7270	0.9275	153	110	149	18.9	775	C316XA10200MB03BMR
35	rm	0.5240	0.6688	183	133	183	21.0	1010	C317XA10200MB03BMR
50	sm	0.3870	0.4944	206	152	206	21.3	1085	C418XA10200MB03BMR
70	sm	0.2680	0.3431	251	188	256	23.3	1490	C419XA10200MB03BMR
95	sm	0.1930	0.2481	303	230	319	26.8	2015	C445XA10200MB03BMR
120	sm	0.1530	0.1976	345	266	374	30.3	2525	C446XA10200MB03BMF
Three Core Cables									
1.5	rm	12.1000	15.4287	27	18	23	10.1	150	C208XA10300MB71BMR
2.5	rm	7.4100	9.4485	35	24	30	11.0	195	C210XA10300MB71BMR
4	rm	4.6100	5.8783	46	31	40	12.1	260	C212XA10300MB71BMR
6	rm	3.0800	3.9274	57	39	51	13.4	340	C213XA10300MB71BMR
10	rm	1.8300	2.3336	75	53	70	15.1	445	C314XA10300MB71BMR
16	rm	1.1500	1.4667	97	69	93	17.3	660	C315XA10300MB71BMR
25	rm	0.7270	0.9275	126	92	126	20.6	940	C316XA10300MB71BMR
35	sm	0.5240	0.6688	144	105	141	20.0	1210	C417XA10300MB71BMR
50	sm	0.3870	0.4944	171	127	173	23.0	1580	C418XA10300MB71BMR
70	sm	0.2680	0.3431	209	159	220	26.5	2210	C419XA10300MB71BMR
95	sm	0.1930	0.2481	251	193	271	29.9	2970	C445XA10300MB71BMR
120	sm	0.1530	0.1976	286	223	317	33.2	3710	C446XA10300MB71BMF
Four Core Cables									
1.5	rm	12.1000	15.4287	27	18	23	10.8	175	C208XA10400MB11BMR
2.5	rm	7.4100	9.4485	35	24	30	11.9	235	C210XA10400MB11BMR
4	rm	4.6100	5.8783	46	31	40	13.2	315	C212XA10400MB11BMR
6	rm	3.0800	3.9274	57	39	51	14.5	420	C213XA10400MB11BMR
10	rm	1.8300	2.3336	75	53	70	16.4	600	C314XA10400MB11BMR
16	rm	1.1500	1.4667	97	69	93	18.9	840	C315XA10400MB11BMR
25	rm	0.7270	0.9275	126	92	126	22.6	1190	C316XA10400MB11BMR
35	sm	0.5240	0.6688	144	105	141	23.0	1535	C417XA10400MB11BMR
50	sm	0.3870	0.4944	171	127	173	26.5	2020	C418XA10400MB11BMR
70	sm	0.2680	0.3431	209	159	220	30.8	2865	C419XA10400MB11BMR
95	sm	0.1930	0.2481	251	193	271	33.5	3890	C445XA10400MB11BMR
120	sm	0.1530	0.1976	286	223	317	37.6	4890	C446XA10400MB11BMF
Five Core Cables									
1.5	rm	12.1000	15.4287	27	18	23	12.1	190	C208XA10500MB14BMR
2.5	rm	7.4100	9.4485	35	24	30	13.3	255	C210XA10500MB14BMR
4	rm	4.6100	5.8783	46	31	40	14.8	345	C212XA10500MB14BMR
6	rm	3.0800	3.9274	57	39	51	16.3	460	C213XA10500MB14BMR
10	rm	1.8300	2.3336	75	53	70	17.9	660	C314XA10500MB14BMR
16	rm	1.1500	1.4667	97	69	93	20.6	980	C315XA10500MB14BMR
25	rm	0.7270	0.9275	126	92	126	24.8	1460	C316XA10500MB14BMR
35	sm	0.5240	0.6688	144	105	141	27.1	1915	C417XA10500MB14BMR
50	sm	0.3870	0.4944	171	127	173	31.2	2540	C418XA10500MB14BMR
70	sm	0.2680	0.3431	209	159	220	35.1	3575	C419XA10500MB14BMR
95	sm	0.1930	0.2481	251	193	271	39.3	4850	C445XA10500MB14BMR
120	sm	0.1530	0.1976	286	223	317	43.7	6095	C446XA10500MB14BMF

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Single-Core Cables, with Stranded Copper Conductors, XLPE Insulated, Aluminium Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS



APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of BS 5467 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION

Conductor

Plain annealed stranded circular or circular compacted copper conductor (Class 2 to BS EN 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) - Type (GP 8) to BS 7655-1.3.

Core Identification

● ● Brown or Blue (Please specify at order time)

Bedding

Extruded layer of Polyvinyl Chloride (PVC).

Armouring

Single layer of round non-magnetic (aluminium) wires.

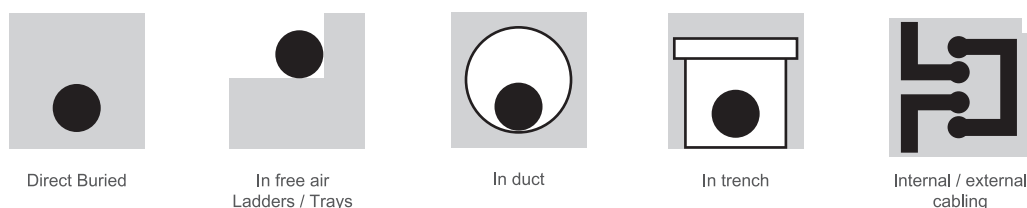
Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (9) to BS 7655-4.2.

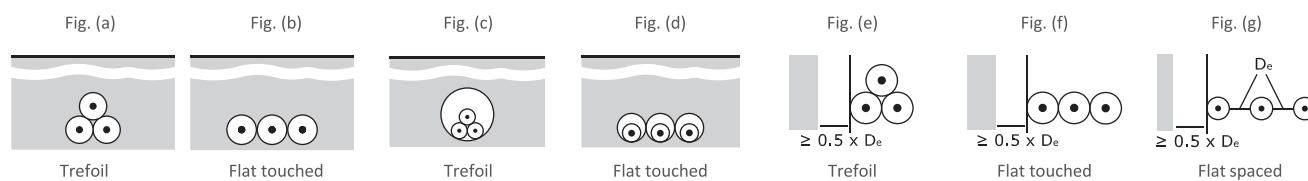
Note: The core identification colours shown above are specified by BS 5467. However, any other colours can be provided upon a customer's request.



CABLE INSTALLATION



Nominal cross sectional area	ELECTRICAL DATA									DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings							Approx. overall diameter	Approx. overall weight	
	DC at 20 °C	AC at 90 °C	Buried direct in ground		In buried ducts		In free air					
			(a)	(b)	(c)	(d)	(e)	(f)	(g)	mm	kg / km	
mm ²	Ω / km	Ω / km	A	A	A	A	A	A	A	mm	kg / km	
50	0.3870	0.4939	178	178	152	163	202	206	249	17.0	675	C318XA1010AMB54BMR
70	0.2680	0.3425	217	215	189	198	253	257	307	19.5	940	C319XA1010AMB54BMR
95	0.1930	0.2472	257	255	223	234	308	310	366	21.3	1215	C345XA1010AMB54BMR
120	0.1530	0.1965	290	287	253	263	354	354	413	22.8	1475	C346XA1010AMB54BMR
150	0.1240	0.1598	323	318	284	291	403	400	461	26.0	1860	C347XA1010AMB54BMR
185	0.0991	0.1286	361	354	320	322	461	453	512	28.3	2270	C348XA1010AMB54BMR
240	0.0754	0.0992	411	401	367	360	539	521	579	30.8	2855	C349XA1010AMB54BMR
300	0.0601	0.0805	456	440	410	391	612	583	637	33.6	3475	C350XA1010AMB54BMR
400	0.0470	0.0647	494	472	450	410	685	628	672	38.0	4515	C351XA1010AMB54BMR
500	0.0366	0.0528	539	511	497	439	770	691	729	42.0	5695	C352XA1010AMB54BMF
630	0.0283	0.0436	582	547	541	465	854	749	783	46.2	7105	C353XA1010AMB54BMF
800	0.0221	0.0368	599	565	564	481	908	781	829	52.1	9215	C354XA1010AMB54BMF
1000	0.0176	0.0325	629	595	601	513	996	849	915	60.7	11490	C255XA1010AMB54BMF



Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Multi-Core Cables, with Stranded Copper Conductors, XLPE Insulated, Steel Wire Armoured and PVC Sheathed

APPLICATIONS

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

CABLE CHARACTERISTICS

						
Max. Operating temperature	Max. Short circuit temperature	Flame propagation BS EN 60332-1-2	Oil resistant ASTM D 1047	Mechanical impact Very Good	UV Resistant	Min. bending radius (r) = 12 Ø

APPLICABLE STANDARDS

alfanar Low Voltage power cables are designed and tested to meet all the requirements of the latest edition of BS 5467 standard. In addition, **alfanar** can also supply a range of alternative designs to meet customer-specified requirements.

CABLE CONSTRUCTION




Conductor

Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to BS EN 60228).

Insulation

Extruded layer of Cross-linked Polyethylene (XLPE) - Type (GP 8) to BS 7655-1.3.

Core Identification

-  Brown, Blue
-  Brown, Black, Grey
-  Blue, Brown, Black, Grey

Assembly

Cores are assembled together using Non-hygroscopic filler, if needed.

Bedding

Extruded layer of Polyvinyl Chloride (PVC)

Armouring

Single layer of round galvanized steel wires.




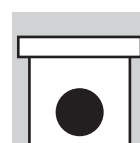

Outer Jacket

Extruded layer of Polyvinyl Chloride (PVC) - Type (9) to BS 7655-4-2.

Note: The core identification colours shown above are specified by BS 5467. However any other colours can be provided upon customer's request



CABLE INSTALLATION

				
Direct Buried	In free air Ladders / Trays	In duct	In trench	Internal / external cabling

Nominal cross sectional area	ELECTRICAL DATA						DIMENSIONS AND WEIGHTS		Cable Code
	Max. Conductor Resistance		Continuous Current Ratings			Approx. overall diameter	Approx. overall weight		
	DC at 20 °C	AC at 90 °C	Laid in ground	Laid in ducts	Laid in free air				
mm ²	Ω / km	Ω / km	A	A	A	mm	kg / km		
Two-core Cables									
1.5	rm	12.1000	15.4287	33	24	29	11.5	285	C208XA1020WMB03BMR
2.5	rm	7.4100	9.4485	42	31	38	13.0	360	C210XA1020WMB03BMR
4	rm	4.6100	5.8783	55	40	51	14.1	430	C212XA1020WMB03BMR
6	rm	3.0800	3.9274	68	50	64	15.2	510	C213XA1020WMB03BMR
10	rm	1.8300	2.3336	90	67	87	16.6	635	C314XA1020WMB03BMR
16	rm	1.1500	1.4667	116	87	114	19.3	935	C315XA1020WMB03BMR
25	rm	0.7270	0.9275	151	114	154	22.6	1280	C316XA1020WMB03BMR
35	rm	0.5240	0.6688	180	138	188	26.0	1765	C317XA1020WMB03BMR
50	sm	0.3870	0.4944	204	158	211	26.5	1875	C418XA1020WMB03BMR
70	sm	0.2680	0.3431	247	193	259	28.7	2355	C419XA1020WMB03BMR
95	sm	0.1930	0.2481	296	235	320	33.4	3280	C445XA1020WMB03BMF
120	sm	0.1530	0.1976	336	270	372	36.9	3915	C446XA1020WMB03BMF
150	sm	0.1240	0.1612	375	304	421	39.7	4620	C447XA1020WMB03BMF
185	sm	0.0991	0.1302	424	349	489	45.9	6060	C448XA1020WMB03BMF
240	sm	0.0754	0.1012	485	403	569	49.8	7360	C449XA1020WMB03BMS
300	sm	0.0601	0.0829	538	451	639	53.4	8800	C450XA1020WMB03BMS
400	sm	0.0470	0.0676	598	504	719	56.9	12800	C451XA1020WMB03BMS
Three-core Cables									
1.5	rm	12.1000	15.4287	27	19	24	12.0	315	C208XA1030WMB71BMR
2.5	rm	7.4100	9.4485	35	25	32	13.6	400	C210XA1030WMB71BMR
4	rm	4.6100	5.8783	45	33	42	14.7	485	C212XA1030WMB71BMR
6	rm	3.0800	3.9274	56	41	53	16.0	590	C213XA1030WMB71BMR
10	rm	1.8300	2.3336	75	56	73	18.6	840	C314XA1030WMB71BMR
16	rm	1.1500	1.4667	96	72	96	21.0	1090	C315XA1030WMB71BMR
25	rm	0.7270	0.9275	125	95	130	25.6	1665	C316XA1030WMB71BMR
35	sm	0.5240	0.6688	142	109	145	25.2	1905	C417XA1030WMB71BMR
50	sm	0.3870	0.4944	169	132	177	28.2	2390	C418XA1030WMB71BMR
70	sm	0.2680	0.3431	206	163	222	31.7	3145	C419XA1030WMB71BMR
95	sm	0.1930	0.2481	246	197	271	36.5	4325	C445XA1030WMB71BMF
120	sm	0.1530	0.1976	279	226	314	39.8	5195	C446XA1030WMB71BMF
150	sm	0.1240	0.1612	311	255	356	44.1	6590	C447XA1030WMB71BMF
185	sm	0.0991	0.1302	349	290	407	48.1	7905	C448XA1030WMB71BMF
240	sm	0.0754	0.1012	400	336	470	53.2	9830	C449XA1030WMB71BMS
300	sm	0.0601	0.0829	446	378	541	58.3	11985	C450XA1030WMB71BMS
400	sm	0.0470	0.0676	499	427	620	65.5	14940	C451XA1030WMB71BMS
Four Core Cables									
1.5	rm	12.1000	15.4287	27	19	24	12.7	350	C208XA1040WMB11BMR
2.5	rm	7.4100	9.4485	35	25	32	14.5	455	C210XA1040WMB11BMR
4	rm	4.6100	5.8783	45	33	42	15.8	560	C212XA1040WMB11BMR
6	rm	3.0800	3.9274	56	41	53	18.0	800	C213XA1040WMB11BMR
10	rm	1.8300	2.3336	75	56	73	19.9	990	C314XA1040WMB11BMR
16	rm	1.1500	1.4667	96	72	96	22.6	1305	C315XA1040WMB11BMR
25	rm	0.7270	0.9275	125	95	130	27.6	2010	C316XA1040WMB11BMR
35	sm	0.5240	0.6688	142	109	145	28.2	2380	C417XA1040WMB11BMR
50	sm	0.3870	0.4944	169	132	177	31.9	3005	C418XA1040WMB11BMR
70	sm	0.2680	0.3431	206	163	222	37.4	4290	C419XA1040WMB11BMR
95	sm	0.1930	0.2481	246	197	271	40.1	5435	C445XA1040WMB11BMF
120	sm	0.1530	0.1976	279	226	314	45.4	7000	C446XA1040WMB11BMF
150	sm	0.1240	0.1612	311	255	356	49.9	8370	C447XA1040WMB11BMF
185	sm	0.0991	0.1302	349	290	407	54.9	10105	C448XA1040WMB11BMF
240	sm	0.0754	0.1012	400	336	470	60.9	12680	C449XA1040WMB11BMS
300	sm	0.0601	0.0829	446	378	541	66.5	15395	C450XA1040WMB11BMS
400	sm	0.0470	0.0676	499	427	620	76.8	20215	C451XA1040WMB11BMS

