Feichun
Flexible Cables

for Mining and Industrial Applications

Cable







FEICHUN SPECIAL CABLES

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Introduction

FeiChun Cables specializes in the manufacturing of high-qualityminin g power cable,mining trailing cable, and a comprehensive range of mi ning cables includingreeling cablesandmine power cables.
Our products meet the highest industry standards such asAS/NZS 180 2:2003,AS/NZS 2802:2000,VDE,ICEA&MSHA.
We offer a wide variety of cable types includingType 241, TypeNTS WOEU,NTMTWOEU,NSHTOEU,NSSHCGEOEU,(N)SSHOEU,NS SHOEU-O/J,NSSHOEU,NTSCGERLWOEU,NTSKCGERLOEU,NT SCGECWOEU,(N)TSCGECWOEU,(N)TSCGEWOEU,NSGAFOEU, NSHXAFOE,N3GHSSYCY,(N)SHOEU, and 2YSLGCGOEU.

Additionally, we provide reeling fiber optic cables,Type 209,Type 210, Type 240,Type 245,Type 260,Type 275,Type 409,Type 412,Type 440, Type 441,Type 450,Type 455,Type W,Type G,Type G-GC,Type SHD, Type SHD-PCG,Type SHD-GC, andType MP-GC.

Our cables ensure reliable performance for medium voltage fixed insta llations and other demanding mining applications.

When it comes to the demanding environment of the mining industry, selecting the right cable is crucial. Feichun Cable offers Australian sta ndard mining cables known for their superior quality and performance, providing reliable solutions for global mining customers.

Our cables not only meet international and Australian standards but also excel in various challenging environments.

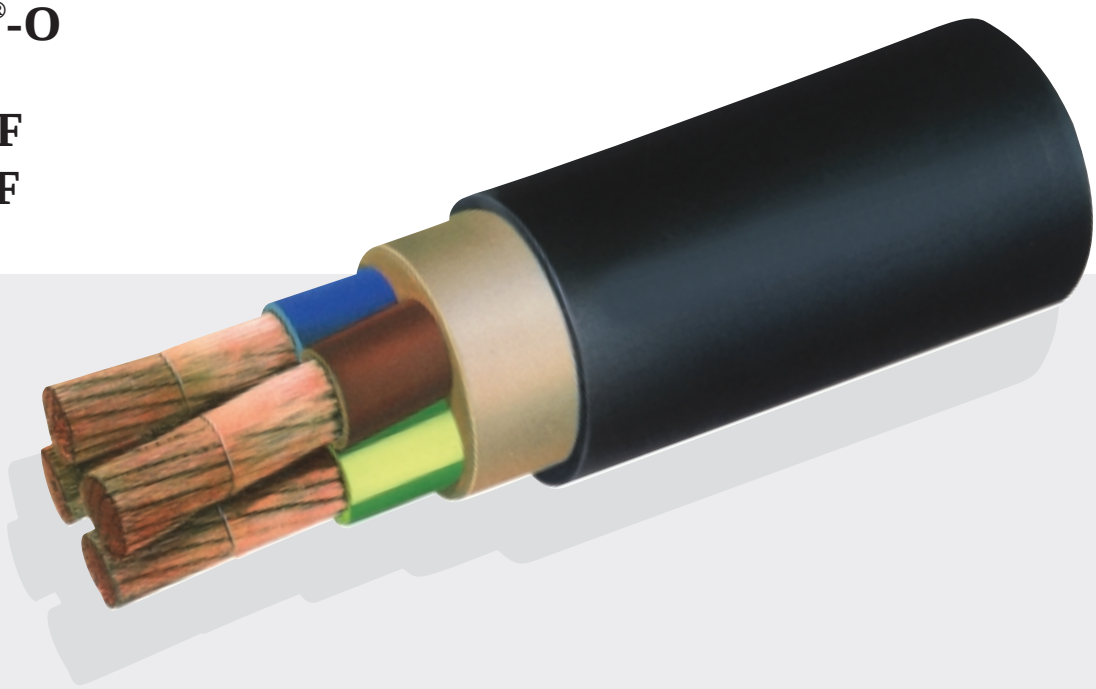
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* optical fibres

Rubber-insulated Flexible Cable in Harmonised Design TENAX®-O

H07RN-F
A07RN-F



H07RN-F, A07RN-F
acc. to DIN VDE 0282, Part 4

Construction:

Fine stranded conductor (up to 10mm^2 of tinned copper wires), insulation of El 4 rubber compound up to 5 cores coloured, thereafter black with numbers - cables manufactured by us have insulations made of an ozone and sunlight-resistant ethylene propylene rubber compound (TENAX-O); additional protection for the cores at the connection ends is therefore unnecessary-, twisted cores, inner sheath of EM 1 rubber compound (only for conductor cross-sections greater than 10 mm^2 or with more than 5 cores), outer sheath of chlorinated rubber compound EM 2, black, oil-resistant and flame retardant.

