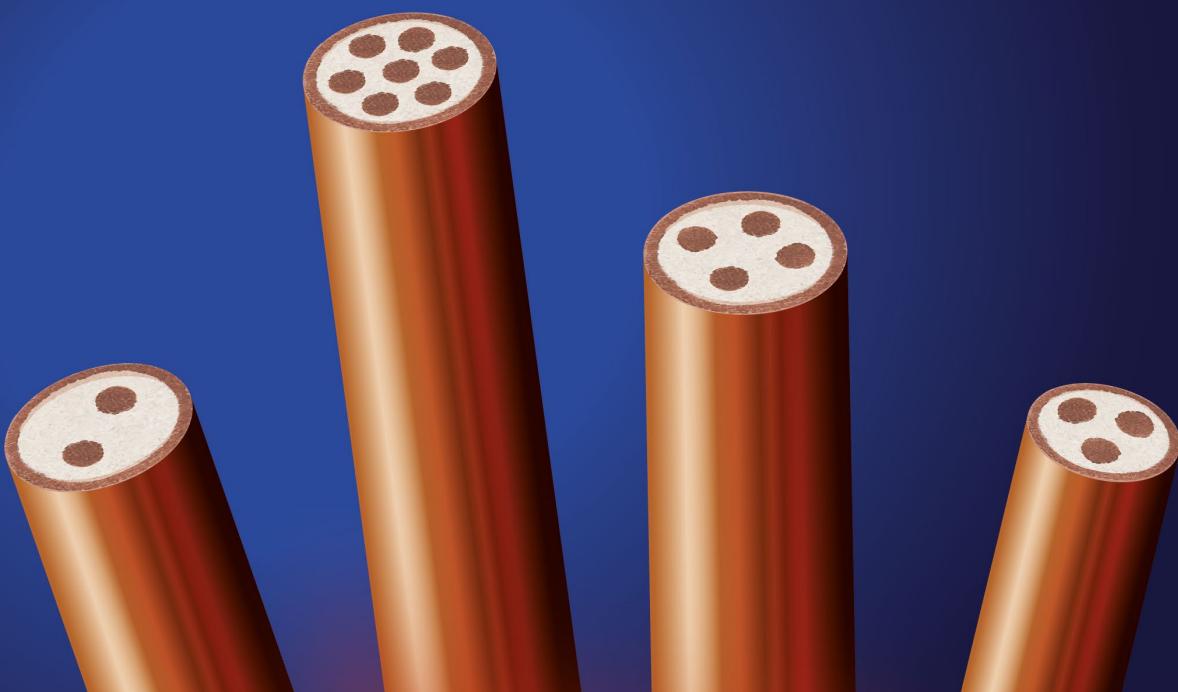
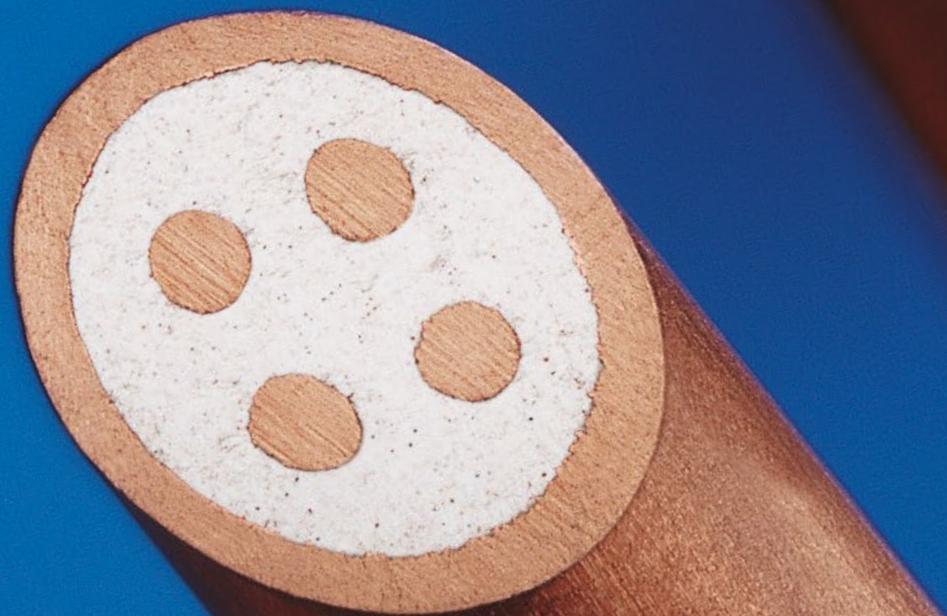


# MICO™

MINERAL  
INSULATED  
CABLES

KME Italy SpA  
COPPER DIVISION  
[EN]







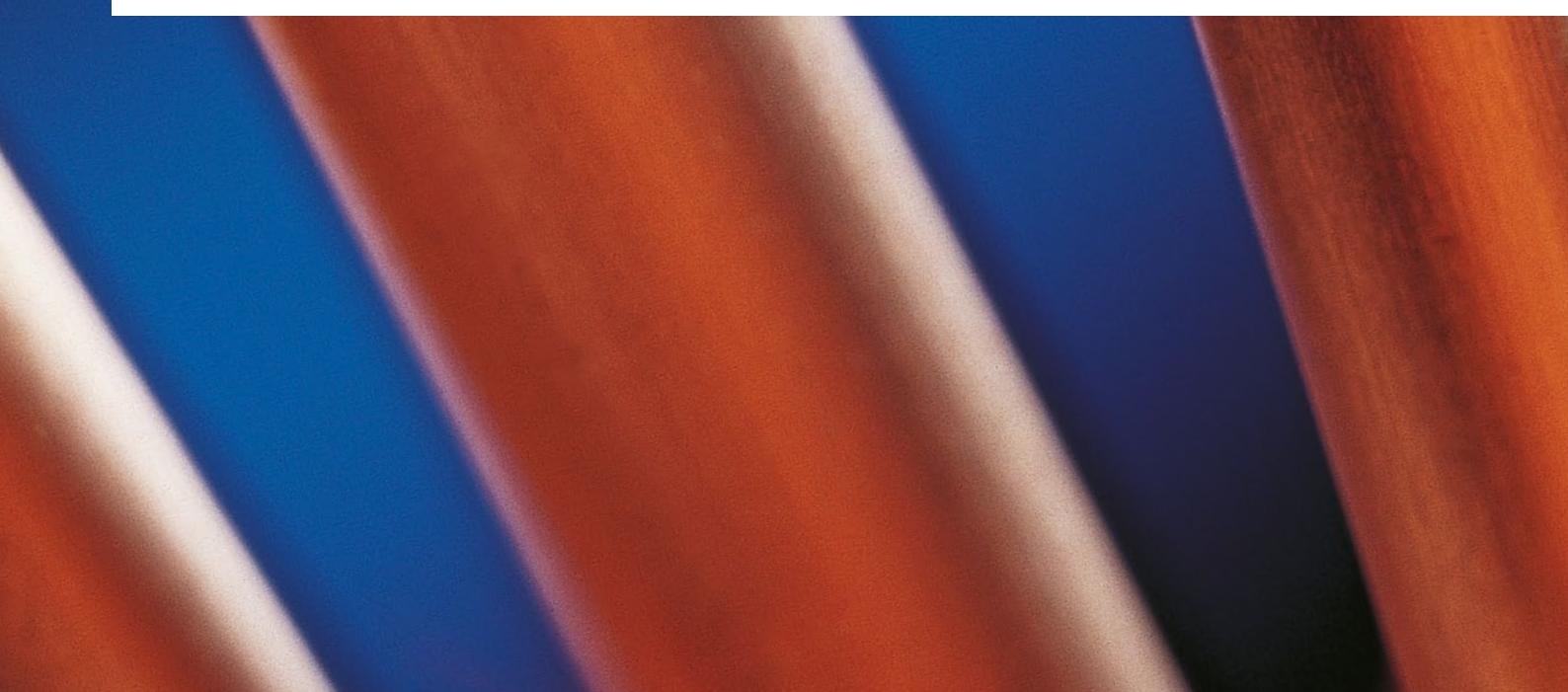
## KME THE COMPANY

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With its worldwide production plants, **KME** is one of the world's largest manufacturers of copper and copper alloy products. We offer innovative product solutions tailored to the respective individual requirements of our customers from the most various industrial sectors.

The Copper Division of **KME** is the only manufacturer worldwide to offer sheets, strip, wire, bars and pipes from one source. Apart from a unique product variety in our major product groups, our three main sites in Fornaci di Barga (IT); Osnabrück (DE) and Hettstedt (DE) specialise in individual solutions for the industrial, construction and plant engineering sectors.

The company, which is run by the **KME** Group S.p.A., has a European management.





# MICO™

The Mineral Insulated Cable is the safest choice for **power and heating** (prevention and protection from fire in industrial and civil applications) as well as for **electrical heat tracing** (industrial and building processes).