Laying Conditions: Ambient air temperature of 40 °C, Ambient ground temperature of 35 °C, Soil thermal resistivity of 1.5 K·m/W and Depth of laying of 0.5 m. In case of different laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.

Annex A: Guides to Use

A.1 Aim

The aim of this annex is to inform users of characteristics and limitations of electric cables and thereby to minimize their misuse.

It is assumed that the design of installation and the specification, purchase and installation of cables is entrusted to suitably skilled and competent people.

In cases of doubt as to the suitability of cables for a particular use further specific information should be obtained from the manufacturer.

A.2 Cable Selection and Design

A.2.1 The products specified in this catalogue are intended to be used for the supply of electrical energy up to rated voltage of 0.6/1 (1.2) kV. This rating should not be exceeded.

A.2.2 These cables are intended for use within a nominal power frequency range of 49 Hz to 61 Hz.

A.2.3 In addition to the current ratings, due regard should be given to:

- a. The capability of the cable to withstand the worst anticipated fault condition of the system;
- b. The earth loop impedance;
- c. The operating characteristics of the connected equipment;
- d. The voltage drop requirements during normal load or motor starting conditions.

A.2.4 The possible effects of transient over-voltages should be recognized as they can be detrimental to cables.

A.3 Environment and Application

A.3.1 Reasonable protection against mechanical damage, appropriate to the choice of cable and the installation conditions, should be provided.

A.3.2 Cables included in this catalogue contain PVC, and when exposed to the effects of external fire will produce harmful smoke and fumes, and where bundled together may propagate fire. When circumstances dictate, consideration should be given to the use of any of our Fire Survival Cables products. Please refer to [alfanar's](#) Fire Survival Cables catalogue for more information.

A.3.3 Cables can be harmed by exposure to corrosive products or solvent substances, especially petroleum based chemicals or their vapours.

A.3.4 Cables specified in this catalogue are not specifically designed for use:

- a. As self-supporting aerial cables;
- b. As submarine cable or for laying in water-logged conditions;
- c. Where subsidence is likely, unless special precautions are taken to minimize damage;
- d. Where any exposure to excessive heat under normal operating conditions is involved;
- e. Where the sheath is subjected to a voltage test after installation.

A.3.5 If cables are exposed to localized heat, solar radiation or high temperature ambient conditions or there is a possibility of higher soil thermal resistivity, the current carrying capacity will be reduced.

A.3.6 The standard sheathing compound (PVC) supplied on these cables do not provide protection against damage by rodents, termites etc., unless requested earlier at time of purchase order.

A.3.7 loaded cables can have surface temperatures that require protection against accidental contact.

Annex A: Guides to Use

A.4 Installation (Please refer to Annex I for more information)

- A.4.1 Precautions should be taken to avoid mechanical damage to the cables before and during installation.
- A.4.2 Exceeding the manufacturer's recommended maximum pulling tensions can result in damage to the cable.
- A.4.3 If cables are to be installed in ducts, the correct size of duct should be used.
- A.4.4 The type of jointing and filling compounds employed should be chemically compatible with the cable materials.
- A.4.5 The cable support system should be such as to avoid damage or danger under normal or fault conditions.
- A.4.6 Cables specified in this catalogue are designed for fixed installations only; for example they are not for use as trailing or reeling cables.
- A.4.7 Repeated over-voltage testing can lead to premature failure of the cable.
- A.4.8 The selection of cable glands, accessories and any associated tools should take account of all aspects of intended use.

A.5 Storage and handling of drums (Please refer to Annex I for more information)

- A.5.1 Cable drums should be regularly inspected during storage to assess their physical condition.
- A.5.2 Battens, where applied, should not be removed from drums until the cable is about to be installed.
- A.5.3 When handling drums, reasonable precautions should be taken to avoid injury. Due regard should be paid to the weight, method and direction of rolling, lifting, protruding nails and splinters.
- A.5.4 Care should be taken to avoid deterioration of drums or their becoming a hazard to the general public.
- A.5.5 A detailed guide to the safe handling of cable drums is available in Annex (I) of this catalogue.

Annex B: Continuous Current Ratings

B.1 General

This annex deals solely with the installation conditions used to calculate the steady-state continuous current ratings of single-core and multi-core cables having extruded insulation. The tabulated current ratings provided in this catalogue have been calculated for cables having a rated voltage of 0.6/1 kV and constructions as detailed in each relevant type.

The tabulated current ratings in this catalogue have been calculated using the methods set out in IEC 60287.

B.2 Temperatures

The maximum conductor temperatures for which the tabulated current ratings have been calculated are 70 °C and 90 °C for PVC and XLPE insulated cables respectively.

The reference ambient temperatures assumed are as follows:

- For cables in free air: **40 °C**
- For buried cables, either directly in the soil or in ducts in the ground: **35 °C**

Derating factors for other ambient temperatures are given in Tables C.1 and C.2.

The current ratings for cables in air do not take account of the increase, if any, due to solar or other infra-red radiation. Where the cables are subject to such radiation, the current rating should be derived by the methods specified in IEC 60287.

B.3 Soil thermal resistivity

The tabulated current ratings in this catalogue for cables in ducts or direct in the ground relate to a soil thermal resistivity of **1.5 °C.m/W**. Derating factors for other values of thermal resistivity are given in tables C.4 to C.7.

It is assumed that the soil properties are uniform; no allowance has been made for the possibility of moisture migration, which can lead to a region of high thermal resistivity around the cable. If partial drying-out of the soil is foreseen, the permissible current rating should be derived by the methods specified in IEC 60287.

B.4 Methods of installation

Current ratings tabulated in this catalogue are for cables installed in the following conditions.

B.4.1 Single-core cables buried direct

Current ratings are given for cables buried direct in the ground at a depth of **0.5 m** (derating factors for other values of burial depth are given in table C.3) under the following conditions:

1. Three cables in trefoil formation touching throughout their length **Fig. (a)**;
2. Three cables in horizontal flat formation touching throughout their length, **Fig. (b)**.

The cable depth is measured to the cable axis or centre of the trefoil group.

B.4.2 Single-core cables in polyvinyl chloride (PVC) ducts

Current ratings are given for cables in polyvinyl chloride (PVC) ducts buried at a depth of 0.5 m (derating factors for other values of burial depth are given in table C.3) with one cable per duct as follows:

1. Three cables in trefoil formation in single duct **Fig. (c)**;
2. Three cables in horizontal flat formation, ducts touching throughout their length **Fig. (d)**.

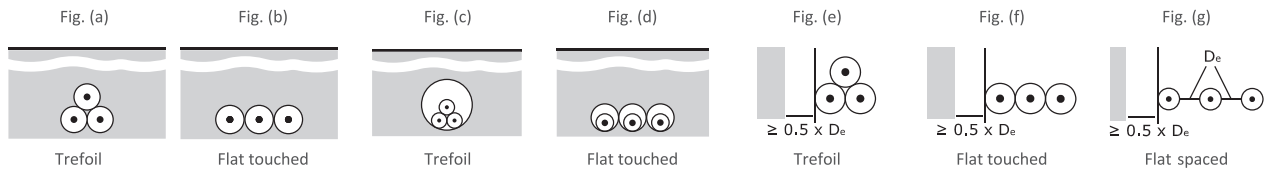
The ducts are assumed to be polyvinyl chloride (PVC) having an inside diameter of 1.5 times the outside diameter of the cable and a wall thickness equal to 6 % of the duct inside diameter. The ratings are based on the assumption that the ducts are air filled. The tabulated ratings may be applied to cables in ducts having an inside diameter of between 1.2 and 2 times the outside diameter of the cables. For this range of diameters, the variation in the rating is less than 2 % of the tabulated value.

Annex B: Continuous Current Ratings

B.4.3 Single-core cables in air

The cables are assumed to be spaced at least 0.5 times the cable diameter D_e from any vertical surface and installed on brackets or ladder racks as follows:

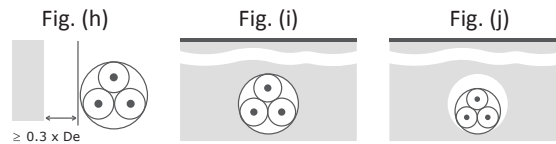
1. Three cables in trefoil formation touching throughout their length **Fig. (e)**.
2. Three cables in horizontal flat formation touching throughout their length **Fig. (f)**.
3. Three cables in horizontal flat formation with a clearance of one cable diameter D_e **Fig. (g)**.



B.4.4 Three-core cables

Current ratings are given for multi-core cables installed under the following conditions:

1. Single cable in air spaced at least 0.3 times the cable diameter D_e from any vertical surface **Fig. (h)**.
2. Single cable buried direct in the ground at a depth of 0.5 m (derating factors for other values of burial depth are given in table C.3) **Fig. (i)**.
3. Single cable in a buried polyvinyl chloride (PVC) duct having dimensions calculated in the same manner as for the single-core cables in ducts. The depth of burial of the duct is 0.5 m (derating factors for other values of burial depth are given in table C.3) **Fig. (j)**.



B.5 Cable loading

The tabulated ratings relate to circuits carrying a balanced three-phase load at a rated frequency of 60 Hz. However, the tabulated ratings can be safely used with circuits carrying a balanced three-phase load at a rated frequency of 50 Hz, where the continuous current rating values are slightly higher in case of rated frequency of 50 Hz.

B.6 Rating factors for grouped circuits

The tabulated current ratings apply to a set of three single-core cables or one multi-core cable forming either a single-phase circuit (two-core cables) or a three-phase circuit. When a number of circuits are installed in close proximity, the rating should be reduced by the appropriate factor from tables C.8 to C.12.

These rating factors should also be applied to groups of parallel cables forming the same circuit. In such cases, attention should also be given to the arrangement of the cables to ensure that the load current is shared equally between the parallel cables.

B.7 Derating factors

The derating factors given in tables C.1 to C.12 for temperature, installation conditions and grouping are averages over a range of conductor sizes and cable types. For particular cases, the derating factor may be calculated using the methods in IEC 60287.