Application:

For the connection of heating units, industrial tools, mobile equipment and machines, e.g. vulcanisation plates, hand-operated equipment, transportable motors etc., under normal mechanical loads in dry and damp areas, outdoors and in explosion hazard areas, as well as in industrial and agricultural applications and on building sites.

The cables can be installed in fixed positions e.g. in provisional constructions, at building sites or in conveyor systems and machines.



Technical Data:

Rated voltage U0 / U 450 V / 750 V

Also authorized for 1000 V when laid protected in pipes or equipment and when used as a rotor supply cable for engines

Permissible temperature on cable surface

static	-40°C / +60°C
flexing	-25°C / +60°C

Smallest permissible bending radius fixed installation

up to	12 mm diameter	3 D*
above	12 mm diameter	4 D*

mobile application

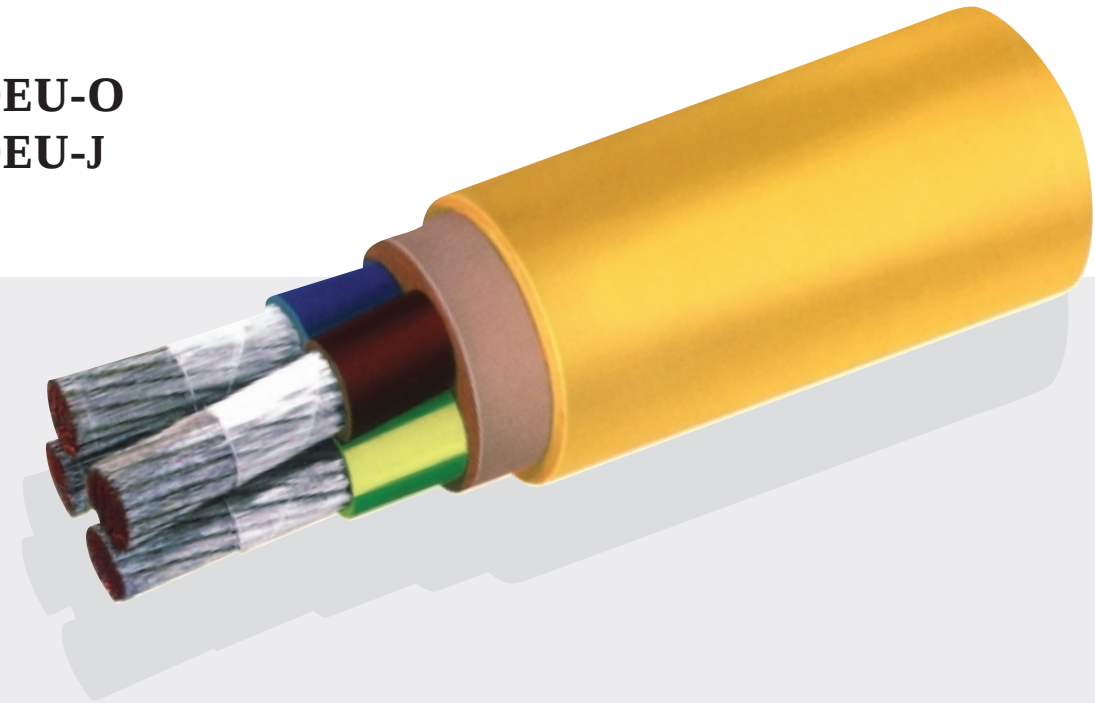
up to	12 mm diameter	4 D*
12 up to	20 mm diameter	5 D*
above	12 mm diameter	6 D*

*D = cable diameter

Code	No. of cores Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance appr. Ω/km
H07RN-F	1 x 1.5	6.5	60	-
	1 x 2.5	7	75	-
	1 x 4	8	100	-
	1 x 6	9	130	-
	1 x 10	10.5	200	-
	1 x 16	12.5	290	-
	1 x 25	14.5	410	-
	1 x 35	16	540	-
	1 x 50	18.5	730	-
	1 x 70	21	970	-
	1 x 95	24	1260	-
	1 x 120	26	1560	-
	1 x 150	29	1910	-
	1 x 185	32	2300	-
	1 x 240	35	2930	-
	1 x 300	38	3630	-
	2 x 1.5	9.5	140	0.105
	3 x 1.5	10	170	0.105
	3 x 2.5	12	230	0.101
	4 x 1.5	12	210	0.105
	4 x 2.5	13	290	0.101
	4 x 4	15	400	0.097
	4 x 6	17	550	0.091
	4 x 10	23	930	0.089
	4 x 16	28	1350	0.083
	4 x 25	33	1960	0.081
	4 x 35	37	2540	0.078
	4 x 50	42	3490	0.077
	4 x 70	48	4700	0.075
	4 x 95	55	6080	0.074
	4 x 120	60	7330	0.073
	4 x 150	66	9000	0.072
	5 x 1.5	13	260	0.105
	5 x 2.5	15	360	0.101
	5 x 4	17	500	0.097
	5 x 6	19	660	0.091
	5 x 10	25	1130	0.089
	5 x 16	31	1680	0.083
	5 x 25	37	2420	0.081
	7 x 1.5	17	410	0.105
	7 x 2.5	19	560	0.101
	8 x 2.5	21	650	0.101
	12 x 2.5	24	820	0.101