## MICO™ MINERAL INSULATED CABLE IS COMPOSED BY:

- ETP solid (not stranded) copper cores, from 1 to 400 mm<sup>2</sup>, melting point 1082°C
- Magnesium Oxide (MgO) as electrical insulation, due to its high performance at high temperature (melting point 2600°C)
- high quality DHP copper sheath, manufactured starting from tubes extruded and drawn only (not welded), melting point 1082°C
- LSF additional outer covering. Such flame retardant poliolephin is characterised by high performance in corrosion resistance and low smoke emission.

## MICO™ CABLE RANGE IS DIVIDED INTO:

- Light duty cables (300/500 V) from 2 to 7 cores, from 1 to 4 mm<sup>2</sup> size
- Heavy Duty Cables (450/750 V) from 1 to 19 cores, 400 mm<sup>2</sup> maximum size for single core, 25 mm<sup>2</sup> maximum size up to 4 cores.

Production process held by KME foresee many steps of diameter reduction (both drawings and rollings) separated by high temperature annealing.

Long lead time (average is 8 weeks) grants high quality cable at the end of the process: strong compression of MgO powder (density about 2 kg/cm<sup>3</sup>) allows very high values of insulation resistance (also if burned, 180° bended or flattened) and thermal conductivity. Therefore current ratings are higher than soft skin cables, especially at high temperature.

### LIGHT DUTY CABLES

Mineral Insulated cables – Light duty cable (300/500 V) – is the best solution for electric circuits installed at sight, in historical or relevant buildings, both indoor and outdoor. Due to their small dimensions, they can be installed quickly and easily. Copper outer sheath, whose cross section is designed to be used as earth conductor, protects the cable from any mechanical stress like impacts, bending or flattening, giving at the same time a beautiful esthetical aspect to the cable. MICO™ is not only a simple cable but, combining its use with the large range of copper and brass accessories, designed by KME, it can be considered as a complete wiring system.

### HEAVY DUTY CABLES

The increasing of nominal voltage (450/750 V), due to higher thickness of copper outer sheath and Magnesium Oxide insulation, allows KME Mineral Insulated heavy duty cables to be installed in every critical environment, due to high humidity degree, or wherever the installation is dangerous due to possible mechanical damages. Wide manufacturing range, similar to soft skin wiring cable range, allow heavy duty cables design whenever big power is required.

Mineral cables are more efficient than standard wiring cables, in terms of resistance to thermal effects: this means that core cross sections (and cable outer diameters as well) can be reduced, under the same conditions of current ratings.

# APPLICATIONS AND ADVANTAGES

#### FIRE RESISTANCE –



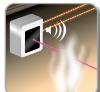
Weaker situation is copper melting point (1082°C). MICO™ is the safest cable, it can withstand to severe fire, water and mechanical tests as foreseen by British (LPCB), European and Australian standards

#### EMERGENCY SYSTEMS –



MICO™ is the only cable to go on working also during a fire, so to supply (for at least 120 minutes, maximum time 3 hours) emergency lamps, acoustic alarms, sprinklers, automatic doors, elevators and so on.

#### FIRE DETECTION –



MICO™ cables allow fire controller units to receive signals by fire detectors also during a fire. MICO™ twisted cables (for signal transmission), in addition to MICO™ light duty cables (for power supply), are able to match technical requirements by most popular fire detection systems

#### BUS SYSTEMS –



World leaders like ABB or Schneider Electric already tested and approved MICO™ as suitable cable for distribution in their bus systems, limiting MICO™ specification in fire hazardous areas or in historical buildings, where standard bus cables need are not recommended

#### HISTORICAL BUILDINGS –



Standard electrical plant can deeply impact aesthetical aspect of old buildings: where integrity of original structure must be saved and hidden installation is not allowed (or its cost would be too much), MICO™ is the perfect solution for an installation at sight. You can also trust on copper capacity of disappearing, day after day, if used on particular environment like stone, brick, wood.

#### TUNNELS –



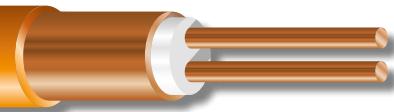
Emergency lights and fan coils are required to go on working also during a fire, to allow people using emergency exits. In order to save their life, MICO™ is really able to withstand high temperatures during a car fire.

# MICO™ POWER CABLES

**THE MICO™ MINERAL INSULATED CABLE IS AN EXCELLENT CHOICE FOR ELECTRICAL CIRCUITS IN THE AREA OF FIRE AND SAFETY.**

The MICO™ Mineral insulated power cable is composed of:

- 99.9% ETP (Electrolytic Tough Pitch) copper conductors, with a melting point of 1083°C;
- Magnesium oxide insulation, with a melting point of 2400°C;
- DHP (Deoxidised High Phosphorus) copper outer sheath, with a melting point of 1083°C;
- Additional LSF (Low Smoke Fumes) outer covering.



## PRODUCT RANGE:

*MICO™ MINERAL INSULATED CABLES ARE DIVIDED INTO TWO RANGES, ACCORDING TO THEIR VOLTAGE RATING*

- Light duty cables with 300/500 V as rated voltage, for low power lighting and power systems.
- Heavy duty cables with 450/750 V as rated voltage, for electric power plants.
- Light Duty Cables are characterised by small dimensions and weight, (as described in the manufacturing standard EN 60702:2002+A1:2015). So they are easily installed in the most difficult circumstances.
- Heavy Duty Cables offer great resistance to mechanical stresses, so they are ideal for installation in hazardous areas. Each range is split into groups, according to the number of cores:
  - Single core heavy duty cables covering full range conductor size, from 1.5 mm<sup>2</sup> to 400 mm<sup>2</sup>
  - Multi core heavy duty cables up to 19 conductors:

## TECHNICAL DATA

### INSULATION DIELECTRIC STRENGTH, CURRENT RATINGS AND VOLT DROP

KME can give you complete technical support for the correct cable selection. The MICO™ catalogue contains complete dimensional and electric characteristics for high temperature and critical applications. Contact us for all your requirements!

Additionally you will receive information concerning the following:

- insulation dielectric strength
- current ratings
- volt drop

## ACCESSORIES

When you install MICO™ there is an easy way to select standard accessories. Starting from total length of Mineral Insulated Cable required, fix the number of cuts you need to make, depending upon installation conditions. For each single cut (from power supply to junction box or electric load) you need 2 terminations (2 seals and 2 glands). Every metre of installed cable needs 2 fixing clips.

If you need particular junction boxes, where a pleasant aesthetic aspect is required, there are KME waterproof brass junction boxes. If you order LSF covered cable, LSF protection shrouds are available, as well as the covered clips. The termination procedure can be easily completed, by using 3 tools (ringer, stripper and crimping tool) supplied together with the cable, if required.

# APPLICATIONS AND ADVANTAGES

## APPLICATIONS

MICO™ is used in the following applications:

- Fire detection systems, where regulations require fireproof conductors.
- Emergency circuits, with the purpose of continuing the power supply, even during a fire, to emergency lights, automatic shutdown systems, alarms and so on.
- Distribution of signals and power to potentially explosive atmospheres, in accordance with the ATEX directive.
- Distribution of signals and power to historic buildings, for both indoor and outdoor systems.

## BUILDING APPLICATIONS

### Historical Areas

Churches, Museums, Castles, Libraries,  
Public outdoor lighting

### Safety and Fire

Cinemas and theatres, Airports, Underground,  
Hospitals, Commercial centres

### Services

Road and rail tunnels, Multi-storey car parks,  
Public service buildings, Telecommunication

## INDUSTRIAL APPLICATIONS

### Hazardous areas

Refineries and oil platforms, Gas works, Pharmaceutical plants, Paint factories, Chemical facilities.

### High operating temperatures

Metallurgical, Iron and Steel industry, Heat treatment of materials, Foundries, Nuclear power stations, Ships.

## ADVANTAGES

1. Something that we would like to emphasize particularly is the fact that the MICO™ cable offers a complete solution ready for installation in all those cases where it is necessary to apply in view: it can be said, in fact, that the cable MICO™ is a complete pipeline more than a simple electric cable.
2. The copper sheath is designed to be used as earth conductor.

### Fireproof:

MICO™ cable can withstand very high temperatures (higher than 1000°C), since all its components are inorganic. It can continue working during a fire, maintaining all emergency services.

### Waterproof:

The MICO™ copper sheath and the special waterproof IP65/IP67 glands prevent the penetration of moisture and dust towards the cores. Mineral insulated cables are highly suited for outdoor applications.

### Mechanical strength:

The copper sheath acts as a metallic screen, and therefore MICO™ cables can withstand extremely high mechanical stress such as crushing, 180° bending and flattening. No conduit required.

### High operating temperatures:

MICO™ bare cables can operate indefinitely up to 250°C; for higher temperatures, the lifetime of the cable is lessened as it approaches the melting point of copper (1083°C).