Annex C: Derating Factors

Table C.1

Derating factors for ambient ground temperature

Max. Conductor temperature	Ambient ground temperature °C										
	10	15	20	25	30	35	40	45	50	55	60
70 °C (PVC)	1.31	1.25	1.19	1.13	1.06	1.00	0.92	0.85	0.75	0.65	0.54
90 °C (XLPE)	1.20	1.17	1.12	1.08	1.04	1.00	0.96	0.90	0.85	0.80	0.73

Table C.2

Derating factors for ambient air temperature

Max. Conductor temperature	Ambient air temperature °C										
	10	15	20	25	30	35	40	45	50	55	60
70 °C (PVC)	1.40	1.34	1.29	1.22	1.15	1.08	1.00	0.91	0.82	0.70	0.57
90 °C (XLPE)	1.26	1.23	1.19	1.14	1.10	1.05	1.00	0.96	0.90	0.84	0.78

Table C.3

Derating factors for depth of laying

Depth of laying (mt.)	Cables cross section		
	Up to 70 mm ²	95 up to 240 mm ²	300 mm ² & above
0.50	1.00	1.00	1.00
0.60	0.99	0.98	0.97
0.80	0.97	0.96	0.94
1.00	0.95	0.93	0.92
1.25	0.94	0.92	0.89
1.50	0.93	0.90	0.87
1.75	0.92	0.89	0.86
2.00	0.91	0.88	0.85

Table C.4

Derating factors for soil thermal resistivities for cables buried direct in the ground or in buried ducts

Method of installation	Values of soil thermal resistivity K.m/W						
	0.5	0.7	1.0	1.5	2.0	2.5	3.0
Direct buried cables	1.47	1.27	1.17	1.00	0.88	0.78	0.70
Cable in buried ducts	1.16	1.09	1.07	1.00	0.95	0.91	0.87

NOTE 1 : Values given are averages for the cable types and range of conductor sizes considered in this catalogue. The overall accuracy of derating factors is within $\pm 5\%$.

Annex C: Derating Factors

Table C.5

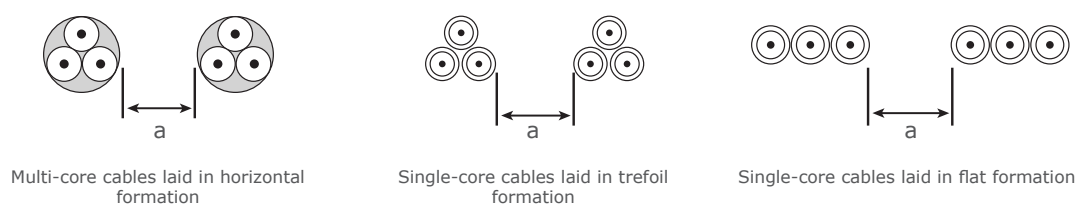
Derating factors for more than one circuit of single-core or multi-core cables laid directly in the ground (Fig. a)

Number of circuits	Circuit to circuit clearance (a)				
	Cables touching	One cable diameter	0.125 m	0.25 m	0.5 m
2	0.75	0.80	0.85	0.90	0.90
3	0.65	0.70	0.75	0.80	0.85
4	0.60	0.60	0.70	0.75	0.80
5	0.55	0.55	0.65	0.70	0.80
6	0.50	0.55	0.60	0.70	0.80
7	0.45	0.51	0.59	0.67	0.76
8	0.43	0.48	0.57	0.65	0.75
9	0.41	0.46	0.55	0.63	0.74
12	0.36	0.42	0.51	0.59	0.71
16	0.32	0.38	0.47	0.56	0.68
20	0.29	0.35	0.44	0.53	0.66

NOTE 1 : Values given are averages for the cable types and range of conductor sizes considered in this catalogue. The process of averaging, together with rounding off, can result in some cases in errors up to $\pm 10\%$. Where more precise values are required they may be calculated by methods given in IEC 60287-2-1.

NOTE 2 : If a circuit consists of (m) parallel conductors per phase, then for determining the reduction factor, this circuit should be considered as (m) circuits.

Fig. a



Annex C: Derating Factors

Table C.6

Derating factors for more than one circuit of single-core cables laid in single-way ducts in the ground (Fig. b)

Number of circuits	Duct to duct clearance (a)			
	Ducts touching	0.25 m	0.5 m	1.0 m
2	0.80	0.90	0.90	0.95
3	0.70	0.80	0.85	0.90
4	0.65	0.75	0.80	0.90
5	0.60	0.70	0.80	0.90
6	0.60	0.70	0.80	0.90
7	0.53	0.66	0.76	0.87
8	0.50	0.63	0.74	0.87
9	0.47	0.61	0.73	0.86
10	0.45	0.59	0.72	0.85
11	0.43	0.57	0.70	0.85
12	0.41	0.56	0.69	0.84
13	0.39	0.54	0.68	0.84
14	0.37	0.53	0.68	0.83
15	0.35	0.52	0.67	0.83
16	0.34	0.51	0.66	0.83
17	0.33	0.50	0.65	0.82
18	0.31	0.49	0.65	0.82
19	0.30	0.48	0.64	0.82
20	0.29	0.47	0.63	0.81

NOTE 1 : Values given are averages for the cable types and range of conductor sizes considered in this catalogue. The process of averaging, together with rounding off, can result in some cases in errors up to $\pm 10\%$. Where more precise values are required they may be calculated by methods given in IEC 60287-2-1.

NOTE 2 : If a circuit consists of (n) parallel conductors per phase, then for determining the reduction factor, this circuit should be considered as (n) circuits.

Fig. b



Annex C: Derating Factors

Table C.7

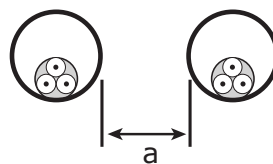
Derating factors for more than one circuit of multi-core cables laid in single-way ducts in the ground (Fig. c)

Number of circuits	Duct to duct clearance (a)			
	Ducts touching	0.25 m	0.5 m	1.0 m
2	0.85	0.90	0.95	0.95
3	0.75	0.85	0.90	0.95
4	0.70	0.80	0.85	0.90
5	0.65	0.80	0.85	0.90
6	0.60	0.80	0.80	0.90
7	0.57	0.76	0.80	0.88
8	0.54	0.74	0.78	0.88
9	0.52	0.73	0.77	0.87
10	0.49	0.72	0.76	0.86
11	0.47	0.70	0.75	0.86
12	0.45	0.69	0.74	0.85
13	0.44	0.68	0.73	0.85
14	0.42	0.68	0.72	0.84
15	0.41	0.67	0.72	0.84
16	0.39	0.66	0.71	0.83
17	0.38	0.65	0.70	0.83
18	0.37	0.65	0.70	0.83
19	0.35	0.64	0.69	0.82
20	0.34	0.63	0.68	0.82

NOTE 1 : Values given are averages for the cable types and range of conductor sizes considered in this catalogue. The process of averaging, together with rounding off, can result in some cases in errors up to $\pm 10\%$. Where more precise values are required they may be calculated by methods given in IEC 60287-2-1.

NOTE 2 : If a circuit consists of (n) parallel conductors per phase, then for determining the reduction factor, this circuit should be considered as (n) circuits.

Fig. c

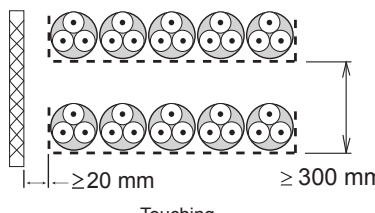
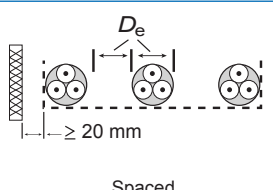
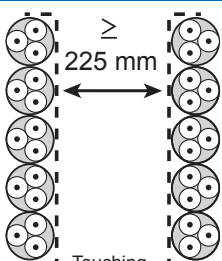
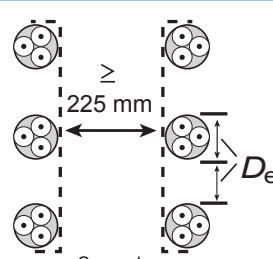
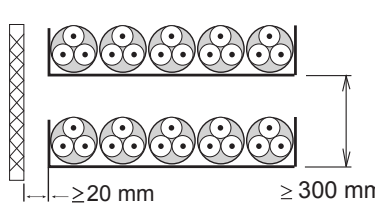


ulti-core cables in single-way duc
laid in horizontal formation

Annex C: Derating Factors

Table C.8

Derating factors for group of more than one multi-core cable in free air

Method of Installation		No. of trays	No. of cables per tray							
			1	2	3	4	6	9		
Cables on horizontal perforated cable tray systems (note 4)	 <p>Touching</p>	1	1.00	0.88	0.82	0.79	0.76	0.73		
		2	1.00	0.87	0.80	0.77	0.73	0.68		
		3	1.00	0.86	0.79	0.76	0.71	0.66		
		6	1.00	0.84	0.77	0.73	0.68	0.64		
	 <p>Spaced</p>	1	1.00	1.00	0.98	0.95	0.91	-		
		2	1.00	0.99	0.96	0.92	0.87	-		
3		1.00	0.98	0.95	0.91	0.85	-			
Method of Installation		No. of trays	No. of cables per tray							
			1	2	3	4	6	9		
Cables on vertical perforated cable tray systems (note 5)	 <p>Touching</p>	1	1.00	0.88	0.82	0.78	0.73	0.72		
		2	1.00	0.88	0.81	0.76	0.71	0.70		
	 <p>Spaced</p>	1	1.00	0.91	0.89	0.88	0.87	-		
		2	1.00	0.91	0.88	0.87	0.85	-		
		Method of Installation		No. of trays	No. of cables per tray					
					1	2	3	4	6	9
Cables on horizontal unperforated cable tray systems	 <p>Touching</p>	1	0.97	0.84	0.78	0.75	0.71	0.68		
		2	0.97	0.83	0.76	0.72	0.68	0.63		
		3	0.97	0.82	0.75	0.71	0.66	0.61		
		6	0.97	0.81	0.73	0.69	0.63	0.58		

Annex C: Derating Factors

Method of Installation	No. of ladders	No. of cables per ladder						
		1	2	3	4	6	9	
Cables on horizontal cable ladder systems, cleats, etc. (note 4)			1	0.87	0.82	0.80	0.79	0.78
			2	0.86	0.80	0.78	0.76	0.73
			3	0.85	0.79	0.76	0.73	0.70
			1	1.00	0.98	0.95	0.91	-
			2	0.99	0.96	0.92	0.87	-
			3	0.98	0.95	0.91	0.85	-

NOTE 1 : Values given should be used as a multiplier to current-carrying capacity for one multi-core cable in free air.

NOTE 2 : Values given are averages for the cable types and range of conductor sizes considered in this catalogue. The spread of values is generally less than 5 %.

NOTE 3 : Factors apply to single layer groups of cables as shown above and do not apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and must be determined by an appropriate method.

NOTE 4 : Values are given for vertical spacing between trays/ladders of 300 mm and at least 20 mm between trays/ladders and wall. For closer spacing, the factors should be reduced.

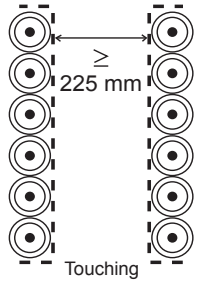
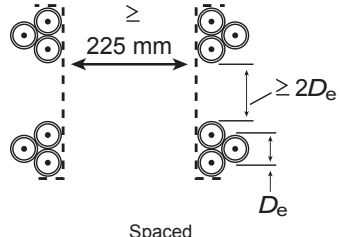
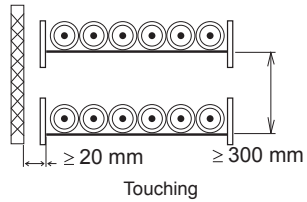
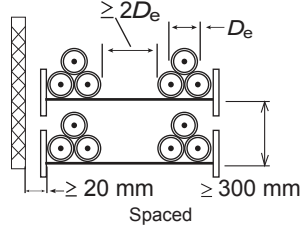
NOTE 5 : Values are given for horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing, the factors should be reduced.

Table C.9

Derating factors for groups of one or more circuits of single-core cables in free air

Method of Installation	No. of trays	No. of three-phase circuits per tray			Use as a multiplier to current-carrying capacity for		
		1	2	3			
Cables on horizontal perforated cable tray systems (note 3)			1	0.98	0.91	0.87	Three cables in flat formation
			2	0.96	0.87	0.81	
			3	0.95	0.85	0.78	
			1	1.00	0.98	0.96	Three cables in trefoil formation
			2	0.97	0.93	0.89	
			3	0.96	0.92	0.86	

Annex C: Derating Factors

Method of Installation		No. of trays	No. of three-phase circuits per tray			Use as a multiplier to current-carrying capacity for
			1	2	3	
Cables on vertical perforated cable tray systems (note 4)		1	0.96	0.86	-	Three cables in flat formation
		2	0.95	0.84	-	
		1	1.00	0.91	0.89	Three cables in trefoil formation
		2	1.00	0.90	0.86	
Method of Installation		No. of ladders	No. of three-phase circuits per ladder			Use as a multiplier to current-carrying capacity for
			1	2	3	
Cables on horizontal cable ladder systems, cleats, etc. (note 3)		1	1.00	0.97	0.96	Three cables in flat formation
		2	0.98	0.93	0.89	
		3	0.97	0.90	0.86	
		1	1.00	1.00	1.00	Three cables in trefoil formation
		2	0.97	0.95	0.93	
		3	0.96	0.94	0.90	

NOTE 1 : Values given are averages for the cable types and range of conductor sizes considered in this catalogue. The spread of values is generally less than 5 %.