Heavy duty
Rubber-insulated Flexible Cable

NSSHOEU-O
NSSHOEU-J



NSSHOEU
acc. to DIN VDE 0250, Part 812

Construction:

Single-core design:
Fine stranded tinned copper conductor (class 5 according to VDE 0295) insulation of heat resisting 3GI3 rubber compound on EPR basis, outer sheath of chlorinated rubber compound 5GM5, yellow, abrasion proof, tear-resistant, oil-resistant and flame retardant.

Multi-core design:

Fine stranded tinned copper conductor (class 5 according to VDE 0295) insulating covering of heat resisting 3GI3 rubber compound on EPR basis, up to 5 cores coloured, thereafter black with number imprint,

stranded cores,

inner sheath of GM1 b rubber compound,

outer sheath of chlorinated rubber compound 5GM5 , yellow, abrasion proof,

Application:

For the connection of mobile equipment and machines under very high mechanical loads in dry and damp areas, outdoors and in explosion hazard areas, particularly in mining and industry, quarries and building sites.

The single-core design is also suitable as a robust connection cable for welding equipment.

NSSHOEU cables can be laid in fixed positions e.g. in provisional constructions or at building sites as well as in conveyor systems and machines.

Reeling systems with guided cables generally require special cable designs with additional features differing from the NSSHOEU Standard.

Technical Data:

Rated voltage U_0 / U	0.6 / 1 kV
Permissible temperature on cable surface	
static	-40 °C / +80°C
flexing	-25 °C / +80°C
Smallest permissible bending radius	
fixed installation	4 D*
mobile application	5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km
NSSHOEU-O	1 x 16	11 - 13.5	260	-
	1 x 25	13 - 16	390	-
	1 x 35	14 - 17	500	-
	1 x 50	16 - 19	680	-
	1 x 70	18 - 21	900	-
	1 x 95	20 - 24	1150	-
	1 x 120	23 - 27	1440	-
	1 x 150	24 - 28	1750	-
	2 x 1.5	11 - 14	210	0.105
	3 x 2.5	13 - 16	300	0.101
NSSHOEU-J	3 x 1.5	12 - 15	240	0.105
	6 x 2.5	13 - 16	300	0.101
	4 x 1.5	13 - 16	280	0.105
	4 x 2.5	15 - 18	400	0.101
	4 x 4	17 - 20	510	0.097
	4 x 6	18 - 21	630	0.091
	4 x 10	22 - 26	950	0.089
	4 x 16	28 - 32	1430	0.083
	4 x 25	33 - 37	2100	0.081
	4 x 35	36 - 40	2650	0.078
	4 x 50	42 - 47	3660	0.077
	3 x 70 / 35	46 - 51	4450	0.075
	3 x 95 / 50	54 - 59	5870	0.074
	3 x 120 / 70	59 - 64	7340	0.073
	5 x 1.5	13 - 16	320	0.105
	5 x 2.5	16 - 19	470	0.101
	5 x 4	18 - 21	600	0.097
	5 x 6	20 - 24	780	0.091
	5 x 10	24 - 28	1130	0.089
	5 x 16	39 - 34	1720	0.083
	5 x 25	35 - 39	2470	0.082
	7 x 1.5	16 - 19	470	0.105
	7 x 2.5	18 - 21	600	0.101
	10 x 1.5	19 - 22	570	0.105
	10 x 2.5	21 - 25	790	0.101
	12 x 2.5	22 - 26	860	0.101
	18 x 2.5	28 - 32	1240	0.101

Special single-core rubber-insulated cables NSGAFOEU, NSGAFCMOEU

Special halogen-free single-core rubber-insulated cables NSHXAFOE, NSHXAFCMOE



NSGAFOEU, NSGAFCMOEU acc. to DIN VDE 0250, Part 602 NSHXAFOE, NSHXAFCMOE acc. to Draft DIN VDE 0250, Part 606

Construction:

Fine stranded tinned Cu conductor (class 5 of DIN VDE 0295), 6 kV version usually with inner semi-conducting layer, insulation of EPR-compound 3GI3, NSGAFOEU sheath of chlorinated rubber 5GM3, oil-resistant and flame retardant, sheath of NSHXAFOE consisting of a halogen-free polymer compound HM3, oil-resistant, flame retardant, low smoke. Screen of-CMOE as spiral of tinned Cu-wires.