**LIGHT DUTY MULTI-CORE CABLES (500 V): RESISTANCE, REACTANCE & IMPEDANCE**

CABLE TYPE	RESISTANCE R (Ω/KM)			RESISTANCE X (Ω/KM)	IMPEDANCE Z (Ω/KM)		
	30 °C	70 °C	105 °C		30 °C	70 °C	105 °C
2L1	18.811	21.656	24.145	0.088	18.811	21.656	24.145
2L1.5	12.575	14.477	16.141	0.083	12.576	14.477	16.141
2L2.5	7.701	8.866	9.885	0.079	7.702	8.866	9.885
2L4	4.479	5.157	5.749	0.075	4.480	5.157	5.749
3L1	18.811	21.656	24.145	0.091	18.811	21.656	24.145
3L1.5	12.575	14.477	16.141	0.086	12.576	14.477	16.141
3L2.5	7.701	8.866	9.885	0.079	7.702	8.866	9.885

Above indicated values are valid also for multi-core cables with 4 & 7 conductors

**HEAVY DUTY TWO-CORE CABLES (750 V): RESISTANCE, REACTANCE & IMPEDANCE**

CABLE TYPE	RESISTANCE R (Ω/KM)			RESISTANCE X (Ω/KM)	IMPEDANCE Z (Ω/KM)		
	30 °C	70 °C	105 °C		30 °C	70 °C	105 °C
2H1.5	12.575	14.477	16.141	0.101	12.576	14.478	6.142
2H2.5	7.701	8.866	9.885	0.094	7.702	8.866	9.885
2H4	4.791	5.516	6.150	0.088	4.792	5.516	6.150
2H6	3.200	3.685	4.109	0.083	3.201	3.686	4.110
2H10	1.902	2.190	2.441	0.079	1.904	2.191	2.442
2H16	1.195	1.376	1.534	0.075	1.198	1.378	1.536
2H25	0.756	0.870	0.970	0.073	0.759	0.873	0.973

Above indicated values are valid also for all the other types of multi-core cables (with 3, 4, 7, 12 & 19 conductors).

**SINGLE-CORE TRIPLET CABLES: RESISTANCE, REACTANCE & IMPEDANCE**

CABLE TYPE	RESISTANCE R (Ω/KM)			RESISTANCE X (Ω/KM)	IMPEDANCE Z (Ω/KM)		
	30 °C	70 °C	105 °C		30 °C	70 °C	105 °C
1H1.5	12.576	14.478	16.142	0.139	12.577	14.478	16.142
1H2.5	7.702	8.866	9.885	0.128	7.703	8.867	9.886
1H4	4.792	5.516	6.15	0.120	4.793	5.518	6.150
1H6	3.202	3.686	4.109	0.112	3.204	3.687	4.111
1H10	1.903	2.190	2.442	0.104	1.906	2.193	2.444
1H16	1.196	1.377	1.535	0.098	1.200	1.380	1.538
1H25	0.757	0.871	0.971	0.093	0.763	0.876	0.975
1H35	0.546	0.628	0.700	0.089	0.554	0.635	0.706
1H50	0.404	0.465	0.518	0.085	0.413	0.473	0.525
1H70	0.281	0.323	0.360	0.083	0.293	0.333	0.369
1H95	0.204	0.234	0.260	0.080	0.219	0.247	0.272
1H120	0.163	0.186	0.207	0.078	0.180	0.202	0.221
1H150	0.133	0.152	0.169	0.077	0.154	0.170	0.185
1H185	0.109	0.123	0.137	0.076	0.133	0.145	0.157
1H240	0.086	0.096	0.106	0.076	0.115	0.123	0.131
1H300	0.076	0.084	0.092	0.075	0.107	0.113	0.119
1H400	0.075	0.063	0.069	0.075	0.095	0.099	0.103

**SINGLE-CORE CABLES LAID SIDE BY SIDE: RESISTANCE, REACTANCE & IMPEDANCE**

CABLE TYPE	RESISTANCE R (Ω/KM)								
	30 °C			70 °C			105 °C		
	R	S	T	R	S	T	R	S	T
1H1.5	12.61	12.57	12.53	14.51	14.47	14.44	16.18	16.14	16.10
1H2.5	7.740	7.702	7.665	8.905	8.866	8.829	9.924	9.885	9.848
1H4	4.831	4.792	4.755	5.555	5.516	5.480	6.189	6.150	6.113
1H6	3.241	3.202	3.166	3.725	3.686	3.649	4.148	4.109	4.073
1H10	1.942	1.903	1.867	2.229	2.190	2.154	2.481	2.442	2.406
1H16	1.236	1.196	1.161	1.416	1.377	1.341	1.574	1.535	1.499
1H25	0.797	0.757	0.722	0.911	0.871	0.836	1.011	0.971	0.935
1H35	0.587	0.546	0.512	0.669	0.628	0.594	0.74	0.700	0.665
1H50	0.446	0.404	0.371	0.506	0.464	0.431	0.558	0.517	0.483
1H70	0.323	0.280	0.249	0.364	0.322	0.290	0.401	0.359	0.326
1H95	0.246	0.203	0.172	0.276	0.233	0.201	0.302	0.259	0.227
1H120	0.206	0.161	0.132	0.229	0.185	0.155	0.249	0.206	0.175
1H150	0.177	0.132	0.104	0.195	0.151	0.122	0.212	0.168	0.138
1H185	0.154	0.107	0.083	0.168	0.122	0.096	0.181	0.135	0.108
1H240	0.132	0.083	0.063	0.142	0.095	0.072	0.152	0.104	0.081
1H300	0.122	0.073	0.056	0.130	0.082	0.062	0.137	0.090	0.068
1H400	0.104	0.054	0.038	0.110	0.061	0.042	0.115	0.067	0.046

CABLE TYPE	REACTANCE X (Ω/KM)						IMPEDANCE Z (Ω/KM)					
	30 °C			70 °C			105 °C					
	R	S	T	R	S	T	R	S	T	R	S	T
1H1.5	0.160	0.139	0.161	12.61	12.57	12.54	14.52	14.48	14.44	16.18	16.14	16.10
1H2.5	0.149	0.128	0.150	7.742	7.703	7.667	8.906	8.867	8.831	9.925	9.886	9.850
1H4	0.140	0.120	0.142	4.833	4.793	4.757	5.557	5.517	5.482	6.190	6.151	6.115
1H6	0.132	0.112	0.135	3.244	3.204	3.168	3.727	3.687	3.652	4.150	4.111	4.075
1H10	0.124	0.104	0.127	1.946	1.905	1.871	2.233	2.193	2.158	2.484	2.444	2.409
1H16	0.117	0.098	0.121	1.242	1.200	1.167	1.421	1.380	1.347	1.579	1.538	1.504
1H25	0.112	0.093	0.117	0.805	0.762	0.731	0.918	0.876	0.844	1.017	0.975	0.943
1H35	0.107	0.089	0.113	0.597	0.553	0.524	0.677	0.634	0.604	0.748	0.706	0.675
1H50	0.103	0.085	0.110	0.457	0.413	0.387	0.516	0.472	0.445	0.568	0.524	0.496
1H70	0.099	0.083	0.108	0.338	0.292	0.271	0.378	0.333	0.309	0.413	0.368	0.343
1H95	0.096	0.080	0.106	0.264	0.218	0.202	0.292	0.246	0.227	0.317	0.271	0.250
1H120	0.093	0.078	0.105	0.226	0.179	0.169	0.248	0.201	0.187	0.267	0.220	0.203
1H150	0.090	0.077	0.104	0.199	0.153	0.147	0.216	0.169	0.160	0.231	0.185	0.172
1H185	0.086	0.077	0.104	0.177	0.132	0.133	0.190	0.144	0.141	0.202	0.156	0.150
1H240	0.082	0.077	0.104	0.155	0.113	0.122	0.166	0.122	0.127	0.175	0.130	0.132
1H300	0.078	0.076	0.103	0.145	0.105	0.117	0.153	0.112	0.121	0.161	0.118	0.124
1H400	0.077	0.076	0.103	0.129	0.094	0.110	0.136	0.098	0.112	0.142	0.102	0.114


**SINGLE-CORE CABLES LAID AT THE DISTANCE OF A DIAMETER: RESISTANCE, REACTANCE & IMPEDANCE**

CABLE TYPE	RESISTANCE R (Ω/KM)								
	30 °C			70 °C			105 °C		
	R	S	T	R	S	T	R	S	T
1H1.5	12.61	12.57	12.54	14.52	14.48	14.44	16.18	16.14	16.10
1H2.5	7.743	7.703	7.767	8.907	8.867	8.831	9.925	9.886	9.850
1H4	4.833	4.793	4.728	5.557	5.518	5.482	6.191	6.151	6.115
1H6	3.244	3.203	3.169	3.727	3.687	3.652	4.150	4.111	4.075
1H10	1.946	1.905	1.870	2.232	2.192	2.157	2.484	2.443	2.408
1H16	1.24	1.199	1.165	1.420	1.379	1.345	1.578	1.537	1.502
1H25	0.803	0.760	0.728	0.916	0.874	0.841	1.015	0.973	0.940
1H35	0.593	0.550	0.519	0.674	0.632	0.600	0.745	0.703	0.671
1H50	0.453	0.409	0.379	0.512	0.469	0.438	0.564	0.521	0.490
1H70	0.332	0.287	0.259	0.372	0.328	0.299	0.408	0.364	0.334
1H95	0.257	0.210	0.185	0.285	0.239	0.212	0.310	0.265	0.237
1H120	0.217	0.170	0.147	0.239	0.193	0.168	0.259	0.213	0.186
1H150	0.190	0.142	0.121	0.207	0.160	0.137	0.222	0.176	0.151
1H185	0.169	0.120	0.105	0.182	0.134	0.116	0.194	0.146	0.126
1H240	0.148	0.100	0.141	0.158	0.110	0.097	0.167	0.118	0.103
1H300	0.139	0.093	0.085	0.147	0.099	0.088	0.154	0.105	0.092
1H400	0.120	0.075	0.069	0.126	0.079	0.071	0.131	0.083	0.073

