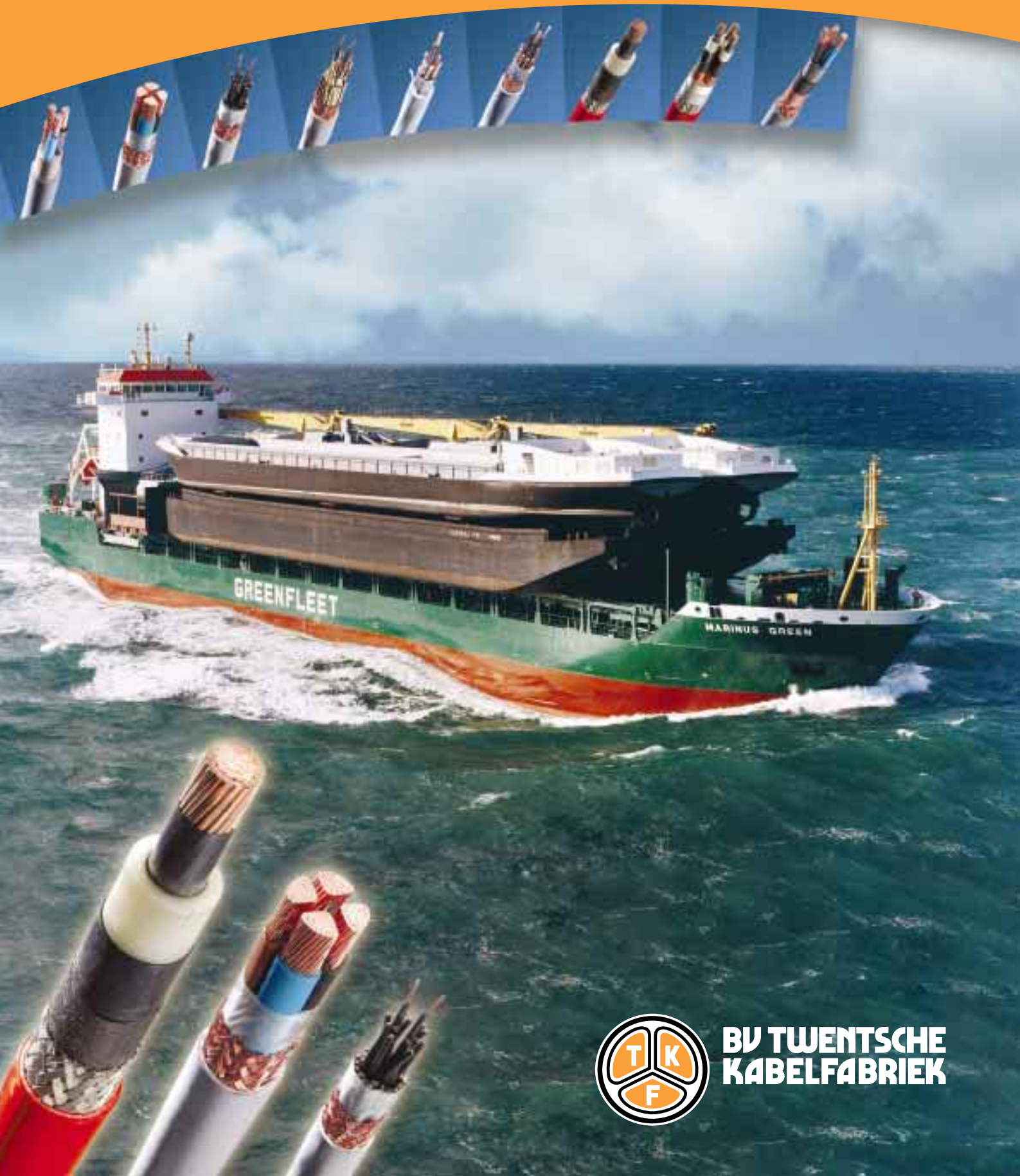


Twenkaship Marine Cables



**BV TWENTSCHE
KABELFABRIEK**



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About TKF

The Twentsche Kabelfabriek Company (TKF), was founded in 1930, has grown from a local Dutch cable producer to a cable technology leader servicing customers all over the world.

Our customers come first

We dedicated ourselves to efficient and reliable cable solutions that match specific customer needs. It's why today's professionals choose for TKF. Through the years TKF has focused on becoming a better partner for its customers worldwide. Obviously a good philosophy, looking at the long-term relationships between TKF and a growing number of companies.



Professionals that value the continuous pursuit for better understanding between suppliers, customers, installers and end-users. Through understanding our customers requirements, the company's technological resources are applied to make better cable products to support your business.

The focus for better service

The areas of application TKF focuses on are power distribution, the process industry, telecom as well as special applications such as shipbuilding. Given this segmentation, TKF is able to offer state-of-the-art products and valuable services that precisely fit the identified needs within a specific

application; from installation advice to the Turn Key projects of out-sourcing the construction of complete telecom or power-distribution networks.

Our flexible and transparent attitude

The TKF organisation is structured in such a way that customers benefit from a high level of flexibility. This is expressed in short delivery times due to smart processes combined with high stock levels. With other services to cut and label cables to specific customer



requirements and thus supply exactly the right cables at the right location, at the right time. Furthermore the company has the ability to operate in a clear and simple way. Each customer will be supported by a TKF contact. One single contact who is the spokesman for the complete route of the product design, production planning, delivery and quality assurance.



**BU TWENTSCHE
KABELFABRIEK**

State-of-the-art materials

The compounding and construction of the materials used define the characteristics of a cable. That is why research and development of new materials is one of the core competences of TKF. All material knowledge is therefore available through in-house expertise. The R&D-specialists are continuously working on new materials, cable constructions and production technologies. The ultra-modern compounding installation finishes the process. This way customer understanding leads to products that truly fulfil the identified requirements.



Our standards & quality policy

TKF is a ISO-9001 "overall organisation" company as well as a ISO-14001 "environmental" certified company. All products are produced according to these international guidelines. But the TKF quality assurance system is even more stringent than the international standards require. Various stages of the manufacturing process are regularly and intensively monitored while all final products are tested. This procedure is audited and approved by the Dutch Electrical Board (KEMA), allowing TKF to state the KCQ hallmark on its products (KEMA Certified Quality).



Delivery program



A broad range of cable solutions is available for various applications but only in one quality – the TKF quality.

The Energy Industry

TKF offers a complete range of top quality cables for power distribution, including:

- Single core XLPE insulated medium voltage cables 6/10 kV up to 36/50 kV
- Three core XLPE insulated medium-voltage cables 6/10 up to 18/30 kV
- Transformer switch connection cables
- Low voltage distribution cables
- Paper insulated, lead sheathed medium voltage cables up to 12.5 kV



The Telecom Industry

Since 1930 TKF has supported major telecom companies with the delivery of cables and cable management solutions:

- Optical fibre cables
- Copper wire telephone cables
- Data and telecommunication cables
- Coaxial cables
- Modular cable systems



The Installation Industry

For general building, infrastructure, marine and industrial companies TKF delivers a wide range of cables, such as:

- Low voltage installation cables and wires
- Low voltage distribution cables
- Signal and telecommunication cables
- Marine cables
- EMC motor cables



The Process Industry

Besides energy, installation and telecom cables the portfolio of TKF consist of cables especially for the process industry.

- Instrumentation cables
- Thermocouple cables
- Fieldbus cables
- Lead sheathed cables



Dedicated cables for marine applications

The dedicated cable range for marine applications shows TKF's commitment to offer truly customer oriented solutions. The combination of a continuous anticipation of the on-going developments in the synthetic industry and a long history with ship-yards and ship installers has proven to be a clear reason why many professionals choose TKF marine cables.



hydrocarbons that are commonly used on board ships.