Application:

For fixed installation in track-bound vehicles and buses, in pipes and closed installation ducts, as well as for the connection of mobile parts. 3 kV-rated cables can be used in low-voltage switch boards to ensure inherently short-circuit and earth-fault proof connections.

The Types NSGAFCMOEU and NSHXAFCMOE are designed for higher mechanical stress, for instance as a connection link for heating circuits of track-bound vehicles and buses.

Technical Data:

Rated voltage U0 / U	1.8 / 3 kV
	3.6 / 6 kV
Permissible temperature on cable surface	
static	-40°C / +80°C
flexing	-25°C / +80°C
Smallest permissible static bending radius	
NSGAFOEU, NSGAFCMOEU	4D*
NSHXAFOE, NSHXAFCMOE	6D*

*D = cable diameter

Code	Nominal/ cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Continuous current-rating A*	Fire load rating for NSHXAFOE/NSHXAFCMOE kWh/m
NSGAFOEU	1.5	6	60	30	0.20
1.8/3 kV	2.5	6.5	70	41	0.22
	4	7	80	55	0.25
NSHXAFOE	6	7.5	100	70	0.28
1.8/3 kV	10	9	160	98	0.37
	16	10.5	220	132	0.43
	25	13	300	176	0.64
	35	14.5	410	218	0.73
	50	16	560	276	0.83
	70	18	770	347	0.94
	95	20.5	1050	416	1.26
	120	22.5	1290	488	1.38
	150	25	1590	566	1.61
	185	27	1910	644	1.88
	240	30	2530	775	2.24
	300	33	3090	898	2.62
NSGAFOEU	1.5	10.5	135	32	0.45
3.6/6 kV	2.5	11	150	43	0.49
	4	11.5	170	56	0.54
NSHXAFOE	6	12	200	71	0.59
3.6/6 kV	10	13	250	99	0.66
	16	15	350	133	0.81
	25	17	480	174	1.03
	35	18.5	600	215	1.15
	50	20	760	270	1.30
	70	22	960	338	1.45
	95	24	1240	403	1.79
	120	26.5	1530	473	2.06
	150	28	1790	546	2.24
	185	30	2130	622	2.42
NSGAFCMOEU	185	38.5	3060	622	4.58
NSHXAFCMOE					
3.6/6 kV					

* at 30°C ambient temperature free in air as in DIN VDE 0298 Part 4, Table 11

Welding Cables
Standard Design and TENAX®-SL

H01N2-D
H01N2-E



H01N2-D
H01N2-E
acc. to DIN VDE 0282, Part 6

Construction:

Very fine stranded conductor of bare copper, with laid-up tape, sheath of EM5 black chlorinated oil-resistant, flame retardant rubber compound. The highly flexible TENAX-SL cable has a sheath of coloured CSP compound.

Application:

As flexible power supply cable from welding equipment to welding electrode under high mechanical loads in dry and damp areas and outdoors. The cable can be used for welding equipment in industry, e.g. automotive industry and shipbuilding, machine tool manufacture, and for manual electrodes, e.g. in workshops or on building sites.

The TENAX-SL model is specially designed for highly flexible connection. A further characteristic of this model is its coloured, particularly abrasion-resistant and heat-resistant sheath, which increases the cable's current-carrying capacity.

Technical Data:

Permissible temperature on cable surface	
static	-40°C / +85°C
flexing	-25°C / +85°C
The permissible upper temperature for the TENAX-SL design is	90 °C
Smallest permissible bending radius	
static	4 D*
flexing	5 D*