CABLE TYPE	REACTANCE X (Ω/KM)						IMPEDANCE Z (Ω/KM)					
	30 °C			70 °C			105 °C					
	R	S	T	R	S	T	R	S	T	R	S	T
1H1.5	0.203	0.182	0.205	12.61	12.57	12.54	14.52	14.48	14.44	16.18	16.14	16.10
1H2.5	0.192	0.171	0.194	7.745	7.705	7.670	8.907	8.867	8.831	9.927	9.888	9.852
1H4	0.183	0.163	0.186	4.837	4.796	4.762	5.560	5.520	5.485	6.194	6.154	6.118
1H6	0.175	0.156	0.179	3.248	3.207	3.174	3.731	3.691	3.656	4.154	4.114	4.079
1H10	0.167	0.148	0.171	1.953	1.911	1.878	2.239	2.197	2.164	2.489	2.448	2.414
1H16	0.160	0.141	0.165	1.250	1.207	1.177	1.429	1.386	1.355	1.586	1.543	1.511
1H25	0.154	0.136	0.161	0.817	0.772	0.746	0.928	0.884	0.856	1.026	0.983	0.954
1H35	0.150	0.132	0.157	0.611	0.566	0.543	0.690	0.645	0.620	0.760	0.716	0.689
1H50	0.145	0.129	0.154	0.475	0.429	0.410	0.532	0.486	0.465	0.583	0.537	0.514
1H70	0.140	0.126	0.152	0.360	0.313	0.301	0.398	0.351	0.336	0.431	0.385	0.367
1H95	0.136	0.123	0.150	0.289	0.244	0.239	0.315	0.269	0.260	0.339	0.292	0.281
1H120	0.133	0.121	0.149	0.253	0.209	0.209	0.273	0.228	0.224	0.291	0.245	0.238
1H150	0.129	0.120	0.147	0.227	0.185	0.190	0.243	0.199	0.201	0.257	0.213	0.211
1H185	0.123	0.199	0.147	0.205	0.168	0.179	0.218	0.178	0.187	0.194	0.146	0.126
1H240	0.116	0.117	0.145	0.183	0.153	0.168	0.194	0.160	0.173	0.203	0.166	0.178
1H300	0.112	0.115	0.143	0.172	0.146	0.162	0.182	0.151	0.166	0.190	0.156	0.170
1H400	0.108	0.115	0.142	0.155	0.135	0.152	0.163	0.139	0.160	0.170	0.142	0.159

**VOLTAGE DROP IN SINGLE-CORE TRIPLET CABLES**

CABLE TYPE	VOLTAGE DROP (mV/Am)					
	$\cos \phi = 1$			$\cos \phi = 0.8$		
	30°C	70°C	105°C	30°C	70°C	105°C
1H1.5	21.780	25.080	27.960	17.570	20.210	22.510
1H2.5	13.340	15.360	17.120	10.800	12.420	13.830
1H4	8.300	9.550	10.650	6.760	7.770	8.650
1H6	5.550	6.380	7.120	4.550	5.220	5.810
1H10	3.300	3.790	4.230	2.740	3.140	3.490
1H16	2.070	2.380	2.660	1.760	2.010	2.230
1H25	1.310	1.510	1.680	1.150	1.300	1.440
1H35	0.950	1.090	1.210	0.850	0.960	1.060
1H50	0.700	0.810	0.900	0.650	0.730	0.810
1H70	0.490	0.560	0.620	0.480	0.530	0.580
1H95	0.350	0.400	0.450	0.370	0.410	0.440
1H120	0.280	0.320	0.360	0.310	0.340	0.370
1H150	0.230	0.260	0.290	0.260	0.280	0.310
1H185	0.190	0.210	0.240	0.230	0.250	0.270
1H240	0.150	0.210	0.180	0.200	0.250	0.230
1H300	0.130	0.150	0.160	0.180	0.190	0.210
1H400	0.099	0.110	0.120	0.160	0.170	0.170

**VOLTAGE DROP IN SINGLE-CORE CABLES LAID SIDE BY SIDE**

CABLE TYPE	VOLTAGE DROP (mV/Am)					
	$\cos \phi = 1$			$\cos \phi = 0.8$		
	30°C	70°C	105°C	30°C	70°C	105°C
1H1.5	21.780	25.080	27.960	17.570	20.210	22.510
1H2.5	13.340	15.360	17.120	10.800	12.420	13.830
1H4	8.300	9.550	10.650	6.760	7.770	8.650
1H6	5.550	6.380	7.120	4.550	5.220	5.810
1H10	3.300	3.790	4.230	2.740	3.140	3.490
1H16	2.070	2.380	2.660	1.760	2.010	2.230
1H25	1.310	1.510	1.680	1.150	1.300	1.440
1H35	0.950	1.090	1.210	0.850	0.960	1.060
1H50	0.700	0.810	0.900	0.650	0.730	0.810
1H70	0.490	0.560	0.620	0.480	0.530	0.580
1H95	0.350	0.400	0.450	0.370	0.410	0.440
1H120	0.280	0.320	0.360	0.310	0.340	0.370
1H150	0.230	0.260	0.290	0.260	0.280	0.310
1H185	0.190	0.210	0.240	0.230	0.250	0.270
1H240	0.150	0.210	0.180	0.200	0.250	0.230
1H300	0.130	0.150	0.160	0.180	0.190	0.210
1H400	0.099	0.110	0.120	0.160	0.170	0.170

### VOLTAGE DROP IN SINGLE-CORE CABLES LAID AT THE DISTANCE OF A DIAMETER

CABLE TYPE	VOLTAGE DROP (mV/Am)					
	$\cos \phi = 1$			$\cos \phi = 0.8$		
	30°C	70°C	105°C	30°C	70°C	105°C
1H1.5	21.790	25.080	27.960	17.630	20.270	22.570
1H2.5	13.340	15.360	17.130	10.870	12.480	13.890
1H4	8.300	9.560	10.660	6.830	7.830	8.710
1H6	5.550	6.390	7.120	4.620	5.290	5.870
1H10	3.300	3.800	4.240	2.810	3.210	3.560
1H16	2.060	2.390	2.670	1.830	2.080	2.290
1H25	1.320	1.520	1.690	1.210	1.370	1.510
1H35	0.960	1.100	1.220	0.920	1.030	1.130
1H50	0.720	0.820	0.910	0.720	0.800	0.880
1H70	0.510	0.580	0.640	0.550	0.610	0.660
1H95	0.380	0.430	0.470	0.440	0.480	0.520
1H120	0.310	0.350	0.380	0.380	0.420	0.440
1H150	0.260	0.290	0.320	0.340	0.370	0.390
1H185	0.230	0.250	0.270	0.310	0.330	0.350
1H240	0.200	0.210	0.220	0.280	0.300	0.310
1H300	0.180	0.190	0.200	0.270	0.280	0.290
1H400	0.150	0.160	0.170	0.240	0.250	0.260

### VOLTAGE DROP IN LIGHT DUTY MULTI-CORE CABLES (500 V)

CABLE TYPE	VOLTAGE DROP (mV/Am)					
	$\cos \phi = 1$			$\cos \phi = 0.8$		
	30°C	70°C	105°C	30°C	70°C	105°C
2L1	37.620	43.310	48.290	30.200	34.760	38.740
2L1.5	25.150	28.950	32.280	20.220	23.260	25.930
2L2.5	15.400	17.730	19.770	12.420	14.280	15.910
2L4	8.960	10.310	11.500	7.260	8.340	9.290
3L1	32.580	37.51	41.820	26.160	30.100	33.550
3L1.5	21.780	25.080	27.960	17.510	20.150	22.460
3L2.5	13.340	15.360	17.120	10.750	12.370	13.780

Above indicated values are valid also for multi-core cables with 4 & 7 conductors.

### VOLTAGE DROP IN LIGHT DUTY MULTI-CORE CABLES (750 V)

CABLE TYPE	VOLTAGE DROP (mV/Am)					
	$\cos \phi = 1$			$\cos \phi = 0.8$		
	30°C	70°C	105°C	30°C	70°C	105°C
2H1.5	25.150	28.950	32.280	20.240	23.280	25.950
2H2.5	15.400	17.730	19.770	12.430	14.300	15.930
2H4	9.580	11.030	12.300	7.770	8.930	9.940
2H6	6.401	7.370	8.220	5.220	6.000	6.670
2H10	3.800	4.380	4.880	3.140	3.600	4.000
2H16	2.390	2.750	3.070	2.000	2.290	2.540
2H25	1.510	1.740	1.940	1.300	1.480	1.640

Above indicated values are valid also for all the other types of multi-core cables (with 3, 4, 7, 12 & 19 conductors).