All Twenkaship marine cables fully comply with the requirements as specified in the IEC 60092 series of standards. TKF has obtained type approvals for Twenkaship marine cables from most of the major international classification organisations:

- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- China Classification Society (CCS)
- Det Norske Veritas (DNV)
- Germanischer Lloyd (GL)
- Lloyd Register of Shipping (LRS)

Special design

TKF marine cables are designed, manufactured, tested and approved for use in fixed applications on board ships and offshore platforms. The constructions of the different types of marine cables are halogen-free, light in weight, flexible and flame retardant.

- handling and installation is easier due to the cables light weight and small diameter
- by using the rip-cord underneath the outer sheath, the cable can be stripped faster, easier and over longer lengths without a risk of damaged insulation

Cable characteristics

TKF marine cables feature special characteristics that make a reliable, fast and easy installation possible as well as proper cable functionality for long periods of time:

- the different sheaths and layers will not stick to each other, enabling the fast and easy stripping and termination of the cable

International standards and type approvals

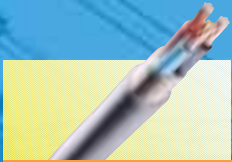
All Twenkaship marine cables are designed and produced according to our own stringent TKF standards. They will therefore always meet or exceed specified customer requirements, as well as the applicable international standards. Our choice of materials and constructions ensure that the cables are resistant to vibration, and most chemicals as well as





TKF marine cables

High-end solutions for all



Twenkaship

Non braided power cables 0.6/1 kV



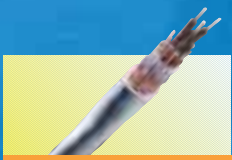
Twenkaship-O

Copper wire braided power cables 0.6/1 kV



Twenkaship-signal

Non braided signal and control cables 250 V



Twenkaship-O-signal

Copper wire braided signal and control cables 250 V





marine cable applications



Twenkaship-com

Copper wire braided communication cables 250 V



Twenkaship-2-com

Copper wire braided and pair shielded communication cables 250 V



Twenkaship-O-medium voltage

Copper wire braided medium voltage power cables 6/10 – 8.7/15 kV



EMC motor cables

Shielded and braided motor cables 0.6/1 kV



Halogen-free power cables

Twenkaship non braided, 0.6/1 kV

Cables designed for power and lighting applications (0.6/1 kV). The halogen-free outer sheath is flame-retardant and has good chemical resistance.

Construction:

- conductors:** stranded plain of annealed high-conductive copper (class-2)
- insulation:** cross-linked polyethylene (XLPE), to withstand a continuous conductor temperature of 85 °C
- cable core:** up to 5 cores: filled up with filling material • more than 5 cores: provided with polyester tape • sector shaped conductors: provided with polyester tape
- outer sheath:** grey halogen-free compound, flame-retardant, SHF1 with a rip-cord
- core ID:**
 - 1-core: black
 - 2-core: black & blue
 - 3-core: black, blue & brown
 - 4-core: black, blue, brown & black (one white stripe)
 - 5-core: black, blue, brown, black (one white stripe) & black (two white stripes)
 - multicore: black with contrasting coloured numbers
- marking:** TKF-(type)-600/1000 V-CS 85-mbzh -TWENKASHIP HALOGEN FREE



Power



Flexible & easy to install



Small diameter

Technical information:

Rated voltage: 600/1000 V
 Test voltage: 3500 V AC
 Min. Temp.: -20 °C during installation
 -40 °C fixed installed
 Standards: IEC 60092-350/-351/-353,
 IEC 60092-359,
 IEC 60092-332-1,
 IEC 60092-332-3-22AF,
 IEC 60228, IEC 60754-1,
 IEC 61034-2

For detailed technical specifications see page 17

no. cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
1x1.5	4.9	40
2x1.5	8.9	120
3x1.5	8.9	130
4x1.5	9.8	150
5x1.5	10.8	180
6x1.5	11.2	170
7x1.5	11.2	175
8x1.5	12.8	230
10x1.5	15.4	310
12x1.5	14.5	290
16x1.5	16.1	380
19x1.5	17.4	440
1x2.5	5.4	50
2x2.5	9.8	150
3x2.5	10.3	170
4x2.5	11.0	200
5x2.5	12.0	245
1x4	5.9	60
2x4	10.8	200
3x4	11.6	230
4x4	12.7	290
1x6	6.5	80
2x6	12.1	260
3x6	12.8	320
4x6	14.0	390
1x10	7.5	120
2x10	14.5	400

no. cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
3x10	14.7	480
4x10	16.7	600
1x16	8.5	180
2x16	16.7	570
3x16	17.2	700
4x16	19.7	880
1x25	10.4	280
2x25	20.4	900
3x25	21.4	1110
1x35	11.6	390
2x35	23.4	1230
3x35*	21.7	1520
1x50	13.3	500
3x50*	23.6	1990
1x70	15.4	720
3x70*	27.4	2850
1x95	17.4	980
3x95*	31.0	3870
1x120	19.4	1240
3x120*	35.0	4870
1x150	21.6	1520
3x150*	38.0	6000
1x185	23.8	1890
3x185*	43.5	7520
1x240	26.9	2450
3x240*	49.0	9770

* = sector shaped conductors



Halogen-free power cables

Twenkaship-O copper wire braided, 0.6/1 kV

Cables designed for power and lighting applications (0.6/1 kV). The halogen-free outer sheath is flame-retardant and has good chemical resistance. The special copper wire braiding reduces Electrical Magnetic Interference (EMI) and gives extra mechanical protection.

Construction:

- conductors:** stranded plain annealed high-conductivity copper (class-2)
- insulation:** cross-linked polyethylene (XLPE), to withstand a continuous conductor temperature of 85 °C
- cable core:** up to 5 cores: filled up with filling material • more than 5 cores: provided with polyester tape • sector shaped conductors: provided with polyester tape
- braiding:** plain copper wires
- outer sheath:** grey halogen-free compound, flame-retardant, SHF1 with a rip-cord
- core ID:**
 - 1-core: black • 2-core: black & blue • 3-core: black, blue & brown
 - 4-core: black, blue, brown & black (one white stripe) • 5-core: black, blue, brown, black (one white stripe) & black (two white stripes)
 - multicore: black with contrasting coloured numbers
- marking:** TKF-(type)-600/1000 V-CS85-mbzh-TWENKASHIP-O HALOGEN FREE



Technical information:

- Rated voltage: 600/1000 V
- Test voltage: 3500 V AC
- Min. Temp.: -20 °C during installation
-40 °C fixed installed
- Standards: IEC 60092-350/-351/-353,
IEC 60092-359,
IEC 60092-332-1,
IEC 60092-332-3-22AF,
IEC 60228, IEC 60754-1,
IEC 61034-2