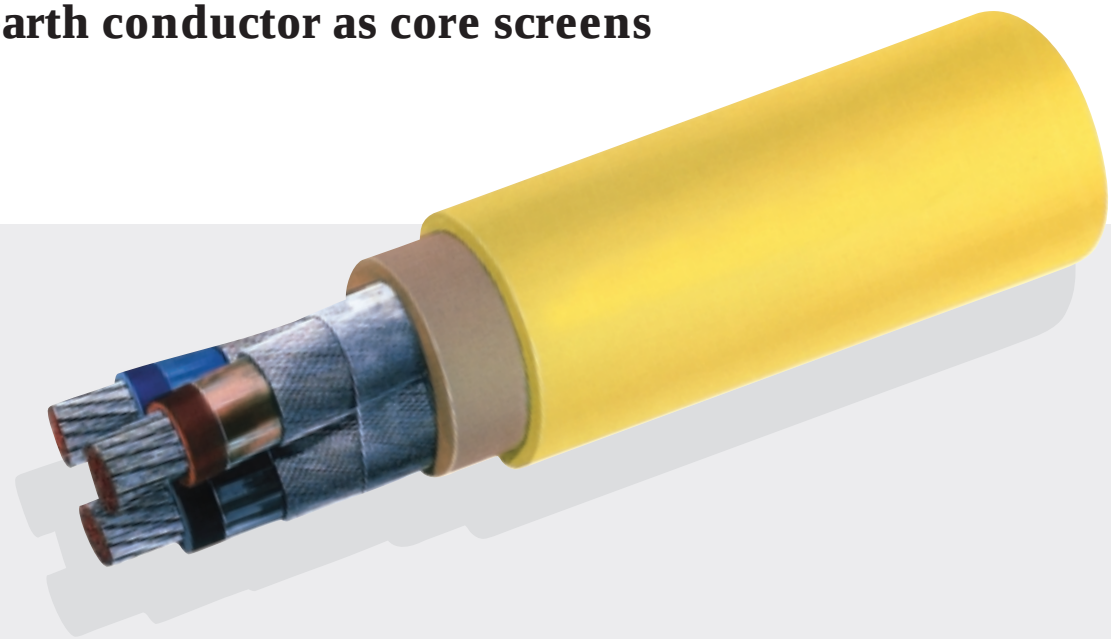
*D = cable diameter

Code	Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Current rating at 30°C ambient. Amp.						
				Contin. operat.	Periodic operation					
					10 min cycle time			5 min cycle time		
				100%*	85%*	60%*	35%*	85%*	60%*	35%*
HO1N2-D	16	10	220	130	131	133	144	132	142	166
	25	11	300	173	175	182	204	179	196	234
	35	12	410	216	220	233	268	226	250	304
	50	14	560	274	281	303	356	287	323	398
	70	16	770	341	352	387	463	360	409	510
	95	18	1050	413	430	478	582	438	502	632
	120	20	1290	480	503	564	692	511	588	745
	150	22	1590	557	586	661	819	594	687	875
	185	24	1910	638	674	765	955	683	793	1012
HO1N2-E TENAX-SL	16	8.5	190	130	131	133	144	132	142	166
	25	9.5	270	173	175	182	204	179	196	234
	35	11	370	216	220	233	268	226	250	304
	50	13	530	274	281	303	356	287	323	398
	70	14.5	720	341	352	387	463	360	409	510
	95	17	1010	413	430	478	582	438	502	632

* Operation factor acc. to DIN VDE 0298, Part 4, Table 12

Heavy duty Rubber-insulated Flexible Cable

NSSHOEU
with earth conductor as core screens



NSSHOEU
acc. to DIN VDE 0250, Part 812

Construction:

Fine stranded conductor of tin-coated copper wires,

insulation of heat resisting 3GI3 rubber compound on EPR basis, coloured,

earth conductor distributed as spiral of tinned copper wires over core insulating coverings, cores laid up, control cores can be laid in the interstices, film wrap,

inner sheath of GM1 b, rubber compound, outer sheath of chlorinated rubber compound 5GM5, yellow, abrasion-proof, tear-resistant, oil-resistant and flame retardant.

In the case of small conductor cross-sections and over 3 cores, the earth conductor is located concentrically between the inner and outer sheaths. This position is indicated by the word "KON" behind the earth conductor cross-section.

Application:

For the connection of mobile equipment and machines under very high mechanical loads in dry and damp areas, outdoors and in explosion hazard areas, particularly in mining, and at quarries and building sites.

NSSHOEU cables can be used for fixed connections e.g. in provisional constructions or at building sites as well as in conveyor systems and machines.

Systems with guided cables generally require special cable designs with additional features differing from the NSSHOEU Standard.

Technical Data:

Rated voltage U_0 / U	0.6 / 1 kV
Permissible temperature at cable surface	
static	-40°C / +80°C
flexing	-25°C / +80°C
Smallest permissible bending radius	
fixed installation	4 D*
mobile application	5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor Earth appr. µF/km
NSSHOEU	3 x 2.5 + 3 x 2.5 / 3E	15 - 18	410	0.112	0.20
	3 x 6 + 3 x 6 / 3E	18 - 21	660	0.100	0.26
	3 x 10 + 3 x 10 / 3E	22 - 26	950	0.096	0.29
	3 x 16 + 3 x 16 / 3E	28 - 32	1350	0.088	0.38
	3 x 70 + 3 x 35 / 3E	44 - 49	4360	0.078	0.60
	3 x 95 + 3 x 50 / 3E	52 - 57	5740	0.078	0.62
	3 x 120 + 3 x 70 / 3E	56 - 61	6870	0.077	0.71
	3 x 150 + 3 x 70 / 3E	62 - 68	8140	0.076	0.72
	3 x 6 + 3 x 6 / 3E + 3 x 1.5	20 - 24	810	0.106	0.23
	3 x 10 + 3 x 10 / 3E + 3 x 2.5	24 - 28	1150	0.101	0.26
	3 x 16 + 3 x 16 / 3E + 3 x 2.5	28 - 32	1470	0.088	0.38
	3 x 25 + 3 x 16 / 3E + 3 x 2.5	30 - 34	1960	0.086	0.41
	3 x 35 + 3 x 16 / 3E + 3 x 2.5	34 - 38	2590	0.082	0.46
	3 x 50 + 3 x 25 / 3E + 3 x 2.5	41 - 46	3560	0.081	0.51
	3 x 70 + 3 x 35 / 3E + 3 x 2.5	44 - 49	4470	0.078	0.60
	3 x 95 + 3 x 50 / 3E + 3 x 2.5	52 - 57	5850	0.078	0.62
NSSHOEU	3 x 2.5 / 2.5 KON	14 - 17	380	0.101	-
	5 x 2.5 / 2.5 KON	18 - 21	560	0.101	-
	5 x 4 / 4 KON	20 - 24	710	0.097	-
	5 x 6 / 6 KON	20 - 24	910	0.091	-