NOTE 2 : Factors are given for single layers of cables (or trefoil groups) as shown in the table and do not apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and should be determined by an appropriate method.

NOTE 3 : Values are given for vertical spacing between cable trays/ladders of 300 mm and at least 20 mm between cable trays/ladders and wall. For closer spacing the factors should be reduced.

NOTE 4 : Values are given for horizontal spacing between cable trays of 225 mm with cable trays mounted back to back. For closer spacing the factors should be reduced.

NOTE 5 : If a circuit consists of (m) parallel conductors per phase, then for determining the reduction factor this circuit should be considered as (m) circuits.

Annex D: Formulas

D.1 Resistance

The values of conductor DC resistance given in the previous tables are based on 20 °C. In case the DC resistance is required at any other temperature, the following formula is used:

$$R_{\theta} = R_{20} \times [1 + \alpha (\theta - 20)] \quad \Omega/\text{km}$$

Where

R_{θ}	Conductor DC resistance at θ °C	Ω /km
R_{20}	Conductor DC resistance at 20 °C	Ω /km
θ	Operating temperature	°C
α	Resistance temperature coefficient = 0.00393 for Copper = 0.00403 for Aluminum	1 / °C

To get the AC resistance of the conductor at its operating temperature, the following formula is used:

$$R_{a.c} = R_{\theta} \times (1 + \gamma_p + \gamma_s) \quad \Omega/\text{km}$$

Where

γ_p and γ_s are the proximity and skin effect factors, respectively, which depend on the laying and operating frequency of the cable.

D.2 Inductance

Self and mutual inductance are formulated as follows:

$$L = K + 0.2 \ln \left(\frac{2S}{d} \right) \quad \text{mH}/\text{km}$$

Where

L	Inductance	mH/km
K	Constant depends on the conductors' number of wires	
d	Conductor diameter	mm
S	Axial spacing between cables = 1 x S in case of trefoil formation = 1.26 X S in case of flat formation	mm

D.3 Capacitance

$$C = \frac{\epsilon_r}{18 \ln \frac{D}{d}} \quad \mu\text{F}/\text{km}$$

Where

C	Capacitance	$\mu\text{F}/\text{km}$
ϵ_r	Relative permittivity of insulation	
D	Diameter over insulation,	mm
d	Diameter under insulation	mm

Annex D: Formulas

D.4 Insulation Resistance

$$R = k \ln \left(\frac{D}{d} \right) \quad \text{M}\Omega \cdot \text{km}$$

Where

R	Insulation resistance	MΩ.km
K	Constant depends on the insulation	
d	Diameter of the conductor	mm
D	Diameter of the insulated core	mm

D.5 Charging Current

The charging current is the capacitive current which flows when an AC voltage is applied to the cables as a result of the capacitance between the conductor and earth, and for a multi-core cable in which cores are not screened, between conductors. The value can be derived from following the equation:

$$I_c = U_o \omega C 10^{-6} \quad \text{A/km}$$

Where

I _c	Charging current	A/km
U _o	Phase voltage	V
ω	2 π f	
f	Operating frequency	Hz
C	Capacitance to neutral	μF/km

D.6 Dielectric Losses

The dielectric losses of an AC cable are proportional to the capacitance, the frequency, the phase voltage and the power factor. The value can be derived from the following equation:

$$W_d = \omega C U_o^2 \tan \delta 10^{-6} \quad \text{W/km/Ph}$$

Where

W _d	Dielectric Losses	W/km/Ph
ω	2 π f	
f	Operating frequency	Hz
C	Capacitance to neutral	μF/km
U _o	Phase voltage	V
tan δ	Dielectric power factor	

Annex D: Formulas

D.7 Short Circuit Capacity

Tables F.1 to F.4 give the short circuit current for conductor based on the following conditions:

1. Short circuit starts from the maximum operating conductor temperature of 70 °C and 90 °C for PVC and XLPE insulation respectively
2. Maximum temperature during short circuit is 160 °C (Cross section $\leq 300 \text{ mm}^2$) and 140 °C (Cross section $> 300 \text{ mm}^2$) for PVC insulation and 250 °C for XLPE insulation.
3. Maximum short circuit duration is 5 seconds.

If the short circuit current is required at duration not mentioned in the catalogue, it is obtained by dividing the short circuit current for 1 second by the square root of the required duration as follows:

Where

$I_{s.c.t.}$	Short circuit current for t second	kA
$I_{s.c.1}$	Short circuit current for 1 second	kA
t	Duration	Sec.

D.8 Voltage Drop

When current flows in a cable conductor there is a voltage drop between the ends of the conductors, which is the product of the current and the impedance. The following equations should be used to calculate the voltage drop:

A. Single phase circuit:

$$V_d = 2I \ell (R \cos F + X \sin F) \quad \text{V}$$

B. Three phase circuit:

$$V_d = \sqrt{3}I \ell (R \cos F + X \sin F) \quad \text{V}$$

Where

V_d	Voltage drop	V
I	Load current	A
ℓ	Route length	km
R	AC Resistance	Ω/km
X	Reactance	Ω/km
$\cos F$	Power factor	

Where

$$X = \omega L 10^{-3} \quad \Omega/\text{km}$$

Where

ω	$2 \pi f$	
f	Operating frequency	Hz
L	inductance	mH/km

Relation between $\cos F$ and $\sin F$:

$\cos F$	1.0	0.9	0.85	0.8	0.6
$\sin F$	0.0	0.44	0.53	0.6	0.8

- LV cabling system should be planned so as not to exceed voltage drop of 3-5% in normal operating conditions.
- Voltage drop data for LV single and multi core cables are tabulated in table G.1 and G.2.

Annex E: Electrical Parameters Of Cables

Table E.1

Single-core cables with copper conductors - PVC Insulated

Nominal area of conductor	Max. Conductor Resistance		Reactance at (60 Hz, Trefoil)	Impedance at (70 °C, 60 Hz)	Capacitance
	DC at 20 °C	AC at 70 °C			
mm ²	Ω / km	Ω / km	Ω / km	Ω / km	μF / km
Non-armoured Cables					
1.5	12.1000	14.4777	0.178	14.479	0.619
2.5	7.4100	8.8661	0.164	8.868	0.763
4	4.6100	5.5159	0.157	5.518	0.753
6	3.0800	3.6853	0.147	3.688	0.904
10	1.8300	2.1897	0.139	2.194	1.028
16	1.1500	1.3762	0.130	1.382	1.254
25	0.7270	0.8702	0.125	0.879	1.271
35	0.5240	0.6274	0.119	0.639	1.489
50	0.3870	0.4637	0.113	0.477	1.497
70	0.2680	0.3217	0.108	0.339	1.753
95	0.1930	0.2324	0.106	0.255	1.782
120	0.1530	0.1850	0.103	0.212	1.964
150	0.1240	0.1508	0.102	0.182	1.955
185	0.0991	0.1216	0.101	0.158	1.969
240	0.0754	0.0942	0.100	0.137	2.042
300	0.0601	0.0769	0.098	0.125	2.113
400	0.0470	0.0625	0.097	0.115	2.189
500	0.0366	0.0515	0.095	0.108	2.318
630	0.0283	0.0433	0.093	0.103	2.580
800	0.0221	0.0374	0.092	0.099	2.899
1000	0.0176	0.0333	0.089	0.095	3.314
Armoured Cables ⁽¹⁾					
6	3.0800	3.6853	0.187	3.690	0.904
10	1.8300	2.1897	0.178	2.197	1.028
16	1.1500	1.3761	0.165	1.386	1.254
25	0.7270	0.8701	0.156	0.884	1.271
35	0.5240	0.6273	0.149	0.645	1.489
50	0.3870	0.4635	0.140	0.484	1.497
70	0.2680	0.3214	0.133	0.348	1.753
95	0.1930	0.2320	0.128	0.265	1.782
120	0.1530	0.1844	0.125	0.223	1.964
150	0.1240	0.1501	0.121	0.193	1.955
185	0.0991	0.1208	0.118	0.169	1.969
240	0.0754	0.0933	0.115	0.148	2.042
300	0.0601	0.0757	0.114	0.137	2.113
400	0.0470	0.0611	0.112	0.127	2.189
500	0.0366	0.0499	0.109	0.120	2.318
630	0.0283	0.0415	0.106	0.114	2.580
800	0.0221	0.0352	0.105	0.111	2.899
1000	0.0176	0.0312	0.101	0.105	3.314

(1) The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E: Electrical Parameters Of Cables

Table E.2

Single-core cables with aluminium conductors - PVC Insulated

Nominal area of conductor mm ²	Max. Conductor Resistance		Reactance at (60 Hz, Trefoil) Ω / km	Impedance at (70 °C, 60 Hz) Ω / km	Capacitance μF / km
	DC at 20 °C Ω / km	AC at 70 °C Ω / km			
Non-armoured Cables					
10	3.0800	3.7007	0.139	3.703	1.028
16	1.9100	2.2950	0.130	2.299	1.254
25	1.2000	1.4420	0.125	1.447	1.271
35	0.8680	1.0432	0.119	1.050	1.489
50	0.6410	0.7706	0.113	0.779	1.497
70	0.4430	0.5329	0.108	0.544	1.753
95	0.3200	0.3854	0.106	0.400	1.782
120	0.2530	0.3052	0.103	0.322	1.964
150	0.2060	0.2490	0.102	0.269	1.955
185	0.1640	0.1989	0.101	0.223	1.969
240	0.1250	0.1527	0.100	0.182	2.042
300	0.1000	0.1233	0.098	0.158	2.113
400	0.0778	0.0975	0.097	0.137	2.189
500	0.0605	0.0779	0.095	0.123	2.318
630	0.0469	0.0630	0.093	0.113	2.580
800	0.0367	0.0524	0.091	0.105	2.907
1000	0.0291	0.0450	0.089	0.100	3.314
Armoured Cables ⁽¹⁾					
10	3.0800	3.7007	0.178	3.705	1.028
16	1.9100	2.2949	0.165	2.301	1.254
25	1.2000	1.4419	0.156	1.450	1.271
35	0.8680	1.0431	0.149	1.054	1.489
50	0.6410	0.7704	0.140	0.783	1.497
70	0.4430	0.5327	0.133	0.549	1.753
95	0.3200	0.3851	0.128	0.406	1.782
120	0.2530	0.3048	0.125	0.329	1.964
150	0.2060	0.2486	0.121	0.276	1.955
185	0.1640	0.1984	0.118	0.231	1.969
240	0.1250	0.1521	0.115	0.191	2.042
300	0.1000	0.1225	0.114	0.167	2.113
400	0.0778	0.0966	0.112	0.148	2.189
500	0.0605	0.0768	0.109	0.133	2.318
630	0.0469	0.0617	0.106	0.123	2.580
800	0.0367	0.0506	0.105	0.117	2.907
1000	0.0291	0.0431	0.101	0.110	3.314

(1) The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E: Electrical Parameters of Cables

Table E.3

Single-core cables with copper conductors – XLPE Insulated

Nominal area of conductor	Max. Conductor Resistance		Reactance at (60 Hz, Trefoil)	Impedance at (90 °C, 60 Hz)	Capacitance
	DC at 20 °C	AC at 90 °C			
mm ²	Ω / km	Ω / km	Ω / km	Ω / km	μF / km
Non-armoured Cables					
1.5	12.1000	15.4287	0.175	15.430	0.212
2.5	7.4100	9.4485	0.161	9.450	0.264
4	4.6100	5.8782	0.150	5.880	0.309
6	3.0800	3.9274	0.141	3.930	0.379
10	1.8300	2.3335	0.134	2.337	0.433
16	1.1500	1.4665	0.125	1.472	0.533
25	0.7270	0.9273	0.121	0.935	0.505
35	0.5240	0.6686	0.115	0.678	0.599
50	0.3870	0.4941	0.108	0.506	0.629
70	0.2680	0.3428	0.104	0.358	0.679
95	0.1930	0.2476	0.102	0.268	0.781
120	0.1530	0.1970	0.100	0.185	0.797
150	0.1240	0.1605	0.099	0.189	0.767
185	0.0991	0.1294	0.098	0.162	0.753
240	0.0754	0.1002	0.096	0.139	0.807
300	0.0601	0.0817	0.094	0.125	0.858
400	0.0470	0.0663	0.094	0.115	0.870
500	0.0366	0.0545	0.092	0.107	0.904
630	0.0283	0.0454	0.092	0.102	0.928
800	0.0221	0.0390	0.091	0.099	0.971
1000	0.0176	0.0346	0.088	0.095	1.105
Armoured Cables ⁽¹⁾					
6	3.0800	3.9273	0.184	3.932	0.379
10	1.8300	2.3335	0.175	2.340	0.433
16	1.1500	1.4665	0.162	1.475	0.533
25	0.7270	0.9272	0.153	0.940	0.505
35	0.5240	0.6685	0.145	0.684	0.599
50	0.3870	0.4939	0.137	0.512	0.629
70	0.2680	0.3424	0.130	0.366	0.679
95	0.1930	0.2471	0.125	0.277	0.781
120	0.1530	0.1964	0.122	0.231	0.797
150	0.1240	0.1598	0.118	0.199	0.767
185	0.0991	0.1286	0.116	0.173	0.753
240	0.0754	0.0991	0.113	0.150	0.807
300	0.0601	0.0805	0.109	0.135	0.858
400	0.0470	0.0647	0.110	0.127	0.870
500	0.0366	0.0527	0.107	0.119	0.904
630	0.0283	0.0436	0.104	0.113	0.928
800	0.0221	0.0367	0.105	0.111	0.971
1000	0.0176	0.0324	0.100	0.105	1.105