For detailed technical specifications
see page 18

no. cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
1x1.5	6.6	70
2x1.5	9.6	166
3x1.5	10.0	170
4x1.5	10.8	200
5x1.5	11.8	230
6x1.5	12.6	227
7x1.5	12.6	235
8x1.5	14.6	330
10x1.5	16.1	430
12x1.5	16.7	410
16x1.5	18.3	505
19x1.5	19.3	580
1x2.5	7.0	84
2x2.5	10.4	195
3x2.5	11.1	220
4x2.5	11.9	255
5x2.5	12.8	310
1x4	7.5	94
2x4	11.6	255
3x4	12.2	290
4x4	13.2	350
1x6	8.0	120
2x6	12.6	320
3x6	13.3	380
4x6	15.1	500
1x10	9.0	175
2x10	14.9	515
3x10	15.7	590
4x10	17.2	725

no. cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
1x16	9.9	245
2x16	16.9	695
3x16	17.8	840
4x16	19.6	1035
1x25	11.6	360
2x25	20.1	1055
3x25	21.3	1280
4x25	23.4	1570
1x35	12.7	490
2x35	22.5	1420
3x35*	23.9	1690
4x35*	26.3	2070
1x50	14.9	660
3x50*	27.5	2180
4x50*	30.3	2680
1x70	16.7	910
3x70*	31.2	3060
4x70*	34.4	3760
1x95	18.3	1200
3x95*	34.8	4115
4x95*	39.1	5060
1x120	20.1	1450
3x120*	39.2	5240
1x150	22.1	1850
3x150*	43.5	6420
1x185	24.0	2280
3x185*	47.8	7960
1x240	26.6	2900
3x240*	53.7	10280

* = sector shaped conductors



Halogen-free communication cables

Twenkaship-com copper wire braided

Cables designed for control, instrumentation, tele- and data-communication up to 250 V. The most striking cable features: low Electric Magnetic Interference (EMI), good cross talk attenuation, minimal signal losses. The halogen-free outer sheath is flame-retardant and has good chemical resistance.

Construction:

- conductors:** stranded plain annealed high-conductive copper (class-2)
- insulation:** cross-linked polyethylene (XLPE), to withstand continuous conductor temp. of 85 °C
- cable core:** twisted pairs laid up and provided with a polyester tape
- braiding:** plain copper wires
- outer sheath:** grey halogen-free compound, flame-retardant, SHF1 - rip-cord
- core ID:** black with contrasting coloured numbers
- marking:** TKF-(type)-250 V-CS 85-mbzh-TWENKASHIP-COM HALOGEN FREE



Technical information:

- Rated voltage: 250 V
- Test voltage: 1500 V AC
- Min. Temp.: -20 °C during installation
-40 °C fixed installed
- Standards: IEC 60092-350/-351/-359,
IEC 60092-375,
IEC 60092-332-1,
IEC 60092-332-3-22AF,
IEC 60228,
IEC 60754-1, IEC 61034-2

For detailed technical specifications see page 19

no.cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
1x2x0.75	8.8	80
1x3x0.75	9.2	95
1x4x0.75	9.7	110
4x2x0.75	14.1	200
6x2x0.75	16.9	270
7x2x0.75	17.0	310
10x2x0.75	19.8	400
14x2x0.75	22.8	525
19x2x0.75	25.2	675
24x2x0.75	28.3	805
30x2x0.75	31.3	960
37x2x0.75	34.6	1215

Twenkaship-2-com copper wire braided & pair shielded

Designed for control, instrumentation, tele- and data-communication up to 250 V. Cable features as Twenkaship-com (see above) plus each pair and overall electrically shielded.

Construction:

- conductors:** stranded plain annealed high-conductive copper (class-2)
- insulation:** cross-linked polyethylene (XLPE), to withstand continuous conductor temp. of 85 °C
- cable core:** twisted pairs laid up, individual and overall shielded with an aluminium/polyester tape
- braiding:** plain copper wires
- outer sheath:** grey halogen-free compound, flame-retardant, SHF1 - rip-cord
- core ID:** black with contrasting coloured numbers
- marking:** TKF-(type)-250 V-CS 85-mbzh-TWENKASHIP-2-COM HALOGEN FREE



Technical information:

- Rated voltage: 250 V
- Test voltage: 1500 V AC
- Min. Temp.: -20 °C during installation
-40 °C fixed installed
- Standards: IEC 60092-350/-351/-359,
IEC 60092-375,
IEC 60092-332-1,
IEC 60092-332-3-22AF,
IEC 60228,
IEC 60754-1, IEC 61034-2

For detailed technical specifications see page 19

no.cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
2x2x0.75	12.4	165
4x2x0.75	15.0	240
6x2x0.75	18.0	315
7x2x0.75	18.1	375
10x2x0.75	21.0	480
14x2x0.75	24.2	625
19x2x0.75	26.8	810
24x2x0.75	30.0	955
30x2x0.75	33.2	1145
37x2x0.75	36.7	1140



Halogen-free signal & control cables

Twenkaship-signal non braided

Cables designed for signal, control and alarm purposes up to 250 V. The halogen-free outer sheath is flame-retardant and has good chemical resistance.

Construction:

- conductors:** stranded plain of annealed high-conductive copper (class-2)
- insulation:** cross-linked polyethylene (XLPE), to withstand continuous conductor temp. of 85 °C
- cable core:**
 - ≤ 5 cores: filled up with filling material
 - multi cores: with polyester tape
- outer sheath:** grey halogen-free compound, flame-retardant, SHF1 - rip-cord
- core ID:**
 - 1-core: black
 - 2-core: black & blue
 - 3-core: black, blue & brown
 - 4-core: black, blue, brown & black (one white stripe)
 - 5-core: black, blue, brown, black (one white stripe) & black (two white stripes)
 - multicore: black with contrasting coloured numbers
- marking:** TKF-(type)-250 V-CS 85-mbzh-TWENKASHIP-SIGNAL HALOGEN FREE



Signal



Flexible & easy to install



Small diameter

no.cores	0.75 sq. mm		1.0 sq. mm	
	approx. overall diameter mm	approx. weight kg/km	approx overall diameter mm	approx. weight kg/km
2x	7.5	80	8.6	100
3x	7.9	80	9.1	110
4x	8.7	100	9.4	120
5x	9.4	120	10.1	140
7x	9.6	110	10.4	140
12x	12.9	190	13.6	230
19x	15.0	270	16.4	330
27x	18.2	380	19.0	440
37x	20.3	490	22.0	620

Technical information:

- Rated voltage: 250 V
- Test voltage: 1500 V AC
- Min. Temp.: -20 °C during installation
-40 °C fixed installed
- Standards: IEC 60092-350/-351/-359,
IEC 60092-376,
IEC 60092-332-1,
IEC 60092-332-3-22AF,
IEC 60228,
IEC 60754-1, IEC 61034-2

For detailed technical specifications see page 20

Twenkaship-O-signal copper wire braided

Cables designed for signal, control and alarm purposes up to 250 V. The halogen-free outer sheath is flame-retardant and has good chemical resistance. The copper wire braiding reduces EMI and gives extra mechanical protection.

Construction:

- conductors:** stranded plain of annealed high-conductive copper (class-2)
- insulation:** cross-linked polyethylene (XLPE), to withstand continuous conductor temp. of 85° C
- cable core:**
 - ≤ 5 cores: filled up with filling material
 - multi cores: with polyester tape
- braiding:** plain copper wires
- outer sheath:** grey halogen-free compound, flame-retardant, SHF1 - rip-cord
- core ID:**
 - 1-core: black
 - 2-core: black & blue
 - 3-core: black, blue & brown
 - 4-core: black, blue, brown & black (one white stripe)
 - 5-core: black, blue, brown, black (one white stripe) & black (two white stripes)
 - multicore: black with contrasting coloured numbers
- marking:** TKF-(type)-250 V-CS 85-mbzh-TWENKASHIP-O-SIGNAL HALOGEN FREE



Signal



Flexible & easy to install



Small diameter



Copper braiding

no.cores	0.75 sq. mm		1.0 sq. mm	
	approx. overall diameter mm	approx. weight kg/km	approx overall diameter mm	approx. weight kg/km
2x	10.2	140	10.9	165
3x	10.5	140	11.2	185
4x	10.6	160	11.5	190
5x	11.3	190	12.7	210
7x	11.8	185	13.3	220
12x	14.9	280	15	325
19x	17.2	380	17.8	455
27x	20.4	510	21.1	570
37x	22.1	645	23.9	790

Technical information:

- Rated voltage: 250 V
- Test voltage: 1500 V AC
- Min. Temp.: -20 °C during installation
-40 °C fixed installed
- Standards: IEC 60092-350/-351/-359,
IEC 60092-376,
IEC 60092-332-1,
IEC 60092-332-3-22AF,
IEC 60228,
IEC 60754-1, IEC 61034-2

For detailed technical specifications see page 20



Power



Copper braiding

Technical information:

Rated voltage: 6/10 kV or 8.7/15 kV

Min. Temp.: -5 °C during installation
-40 °C fixed installed

Standards: IEC 60092-350/-351/-359,
IEC 60228,
IEC 60354, IEC 60376
IEC 60332-1,
IEC 60332-3 -22AF,
IEC 60754-1, IEC 61034-2

For detailed technical specifications
see page 21

Halogen-free power cables

Twenkaship-O 6/10 kV - 8.7/15 kV, one core

Single core medium voltage cables designed for electric power transport between the engine room generator and electrical machines. Higher voltages available on request.