Shielded High-Voltage Cable with Rubber-Insulation and PVC Sheath

N3GHSSYCY



N3GHSSYCY
acc. to DIN VDE 0250, Part 605

Construction:

Fine stranded conductor of copper wires, inner conductive covering, insulation of 3GI3 EPR compound, field-limiting conductive layer.

In the 3.6/6-kV cables, the conductive layers on the conductors and over the insulation are made of conductive tapes, while in the 6/10-kV cables they are made of extruded rubber layers applied in triple extrusion. Earth conductor distributed as spiral of copper wires over the outer semi-conductive layer of the cores. Pilot cores with fine stranded copper conductors and numbered EPR insulation, plastic filler, PVC inner sheath a conductive non-metallic layer acting as a monitoring shield and braid of copper wires, PVC intermediate sheath, braid of galvanized steel wires, red PVC outer jacket (YM5). The cables are usually supplied in matched lengths of 100 m. Both cable ends are equipped with cast-resin terminations which are adapted to the two-part entry fittings in the high-voltage connection box.

Application:

For the connection of mobile operating equipment, in mines and underground excavations with hazardous environments, in stationary operation, e.g. high-voltage transformers in mining and tunnelling, which are shifted forward in stages as excavation work progresses, in particular in 10 kV networks and - due to the low capacitance of the cables - in expanded 5 kV networks. The mobility of the cable means it can be laid in containers and can be unwound from these as working operations progress. The phase-concentric earth conductor and the common concentric monitoring shield, in conjunction with a high-voltage protection circuit, make it possible to monitor the cable for insulation faults and damage resulting from external influences.

Technical Data:

Rated voltage U_0/U	3.6/6 kV 6/10kV
Permissible temperature on cable surface	
static	-40°C/+80°C
flexing	+5°C/+80°C
Smallest permissible bending radius	
fixed installation and during operation-related transportation and installation	5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor Earth appr. µF/km
N3GHSSYCY 3.6/6 kV	3 x 25 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	53	4290	0.109	0.29
	3 x 35 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	56	4900	0.104	0.33
	3 x 50 + 3 x 25 / 3E + 3 x 2.5 ST + ÜL	59	5680	0.099	0.38
	3 x 70 + 3 x 35 / 3E + 3 x 2.5 ST + ÜL	63	6760	0.095	0.44
	3 x 95 + 3 x 50 / 3E + 3 x 2.5 ST + ÜL	67	8040	0.091	0.49
N3GHSSYCY 6/10 kV	3 x 25 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	60	5360	0.122	0.31
	3 x 35 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	63	5970	0.116	0.34
	3 x 50 + 3 x 25 / 3E + 3 x 2.5 ST + ÜL	67	6850	0.110	0.38
	3 x 70 + 3 x 35 / 3E + 3 x 2.5 ST + ÜL	71	7950	0.104	0.43
	3 x 95 + 3 x 50 / 3E + 3 x 2.5 ST + ÜL	75	9280	0.101	0.48

Face Lighting Cable
Face Cable TENAX®-Streb

NSSHCGEOEU



NSSHCGEOEU
acc. to DIN VDE 0250, Part 812

Construction:

Fine stranded conductor of tinned copper wires, insulation of heat-resistant 3GI3 rubber compound on EPR basis, coloured, wrapped with rubberized textile tape, layer of conductive rubber compound.

Monitoring conductor as flexible copper-steel conductor, covering of conductive rubber compound.
Cores laid up, with three monitoring conductors laid in the outer interstices. Film wrapping,

inner sheath of GM1 b rubber compound, concentric earth conductor as spiral of copper-steel strands.

Outer sheath of chlorinated rubber compound 5GM5, yeilow, abrasion and tear-resistant, oil-resistant and flame retardant.

Where there is little danger of damage from impact or pinching, the earth conductor is also designed as a spiral of tin-coated copper wires. This design features two control cores and one monitoring conductor of tinned copper strands.

Application:

For the connection of lighting equipment and stationary drives under high mechanical loads, predominantly in mining situations.