(1) The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E: Electrical Parameters of Cables

Table E.4

Single-core cables with aluminium conductors - XLPE Insulated

Nominal area of conductor mm ²	Max. Conductor Resistance		Reactance at (60 Hz, Trefoil) Ω / km	Impedance at (90 °C, 60 Hz) Ω / km	Capacitance μF / km
	DC at 20 °C Ω / km	AC at 90 °C Ω / km			
Non-armoured Cables					
10	3.0800	3.9489	0.134	3.951	0.433
16	1.9100	2.4489	0.125	2.452	0.533
25	1.2000	1.5387	0.121	1.543	0.505
35	0.8680	1.1131	0.115	1.119	0.599
50	0.6410	0.8222	0.108	0.829	0.629
70	0.4430	0.5686	0.104	0.578	0.679
95	0.3200	0.4112	0.102	0.424	0.781
120	0.2530	0.3255	0.100	0.341	0.797
150	0.2060	0.2656	0.099	0.283	0.767
185	0.1640	0.2121	0.098	0.234	0.753
240	0.1250	0.1627	0.096	0.189	0.807
300	0.1000	0.1314	0.094	0.162	0.858
400	0.0778	0.1038	0.094	0.140	0.870
500	0.0605	0.0828	0.092	0.124	0.904
630	0.0469	0.0666	0.092	0.114	0.928
800	0.0367	0.0551	0.091	0.106	0.973
1000	0.0291	0.0471	0.088	0.100	1.105
Armoured Cables (1)					
10	3.0800	3.9489	0.175	3.953	0.433
16	1.9100	2.4489	0.162	2.454	0.533
25	1.2000	1.5386	0.153	1.546	0.505
35	0.8680	1.1130	0.145	1.122	0.599
50	0.6410	0.8221	0.137	0.833	0.629
70	0.4430	0.5684	0.130	0.583	0.679
95	0.3200	0.4109	0.125	0.429	0.781
120	0.2530	0.3252	0.122	0.347	0.797
150	0.2060	0.2651	0.118	0.290	0.767
185	0.1640	0.2116	0.116	0.241	0.753
240	0.1250	0.1621	0.113	0.197	0.807
300	0.1000	0.1306	0.109	0.170	0.858
400	0.0778	0.1028	0.110	0.150	0.870
500	0.0605	0.0816	0.107	0.134	0.904
630	0.0469	0.0653	0.104	0.123	0.928
800	0.0367	0.0533	0.104	0.117	0.973
1000	0.0291	0.0452	0.100	0.110	1.105

(1) The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E: Electrical Parameters of Cables

Table E.5

Multi-core cables with copper conductors - PVC Insulated

Nominal area of conductor	Max. Conductor Resistance		Reactance at (60 Hz)	Impedance at (70 °C, 60 Hz)	Capacitance
	DC at 20 °C	AC at 70 °C			
mm ²	Ω / km	Ω / km	Ω / km	Ω / km	μF / km
1.5	12.1000	14.4777	0.132	14.478	0.630
2.5	7.4100	8.8661	0.123	8.867	0.759
4	4.6100	5.5159	0.123	5.517	0.768
6	3.0800	3.6853	0.116	3.687	0.897
10	1.8300	2.1898	0.111	2.193	1.028
16	1.1500	1.3763	0.105	1.380	1.254
25	0.7270	0.8703	0.104	0.877	1.293
35	0.5240	0.6276	0.101	0.636	1.489
50	0.3870	0.4639	0.097	0.474	1.497
70	0.2680	0.3220	0.094	0.336	1.753
95	0.1930	0.2328	0.094	0.251	1.782
120	0.1530	0.1856	0.091	0.207	1.964
150	0.1240	0.1514	0.091	0.177	1.955
185	0.0991	0.1224	0.091	0.152	1.969
240	0.0754	0.0952	0.090	0.131	2.042
300	0.0601	0.0780	0.089	0.119	2.113
400	0.0470	0.0638	0.089	0.109	2.189
500	0.0366	0.0531	0.088	0.103	2.318

Table E.6

Multi-core cables with aluminium conductors - PVC Insulated

Nominal area of conductor	Max. Conductor Resistance		Reactance at (60 Hz)	Impedance at (70 °C, 60 Hz)	Capacitance
	DC at 20 °C	AC at 70 °C			
mm ²	Ω / km	Ω / km	Ω / km	Ω / km	μF / km
10	3.0800	3.7007	0.111	3.702	1.028
16	1.9100	2.2950	0.105	2.297	1.254
25	1.2000	1.4421	0.106	1.446	1.242
35	0.8680	1.0433	0.101	1.048	1.489
50	0.6410	0.7707	0.097	0.777	1.497
70	0.4430	0.5331	0.094	0.541	1.753
95	0.3200	0.3856	0.094	0.397	1.782
120	0.2530	0.3055	0.091	0.319	1.964
150	0.2060	0.2494	0.091	0.265	1.955
185	0.1640	0.1994	0.091	0.219	1.969
240	0.1250	0.1533	0.090	0.178	2.042
300	0.1000	0.1240	0.090	0.153	2.113
400	0.0778	0.0984	0.089	0.132	2.189
500	0.0605	0.0789	0.088	0.118	2.318

Annex E: Electrical Parameters of Cables

Table E.7

Multi-core cables with copper conductors – XLPE Insulated

Nominal area of conductor	Max. Conductor Resistance		Reactance at (60 Hz)	Impedance at (90 °C, 60 Hz)	Capacitance
	DC at 20 °C	AC at 90 °C			
mm ²	Ω / km	Ω / km	Ω / km	Ω / km	μF / km
1.5	12.1000	15.4287	0.128	15.429	0.212
2.5	7.4100	9.4485	0.118	9.449	0.264
4	4.6100	5.8783	0.113	5.879	0.309
6	3.0800	3.9274	0.106	3.929	0.379
10	1.8300	2.3336	0.103	2.336	0.433
16	1.1500	1.4667	0.098	1.470	0.533
25	0.7270	0.9275	0.099	0.933	0.505
35	0.5240	0.6688	0.096	0.676	0.599
50	0.3870	0.4944	0.092	0.503	0.629
70	0.2680	0.3431	0.090	0.355	0.679
95	0.1930	0.2481	0.088	0.263	0.781
120	0.1530	0.1976	0.087	0.216	0.797
150	0.1240	0.1612	0.088	0.183	0.767
185	0.0991	0.1302	0.088	0.157	0.753
240	0.0754	0.1012	0.087	0.133	0.807
300	0.0601	0.0829	0.086	0.119	0.858
400	0.0470	0.0676	0.085	0.109	0.870
500	0.0366	0.0561	0.085	0.102	0.904

Table E.8

Multi-core cables with aluminium conductors – XLPE Insulated

Nominal area of conductor	Max. Conductor Resistance		Reactance at (60 Hz)	Impedance at (90 °C, 60 Hz)	Capacitance
	DC at 20 °C	AC at 90 °C			
mm ²	Ω / km	Ω / km	Ω / km	Ω / km	μF / km
10	3.0800	3.9490	0.103	3.950	0.433
16	1.9100	2.4490	0.098	2.451	0.533
25	1.2000	1.5388	0.099	1.542	0.497
35	0.8680	1.1133	0.096	1.117	0.599
50	0.6410	0.8224	0.092	0.827	0.629
70	0.4430	0.5688	0.090	0.576	0.679
95	0.3200	0.4115	0.088	0.421	0.781
120	0.2530	0.3259	0.087	0.337	0.797
150	0.2060	0.2660	0.088	0.280	0.767
185	0.1640	0.2126	0.088	0.230	0.753
240	0.1250	0.1634	0.087	0.185	0.807
300	0.1000	0.1321	0.086	0.158	0.858
400	0.0778	0.1047	0.085	0.135	0.870
500	0.0605	0.0838	0.085	0.119	0.904

Annex F: Short Circuit Capacity

F.1 Permissible short circuit current

The short circuit capacity of a current carrying component of a cable is determined by the following factors:

- The temperature prior to the short circuit, generally taken to be that corresponding with the maximum conductor operating temperature under normal conditions
- The energy produced by the short circuit, a function of both the magnitude and the duration of the current
- The limiting final temperature, generally determined by all materials in direct contact with the conducting component

The short circuit current ratings given below in Tables F.1 to F.4 are calculated in accordance with the following formula as given in IEC 60949:

$$I = \frac{K \times S}{\sqrt{t}} \sqrt{\ln \left(\frac{\theta_f + \beta}{\theta_i + \beta} \right)}$$

Where

- I*** : Permissible Short circuit current (A)
t : Duration of short circuit (seconds)
S : Cross-sectional area of the current-carrying component (mm²)
K : Constant depending on the material of the current-carrying component (As^{1/2} / mm²)
θ_i : Initial temperature before short circuit in (°C)
θ_f : Final temperature at short circuit in (°C)
β : Reciprocal of temperature coefficient of resistance of the current carrying component at 0 °C

The short-circuit current ratings given below are the symmetrical currents which will cause the conductor temperature to rise from the normal operating value to the maximum short-circuit value in the time stated, assuming adiabatic conditions (i.e. neglecting heat loss).

Annex F: Short Circuit Capacity

Table F.1

Short circuit current (kA) - Copper conductor - PVC Insulated

Nominal area of conductor	Short circuit duration (sec.)									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
mm ²										
1.5	0.55	0.39	0.31	0.27	0.24	0.17	0.12	0.10	0.09	0.08
2.5	0.91	0.64	0.52	0.45	0.41	0.29	0.20	0.17	0.14	0.13
4	1.45	1.03	0.84	0.73	0.65	0.46	0.33	0.27	0.23	0.21
6	2.18	1.54	1.26	1.09	0.98	0.69	0.49	0.40	0.35	0.31
10	3.6	2.6	2.1	1.8	1.6	1.2	0.8	0.7	0.6	0.5
16	5.8	4.1	3.4	2.9	2.6	1.8	1.3	1.1	0.9	0.8
25	9.1	6.4	5.2	4.5	4.1	2.9	2.0	1.7	1.4	1.3
35	12.7	9.0	7.3	6.4	5.7	4.0	2.8	2.3	2.0	1.8
50	18.2	12.9	10.5	9.1	8.1	5.8	4.1	3.3	2.9	2.6
70	25.5	18.0	14.7	12.7	11.4	8.1	5.7	4.6	4.0	3.6
95	34.5	24.4	19.9	17.3	15.5	10.9	7.7	6.3	5.5	4.9
120	43.6	30.9	25.2	21.8	19.5	13.8	9.8	8.0	6.9	6.2
150	54.5	38.6	31.5	27.3	24.4	17.3	12.2	10.0	8.6	7.7
185	67.3	47.6	38.8	33.6	30.1	21.3	15.0	12.3	10.6	9.5
240	87.3	61.7	50.4	43.6	39.0	27.6	19.5	15.9	13.8	12.3
300	109.1	77.1	63.0	54.5	48.8	34.5	24.4	19.9	17.3	15.4
400	130.0	91.9	75.1	65.0	58.2	41.1	29.1	23.7	20.6	18.4
500	162.5	114.9	93.8	81.3	72.7	51.4	36.3	29.7	25.7	23.0
630	204.8	144.8	118.2	102.4	91.6	64.8	45.8	37.4	32.4	29.0
800	260.1	183.9	150.1	130.0	116.3	82.2	58.2	47.5	41.1	36.8
1000	325.1	229.9	187.7	162.5	145.4	102.8	72.7	59.4	51.4	46.0

Table F.2

Short circuit current (kA) - Aluminum conductor - PVC Insulated

Nominal area of conductor	Short circuit duration (sec.)									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
mm ²										
10	2.40	1.70	1.39	1.20	1.07	0.76	0.54	0.44	0.38	0.34
16	3.8	2.7	2.2	1.9	1.7	1.2	0.9	0.7	0.6	0.5
25	6.0	4.2	3.5	3.0	2.7	1.9	1.3	1.1	1.0	0.8
35	8.4	5.9	4.9	4.2	3.8	2.7	1.9	1.5	1.3	1.2
50	12.0	8.5	6.9	6.0	5.4	3.8	2.7	2.2	1.9	1.7
70	16.8	11.9	9.7	8.4	7.5	5.3	3.8	3.1	2.7	2.4
95	22.8	16.1	13.2	11.4	10.2	7.2	5.1	4.2	3.6	3.2
120	28.8	20.4	16.7	14.4	12.9	9.1	6.4	5.3	4.6	4.1
150	36.0	25.5	20.8	18.0	16.1	11.4	8.1	6.6	5.7	5.1
185	44.5	31.4	25.7	22.2	19.9	14.1	9.9	8.1	7.0	6.3
240	57.7	40.8	33.3	28.8	25.8	18.2	12.9	10.5	9.1	8.2
300	72.1	51.0	41.6	36.0	32.2	22.8	16.1	13.2	11.4	10.2
400	86.0	60.8	49.7	43.0	38.5	27.2	19.2	15.7	13.6	12.2
500	107.5	76.0	62.1	53.8	48.1	34.0	24.0	19.6	17.0	15.2
630	135.5	95.8	78.2	67.7	60.6	42.8	30.3	24.7	21.4	19.2
800	172.0	121.6	99.3	86.0	76.9	54.4	38.5	31.4	27.2	24.3
1000	215.0	152.1	124.2	107.5	96.2	68.0	48.1	39.3	34.0	30.4