Construction:

- conductor:** circular conductor of stranded plain annealed high-conductive copper (class-2)
- conductor screen:** semi-conductive polymer layer
- insulation:** high quality cross-linked polyethylene (XLPE)
- insulation screen:** semi-conductive polymer layer, covered by conductive swelling tape
- braiding:** tinned copper wires
- outer sheath:** red halogen-free, flame-retardant compound, SHF1
- marking:** TKF-(type)-../.. kV-CS 85-mbzh-TWENKASHIP-O HALOGEN FREE

no.cores x sq. mm	6/10 kV		8.7/15 kV	
	approx. overall diameter mm	approx. weight kg/km	approx. overall diameter mm	approx. weight kg/km
1x16	20	600	22	700
2x25	21	700	23	800
1x35	22	800	24	900
1x50	23	900	26	1000
1x70	25	1100	28	1300
1x95	27	1500	29	1600
1x120	28	1700	31	1900
1x150	30	2000	32	2200
1x185	32	2400	34	2600
1x240	34	3100	37	3300
1x300	37	3700	39	3900
1x400	41	4700	43	4800



Power



Copper braiding

Technical information:

Rated voltage: 6/10 kV or 8.7/15 kV

Min. Temp.: -5 °C during installation
-40 °C fixed installed

Standards: IEC 60092-350/-351/-359,
IEC 60228,
IEC 60354, IEC 60376
IEC 60332-1,
IEC 60332-3 -22AF,
IEC 60754-1, IEC 61034-2

For detailed technical specifications
see page 21

Twenkaship-O 6/10 kV - 8.7/15 kV, three core

Three core medium voltage cables designed for electric power transport between the engine room generator and electrical machines. Higher voltages available on request.

Construction:

- conductors:** circular conductors of stranded plain annealed high-conductive copper (class-2)
- conductor screen:** semi-conductive polymer layer
- insulation:** high quality cross-linked polyethylene (XLPE)
- insulation screen:** semi-conductive polymer layer, covered by conductive swelling tape
- cable core:** 3 cores filled up with filling material, earthing with copper tape each core
- inner sheath:** halogen-free, flame-retardant compound
- braiding:** tinned copper wires
- outer sheath:** red halogen-free, flame-retardant compound, SHF1
- marking:** TKF-(type)-../.. kV-CS 85-mbzh-TWENKASHIP-O HALOGEN FREE

no.cores x sq. mm	6/10 kV		8.7/15 kV	
	approx. overall diameter mm	approx. weight kg/km	approx. overall diameter mm	approx. weight kg/km
3x16	45	2800	50	3300
3x25	47	3200	52	3800
3x35	50	3800	55	4400
3x50	52	4300	58	5000
3x70	57	5300	62	6000
3x95	61	6500	66	7200
3x120	64	7500	70	8200
3x150	68	8700	73	9500
3x185	72	10200	77	11000
3x240	78	12500	83	13400



Special cables

EMC motor cables 0.6/1 kV

Cables designed for applications in environments where Electromagnetic Interference (EMI) is expected, i.e. from frequency-controlled motors. The special double shielding of copper tape combined with copper braiding is highly efficient against influences caused by EMI. EMC motor cables with halogen-free construction are available on request.



no. cores x sq. mm	approx. overall diameter mm	approx. weight kg/km
3x2.5	14	360
3x4	15	410
3x6	17	540
3x10	19	720
3x16	21	1010
3x25	25	1440
3x35	29	1910
3x50	32	2530
3x70	39	3440
3x95	42	4450
3x120	47	5600
3x150	52	6790



Reduced EMI effects



Motor



Copper braiding

Fire resistant cables

Cables designed for applications that require continued operation in case of fire for a certain period of time. The TKF fire resistant cable design safeguards functionality during great heat or fire according to international standards. Different types of fire resistant cables are available for power, signal or communication purposes. In the industry TKF has played and continues to play an active role in developing enhanced fire resistant cables based on changing international standards. Additional information on the actual fire resistant cable delivery program of TKF can be requested from your local supplier.



Technical specifications and standards

Cables on board ships and oilrigs are often exposed to extreme conditions. The construction and materials used by our marine cables are specifically designed for these demanding environments. The characteristics of each cable are the result of the materials used as well as the way these materials are processed. It is why TKF has invested in advanced compound research and testing facilities as well as ultra-modern production systems.

Materials

Insulation

All Twenkaship Marine Cables are insulated with Cross-Linked Polyethylene (XLPE). This material allows a continuous conductor temperature of 85 °C and withstands a temporary overload temperature of 130 °C and a short-circuit temperature of 250 °C. This insulation material also offers good low temperature properties with a brittleness temperature of approximately -70 °C.

The XLPE material has electrical properties equal to that of polyethylene (PE), which results in very low dielectric losses for the power cables and excellent transmission properties for the instrumentation and communication cables.

The XLPE material does not contain any hygroscopic elements like fillers, which results in extremely low moisture absorption. Furthermore the material has a high resistance to most chemicals. The insulation material used by TKF for its Twenkaship Marine Cables meets the requirements as specified in the IEC 60092-351, type XLPE.

When fire-resistant cables are requested according to IEC 60331 the copper conductors of the cables are fully wrapped with mica glass tape before being insulated with XLPE material.

Sheathing

The halogen-free compound used as our sheathing material does not contain halogens or any heavy metals to produce the flame-retardancy. Extensive research has enabled TKF to supply all these materials with excellent characteristics, good mechanical properties, low moisture absorption and high resistance to most chemicals. The materials meet the requirements as specified in the IEC 60811-2-1 for oil resistance (ASTM oil 2, 4 hours, 70 °C) as well as the requirements as specified in IEC 6092-359 under type SHF-1 for mechanical properties. Due to the selected sheath materials, TKF marine cables are very suitable for installation and usage in areas with low temperatures.

International standards

Fire performance

With regards to the fire performance TKF offers cables that meet the following standards:

Halogen free sheathed: IEC 60332-1, IEC 60332-3 Class A, IEC 60754-1 and IEC 61034-2

Fire resistant cables: IEC 60331

NEN IEC 60092-350

Electrical installations in ships – part 350: shipboard power cables – general construction and test requirements.

NEN IEC 60092-351

Electrical installations in ships – part 351: insulation materials for shipboard and mobile and fixed offshore units, power, telecommunication and control data cables.

NEN IEC 60092-353

Electrical installations in ships – part 353: single and multicore non-radial field power cables with extruded solid insulation for rated voltages 1 kV and 3 kV.