**TABLE I/1: SINGLE-CORE H (750 V) M.I.C.**

Bare, exposed to touch or covered with thermoplastic material (metal sheath maximum temperature 70°C). For bare cables we must multiply by 0.9. Cables sheaths are connected to the ends.

CABLE TYPE	TRIPLET CABLES IN AIR	LAID SIDE BY SIDE CABLES IN AIR		HORIZONTAL SPACED CABLES IN AIR		VERTICAL SPACED CABLES IN AIR		LAID CABLES IN AIR, FIXED ON WALL OR CEILING		TRIPLET CABLES IN AIR, FIXED ON WALL OR CEILING
	13-14, 15-16*	13-14, 15-16*		14, 15-16*		14, 15-16*		11, 11A*		11, 11A*
	3 cables	2 cables	3 cables	2 cables	3 cables	2 cables	3 cables	2 cables	3 cables	3 cables
(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1H2.5	22	26	26	26	32	26	28	25	23	21
1H4	30	36	34	36	43	36	37	34	31	28
1H6	40	47	45	47	56	47	49	45	41	37
1H10	51	60	57	60	71	60	62	57	52	48
1H16	69	82	77	82	95	82	84	77	70	65
1H25	92	109	102	109	125	109	110	102	92	86
1H35	120	142	132	142	162	142	142	133	120	112
1H50	147	174	161	174	197	174	173	163	147	137
1H70	182	215	198	215	242	215	213	202	181	169
1H95	223	264	241	264	294	264	259	247	221	207
1H120	267	317	289	317	351	317	309	296	264	249
1H150	308	364	331	364	402	364	353	340	303	286
1H185	352	416	377	416	454	416	400	388	346	327
1H240	399	472	426	472	507	472	446	440	392	371
1H185	466	552	496	552	565	552	497	514	457	434

**TABLE II/2: MULTI-CORE H (750 V) E L (500 V) M.I.C.**

Bare, exposed to touch or covered with thermoplastic material (metal sheath maximum temperature 70°C). For bare cables we must multiply by 0.9.

NOMINAL CONDUCTOR CROSS SECTION	CABLE IN AIR, SPACED FROM WALL OR CEILING OR ON PLATFORM			CABLE IN AIR, FIXED ON WALL OR CEILING	
	3-14-15-16*			11-11A*	
	MM <sup>2</sup>	2 cables	3 cables	2 cables	3 cables
serie	(A)	(A)	(A)	(A)	(A)
<b>500 V</b>					
1.5	25	21	23	19	
2.5	33	28	31	26	
4	44	37	40	35	
<b>750 V</b>					
1.5	26	22	25	21	
2.5	37	30	34	28	
4	47	40	45	37	
6	60	51	57	48	
10	82	69	77	65	
16	109	92	102	86	
25	142	120	133	112	

\* Installation methods taken from 3<sup>rd</sup> edition of CEI 64-8/5 norm, table 52 C.

**TABLE I/2: SINGLE-CORE H (450/750 V) M.I.C.**

Bare, exposed to touch or covered with thermoplastic material (metal sheath maximum temperature 70°C).  
For bare cables we must multiply by 0.9. Cables sheaths are connected to the ends.

CABLE TYPE	TRIPLET CABLES IN AIR	LAID SIDE BY SIDE CABLES IN AIR		HORIZONTAL SPACED CABLES IN AIR		VERTICAL SPACED CABLES IN AIR		LAID CABLES IN AIR, FIXED ON WALL OR CEILING		TRIPLET CABLES IN AIR, FIXED ON WALL OR CEILING
	13-14, 15-16*	13-14, 15-16*		14, 15-16*		14, 15-16*		11, 11A*		11, 11A*
	3 cables	2 cables	3 cables	2 cables	3 cables	2 cables	3 cables	2 cables	3 cables	3 cables
	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1H1.5	28	33	32	33	40	33	35	31	30	26
1H2.5	38	45	43	45	54	45	47	42	41	35
1H4	50	60	56	60	70	60	61	55	53	47
1H6	64	76	71	76	89	76	78	70	67	59
1H10	87	104	96	104	120	104	105	96	91	81
1H16	115	137	127	137	157	137	137	127	119	107
1H25	150	179	164	179	204	179	178	166	154	140
1H35	184	220	200	220	248	220	216	203	187	171
1H50	228	272	247	272	304	272	266	251	230	212
1H70	279	333	300	333	370	333	323	307	280	260
1H95	335	400	359	400	441	400	385	369	334	312
1H120	385	460	411	460	505	460	441	424	383	359
1H150	441	526	469	526	565	526	498	485	435	410
1H185	500	596	530	596	629	596	557	550	492	465
1H240	584	697	617	697	704	697	624	643	572	544

**TABLE II/2: MULTI-CORE H (750 V) E L (500 V) M.I.C.**

Bare, exposed not exposed to touch (metal sheath maximum temperature 105°C).  
Correction factor for bundle is not required.

NOMINAL CONDUCTOR CROSS SECTION	CABLE IN AIR, SPACED FROM WALL OR CEILING OR ON PLATFORM			CABLE IN AIR, FIXED ON WALL OR CEILING	
	3-14-15-16*			11-11A*	
	MM <sup>2</sup>	2 cables	3 cables	2 cables	3 cables
serie	(A)	(A)	(A)	(A)	(A)
<b>500 V</b>					
1.5	31	26	28	24	
2.5	41	35	38	33	
4	54	46	51	44	
<b>750 V</b>					
1.5	33	26	32	26	
2.5	45	35	42	35	
4	60	47	55	47	
6	76	59	70	59	
10	104	81	96	81	
16	137	107	127	107	
25	179	140	166	140	

\* Installation methods taken from 3<sup>rd</sup> edition of CEI 64-8/5 norm, table 52 C.

**TABLE III: CORRECTION FACTOR K<sub>c</sub> FOR ROOM TEMPERATURE DIFFERENT FROM 30°C**

ROOM TEMPERATURE °C	BARE CABLE OR COVERED BY THERMO- PLASTIC MATERIAL EXPOSED TO TOUCH	BARE CABLE NOT EXPOSED TO TOUCH
	70°C	105°C
10	1.26	1.14
15	1.20	1.11
20	1.14	1.07
25	1.07	1.04
30	-	-
35	0.93	0.96
40	0.85	0.92
45	0.76	0.88
50	0.67	0.84
55	0.57	0.80
60	0.45	0.75
65	-	0.70
70	-	0.65
75	-	0.60
80	-	0.54
85	-	0.47
90	-	0.40
95	-	0.32

**NOMINAL COPPER SHEATH RESISTANCE**

RATED VOLTAGE	CROSS- SECTION MM <sup>2</sup>	NOMINAL COPPER SHEATH RESISTANCE (Ω/KM)						
		1 cond	2 cond	3 cond	4 cond	7 cond	12 cond	19 cond
500 V	1	2.855	2.279	1.964	1.491			
	1.5	2.422	1.931	1.689	1.293			
	2.5	1.833	1.614	1.344	0.990			
	4	1.419						
750 V	1.5	2.981	1.381	1.266	1.093	0.832	0.541	0.414
	2.5	2.677	1.184	1.068	0.934	0.697	0.458	
	4	2.238	0.979	0.892	0.753			
	6	1.931	0.824	0.746	0.645			
	10	1.614	0.645	0.569	0.502			
	16	1.310	0.505	0.453	0.388			
	25	1.016	0.397	0.364	0.308			
	35	0.852						
	50	0.697						
	70	0.558						
	95	0.470						
	120	0.405						
	150	0.348						
	185	0.300						
	240	0.248						
	300	0.204						
	400	0.163						