The phase-concentric monitoring conductor and the common-concentric earth conductor make it possible to monitor the cable for insulation faults and damage resulting from external influences. These cables may therefore be used in mines without requiring additional mechanical protection.

Technical Data:

Rated voltage U_0 / U	0.6 / 1 kV
Perrmissible temperature on cable surface	
static	-40°C / +80°C
flexing	-25°C / +80°C
Smallest permissible bending radius	
static	4 D*
flexing	5 D*

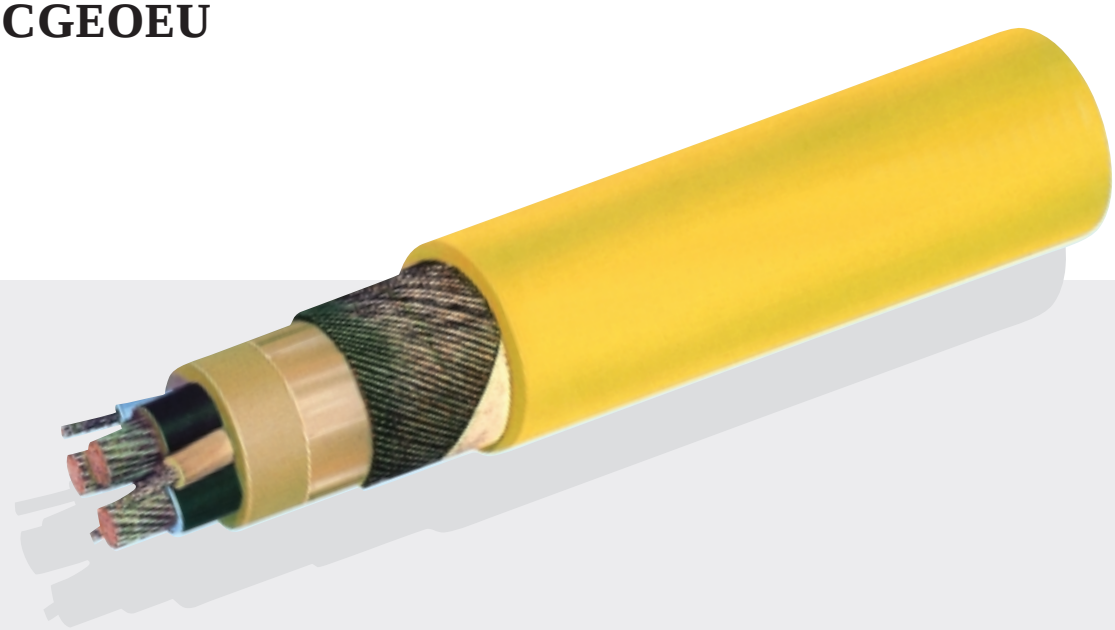
*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	D.C. resistance at 20°C appr. Ω/km	Inductive resistance at 50 Hz appr. Ω/km
NSSHCGEOEU	3 x 6/6 KON + 3 ÜL	26 - 29	1170	3.39	0.137
NSSHCGEOEU	3 x 6/6 KON + 2 x 1.5 St + 1.5 ÜL	23 - 27	930	3.39	0.133



Coal Cutter Cable Schräm-TENAX®-V

NSSHCGEOEU



NSSHCGEOEU
acc. to DIN VDE 0250, Part 812

Construction:

Particularly fine stranded conductor of tin-coated copper wires in special flexible design,

insulation of heat-resistant 3GI3 rubber compound on EPR basis with particularly high mechanical strength, coloured, wrapped with rubberized textile tape, layer of conductive rubber mixture.

Pilot cores with copper-steel conductors capable of expansion and compression and insulating covering on EPR basis (3GI3), monitoring conductor similar to the control cores, but with covering of conductive rubber compound.

Cores laid up, the pilot cores and monitoring conductor being laid in the outer interstices,

film wrapping,

inner sheath of GM1 b rubber compound of high mechanical strength, reinforced version of concentric earth conductor as spiral of copper and steel wires,

outer sheath of chlorinated rubber compound 5GM5, yellow, abrasion and tear-resistant, oil-resistant and flame retardant.

The cable can also be supplied with three control cores. In this case, the monitoring conductor is located, inductively balanced, as a wrapping of tinned copper wires above the insulating coverings of the control cores.

Application:

For the connection of mobile machines under very high mechanical loads, predominantly for mining applications, e.g. for coal-cutting machines, particularly suitable for extreme bending loads under low tensile stress.

The phase-concentric monitoring shield and the common-concentric earth conductor, in conjunction with appropriate monitoring equipment, make it possible to monitor the cable for insulation faults and damage resulting from external influences.