IEC 60092-354

Electrical installations in ships – shipboard cables – single and three core power cables with extruded solid insulation for rated voltages 6 kV, 10 kV and 15 kV.

IEC 60092-359

Electrical installations in ships – sheathing materials for shipboard and telecommunication cables.

IEC 60092-375

Electrical installations in ships – shipboard telecommunication cables and radio-frequency cables. General instrumentation, control and communication cables.

IEC 60092-376

Electrical installations in ships – shipboard multicore cables for control circuits.

IEC 60332-1

Tests on electric cables under fire conditions – part 1: test on a single vertical insulated wire or cable.



IEC 60332-3-22

Tests on electric cables under fire conditions – part 3-22: test for vertical flame spread of vertically – mounted bunched wires or cables – category A.

IEC 60754-1

Test on gases evolved during combustion of electric cables – determination of the amount of halogen acid gas.

IEC 61034-1

Measurement of smoke density of cables burning under defined conditions – test apparatus.

IEC 60811

Test methods.

IEC 60228

Conductors of insulated cables.

IEC 60331-11

Tests for electric cables under fire conditions – circuit integrity – apparatus – fire alone at a flame temperature of at least 750 degrees C.

IEC 60331-21

Tests for electric cables under fire conditions – circuit integrity – procedures and requirements – cables of rated voltage up to and incl. 0.6/1.0 kV.

Maximum permissible short-circuit current calculations

The maximum permissible short circuit current for the different cables is based on the formula:

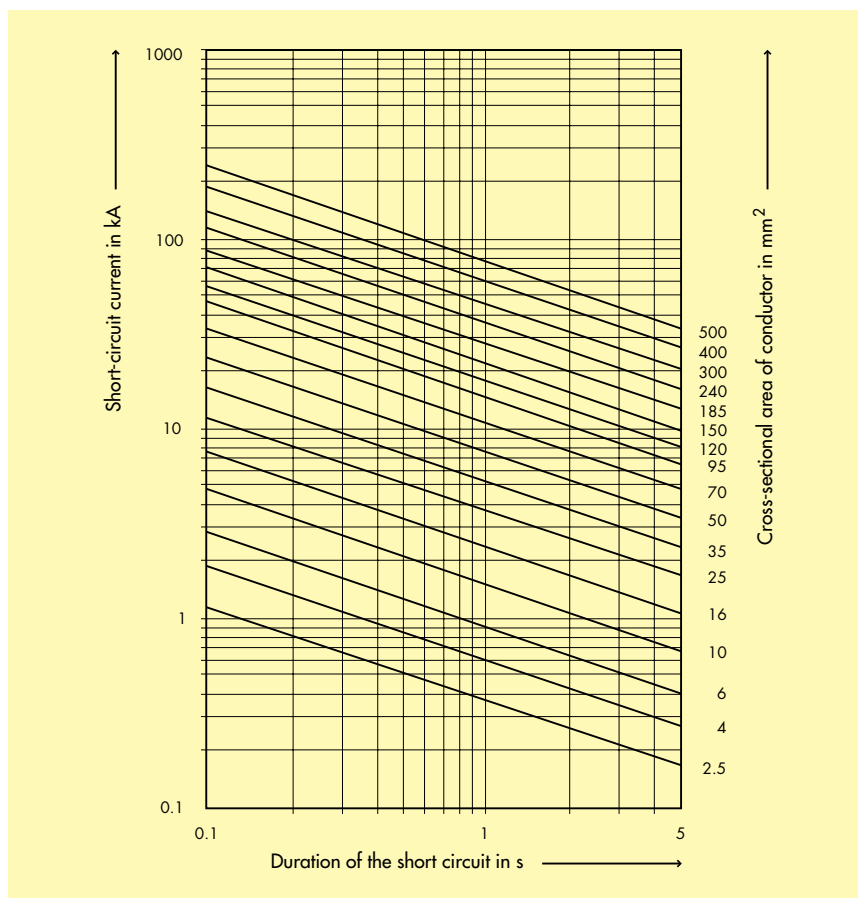
$$I_k = 146 \cdot \frac{S}{\sqrt{t}}$$

I_k = the maximum permissible short-circuit current in Amps

S = the cross-section area of the conductor in mm^2

t = the duration of the short circuit in seconds

The formula is acceptable for an increase in temperature from 85 °C at the start to 250 °C at the end (according to IEC 60093-3). In the figure below the permissible short-circuit current is given in kA as a function of time (from 0.1 to 5 seconds) and as a function of the cross-sectional area of the conductor.



Reactance calculations

The reactance of cables can be calculated with the following formula:

$$2 \cdot \pi \cdot f \cdot L$$

f = frequency in Hz

L = inductance in H

The technical data may be changed without prior notice.



Technical information

Current ratings

Current ratings ¹⁾ in continuous service for single- and multi-core cables (according to IEC 60092-352/Ambient temperature 45 °C)			
Nominal Cross-sectional area (mm ²)	Current rating (A)		
	Number of cores loaded		
1	16	14	11
1.5	20	17	14
2.5	28	24	20
4	38	32	27
6	48	41	34
10	67	57	47
16	90	77	63
25	120	102	84
35	145	123	102
50	180	153	126
70	225	191	158
95	275	234	193
120	320	272	224
150	365	310	256
185	415	353	291
240	490	417	343

1) Current ratings are dictated by installation circumstances, so the reduction factors of IEC 60092-352 should be taken into account.

Air temperature correction factors

Correction factors for various ambient air temperatures									
Maximum conductor Temperature	Correction factors for ambient air temperature of								
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C	75 °C
85 °C	1.12	1.06	1.00	0.94	0.87	0.79	0.71	0.61	0.50

Bending radius

Bending radii (acc. to IEC 60092-352)		
Outer covering	Overall diameter of cable (D)	Minimum internal bending radius
Braided	Any	6D
Non-braided	≤ 25 mm	4D
Non-braided	> 25 mm	6D

Bending radii medium voltage	
15 x (D +d)	
D = overall diameter	
d = conductor diameter	