Annex F: Short Circuit Capacity

Table F.3

Short circuit current (kA) - Copper conductor - XLPE Insulated

Nominal area of conductor	Short circuit duration (sec.)									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
mm ²										
1.5	0.68	0.48	0.39	0.34	0.30	0.21	0.15	0.12	0.11	0.10
2.5	1.13	0.80	0.65	0.57	0.51	0.36	0.25	0.21	0.18	0.16
4	1.81	1.28	1.04	0.90	0.81	0.57	0.40	0.33	0.29	0.26
6	2.71	1.92	1.57	1.36	1.21	0.86	0.61	0.50	0.43	0.38
10	4.52	3.20	2.61	2.26	2.02	1.43	1.01	0.83	0.72	0.64
16	7.2	5.1	4.2	3.6	3.2	2.3	1.6	1.3	1.1	1.0
25	11.3	8.0	6.5	5.7	5.1	3.6	2.5	2.1	1.8	1.6
35	15.8	11.2	9.1	7.9	7.1	5.0	3.5	2.9	2.5	2.2
50	22.6	16.0	13.1	11.3	10.1	7.2	5.1	4.1	3.6	3.2
70	31.7	22.4	18.3	15.8	14.2	10.0	7.1	5.8	5.0	4.5
95	43.0	30.4	24.8	21.5	19.2	13.6	9.6	7.8	6.8	6.1
120	54.3	38.4	31.3	27.1	24.3	17.2	12.1	9.9	8.6	7.7
150	67.9	48.0	39.2	33.9	30.4	21.5	15.2	12.4	10.7	9.6
185	83.7	59.2	48.3	41.9	37.4	26.5	18.7	15.3	13.2	11.8
240	108.6	76.8	62.7	54.3	48.6	34.3	24.3	19.8	17.2	15.4
300	135.7	96.0	78.4	67.9	60.7	42.9	30.4	24.8	21.5	19.2
400	181.0	128.0	104.5	90.5	80.9	57.2	40.5	33.0	28.6	25.6
500	226.2	160.0	130.6	113.1	101.2	71.5	50.6	41.3	35.8	32.0
630	285.1	201.6	164.6	142.5	127.5	90.1	63.7	52.0	45.1	40.3
800	362.0	256.0	209.0	181.0	161.9	114.5	80.9	66.1	57.2	51.2
1000	452.5	319.9	261.2	226.2	202.4	143.1	101.2	82.6	71.5	64.0

Table F.4

Short circuit current (kA) - Aluminum conductor - XLPE Insulated

Nominal area of conductor	Short circuit duration (sec.)									
	0.1	0.2	0.3	0.4	0.5	1.0	2.0	3.0	4.0	5.0
mm ²										
10	2.99	2.11	1.73	1.49	1.34	0.94	0.67	0.55	0.47	0.42
16	4.8	3.4	2.8	2.4	2.1	1.5	1.1	0.9	0.8	0.7
25	7.5	5.3	4.3	3.7	3.3	2.4	1.7	1.4	1.2	1.1
35	10.5	7.4	6.0	5.2	4.7	3.3	2.3	1.9	1.7	1.5
50	14.9	10.6	8.6	7.5	6.7	4.7	3.3	2.7	2.4	2.1
70	20.9	14.8	12.1	10.5	9.4	6.6	4.7	3.8	3.3	3.0
95	28.4	20.1	16.4	14.2	12.7	9.0	6.3	5.2	4.5	4.0
120	35.9	25.4	20.7	17.9	16.0	11.3	8.0	6.5	5.7	5.1
150	44.8	31.7	25.9	22.4	20.0	14.2	10.0	8.2	7.1	6.3
185	55.3	39.1	31.9	27.6	24.7	17.5	12.4	10.1	8.7	7.8
240	71.7	50.7	41.4	35.9	32.1	22.7	16.0	13.1	11.3	10.1
300	89.6	63.4	51.8	44.8	40.1	28.3	20.0	16.4	14.2	12.7
400	119.5	84.5	69.0	59.8	53.4	37.8	26.7	21.8	18.9	16.9
500	149.4	105.6	86.3	74.7	66.8	47.2	33.4	27.3	23.6	21.1
630	188.2	133.1	108.7	94.1	84.2	59.5	42.1	34.4	29.8	26.6
800	239.0	169.0	138.0	119.5	106.9	75.6	53.4	43.6	37.8	33.8
1000	298.8	211.3	172.5	149.4	133.6	94.5	66.8	54.6	47.2	42.3

Annex G : Voltage Drop Calculations

6.1 Voltage drop

When current flows in a cable conductor, there is a voltage drop between the ends of the conductor, which is the product of the current and the impedance. If the voltage drop were excessive, it could result in the voltage at the equipment being supplied being too low for proper operation.

In order to ensure satisfactory operation of electrical equipment, it is necessary to maintain the voltage at which it is supplied within certain limits.

6.2 Voltage drop limitation in consumers' installations

Most of Electrical Codes normally permit a 3% voltage drop in a “feeder” or “branch circuit” and no more than 5% voltage drop from the supply side of the consumer’s service to the point of utilization.

The voltage drop limitation applying to a circuit needs to be assessed taking account of the function of the circuit and its relationship with other circuits. For example, other voltage drop limits may apply in ELV circuits or may be dictated by motor starting considerations.

In addition, the voltage drop in mains and sub-mains circuits should take account of the voltage drop in final sub-circuits (and vice versa) to ensure the total voltage drop in the installation is within the required limits.

6.3 Use of tabulated mV/A/m values

The process of calculating the voltage drop of a cable under a given operating conditions is normally straightforward. The tabulated voltage drop (mV/A/m) values in Tables G.1 & G.2 represent the worst case conditions, whereby it is assumed that the cable is operating at its maximum permitted operating temperature (70 and 90 °C for PVC and XLPE insulated cables respectively) and is supplying a load having a power factor equal to the power factor of the cable. For three-phase circuits, balanced loading is assumed.

On this basis, where the cable size and type, load current and length of run are known, the voltage drop can be calculated from the below formula. This formula is used to calculate the voltage drop in a circuit when the cable size is known.

$$V_d = \frac{V_t \times I \times L}{1000} \text{ (V)}$$

Where

V_d : The voltage drop for the cable run (V)

V_t : The tabulated voltage drop value for the cable (mV/A/m)

I : The load current (A)

L : The length of cable route/run (m)

6.4 Example

Assume a 4-core 10 mm² cable with copper conductors and XLPE insulated, carrying a load current of 20 A over 60 m route length.

At normal operation, the voltage drop would be:

$$3.53 \times 20 \times 60 \times 0.001 = 4.236 \text{ V}$$

Where 3.53 is the tabulated value in Table G.2 for the voltage drop per amp per meter (mV/A/m) of this cable at its maximum permitted operating temperature (90 °C).

Annex G: Voltage Drop Values

Table G.1

Voltage drop for PVC insulated cables

Nominal area of conductor	Voltage drop (mV/Amp/Meter)									
	Single-core cables								Multi-core cables	
	Unarmoured cables				Armoured cables					
mm ²	Copper		Aluminum		Copper		Aluminum		Copper	Aluminum
	Flat	Trefoil	Flat	Trefoil	Flat	Trefoil	Flat	Trefoil		
1.5	21.494	21.478	-	-	21.540	21.524	-	-	21.436	-
2.5	13.219	13.203	-	-	13.263	13.247	-	-	13.166	-
4	8.281	8.265	-	-	8.320	8.304	-	-	8.233	-
6	5.576	5.560	-	-	5.614	5.598	-	-	5.532	-
10	3.367	3.351	5.592	5.576	3.403	3.387	5.627	5.611	3.326	5.550
16	2.161	2.145	3.514	3.498	2.193	2.177	3.546	3.530	2.123	3.475
25	1.412	1.396	2.253	2.237	1.440	1.424	2.282	2.266	1.377	2.220
35	1.049	1.033	1.661	1.645	1.076	1.060	1.688	1.672	1.017	1.629
50	0.802	0.786	1.254	1.238	0.827	0.811	1.279	1.263	0.772	1.224
70	0.588	0.572	0.899	0.883	0.611	0.595	0.922	0.906	0.561	0.871
95	0.456	0.440	0.681	0.665	0.475	0.459	0.700	0.684	0.429	0.654
120	0.383	0.367	0.560	0.544	0.402	0.386	0.579	0.563	0.357	0.533
150	0.331	0.315	0.476	0.460	0.348	0.332	0.493	0.477	0.307	0.451
185	0.288	0.272	0.402	0.386	0.302	0.286	0.417	0.401	0.264	0.377
240	0.246	0.230	0.332	0.316	0.259	0.243	0.346	0.330	0.223	0.309
300	0.219	0.203	0.287	0.271	0.232	0.216	0.301	0.285	0.197	0.265
400	0.197	0.181	0.249	0.233	0.209	0.193	0.261	0.245	0.175	0.226
500	0.179	0.163	0.218	0.202	0.189	0.173	0.229	0.213	0.159	0.197
630	0.165	0.149	0.194	0.179	0.174	0.158	0.204	0.188	-	-
800	0.155	0.139	0.177	0.161	0.164	0.148	0.187	0.171	-	-
1000	0.147	0.131	0.164	0.148	0.154	0.138	0.172	0.156	-	-

NOTE: The above values for cables voltage drop per ampere per meter were calculated based on the following conditions

- Maximum permitted operating temperature for conductor : 70 °C
- Power factor : 0.85
- Rated frequency : 60 Hz

Annex G: Voltage Drop Values

Table G.2

Voltage drop for XLPE insulated cables

Nominal area of conductor	Voltage drop (mV/Amp/Meter)									
	Single-core cables								Multi-core cables	
	Unarmoured cables				Armoured cables					
mm ²	Copper		Aluminum		Copper		Aluminum		Copper	Aluminum
	Flat	Trefoil	Flat	Trefoil	Flat	Trefoil	Flat	Trefoil		
1.5	22.892	22.876	-	-	22.939	22.923	-	-	22.832	-
2.5	14.074	14.058	-	-	14.120	14.104	-	-	14.019	-
4	8.808	8.792	-	-	8.850	8.834	-	-	8.757	-
6	5.927	5.911	-	-	5.967	5.951	-	-	5.880	-
10	3.574	3.558	5.952	5.936	3.612	3.596	5.990	5.974	3.530	5.908
16	2.289	2.273	3.736	3.720	2.324	2.308	3.770	3.754	2.249	3.696
25	1.492	1.476	2.392	2.376	1.522	1.506	2.422	2.406	1.456	2.357
35	1.106	1.090	1.760	1.744	1.134	1.118	1.788	1.772	1.073	1.727
50	0.843	0.827	1.326	1.310	0.869	0.853	1.352	1.336	0.812	1.295
70	0.617	0.601	0.949	0.933	0.639	0.623	0.972	0.956	0.588	0.920
95	0.474	0.458	0.715	0.699	0.494	0.478	0.735	0.719	0.446	0.687
120	0.398	0.382	0.587	0.571	0.417	0.401	0.607	0.591	0.371	0.560
150	0.343	0.327	0.498	0.482	0.360	0.344	0.515	0.499	0.318	0.472
185	0.296	0.280	0.418	0.402	0.312	0.296	0.434	0.418	0.272	0.394
240	0.252	0.236	0.344	0.328	0.265	0.249	0.358	0.342	0.229	0.320
300	0.223	0.207	0.296	0.280	0.235	0.219	0.308	0.292	0.201	0.273
400	0.199	0.183	0.255	0.239	0.212	0.196	0.268	0.252	0.178	0.232
500	0.181	0.165	0.223	0.207	0.192	0.176	0.234	0.218	0.160	0.201
630	0.167	0.151	0.198	0.182	0.176	0.160	0.208	0.192	-	-
800	0.157	0.141	0.180	0.164	0.166	0.150	0.190	0.174	-	-
1000	0.148	0.132	0.166	0.150	0.156	0.140	0.175	0.159	-	-

NOTE: The above values for cables voltage drop per ampere per meter were calculated based on the following conditions

- Maximum permitted operating temperature for conductor : 90 °C
- Power factor : 0.85
- Rated frequency : 60 Hz

Annex H : Cable Sizing Calculations

H.1 Cable Sizing Calculations

As highlighted earlier, it is of vital importance that the type and size of cable ordered is suitable for its intended use. The proper sizing of an electric cable is important to ensure that the cable can:

- Operate continuously under full load without being damaged or degraded
- Withstand the worst short-circuit currents flowing through the cable
- Provide the load with a suitable voltage (and avoid excessive voltage drops)

Cable sizing methods do differ across international standards (e.g. IEC, NEC, BS, etc.) and some standards emphasize certain things over others. However, the general principles underlying any cable sizing calculations do not change. The main three factors that principally affect the minimum size of cable required for a particular installation are:

1. **The cable current-carrying capacity (load current)**, which is influenced by the cable materials, construction, and installation conditions.
2. **The voltage drop in the cable circuit**, which is a function of load current, load power factor, and length of the cable run.
3. **The short-circuit current**, which is a function of both the magnitude and duration of the short-circuit current and is limited by the cable materials.