CABLE TECHNICAL DATA

Cable type	Core n° x core size (mm²)	Barre cable diameter (mm)	LSF cable diameter (mm)	Core diameter (mm)	Core resistance (Ohm/km)	Copper sheath section (mm²)	Copper sheath resistance (Ohm/km)	Nominal length (m) tolerance 5%	Coil diameter (mm)	Barre cable weight (kg/m)	LSF cable weight (kg/m)	
<b>LIGHT DUTY CABLES (300/500V) - MULTI CORE L CABLES</b>												
2 L 1	2 x 1	5.10	6.40	1.13	17.24	6.04	2.85	100	1900	1200	0.103	0.124
2 L 1.5	2 x 1.5	5.70	7.00	1.38	11.49	7.12	2.42	100	1500	1200	0.132	0.155
2 L 2.5	2 x 2.5	6.60	7.90	1.78	6.90	9.41	1.83	100	1100	1200	0.180	0.206
2 L 4	2 x 4	7.70	9.20	2.26	4.31	12.15	1.42	100	800	1200	0.249	0.280
3 L 1	3 x 1	5.80	7.10	1.13	17.24	7.56	2.28	100	1500	1200	0.131	0.154
3 L 1.5	3 x 1.5	6.40	7.70	1.38	11.49	8.93	1.93	100	1200	1200	0.166	0.192
3 L 2.5	3 x 2.5	7.30	8.80	1.78	6.90	10.68	1.61	100	900	1200	0.225	0.258
4 L 1	4 x 1	6.30	7.60	1.13	17.24	8.78	1.96	100	1300	1200	0.160	0.185
4 L 1.5	4 x 1.5	7.00	8.30	1.38	11.49	10.21	1.69	100	1000	1200	0.204	0.232
4 L 2.5	4 x 2.5	8.10	9.60	1.78	6.90	12.83	1.34	100	700	1200	0.272	0.308
7 L 1	7 x 1	7.60	9.10	1.13	17.24	11.57	1.49	800		1200	0.223	0.258
7 L 1.5	7 x 1.5	8.40	9.90	1.38	11.49	13.33	1.29	600		1200	0.289	0.326
7 L 2.5	7 x 2.5	9.70	11.20	1.78	6.90	17.42	0.99	500		1200	0.417	0.459
2 T 1	2 x 1	5.10	6.40	1.13	17.24	6.04	2.85	100	1900	1200	0.103	0.124
2 T 1.5	2 x 1.5	5.70	7.00	1.38	11.49	7.12	2.42	100	1500	1200	0.132	0.155
2 T 2.5	2 x 2.5	6.60	7.90	1.78	6.90	9.41	1.83	100	1100	1200	0.180	0.206
<b>HEAVY DUTY CABLES (450/750V) - SINGLE CORE H CABLES</b>												
1 H 1.5	1 x 1.5	4.90	6.20	1.38	11.49	5.78	2.98	2030		1200	0.090	0.107
1 H 2.5	1 x 2.5	5.30	6.60	1.78	6.90	6.44	2.68	1740		1200	0.111	0.128
1 H 4	1 x 4	5.90	7.20	2.26	4.31	7.70	2.24	1420		1200	0.143	0.166
1 H 6	1 x 6	6.40	7.70	2.76	2.87	8.93	1.93	1200		1200	0.176	0.202
1 H 10	1 x 10	7.30	8.80	3.57	1.72	10.68	1.61	950		1200	0.235	0.268
1 H 16	1 x 16	8.30	9.80	4.51	1.08	13.16	1.31	730		1200	0.319	0.356
1 H 25	1 x 25	9.60	11.10	5.64	0.69	16.96	1.02	540		1200	0.443	0.485
1 H 35	1 x 35	10.70	12.20	6.68	0.49	20.23	0.85	440		1600	0.581	0.627
1 H 50	1 x 50	12.10	13.60	7.98	0.34	24.73	0.70	350		1600	0.764	0.816
1 H 70	1 x 70	13.70	15.20	9.44	0.25	30.90	0.56	275		1600	0.986	1.044
1 H 95	1 x 95	15.40	17.40	11.00	0.18	36.69	0.47	215		1600	1.279	1.367
1 H 120	1 x 120	16.80	18.80	12.36	0.14	42.59	0.40	185		1600	1.560	1.658
1 H 150	1 x 150	18.40	20.40	13.82	0.11	49.48	0.35	155		1600	1.867	1.974
1 H 185	1 x 185	20.40	22.90	15.35	0.09	57.47	0.30	125		1600	2.315	2.460
1 H 240	1 x 240	23.30	25.80	17.48	0.07	69.39	0.25	98		1600	3.020	3.186
1 H 300	1 x 300	26.00	28.50	19.54	0.06	84.55	0.20	80		1800	3.810	3.986
1 H 400	1 x 400	30.00	32.50	22.57	0.04	105.97	0.16	80		1800	5.006	5.199
<b>HEAVY DUTY CABLES (450/750V) - MULTI CORE H CABLES</b>												
2 H 1.5	2 x 1.5	7.9	9.4	1.38	11.49	12.49	1.38	750		1200	0.225	0.256
2 H 2.5	2 x 2.5	8.7	10.2	1.78	6.90	14.56	1.18	610		1200	0.268	0.306
2 H 4	2 x 4	9.8	11.3	2.26	4.31	17.61	0.98	480		1200	0.345	0.388
2 H 6	2 x 6	10.9	12.4	2.76	2.87	20.93	0.82	370		1200	0.431	0.478
2 H 10	2 x 10	12.7	14.2	3.57	1.72	26.74	0.64	280		1200	0.608	0.662
2 H 16	2 x 16	14.7	16.2	4.51	1.08	34.11	0.51	205		1200	0.845	0.907
2 H 25	2 x 25	17.1	19.1	5.64	0.69	43.39	0.40	150		1200	1.138	1.238
3 H 1.5	3 x 1.5	8.3	9.8	1.38	11.49	13.62	1.27	670		1600	0.242	0.274
3 H 2.5	3 x 2.5	9.3	10.8	1.78	6.90	16.14	1.07	520		1600	0.313	0.354
3 H 4	3 x 4	10.4	11.9	2.26	4.31	19.34	0.89	420		1600	0.405	0.450
3 H 6	3 x 6	11.5	13.0	2.76	2.87	23.11	0.75	350		1600	0.516	0.565
3 H 10	3 x 10	13.6	15.1	3.57	1.72	30.28	0.57	245		1600	0.733	0.791
3 H 16	3 x 16	15.6	17.6	4.51	1.08	38.07	0.45	180		1600	1.011	1.100
3 H 25	3 x 25	18.2	20.2	5.64	0.69	47.37	0.36	135		1600	1.381	1.487
4 H 1.5	4 x 1.5	9.1	10.6	1.38	11.49	15.77	1.09	560		1600	0.298	0.333
4 H 2.5	4 x 2.5	10.1	11.6	1.78	6.90	18.47	0.93	445		1200	0.374	0.418
4 H 4	4 x 4	11.4	12.9	2.26	4.31	22.90	0.75	350		1200	0.496	0.545
4 H 6	4 x 6	12.7	14.2	2.76	2.87	26.74	0.64	270		1200	0.623	0.677
4 H 10	4 x 10	14.8	16.3	3.57	1.72	34.36	0.50	205		1200	0.884	0.946
4 H 16	4 x 16	17.3	19.3	4.51	1.08	44.42	0.39	145		1200	1.236	1.337
4 H 25	4 x 25	20.1	22.6	5.64	0.69	56.01	0.31	110		1200	1.752	1.895
7 H 1.5	7 x 1.5	10.8	12.3	1.38	11.49	20.73	0.83	385		1600	0.431	0.477
7 H 2.5	7 x 2.5	12.1	13.6	1.78	6.90	24.73	0.70	310		1600	0.557	0.609
12 H 1.5	12 x 1.5	14.1	15.6	1.38	11.49	31.85	0.54	210		1600	0.685	0.746
12 H 2.5	12 x 2.5	15.6	17.6	1.78	6.90	37.64	0.46	175		1600	0.878	0.970
19 H 1.5	19 x 1.5	16.6	18.6	1.38	11.49	41.59	0.41	155		1600	0.928	1.044