Halogen-free power cables

Twenkaship non braided power cables 0.6/1 kV

no. cores x sq.mm	mechanical							electrical			
	nominal diameter conductor mm	nominal thickness insulation mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
1x1.5	1.56	0.7	1.0	4.9	40	72	20	12.1	15	0.307	
2x1.5	"	"	1.0	8.9	120	240	36	"	"	"	65
3x1.5	"	"	1.0	8.9	130	240	36	"	"	"	120
4x1.5	"	"	1.1	9.8	150	290	40	"	"	"	125
5x1.5	"	"	1.1	10.8	180	350	44	"	"	"	130
6x1.5	"	"	1.1	11.2	170	375	45	"	"	"	
7x1.5	"	"	1.1	11.2	175	375	45	"	"	"	
8x1.5	"	"	1.2	12.8	230	490	52	"	"	"	
10x1.5	"	"	1.2	15.4	310	710	62	"	"	"	
12x1.5	"	"	1.3	14.5	290	630	58	"	"	"	
16x1.5	"	"	1.3	16.1	380	780	65	"	"	"	
19x1.5	"	"	1.4	17.4	440	910	70	"	"	"	
1x2.5	2	0.7	1.0	5.4	50	88	22	7.41	9.3	0.279	
2x2.5	"	"	1.1	9.8	150	290	40	"	"	"	72
3x2.5	2	"	1.1	10.3	170	320	42	"	"	"	142
4x2.5	"	"	1.1	11.0	200	360	44	"	"	"	156
5x2.5	"	"	1.1	12.0	245	430	48	"	"	"	-
1x4	2.5	0.7	1.0	5.9	60	105	24	4.61	5.8	0.278	-
2x4	"	"	1.1	10.8	200	350	44	"	"	"	82
3x4	"	"	1.1	11.6	230	405	47	"	"	"	162
4x4	"	"	1.2	12.7	290	485	51	"	"	"	173
1x6	3.1	0.7	1.0	6.5	80	130	26	3.08	3.9	0.259	-
2x6	"	"	1.1	12.1	260	440	49	"	"	"	88
3x6	"	"	1.2	12.8	320	490	52	"	"	"	170
4x6	"	"	1.2	14.0	390	590	56	"	"	"	202
1x10	3.75	0.7	1.0	7.5	120	170	30	1.83	2.3	0.244	-
2x10	"	"	1.2	14.5	400	630	58	"	"	"	93
3x10	"	"	1.2	14.7	480	650	59	"	"	"	200
4x10	"	"	1.3	16.7	600	840	67	"	"	"	225
1x16	4.8	0.7	1.0	8.5	180	220	34	1.15	1.4	0.227	-
2x16	"	"	1.3	16.7	570	840	67	"	"	"	99
3x16	"	"	1.3	17.2	700	890	69	"	"	"	214
4x16	"	"	1.4	19.7	880	1160	79	"	"	"	240
1x25	6	0.9	1.1	10.4	280	325	42	0.727	0.91	0.223	-
2x25	"	"	1.4	20.4	900	1250	82	"	"	"	105
3x25	"	"	1.4	21.4	1110	1370	86	"	"	"	230
1x35	7.45	0.9	1.1	11.6	390	400	47	0.524	0.66	0.211	-
2x35	"	"	1.5	23.4	1230	1640	94	"	"	"	111
3x35*	"	"	1.5	21.7	1520	1410	87	"	"	"	140
1x50	8.6	1	1.2	13.3	500	530	54	0.387	0.49	0.212	-
3x50*	"	"	1.7	23.6	1990	1670	95	"	"	"	-
1x70	10.6	1.1	1.3	15.4	720	710	62	0.268	0.34	0.2	180
3x70*	"	"	1.8	27.4	2850	2250	165	"	"	"	-
1x95	12.6	1.1	1.3	17.4	980	910	70	0.193	0.24	0.198	-
3x95*	"	"	1.9	31.0	3870	2880	186	"	"	"	246
1x120	14	1.2	1.4	19.4	1240	1130	78	0.153	0.19	0.192	-
3x120*	"	"	2.1	35.0	4870	3680	210	"	"	"	263
1x150	15.8	1.4	1.5	21.6	1520	1400	87	0.124	0.16	0.193	-
3x150*	"	"	2.2	38.0	6000	4330	228	"	"	"	271
1x185	17.6	1.6	1.5	23.8	1890	1700	96	0.0991	0.124	0.192	-
3x185*	"	"	2.4	43.5	7520	5680	260	"	"	"	278
1x240	20.38	1.7	1.6	26.9	2450	2170	160	0.0754	0.095	0.19	-
3x240*	"	"	2.6	49.0	9770	7200	295	"	"	"	285

* = sector shaped conductor

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Halogen-free power cables

Twenkaship-O copper wire braided power cables 0.6/1 kV

no. cores x sq.mm	mechanical								electrical			
	nominal diameter conductor mm	nominal thickness insulation mm	approx. diameter over braiding mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
1x1.5	1.56	0.7	4.6	1.0	6.6	70	130	40	12.1	15	0.307	-
2x1.5	"	"	7.4	1.1	9.6	166	280	58	"	"	"	139
3x1.5	"	"	7.8	1.1	10.0	170	300	60	"	"	"	161
4x1.5	"	"	8.6	1.1	10.8	200	350	65	"	"	"	172
5x1.5	"	"	9.4	1.2	11.8	230	420	71	"	"	"	176
6x1.5	"	"	10.2	1.2	12.6	227	480	76	"	"	"	-
7x1.5	"	"	10.2	1.2	12.6	235	480	76	"	"	"	-
8x1.5	"	"	12.0	1.3	14.6	330	640	88	"	"	"	-
10x1.5	"	"	13.5	1.3	16.1	430	780	97	"	"	"	-
12x1.5	"	"	13.9	1.4	16.7	410	840	100	"	"	"	-
16x1.5	"	"	15.5	1.4	18.3	505	1005	110	"	"	"	-
19x1.5	"	"	16.3	1.5	19.3	580	1120	115	"	"	"	-
1x2.5	2	0.7	5.0	1.0	7.0	84	150	42	7.41	9.3	0.279	153
2x2.5	"	"	8.2	1.1	10.4	195	325	62	"	"	"	187
3x2.5	"	"	8.7	1.2	11.1	220	370	67	"	"	"	194
4x2.5	"	"	9.5	1.2	11.9	255	425	71	"	"	"	-
5x2.5	"	"	10.4	1.2	12.8	310	490	77	"	"	"	-
1x4	2.5	0.7	5.5	1.0	7.5	94	170	45	4.61	5.8	0.278	-
2x4	"	"	9.2	1.2	11.6	255	400	70	"	"	"	169
3x4	"	"	9.8	1.2	12.2	290	450	73	"	"	"	206
4x4	"	"	10.8	1.2	13.2	350	520	79	"	"	"	222
1x6	3.1	0.7	6.0	1.0	8.0	120	200	48	3.08	3.9	0.259	-
2x6	"	"	10.2	1.2	12.6	320	480	76	"	"	"	183
3x6	"	"	10.9	1.2	13.3	380	530	80	"	"	"	215
4x6	"	"	12.5	1.3	15.1	500	680	91	"	"	"	235
1x10	3.75	0.7	6.8	1.1	9.0	175	240	54	1.83	2.3	0.244	-
2x10	"	"	12.3	1.3	14.9	515	670	89	"	"	"	220
3x10	"	"	13.1	1.3	15.7	590	740	94	"	"	"	237
4x10	"	"	14.4	1.4	17.2	725	890	103	"	"	"	258
1x16	4.8	0.7	7.7	1.1	9.9	245	300	59	1.15	1.4	0.227	-
2x16	"	"	14.1	1.4	16.9	695	860	101	"	"	"	238
3x16	"	"	15.0	1.4	17.8	840	950	107	"	"	"	261
4x16	"	"	16.6	1.5	19.6	1035	1150	118	"	"	"	279
1x25	6	0.9	9.2	1.2	11.6	360	400	70	0.727	0.91	0.223	-
2x25	"	"	17.1	1.5	20.1	1055	1210	121	"	"	"	230
3x25	"	"	18.3	1.5	21.3	1280	1360	128	"	"	"	303
4x25	"	"	20.2	1.6	23.4	1570	1640	140	"	"	"	322
1x35	7.45	0.9	10.3	1.2	12.7	490	480	76	0.524	0.66	0.211	-
2x35	"	"	19.3	1.6	22.5	1420	1520	135	"	"	"	321
3x35*			20.7	1.6	23.9	1690	1720	143	"	"	"	261
4x35*			22.9	1.7	26.3	2070	2080	158	"	"	"	-
1x50	8.6	1	12.3	1.3	14.9	660	670	89	0.387	0.49	0.212	-
3x50*			23.9	1.8	27.5	2180	2270	165	"	"	"	342
4x50*			26.5	1.9	30.3	2680	2750	182	"	"	"	-
1x70	10.6	1.1	13.9	1.4	16.7	910	840	100	0.268	0.34	0.2	-
3x70*			27.4	1.9	31.2	3060	2920	187	"	"	"	397
4x70*			30.4	2.0	34.4	3760	3550	206	"	"	"	-
1x95	12.6	1.1	15.5	1.4	18.3	1200	1005	110	0.193	0.24	0.198	-
3x95*			30.8	2.0	34.8	4115	3630	209	"	"	"	458
4x95*			34.7	2.2	39.1	5060	4580	235	"	"	"	-
1x120	14	1.2	17.1	1.5	20.1	1450	1210	121	0.153	0.19	0.192	-
3x120*			34.8	2.2	39.2	5240	4610	235	"	"	"	476
1x150	15.8	1.4	18.9	1.6	22.1	1850	1460	133	0.124	0.16	0.193	-
3x150*			38.7	2.4	43.5	6420	5670	261	"	"	"	509
1x185	17.6	1.6	20.8	1.6	24.0	2280	1730	144	0.0991	0.124	0.192	-
3x185*			42.8	2.5	47.8	7960	6850	287	"	"	"	-
1x240	20.38	1.7	23.2	1.7	26.6	2900	2125	160	0.0754	0.095	0.19	-
3x240*			48.3	2.7	53.7	10280	8650	322	"	"	"	-