H.2 General Methodology for the Selection of Conductor Size

To select the proper cable size, based on the above three considerations, all cable sizing methods more or less follow the same basic five steps process.

1. Gathering data about the cable, its installation conditions, the load that it will carry, etc.
2. Determine the minimum cable size based on continuous current-carrying capacity
3. Determine the minimum cable size based on voltage drop considerations
4. Determine the minimum cable size based on short-circuit current
5. Select the cable based on the highest of the sizes calculated in step 2, 3, and 4

H.2.1 Step 1: Data Gathering

The first step is to collect the relevant information that is required to perform the sizing calculation. Typically, you will need to obtain the following data:

H.2.1.1 Load Details

The characteristics of the load that the cable will supply, which includes:

- Load type: motor or feeder
- Three-phase, single-phase or DC
- System / source voltage
- Full load current (A) - or calculate this if the load is defined in terms of power (kW)
- Full load power factor
- Distance / length of cable run from source to load

H.2.1.2 Cable Construction

The basic characteristics of the cable's physical construction, which includes:

- Number of cores – single-core or multi-core (e.g. 2C, 3C or 4C)
- Conductor material - e.g. copper or aluminium
- Insulation type - e.g. PVC or XLPE
- Armour type, if required - e.g. AWA, SWA or STA

H.2.1.3 Installation Conditions

Where and how the cable will be installed, which includes:

- Above ground or underground
- Installation / arrangement - e.g. for underground cables, is it directly buried or buried in conduit? For above ground cables, is it installed on cable tray / ladder, against a wall, in air, etc.?
- Ambient or soil temperature of the installation site
- Cable grouping, i.e. the number of cables that are installed together in one group
- Cable spacing, i.e. whether cables are installed touching or spaced
- Soil thermal resistivity (for underground cables)
- Depth of laying (for underground cables)
- For single-core three-phase cables, are the cables installed in trefoil or laid flat?

Annex H : Cable Sizing Calculations

H.2.2 Step 2: Selection of conductor size based on current rating (i.e. load current):

- H.2.2.1 Determine the minimum current for which the cable is to be rated, i.e. the maximum load current.
- H.2.2.2 Ascertain the actual installation conditions of the cable. In case the actual installation conditions are different from the standard laying conditions, appropriate correction (derating) factors from Annex C have to be applied to cater for the actual installation conditions.
- H.2.2.3 Divide the rating from step (H.2.2.1) by the appropriate factor(s) from step (H.2.2.2).
- H.2.2.4 From the tabulated Continuous Current Ratings of the required cable type and intended installation method, select a cable, which has a tabulated rating not less than the value obtained from step (H.2.2.3).

H.2.3 Step 3: Selection of conductor size based on voltage drop:

- H.2.3.1 Determine the maximum Load Current I (A) to be carried by the cable, and the Route Length L (m) of the circuit.
- H.2.3.2 Calculate the maximum voltage drop V_d (V) permitted in the circuit (say 3.0 % of 380 or 400 V).
- H.2.3.3 Using the below equation, calculate the value of V_{ap} (mV/A/m) necessary to meet the specific voltage drop value V_d , calculated in step (H.2.3.2).

$$V_{ap} = \frac{V_d \times 1000}{I \times L} \quad (\text{mV/A/m})$$

Where

- V_{ap} : The maximum voltage drop value permitted for the cable (mV/A/m)
- V_d : The maximum voltage drop value permitted in the circuit (V)
- I : The load current (A)
- L : The length of cable route/run (m)

- H.2.3.4 From the tabulated voltage drop (mV/A/m) values of the required cable type in Tables G.1 & G.2, select a cable, which has a tabulated voltage drop (mV/A/m) value equal or less than the value obtained from step (H.2.3.3).

H.2.4 Step 4: Selection of conductor size based on short-circuit current:

- H.2.4.1 Determine the duration t (s) and the magnitude I_{sc} (A) of the prospective short-circuit current.
- H.2.4.2 Based on the required cable type and duration t (s) of short-circuit, select a cable from the tabulated short circuit current values in Tables F.1, F.2, F.3 & F.4, which has a tabulated short-circuit current value not less than the value determined in step (H.2.4.1).

H.2.5 Step 5: Determination of conductor size:

For any circuit, the cable size selected should not be less than the largest of the sizes calculated to meet the above limitations (this is the smallest size which will meet all of the requirements).

In practice, the current-carrying capacity will be found to prevail in short-run/high-current circuits while voltage drop considerations will usually prevail in long-run/low-current circuits. It is unusual for short-circuit current requirements to determine the conductor size required for low voltage cable

Annex H : Cable Sizing Calculations

H.3 Calculation Example

In this example, we will size a cable for a **40kW, 400V** three-phase motor from the Motor Control Center (MCC) to the field.

H.3.1 Step 1: Data Gathering

The first step is to collect the relevant information that is required to perform the sizing calculation. The following data was collected for the cable to be sized:

- Cable type: Cu/XLPE/SWA/PVC, 3C+E, 0.6/1kV
- Cable installation: above ground on cable ladder bunched (touched) together with 3 other cables on a single layer and at **30 °C** ambient temperature
- Cable run: **80m** (including tails)
- Motor load: **40kW, 400V** three-phase, full load current = **68A**, power factor = **0.85**
- The maximum permissible voltage drop in the circuit = **3.0 %**.
- Protection: maximum prospective short-circuit current (I_{sc}) = **0.6 kA**, duration (t) = **3.0 sec**.

H.3.2 Step 2: Selection of conductor size based on current rating (i.e. load current):

H.3.2.1 The motor full load current = 68A.

H.3.2.2 From Annex (C): The ambient temperature derating is 1.10 (Table C.2), and the grouping derating for 4 bunched (touched) cables on a cable ladder is 0.80 (Table C.8). The overall derating factor is $1.10 \times 0.80 = 0.88$.

H.3.2.3 The motor full load current after derating is $68/0.88 = 78A$, i.e. the current rating for the selected cable should not be less than 78A.

H.3.2.4 From the tabulated current ratings of four-core cables laid in free air for (Cu/XLPE/SWA/PVC) cable type, 4 X 16 mm² cable has a tabulated current rating value of 96A, which exceeds the motor full load current (78A). **Therefore, 4 X 16 mm² is the minimum cable size that should be selected based on load current consideration.**

H.3.3 Step 3: Selection of conductor size based on voltage drop:

H.3.3.1 The maximum load current (I) = 78A, and the cable route length (L) = 80m.

H.3.3.2 The maximum permissible voltage drop in the circuit (V_d) = 3.0 % = 12V.

H.3.3.3 Using the equation stated in (H.2.3.3), $V_{ap} = 1.923$ mV/A/m.

H.3.3.4 From the tabulated voltage drop (mV/A/m) values of the required cable type (Table G.2), the voltage drop value of 16 mm² cable (2.249 mV/A/m) is higher than the value calculated for V_{ap} , and therefore is not complying with the maximum permissible voltage drop requirement. The 25 mm² cable on the other hand has a tabulated voltage drop value of 1.456 mV/A/m, which is lower than the value calculated for V_{ap} . **Therefore, 4 X 25 mm² is the minimum cable size that should be selected based on maximum permissible voltage drop consideration.**

H.3.4 Step 4: Selection of conductor size based on short-circuit current:

H.3.4.1 The magnitude of the prospective short-circuit current (I_{sc}) = 0.6kA, and the duration (t) = 3.0 Sec.

H.3.4.2 From the tabulated short-circuit current values for Cu/XLPE cable type (Table F.3), 10 mm² cable has a tabulated short-circuit current value of 0.83kA, which exceeds the maximum prospective short-circuit current of the system (0.6kA). **Therefore, 4 X 10 mm² is the minimum cable size that should be selected based on short-circuit current consideration.**

H.3.5 Step 5: Determination of conductor size:

For any circuit, the cable size selected should not be less than the largest of the sizes calculated to meet the above limitations (this is the smallest size which will meet all of the requirements).

Therefore, 4 X 25 mm² is the minimum cable size that should be selected to fulfill all the above requirements.

Annex I: Cable Installation Practice

1.1 General

This annex provides installation methods commonly encountered in industrial, residential and electric power utility applications and should be used in conjunction with the engineer's installation specifications and all applicable codes/standards.

The cables included in this catalogue are designed to be installed in air, or for burial in free draining soil conditions either direct buried in the ground or in buried ducts. Where the cables are to be laid in any other environment, reference should be made to **alfanar** for proper recommendations.

1.1.1 Single-core Cables

The following points relating to single-core cables should be noted:

1. Single-core cables carrying the phase currents of a three-phase a.c. circuit must be installed as closely as possible together, to minimize inductive reactance and voltage drop. The preferred formation for three-phase conductors is a "trefoil" or cloverleaf pattern although flat touching formation is also acceptable. Sheaths should be in contact with one another in either case.
2. A single-core cable generates an alternating magnetic field around itself which can cause large increases in voltage drop and power loss due to "transformer effect" when ferrous metal (iron and steel) is allowed to encircle the cable. Steel racking or ladder will not induce this effect, but the following must be observed:
 - a. Cable cleats may be of wood, plastic, or non-ferrous metal but steel saddles should not be used on single cores.
 - b. Where three single phase cables pass through a steel bulkhead, they must all pass through the same hole. Where glanding is required, it is usual to cut out a panel and replace this with a non-ferrous (metal or plastic) plate in which the three or four glands are mounted.

1.1.2 Lugs and Links

Stranded compacted conductors, either round or sector shaped, must have lugs and links fitted that are manufactured for the same nominal cross-sectional area as the conductor. For example, a 150 mm² conductor must have a 150 mm² lug or link fitted, and the correct dies, as stated by the manufacturer, should be used to compress it.

Although the lug or link will appear to be loose on the conductor, this is simply because the initial compression of the joint has already taken place during the manufacture of the conductor; the final compression of the joint will be correct.

If, for example, a 120 mm² lug or link was fitted to a 150 mm² conductor, the joint would be over compressed and likely to fail in service. In addition, the smaller lug in itself would be unable to carry the same maximum current as the larger conductor, particularly with respect to fault currents.

1.2 Pre-installation

To ensure safety during cable installation and reliability once the cable is installed, you should confirm the following prior to installation.

- The cable selected is proper for your application
- The cable has not been damaged in transit or storage

Review all applicable local, state, provincial, and national codes to verify that the cable selected is appropriate for the installation job.

Any existing cable damage must be identified and any further damage prevented from occurring. This is done through proper cable inspection, handling and storage.

1.2.1 Drum Handling

The following recommendations for the storage and handling of cables that are packed on wooden cable drums suitable for storage outdoors should be followed.

Annex I: Cable Installation Practice

Yes

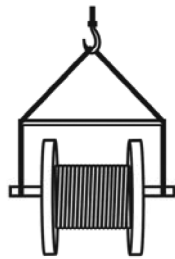


Cradle both reel flanges between forks

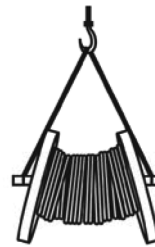
No



Do not lift by top flange. Cable or reel will be damaged



Reels can be hoisted with a shaft extended through both flanges



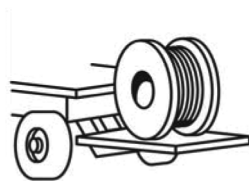
Use a spreader bar to prevent bending the reel flanges and mashing the cable



Place spacers under the bottom flange and between reels to create a space to insert the forks



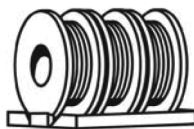
Upended heavy reels will often arrive damaged. Refuse or receive subject to inspection for hidden damage



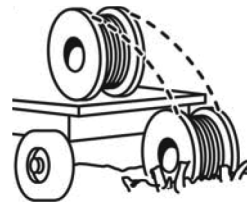
Lower reels from truck using hydraulic gate, hoist or fork lift. LOWER CAREFULLY.



Never allow forks to touch cable surface or reel wrap



Always load with flanges on edge and chock and block securely



Never drop reels

Annex I: Cable Installation Practice

1.2.2 Cable Inspection

Inspect every reel of cable for damage before accepting the shipment. Be particularly alert for cable damage if:

- A reel is laying flat on its flange side
- Several reels are stacked on top of each other
- Other freight is stacked on top of a reel
- Nails have been driven into reel flanges to secure shipping blocks
- A reel flange is damaged
- A reel has been dropped (hidden damage likely)
- A cable covering has been removed, or is stained or damaged
- A cable end seal has been removed or is damaged

1.2.3 Cable Storage

Cables should be stored on hard surfaces so that reel flanges cannot sink. Small reels may weight several hundred kilograms while large reels can exceed several thousand kilograms.