PLAIN SEALS					EARTH TAIL SEALS					CLIPS AND SADDLES				
Plain seals kit	PCS per pack	ISO brass glands ATEX approved*	ISO thread dimension	PCS per pack	Earth tail seals kit	PCS per pack	ISO brass glands ATEX approved	ISO thread dimension	PCS per pack	Single Clips (50 pcs/ pack)	Bare Saddles (50 pcs/ pack)	LSF Single Clips (50 pcs/ pack)	LSF Saddles (50 pcs/ pack)	Earth bonding clamps (10 pcs/ pack)
<b>LIGHT DUTY CABLES (300/500V) - MULTI CORE L CABLES</b>														
XG 2L1	10	RAD 2L1	M20	10	XGFT 2L1	10	RAD 2L1	M20	10	1N01	2N01	1P01	2P01	T01M
XG 2L1.5	10	RAD 2L1.5	M20	10	XGFT 2L1.5	10	RAD 2L1.5	M20	10	1N01	2N02	1P01	2P02	T02M
XG 2L2.5	10	RAD 2L4	M20	10	XGFT 2L2.5	10	RAD 2L2.5	M20	10	1N01	2N04	1P01	2P03	T03M
XG 2L4	10	RAD 3L1	M20	10	XGFT 2L4	10	RAD 2L4	M20	10	1N03	2N05	1P03	2P04	T05M
XG 3L1	10	RAD 3L1.5	M20	10	XGFT 3L1	10	RAD 3L1	M20	10	1N01	2N03	1P01	2P02	T02M
XG 3L1.5	10	RAD 3L2.5	M20	10	XGFT 3L1.5	10	RAD 3L1.5	M20	10	1N01	2N04	1P01	2P03	T03M
XG 3L2.5	10	RAD 4L1	M20	10	XGFT 3L2.5	10	RAD 3L2.5	M20	10	1N02	2N05	1P02	2P04	T04M
XG 4L1	10	RAD 4L1.5	M20	10	XGFT 4L1	10	RAD 4L1	M20	10	1N01	2N04	1P01	2P03	T03M
XG 4L1.5	10	RAD 4L2.5	M20	10	XGFT 4L1.5	10	RAD 4L1.5	M20	10	1N02	2N05	1P02	2P03	T04M
XG 4L2.5	2	RAD 7L1	M25	2	XGFT 4L2.5	10	RAD 4L2.5	M20	10	1N03	2N06	1P04	2P05	T05M
XJ 7L1	2	RAD 7L1.5	M25	2	XJFT 7L1	2	RAD 7L1	M25	2	1N03	2N05	1P03	2P04	T05M
XJ 7L1.5	2	RAD 7L2.5	M25	2	XJFT 7L1.5	2	RAD 7L1.5	M25	2	1N03	2N06	1P04	2P05	T05M
XJ 7L2.5	10	RAD 2L1	M20	10	XJFT 7L2.5	2	RAD 7L2.5	M25	2	1N05	2N07	1P05	2P06	T08M
XG 2L1	10	RAD 2L1.5	M20	10	XGFT 2L1	10	RAD 2L1	M20	10	1N01	2N01	1P01	2P01	T01M
XG 2L1.5	10	RAD 2L2.5	M20	10	XGFT 2L1.5	10	RAD 2L1.5	M20	10	1N01	2N02	1P01	2P02	T02M
<b>HEAVY DUTY CABLES (450/750V) - SINGLE CORE H CABLES</b>														
XG 1H1.5	10	RAD 1H1.5	M20	10	XGFT 1H1.5	10	RAD 1H1.5	M20	10	1N01	2N01	1P01	2P01	T01M
XG 1H2.5	10	RAD 1H2.5	M20	10	XGFT 1H2.5	10	RAD 1H2.5	M20	10	1N01	2N01	1P01	2P01	T01M
XG 1H4	10	RAD 1H4	M20	10	XGFT 1H4	10	RAD 1H4	M20	10	1N01	2N01	1P01	2P01	T02M
XG 1H6	10	RAD 1H6	M20	10	XGFT 1H6	10	RAD 1H6	M20	10	1N01	2N04	1P01	2P03	T01U
XG 1H10	10	RAD 1H10	M20	10	XJFT 1H10	2	RADT 1H10	M25	2	1N02	2N05	1P02	2P04	T02U
XG 1H16	10	RAD 1H16	M20	10	XJFT 1H16	2	RADT 1H16	M25	2	1N03	2N06	1P04	2P05	T03U
XG 1H25	10	RAD 1H25	M20	10	XKFT 1H25	2	RADT 1H25	M32	2	1N05	2N07	1P05	2P06	T04U
XG 1H35	10	RAD 1H35	M20	10	XKFT 1H35	2	RADT 1H35	M32	2	1N06	2N08	1P06	2P07	T05U
XJ 1H50	2	RAD 1H50	M25	2	XMFT 1H50	2	RADT 1H50	M40	2	1N08	2N10	1P07	2P08	T06U
XJ 1H70	2	RAD 1H70	M25	2						1N09	2N11	1P09	2P10	T07U
XJ 1H95	2	RAD 1H95	M25	2						1N10	2N13	1P11	2P11	T08U
XX 1H120	2	RAD 1H120	M32	2						1N11	2N14	1P12	2P12	T09U
XX 1H150	2	RAD 1H150	M32	2						1N13	2N15	1P13	2P13	T10U
XX 1H185	2	RAD 1H185	M32	2						1N14	2N16	1P14	2P14	T11U
XM 1H240	2	RAD 1H240	M40	2						1N15	2N17	1P15	2P15	T12U
T 1H300	2	RAD 1H300	M40	2										T13U
T 1H400	2	RAD 1H400	M40	2										T14U
<b>HEAVY DUTY CABLES (450/750V) - MULTI CORE H CABLES</b>														
XG 2H1.5	10	RAD 2H1.5	M20	10	XGFT 2H1.5	10	RAD 2H1.5	M20	10	1N03	2N06	1P03	2P04	T05M
XG 2H2.5	10	RAD 2H2.5	M20	10	XGFT 2H2.5	10	RAD 2H2.5	M20	10	1N05	2N06	1P04	2P05	T06M
XG 2H4	10	RAD 2H4	M20	10	XJFT 2H4	2	RADT 2H4	M25	2	1N05	2N08	1P05	2P06	T08M
XG 2H6	10	RAD 2H6	M20	10	XJFT 2H6	2	RADT 2H6	M25	2	1N07	2N09	1P07	2P07	T10M
XJ 2H10	2	RAD 2H10	M25	2	XKFT 2H10	2	RADT 2H10	M32	2	1N08	2N10	1P08	2P09	T12M
XJ 2H16	2	RAD 2H16	M25	2	XMFT 2H16	2	RADT 2H16	M40	2	1N09	2N12	1P10	2P11	T14M
XK 2H25	2	RAD 2H25	M32	2	XMFT 2H25	2	RADT 2H25	M40	2	1N12	2N14	1P12	2P13	T17M
XG 3H1.5	10	RAD 3H1.5	M20	10	XGFT 3H1.5	10	RAD 3H1.5	M20	10	1N03	2N06	1P04	2P05	T06M
XG 3H2.5	10	RAD 3H2.5	M20	10	XJFT 3H2.5	2	RADT 3H2.5	M25	2	1N05	2N07	1P05	2P06	T07M
XG 3H4	10	RAD 3H4	M20	10	XJFT 3H4	2	RADT 3H4	M25	2	1N06	2N08	1P06	2P07	T09M
XJ 3H6	2	RAD 3H6	M25	2	XJFT 3H6	2	RAD 3H6	M25	2	1N07	2N09	1P07	2P08	T11M
XJ 3H10	2	RAD 3H10	M25	2	XKFT 3H10	2	RADT 3H10	M32	2	1N09	2N11	1P09	2P10	T13M
XJ 3H16	2	RAD 3H16	M25	2	XMFT 3H16	2	RADT 3H16	M40	2	1N10	2N13	1P11	2P12	T15M
XM 3H25	2	RAD 3H25	M40	2	XMFT 3H25	2	RAD 3H25	M40	2	1N13	2N15	1P13	2P13	T18M
XG 4H1.5	10	RAD 4H1.5	M20	10	XGFT 4H1.5	10	RAD 4H1.5	M20	10	1N05	2N07	1P05	2P06	T07M
XG 4H2.5	10	RAD 4H2.5	M20	10	XJFT 4H2.5	2	RADT 4H2.5	M25	2	1N06	2N08	1P06	2P06	T09M
XJ 4H4	2	RAD 4H4	M25	2	XJFT 4H4	2	RAD 4H4	M25	2	1N07	2N09	1P07	2P08	T11M
XJ 4H6	2	RAD 4H6	M25	2	XKFT 4H6	2	RADT 4H6	M32	2	1N08	2N10	1P08	2P09	T12M
XJ 4H10	2	RAD 4H10	M25	2	XKFT 4H10	2	RADT 4H10	M32	2	1N09	2N12	1P10	2P11	T14M
XK 4H16	2	RAD 4H16	M32	2	XMFT 4H16	2	RADT 4H16	M40	2	1N12	2N14	1P12	2P13	T17M
XM 4H25	2	RAD 4H25	M40	2	XMFT 4H25	2	RAD 4H25	M40	2	1N14	2N16	1P14	2P14	T19M
XJ 7H1.5	2	RAD 7H1.5	M25	2	XJFT 7H1.5	2	RAD 7H1.5	M25	2	1N07	2N09	1P06	2P07	T10M
XJ 7H2.5	2	RAD 7H2.5	M25	2	XJFT 7H2.5	2	RAD 7H2.5	M25	2	1N08	2N10	1P07	2P08	T12M
XJ 12H1.5	2	RAD 12H1.5	M32	2						1N09	2N12	1P09	2P11	T14M
XK 12H2.5	2	RAD 12H2.5	M32	2						1N10	2N13	1P11	2P12	T15M
XM 19H1.5	2	RAD 19H1.5	M40	2						1N11	2N14	1P12	2P12	T16M

# APPROVALS & STANDARDS TERMINATIONS

## APPROVALS & STANDARDS

*Manufacture & Testing*  
LPCB Product Certification

EN 60702-1:2002+A1:2015

423a



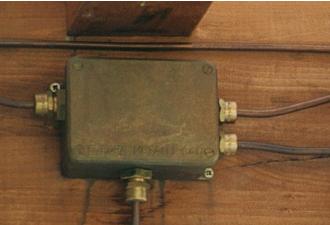
Approved by	Standard Reference	Description
LPCB/IMQ	IEC 60331-1	Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm.
	IEC 60332-1-2	Tests on electric and optical fibre cables under fire conditions: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame.
	IEC 60331-2 (EN 50200:2016)	Test method for fire with shock at a temperature of at least 830 °C for 120 minutes for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter not exceeding 20 mm.
	IEC 60754-2	Test on gases evolved during combustion of materials from cables - Determination of acidity (by pH measurement) and conductivity
	IEC 61034-2	Measurement of smoke density of cables burning under defined conditions: Test procedures and requirements.
LPCB	BS 6387:2013(C,W,Z)	Test method for resistance to fire of cables required to maintain circuit integrity under fire conditions.
IMQ	CPR N°305/2011 (Class Aca)	The Construction Products Regulation (CPR) is a European legislation defining the basic requirements and harmonised essential characteristics that all products designed to be permanently installed in construction works must meet within the scope of the EU. (For bare cables only)

## TERMINATIONS



Manufactured in accordance with	EN 60702-2:2002+A1:2015			
Glands in accordance with	ATEX Directive 2014/34/EU			
Glands Marking	II 2G Ex eb IIC Gb Ex db IIC Gb IECEx IMQ 19.0001 X II 2D Ex tb IIIC Db IP65 Tamb-20°C ÷ + 70°C			

# JUNCTION BOXES (BRASS LINE) AND TOOLS



In order to complete MICO™ system range, KME produces also a valuable metal junction box in sandblasted brass that is manufactured after melting.