* = sector shaped conductor

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Halogen-free communication cables

Twenkaship-com copper wire braided communication cables 250 V

no. cores x sq.mm	mechanical								electrical			
	nominal diameter conductor mm	nominal thickness insulation mm	approx. diameter over braiding mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
1x2x0.75	1.11	0.7	6.6	1.1	8.8	80	230	53	26.0	33	0.65	55
1x3x0.75	"	"	7.0	1.1	9.2	95	250	55	"	"	"	"
1x4x0.75	"	"	7.5	1.1	9.7	110	280	58	"	"	"	"
4x2x0.75	"	"	11.7	1.2	14.1	200	600	85	"	"	"	"
6x2x0.75	"	"	14.3	1.3	16.9	270	860	100	"	"	"	"
7x2x0.75	"	"	14.4	1.3	17.0	310	870	100	"	"	"	"
10x2x0.75	"	"	17.2	1.3	19.8	400	1180	120	"	"	"	"
14x2x0.75	"	"	20.0	1.4	22.8	525	1560	140	"	"	"	"
19x2x0.75	"	"	22.2	1.5	25.2	675	1900	150	"	"	"	"
24x2x0.75	"	"	25.3	1.5	28.3	805	2400	170	"	"	"	"
30x2x0.75	"	"	28.1	1.6	31.3	960	2940	190	"	"	"	"
37x2x0.75	"	"	31.2	1.7	34.6	1215	3590	210	"	"	"	"

Twenkaship-2-com copper wire braided and pair shielded communication cables 250 V

no. cores x sq.mm	mechanical								electrical			
	nominal diameter conductor mm	nominal thickness insulation mm	approx. diameter over braiding mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
2x2x0.75	1.11	0.4	10.2	1.1	12.4	165	460	75	26.0	33	0.65	80
4x2x0.75	"	"	12.0	1.2	15.0	240	670	90	"	"	"	"
6x2x0.75	"	"	14.7	1.3	18.0	315	970	110	"	"	"	"
7x2x0.75	"	"	14.9	1.3	18.1	375	980	110	"	"	"	"
10x2x0.75	"	"	18.3	1.3	21.0	480	1320	130	"	"	"	"
14x2x0.75	"	"	20.7	1.4	24.2	625	1760	145	"	"	"	"
19x2x0.75	"	"	23.9	1.5	26.8	810	2160	160	"	"	"	"
24x2x0.75	"	"	26.7	1.5	30.0	955	2700	180	"	"	"	"
30x2x0.75	"	"	29.7	1.6	33.2	1145	3300	200	"	"	"	"
37x2x0.75	"	"	33.1	1.7	36.7	1440	4040	220	"	"	"	"

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Halogen-free signal cables

Twenkaship-signal non braided signal and control cables 250 V

mechanical								electrical			
no. cores x sq.mm	nominal diameter conductor mm	nominal thickness insulation mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
2x0.75	1.11	0.7	1.0	7.5	80	168	30	24.5	31	0.331	80
3x0.75	"	"	1.0	7.9	80	187	32	"	"	"	130
4x0.75	"	"	1.1	8.7	100	227	35	"	"	"	135
5x0.75	"	"	1.1	9.4	120	265	38	"	"	"	140
7x0.75	"	"	1.1	9.6	110	276	39	"	"	"	150
12x0.75	"	"	1.3	12.9	190	499	52	"	"	"	150
19x0.75	"	"	1.3	15.0	270	675	60	"	"	"	150
27x0.75	"	"	1.5	18.2	380	994	73	"	"	"	150
37x0.75	"	"	1.5	20.3	490	1235	82	"	"	"	150
2x1.0	1.32	0.7	1.0	8.6	100	222	35	18.1	23	0.332	95
3x1.0	"	"	1.0	9.1	110	248	37	"	"	"	140
4x1.0	"	"	1.1	9.4	120	265	38	"	"	"	145
5x1.0	"	"	1.1	10.1	140	306	41	"	"	"	150
7x1.0	"	"	1.1	10.4	140	325	42	"	"	"	160
12x1.0	"	"	1.3	13.6	230	555	55	"	"	"	160
19x1.0	"	"	1.3	16.4	330	807	66	"	"	"	160
27x1.0	"	"	1.5	19.0	440	1080	76	"	"	"	160
37x1.0	"	"	1.5	22.0	620	1450	88	"	"	"	160

Twenkaship-O-signal copper wire braided signal and control cables 250 V

mechanical									electrical			
no. cores x sq.mm	nominal diameter conductor mm	nominal thickness insulation mm	approx. diameter over braiding mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
2x0.75	1.11	0.7	8	1.1	10.2	140	315	62	24.5	31	0.331	80
3x0.75	"	"	8.3	1.1	10.5	140	330	63	"	"	"	130
4x0.75	"	"	8.4	1.1	10.6	160	340	64	"	"	"	135
5x0.75	"	"	9.1	1.1	11.3	190	380	68	"	"	"	140
7x0.75	"	"	9.4	1.2	11.8	185	420	71	"	"	"	150
12x0.75	"	"	12.3	1.3	14.9	280	670	90	"	"	"	150
19x0.75	"	"	14.4	1.4	17.2	380	890	105	"	"	"	150
27x0.75	"	"	17.4	1.5	20.4	510	1250	125	"	"	"	150
37x0.75	"	"	18.9	1.6	22.1	645	1465	135	"	"	"	150
2x1.0	1.32	0.7	8.7	1.1	10.9	165	360	65	18.1	23	0.332	95
3x1.0	"	"	9	1.1	11.2	185	370	67	"	"	"	140
4x1.0	"	"	9.3	1.1	11.5	190	400	69	"	"	"	145
5x1.0	"	"	10.5	1.1	12.7	210	480	76	"	"	"	150
7x1.0	"	"	10.9	1.2	13.3	220	530	80	"	"	"	160
12x1.0	"	"	12.4	1.3	15.0	325	675	90	"	"	"	160
19x1.0	"	"	15	1.4	17.8	455	950	107	"	"	"	160
27x1.0	"	"	18.1	1.5	21.1	570	1340	125	"	"	"	160
37x1.0	"	"	20.7	1.6	23.9	790	1710	145	"	"	"	160