Impact damage can be prevented by the following precautions:

- Aligning reels flange to flange
- Using guards across flanges when different reel sizes are stored together
- Maintaining adequate aisles and barricades to prevent equipment from hitting the cable

1.2.4 Prevention of moisture ingress

Care should be exercised during installation to avoid any damage to cable coverings. This is important in wet or other aggressive environments. The protective end cap should not be removed from the ends of the cable until immediately prior to termination or jointing, especially for cables that do not have an extruded bedding. When the caps have been removed, the unprotected ends of the cable should not be exposed to moisture.

1.3 Installation

A high percentage of cable failures are due to mechanical damage, which typically occurs during transportation, handling and installation.

In fact, most cables are subjected to more mechanical stress during installation than they ever experience in actual operation. Needless to say, handling and installing the cable according to the manufacturer's recommendations is extremely important.

When cables are installed in a raceway, underground electrical duct or cable tray, the following factors must be considered:

- Conductor configuration
- Raceway or cable tray fill
- Physical limitations of cables
- Installation equipment
- Ambient temperature and conditions

Similarly, when cable is installed as exposed wiring or as messenger-supported wiring, all of the above factors except raceway or cable tray fill must be considered as well as the requirements for securing and supporting the cables.

1.3.1 Minimum installation radius

None of the cables included in this catalogue should be bent during installation to a radius smaller than the following:

Annex I: Cable Installation Practice

Single-core cables		
- Unarmoured	:	15 Ø
- Armoured	:	12 Ø
Multi-core cables		
- Unarmoured	:	12 Ø
- Armoured	:	12 Ø

Where Ø is the overall diameter of the cable.

Wherever possible, larger installation radius should be used, except that the minimum bending radius where the cables are placed in position adjacent to joints and terminations may be reduced to that values given below, provided that the bending is carefully controlled, e.g. by the use of a former.

Single-core cables		
- Unarmoured	:	8 Ø
- Armoured	:	8 Ø
Multi-core cables		
- Unarmoured	:	6 Ø
- Armoured	:	6 Ø

I.3.2 Minimum temperature during installation

It is recommended that the cables should be installed only when both the cable and ambient temperature are above 0 °C and have been so for the previous 24 hours, or where special precautions have been taken to maintain the cable above this temperature.

I.3.3 Maximum pulling tension

The maximum pulling tension is depending on the cable design, the mechanical limitations, the conductor material, and the method of laying and pulling the cables. The maximum permissible pulling force can be calculated based on the method of pulling as follows:

I.3.3.1 Pulling eye attached to the conductor

With pulling eye attached to copper conductors, the maximum pulling tension should not exceed 0.036 times circular-mil area of conductor (C_m). With pulling eye attached to aluminum conductors, the maximum pulling tension should not exceed 0.027 times circular-mil area of conductor (C_m). Or in other words

$$T_m = 0.036 \times n \times C_m \text{ (Copper)}$$

$$T_m = 0.027 \times n \times C_m \text{ (Aluminum)}$$

Where

- T_m : Maximum pulling tension in N
 n : The number of conductors
 C_m : Circular mil area of each conductor

The maximum limitation for this calculation is **22240 N** (2268 kgf) for single conductor (1/C) cables, and **44480 N** (4536 kgf) for multi core cables. This limitation is due to unequal distribution of tension forces when pulling multiple conductors.

When the calculated pulling tension is close to (or within 10 % of) the maximum pulling tension, the use of a tension gauge during the pulling is recommended.

I.3.3.2 Cable grip over lead sheath

With cable grip over lead sheath, with commercial lead, the maximum pulling tension on the lead sheath should not exceed **10.33 N/mm²** (1500 lbf/in²).

I.3.3.3 Cable grip over non-lead cable

With cable grip over non-lead cable, the maximum pulling tension should not exceed 4400 N (1000 lbf).

Annex I: Cable Installation Practice

I.3.4 Side wall pressure

One of the limitations to be considered in the installation of electrical cables is sidewall pressure. The sidewall pressure is the force exerted on the insulation and sheath of the cable at a bend point when the cable is under tension, and is normally the limiting factor in an installation where cable bends are involved. The sidewall pressure in general is expressed as the tension out of a bend expressed in newtons divided by the inside radius of the bend expressed in meters.

$$P = \left[\frac{T_o}{r} \right]$$

Where

P : Sidewall pressure in N/m (lbf/ft)
T_o : Tension leaving the bend in N (lbf)
r : Inside radius of conduit in m (ft)

The normal maximum sidewall pressure per meter (foot) of radius is as given below. However, in order to minimize cable damage because of excessive sidewall pressure, the installer should check the proper recommendations for each type of cables to be installed.

Cable Type	Maximum Sidewall Pressure	
	(N/m)	(lbf/ft)
Non-shielded multi-core cables	7300	500
Single-core cables	7300	500
Armoured cables	4400	300

Annex J: Coding Key

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

The type designation provides information on the type of cable, the conductor material, the insulation and sheath materials, the no. of cores, and the principle design features in abbreviated and simplified form.

The type designation is made up of 18 digits or characters. The type of the conductor is specified first and then the cable construction from inside to outside.

You can order our product either by giving the **alfanar** item code stated in the catalogue or if the required cable construction is not included in our catalogue, you can use the following codes to determine the type of cable you require.

1. Type of conductor material

C :	Copper
A :	Aluminum

2. Type of conductor

1 :	Solid
2 :	Stranded - Circular round
3 :	Stranded - Circular compacted
4 :	Stranded - Sector shaped
5 :	Flexible

3 & 4. Size of conductor

08 :	1.5 mm ²
10 :	2.5 mm ²
12 :	4 mm ²
13 :	6 mm ²
14 :	10 mm ²
15 :	16 mm ²
16 :	25 mm ²
17 :	35 mm ²
18 :	50 mm ²
19 :	70 mm ²
32 :	3 x 10 + 6 mm ²
33 :	3 x 16 + 10 mm ²
34 :	3 x 25 + 16 mm ²
35 :	3 x 35 + 16 mm ²
36 :	3 x 50 + 25 mm ²
37 :	3 x 70 + 35 mm ²
38 :	3 x 95 + 50 mm ²
39 :	3 x 120 + 70 mm ²
40 :	3 x 150 + 70 mm ²
41 :	3 x 185 + 95 mm ²
42 :	3 x 240 + 120 mm ²
43 :	3 x 300 + 150 mm ²
44 :	3 x 400 + 185 mm ²
66 :	3 x 500 + 240 mm ²
45 :	95 mm ²

46 :	120 mm ²
47 :	150 mm ²
48 :	185 mm ²
49 :	240 mm ²
50 :	300 mm ²
51 :	400 mm ²
52 :	500 mm ²
53 :	630 mm ²
54 :	800 mm ²
55 :	1000 mm ²

5. Type of insulation material

X :	XLPE Insulation
P :	PVC Insulation rated 70 °C
M :	PVC Insulation rated 90 °C

6. Rated voltage

A :	0.6 / 1 kV
-----	------------

7. Cable construction

1 :	Cores
2 :	Pairs

8 & 9. Number of cores

01 :	1 Core
02 :	2 Cores
03 :	3 Cores
04 :	4 Cores
05 :	5 Cores
≈	≈
61 :	61 Cores

10. Shielding

N :	Copper tape
C :	Copper wires
0 :	Without shielding

11. Armouring

0 :	Without armouring
L :	Pure lead sheathed
N :	Lead alloy sheathed
A :	Aluminum wire armoured
B :	Aluminum tape armoured
G :	Galvanized steel tape armoured
W :	Galvanized steel wire armoured
T :	Non-Galva. steel tape armoured
S :	Lead + G. steel tape armoured
D :	Lead + G. steel wire armoured

X :	Lead + Aluminum wire armoured
R :	Lead + Aluminum tape armoured

12. Outer sheath material

M :	PVC Sheath rated 90 °C
C :	PVC Sheath rated 80 °C

13. Outer sheath color

B :	Black
R :	Red
E :	Grey
L :	Blue
N :	Brown
G :	Green
O :	Orange
M :	Green / Yellow

14 & 15. Core identification

51 :	1C - Red
01 :	2C - Red, Black
04 :	3C - Red, Yellow, Blue
08 :	4C - Red, Yellow, Blue, Black
12 :	5C - Red, Yellow, Blue, Black, G/Y
21 :	6C & Above - Black + No.

Note: The mentioned colors are the most common for core identification. However, any other colors for core identification can be used upon a customer's request.

16. Design standard

I :	IEC Standard
B :	BS Standard
C :	Customer request

17. Packing type

M :	Wooden drum
T :	Steel drum

18. Cutting length

S :	250 Meter
F :	500 Meter
R :	1000 Meter

Note: The mentioned cutting lengths are the most common. However, any other cutting lengths can be supplied as per a customer's drum schedule.

Annex K: Conversion Table

Multiply	By	To obtain	Multiply	By	To obtain
Weight-Imperial			inches	1000	Mils
Ounces	28.3495	grams	inches	25.40	mm
Pounds(Av)	453.59	grams	inches	2.54	cm
Pounds(Av)	0.45359	Kilograms	Feet	30.48	cm
Tons (short)	907.19	Kilograms	Feet	0.3048	Meters
Tons (long)	1016.05	Kilograms	Feet (thousand of)	0.3048	kilometers
Weight-Metric			Yards	0.9144	Meters
Grams	0.03527	Ounces	Miles	1.6093	kilometers
Grams	0.002205	Pounds	Length-Metric		
Kilograms	35.274	Ounces	Millimeters	39.37	Mils
Kilograms	2.2046	Pounds	Millimeters	0.03937	inches
kilograms	0.001102	Tons (short)	Centimeters	0.3937	inches
Kilograms	0.0009842	Tons (long)	Centimeters	0.032808	Feet
Miscellaneous-Imperial			Meters	39.37	inches
Pounds per 1000 feet	1.48816	kg/km	Meters	3.2808	Feet
Pounds per mile	0.28185	kg/km	Meters	1.0936	Yards
Pounds per square inch	0.0007031	kg. per square mm	Kilometers	3280.83	Feet
Pounds per square inch	0.07031	kg. per square cm	Kilometers	0.62137	Miles
Pounds per cubic	27.68	grams per cubic cm	Area-Imperial		
Feet per second	18.288	meters per minute	Square mils	1.2732	Circular mils
Feet per second	1.09728	Kilometers per hour	Square mils	0.000001	Square inches
Miles per hour	1.60935	Kilometers per hour	Circular mils	0.7854	Square mils
Ohms per 1000 feet	3.28083	Ohms per Kilometer	Circular mils	0.0000007854	Square inches
Ohms per mile	0.62137	Ohms per Kilometer	Square mils	0.0005067	Square mm
Decibels per 1000 feet	3.28083	Decibels per kilomter	Square inches	1000000	Square mils
Decibels per mile	0.62137	Decibels per kilomter	Square inches	1273240	Circular mils
Decibels	0.1153	nepers	Square inches	645.16	Square mm
Miscellaneous-Metric			Square inches	6.4516	Square cm
kg/km	0.67197	Pounds per 1000 feet	Square feet	0.09290	Square meters
kg/km	3.54795	Pounds per mile	Square yards	0.8361	Square meters
kg.per square mm	1422.34	Pounds per square inch	Area-Metric		
kg.per square cm	14.2234	Pounds per square inch	Square millimeters	1973.52	Circular mils
Grams per cubic cm	0.03613	Pounds per cubic inch	Square millimeters	0.00155	Square inches
Meters per minute	0.05468	Feet per second	Square centimeters	0.155	Square inches
Kilometers per hour	0.91134	Feet per second	Square meters	10.7639	Square feet
Kilometer per hour	0.62137	Miles per hour	Square meters	1.19599	Square yards
Ohms per Kilometer	0.3048	Ohms per 1000 feet	Volume-Imperial		
Ohms per Kilometer	1.6093	Ohms per mile	Cubic inches	16.38706	Cubic cm
Decibels per kilomter	0.3048	Decibels per 1000 feet	Cubic feet	0.028317	Cubic meters
Decibels per kilometer	1.6093	Decibels per mile	Gallons	4.54609	Liters
Temperature			Volume-U.S.		
° Fahrenheit	5/9(°F)-32	°Celsius	Quarts (liquid)	0.9463	Liters
°Celsius	9/5(°C)+32	°Fahrenheit	Gallons	3.7854	Liters
Lenght-Imperial			Volume-Metric		
Mils	0.001	inches	Cubic cm	0.06102	Cubic inches
Mils	0.0254	mm	Cubic meters	35.3145	Cubic feet
			Liters	1.05668	quarts (liquid U.S)
			Liters	0.26417	gallons (U.S.)

Contact Us

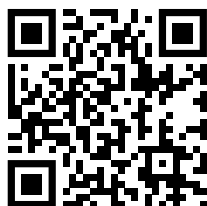


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