## Production dimensions for junction box are:

83 x 117 x 63 mm (small type)  
132 x 191 x 72 mm (large type)

All junction boxes can be supplied with a holed panel, so to install behind it all series of mounting frames and relative switches and sockets.

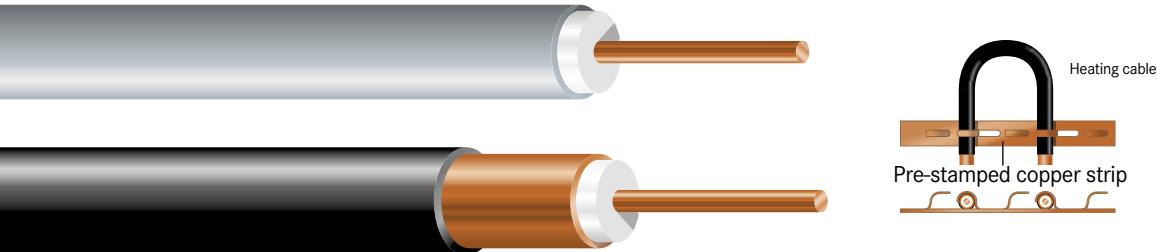


## Tools



- 1) Small bender lever ZBLS (10 mm < Ø < 16 mm)
- 2) Large bender lever ZBLL (Ø > 16 mm)
- 3) Large ringer ZRL
- 4) Small rotary stripper (for 2L1 and 2L1.5 cables) ZSUS
- 5) Spare blade for small stripper ZSUSB
- 6) Crimping tool for G - M20 seals ZDC20
- 7) Crimping tool for J/K - M25/32 seals ZDC25
- 8) Plate type crimper for M - M40 seals ZDD 40
- 9) Large universal stripper ZSU
- 10) Spare blade for large stripper ZSUB
- 11) Straightener ZBSS (Ø < 10 mm)

# MICO™ HEATING CABLES



**KME HEATING CABLES ARE THE BEST ECONOMIC ANSWER AND TECHNICAL SOLUTION FOR POWER TRACING.**

#### PRODUCT RANGE:

MICO™ MINERAL INSULATED HEATING CABLES ARE DIVIDED INTO THREE GROUPS, DEPENDING ON METALLIC TYPE OF THE OUTER SHEATH

- Copper sheathed (and additional HDPE covering)
- Cupro Nickel sheathed

The metallic core can be chosen according to the desired output power (depending from conductor specific resistance):

- Copper (from 4 to  $\Omega 88$  /km)
- Kumanal (from 100 to 2700  $\Omega$ /km)

Mineral insulated heating cables, as well as complementary self regulating heating cables, provide the best performance in the area of electrical heat tracing for building and industrial applications.

*The mineral insulated heating cables are composed of:*

- Single copper (for low specific resistance) or kumanal (up to 2,7  $\Omega$ /m) conductors;
- Magnesium oxide insulation highly compressed
- Copper (resistant up to 250°C) or Cupro-Nickel (up to 400°C) outer sheath
- Additional HDPE outer covering if used under concrete

#### APPLICATIONS:

Mineral insulated heating cables are used in the following applications:

1. With HDPE outer covering
  - Snow melting and frost prevention on outdoor surfaces such as roads, ramps and steps.
  - Frost protection of cold store floors
  - Domestic heating
  - Roof, gutter and downpipe de-icing systems
2. CuproNickel
 

Electrical heat tracing for industrial piping and tanks in the presence of corrosive agents, marine environment or potentially explosive atmospheres.

# APPLICATIONS AND ADVANTAGES

## APPLICATIONS OF HEATING CABLES

Mineral Insulated Cables, in order to be installed, must be specially terminated with cold joints and cold leads in the ends. The heating element can then be connected to power supply without any danger from high temperatures.

Obviously such termination procedure affects the element price if the heating cable is longer than few tens of metres.

However the low price per metre of Mineral Insulated Heating Cables compared to traditional solutions, makes KME Heating Cables the best economic answer and technical solution.

## BUILDING APPLICATIONS

Snow melting and Ice prevention

- Roads and Ramps
- Steps

Floorwarming

Roof and Gutter De-Icing system

Rail and Switchpoint Heating

Instant Hot Water System

Anti-Freeze protection of water pipes

Frost protection of cold store floors

## INDUSTRIAL APPLICATIONS

PetroGas Industry

- In Plant Heat Tracing
- Long Installation Lines

Chemical and Oil industry

- Oil Tank heating
- Pipeline heating

Power generation stations

Nuclear Industry

Fire systems frost protection

## ADVANTAGES

- High power output due to perfect thermal conductivity of the metallic sheath.
- Reduced sizes due to the high dielectric strength of the magnesium oxide while maintaining good thermal conductivity.
- Easy installation due its reduced sizes, as described previously, and annealed state of outer sheath; bending radius is allowed to be reduced to few cm.
- Since the cables are round, there is no need for preferential orientations or directions when laying.
- Great amount of freedom during the design phase, due to the wide range of available resistances that offer an unlimited combination of sheath temperatures and power.



**COPPER CABLES**

CABLE TYPE	RESISTANCE	OUTER DIAMETER	CODUCTOR DIAMETER	CABLE TYPE	OUTER DIAMETER
Code	Ω/km	mm	mm	Code	mm
KC 2700	2700	2.7	0.44	KC 2700 / HDPE	4.3
KC 2000	2000	2.8	0.51	KC 2000 / HDPE	4.4
KC 1600	1600	3.5	0.57	KC 1600 / HDPE	5.1
KC 1250	1250	2.8	0.65	KC 1250 / HDPE	4.4
KC 800	800	3.5	0.81	KC 800 / HDPE	5.1
KC 630	630	4.0	0.91	KC 630 / HDPE	5.6
KC 450	450	4.0	1.08	KC 450 / HDPE	5.6
KC 315	315	4.3	1.29	KC 315 / HDPE	5.9
KC 220	220	4.5	1.54	KC 220 / HDPE	6.1
KC 140	140	4.9	1.93	KC 140 / HDPE	6.5
KC 100	100	5.2	2.28	KC 100 / HDPE	6.8
CC 88	88	2.7	0.50	CC 88 / HDPE	4.3
CC 63	63	3.2	0.59	CC 63 / HDPE	4.8
CC 40	40	3.4	0.74	CC 40 / HDPE	5.0
CC 25	25	3.7	0.94	CC 25 / HDPE	5.3
CC 17	17	4.6	1.13	CC 17 / HDPE	6.2
CC 11	11	4.9	1.38	CC 11 / HDPE	6.5
CC 7	7	5.3	1.78	CC 7 / HDPE	6.9
CC 4	4	5.9	2.26	CC 4 / HDPE	7.5

**CUPRO-NICKEL CABLES**

CABLE TYPE	RESISTANCE	OUTER DIAMETER	CODUCTOR DIAMETER
Code	Ω/km	mm	mm
KN 1600	1600	3.2	0.57
KN 1000	1000	3.4	0.72
KN 630	630	3.7	0.91
KN 400	400	4.0	1.14
KN 250	250	4.4	1.45
KN 160	160	4.9	1.81
CN 63	63	3.2	0.59
CN 40	40	3.4	0.74
CN 25	25	3.7	0.94
CN 17	17	4.6	1.13
CN 11	11	4.9	1.38
CN 7	7	5.3	1.78
CN 4	4	5.9	2.26

CC: Copper core, Copper sheath

KC: Kumanal core, Copper sheath

HDPE = High Density Polyethylene

KN: Kumanal core, Cupro Nickel sheath

CN: Copper core, Cupro Nickel sheath

## TECHNICAL DATA

In order to calculate the start-up current of the heating cable, you must adjust conductor resistance value according to environment temperature; specific cable resistance is proportional to temperature gap, as shown in the following relationship:

$$R_t = R_{20} \cdot [1 + \alpha(t - 20)]$$

- where:
- $R_t$  = resistance at  $t$  temperature
  - $R_{20}$  = resistance at 20 °C temperature
  - $t$  = operating temperature
  - $\alpha$  = temperature coefficient

$\alpha$  and  $[1 + \alpha(t - 20)]$  values are reported on the tables below:

CONDUCTOR TYPE	RESISTIVITY AT 20°C	$\alpha$ COEFFICIENT
Copper (C)	1.72 $\mu\Omega\text{cm}^2/\text{cm}$	0.004
Kumanal (K)	41.0 $\mu\Omega\text{cm}^2/\text{cm}$	0

COPPER C							
Temperature °C	20	40	60	80	100	150	250
$[1 + \alpha(t - 20)]$	1	1.08	1.16	1.24	1.32	1.52	1.92

KUMANAL K	
Temperature °C	from 20 to 350°C
$[1 + \alpha(t - 20)]$	1

further information

# WWW.KME.COM

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COPPER PRODUCTS