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Halogen-free power cables

Twenkaship-O one core copper wire braided power cables 6/10 – 8.7/15 kV

6/10 kV	mechanical								electrical				
no. cores x sq.mm	nominal diameter conductor mm	approx. diameter over insulation mm	approx. diameter over braiding mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force kN	conductor bending radius m	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)	
1x16	5.0	13.4	17.0	1.5	20	600	0.8	0.38	1.15	1.4	0.42	0.18	
1x25	6.0	14.4	18.0	1.5	21	700	1.3	0.41	0.727	0.91	0.40	0.20	
1x35	7.1	15.5	19.1	1.6	22	800	1.8	0.44	0.524	0.66	0.37	0.23	
1x50	8.2	16.6	20.2	1.6	23	900	2.5	0.47	0.387	0.49	0.35	0.25	
1x70	9.9	18.3	21.9	1.7	25	1100	3.5	0.52	0.268	0.34	0.33	0.28	
1x95	11.5	19.9	23.5	1.7	27	1500	4.8	0.58	0.193	0.24	0.32	0.32	
1x120	13.0	21.4	25.0	1.8	28	1700	6.0	0.62	0.153	0.19	0.30	0.35	
1x150	14.5	22.9	26.5	1.9	30	2000	7.5	0.67	0.124	0.16	0.30	0.38	
1x185	16.1	24.5	28.1	1.9	32	2400	9.3	0.72	0.0991	0.124	0.29	0.41	
1x240	18.6	27.0	30.6	2.0	34	3100	12.0	0.79	0.0754	0.095	0.27	0.46	
1x300	20.6	29.0	33.0	2.1	37	3700	15.0	0.86	0.0601	0.075	0.27	0.50	
1x400	24.0	32.5	36.4	2.2	41	4700	20.0	0.98	0.0470	0.059	0.26	0.57	
8.7/15 kV													
1x16	5.0	15.6	19.2	1.6	22	700	0.8	0.41	1.15	1.4	0.44	0.15	
1x25	6.0	16.6	20.2	1.6	23	800	1.3	0.44	0.727	0.91	0.41	0.17	
1x35	7.1	17.7	21.3	1.6	24	900	1.8	0.47	0.524	0.66	0.39	0.19	
1x50	8.2	18.8	22.4	1.7	26	1000	2.5	0.51	0.387	0.49	0.38	0.20	
1x70	9.9	20.5	24.1	1.8	28	1300	3.5	0.57	0.268	0.34	0.36	0.23	
1x95	11.5	22.1	25.7	1.8	29	1600	4.8	0.61	0.193	0.24	0.33	0.26	
1x120	13.0	23.6	27.2	1.9	31	1900	6.0	0.66	0.153	0.19	0.32	0.28	
1x150	14.5	25.1	28.7	1.9	32	2200	7.5	0.70	0.124	0.16	0.31	0.30	
1x185	16.1	26.7	30.3	2.0	34	2600	9.3	0.75	0.0991	0.124	0.30	0.33	
1x240	18.6	29.2	33.2	2.1	37	3300	12.0	0.83	0.0754	0.095	0.29	0.36	
1x300	20.6	31.2	35.2	2.2	39	3900	15.0	0.89	0.0601	0.075	0.28	0.40	
1x400	24.0	34.6	38.6	2.3	43	4800	20.0	1.01	0.0470	0.059	0.27	0.45	

Twenkaship-O three core copper wire braided power cables 6/10 – 8.7/15 kV

6/10 kV	mechanical									electrical				
no. cores x sq.mm	nominal diameter conductor mm	nominal thickness insulation mm	diameter over copper tape mm	approx. diameter over braiding mm	nominal thicknes outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force kN	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)	
3x16	5.0	13.4	15.9	41.4	1.6	45	2800	2.4	0.50	1.15	1.4	0.38	0.18	
3x25	6.0	14.4	16.9	43.7	1.7	47	3200	3.8	0.53	0.727	0.91	0.35	0.20	
3x35	7.1	15.5	18.0	46.3	1.8	50	3800	5.3	0.57	0.524	0.66	0.33	0.22	
3x50	8.2	16.6	19.1	48.8	1.8	52	4300	7.5	0.60	0.387	0.49	0.32	0.24	
3x70	9.9	18.3	20.8	52.8	1.9	57	5300	10.5	0.67	0.268	0.34	0.30	0.28	
3x95	11.5	19.9	22.4	56.5	2.0	61	6500	14.3	0.73	0.193	0.24	0.28	0.31	
3x120	13.0	21.4	23.9	60	2.1	64	7500	18.0	0.77	0.153	0.19	0.27	0.34	
3x150	14.5	22.9	25.4	63.5	2.2	68	8700	22.5	0.83	0.124	0.16	0.26	0.37	
3x185	16.1	24.5	27.0	67.3	2.3	72	10200	27.8	0.88	0.0991	0.124	0.26	0.40	
3x240	18.6	27.0	29.5	73.1	2.4	78	12500	36.0	0.97	0.0754	0.095	0.25	0.45	
8.7/15 kV														
3x16	5.0	15.6	18.1	46.5	1.8	50	3300	2.4	0.55	1.15	1.4	0.40	0.15	
3x25	6.0	16.6	19.1	48.8	1.8	52	3800	3.8	0.58	0.727	0.91	0.38	0.17	
3x35	7.1	17.7	20.2	51.4	1.9	55	4400	5.3	0.62	0.524	0.66	0.36	0.18	
3x50	8.2	18.8	21.3	54.0	1.9	58	5000	7.5	0.66	0.387	0.49	0.34	0.20	
3x70	9.9	20.5	23.0	57.9	2.0	62	6000	10.5	0.72	0.268	0.34	0.32	0.23	
3x95	11.5	22.1	24.6	61.7	2.1	66	7200	14.3	0.78	0.193	0.24	0.30	0.25	
3x120	13.0	23.6	26.1	65.2	2.2	70	8200	18.0	0.83	0.153	0.19	0.29	0.27	
3x150	14.5	25.1	27.6	68.7	2.3	73	9500	22.5	0.88	0.124	0.16	0.28	0.30	
3x185	16.1	26.7	29.2	72.4	2.4	77	11000	27.8	0.93	0.0991	0.124	0.27	0.32	
3x240	18.6	29.2	31.7	78.2	2.6	83	13400	36.0	1.02	0.0754	0.095	0.26	0.36	

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Special cables

EMC Motor cables 0.6/1 kV

no. cores x sq.mm.	mechanical								electrical			
	nominal diameter conductor mm	nominal thickness insulation mm	approx. diameter over braiding mm	nominal thickness outer sheath mm	approx. overall diameter mm	approx. weight kg/km	max. pulling force N	bending radius mm	conductor resistance at 20 °C Rdc(km)	conductor resistance at 85 °C Rdc(km)	approx. inductance L (mH/km)	approx. capacitance C (nF/km)
3x2.5	2	0.7	10.6	1.8	14	360	590	84	7.41	9.3	0.26	158
3x4	2.5	0.7	11.4	1.8	15	410	670	90	4.61	5.8	0.24	183
3x6	3.1	0.7	13.2	1.8	17	540	870	102	3.08	3.9	0.23	198
3x10	3.75	0.7	15.4	1.8	19	720	1080	114	1.83	2.3	0.22	215
3x16	4.8	0.7	17.2	1.8	21	1010	1320	126	1.15	1.4	0.21	247
3x25	6	0.9	21.2	1.8	25	1440	1870	150	0.727	0.91	0.21	253
3x35	7.45	0.9	24.9	1.8	29	1910	2520	174	0.524	0.66	0.20	275
3x50	8.6	1.0	28.2	1.8	32	2530	3070	192	0.387	0.49	0.20	280
3x70	10.6	1.1	34.5	2.0	39	3440	4560	234	0.268	0.34	0.20	301
3x95	12.6	1.1	37.7	2.1	42	4450	5290	252	0.193	0.24	0.19	326
3x120	14	1.2	42.5	2.2	47	5600	6630	282	0.153	0.19	0.19	329
3x150	15.8	1.4	47.0	2.4	52	6790	8110	312	0.124	0.16	0.19	326

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