Technical Data:

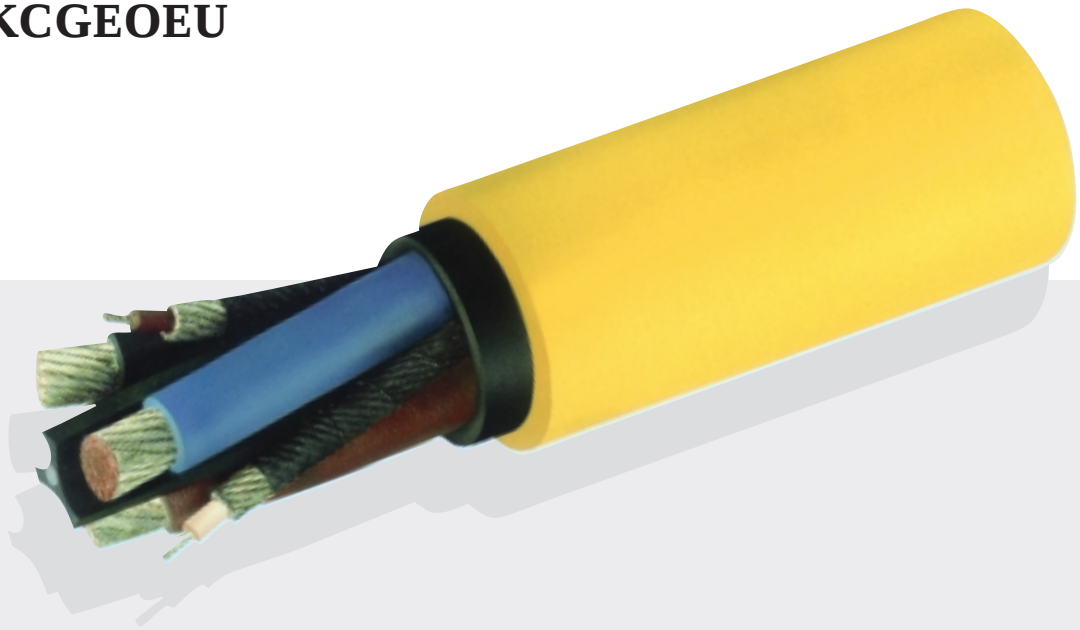
Rated voltage U_0 / U	0.6 / 1 kV
Permissible temperature on cable surface	
static	-40 °C / +80 °C
flexing	-25 °C / +80 °C
Smallest permissible bending radius	
static	1.5 D*
flexing	2.5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor Monitoring Core appr. µF/km
NSSHCGEOEU	3 x 16 / 16 KON + 2 ST + ÜL	35 - 38	2130	0.105	0.30
	3 x 25 / 16 KON + 2 ST + ÜL	38 - 41	2790	0.097	0.38
	3 x 35 / 16 KON + 2 ST + ÜL	41.5 - 45	3390	0.093	0.42
	3 x 50 / 25 KON + 2 ST + ÜL	47.5 - 51	4340	0.090	0.47
	3 x 70 / 35 KON + 2 ST + ÜL	52 - 56	5680	0.087	0.54
	3 x 95 / 50 KON + 2 ST + ÜL	58 - 62	7180	0.086	0.55
	3 x 35 / 16 KON + 3 ST + 3 ÜL	41.5 - 45	3630	0.093	0.42
	3 x 50 / 25 KON + 3 ST + 3 ÜL	47.5 - 51	4585	0.090	0.47
	3 x 70 / 35 KON + 3 ST + 3 ÜL	52 - 56	5925	0.087	0.54
	3 x 95 / 50 KON + 3 ST + 3 ÜL	58 - 62	7430	0.086	0.55

Coal Cutter Cable Schräm-TENAX®-VE

NSSHKCGEOEU



NSSHKCGEOEU
acc. to DIN VDE 0250, Part 812

Construction:

Particularly fine stranded conductor of tinned copper wires of special flexible design.

Insulation of heat-resistant 3GI3 rubber compound on EPR basis with particularly high mechanical strength, coloured,

wrapped with rubberized textile tape. Pilot cores with copper / steel conductors capable of expansion and compression and insulating covering of EPR basis 3GI3.

Earth conductor distributed as strands of very fine copper wire around pilot core insulation, and as fine stranded tinned copper, accommodated in the cradle separator.
Cores laid up over a central cradle separator made of conducting rubber,

with pilot / earth-units in the interstices,

inner sheath of conducting rubber compound, counterwound taping,

outer sheath of yellow chlorinated rubber compound 5GM5, abrasion and tear-resistant, oil-resistant and flame

Application:

For the connection of mobile machines under very high mechanical loads, predominantly for mining applications, e.g. for coal cutting machines, particularly suitable for extreme bending loads under low tensile stress.

The cable complies with the requirements of the Draft DIN VDE Test Standard 0472 Part 818 "Behaviour under Squeezing Stress". It ensures that damage caused by squeezing is detected as earth faults with the highest possible reliability.

Technical Data:

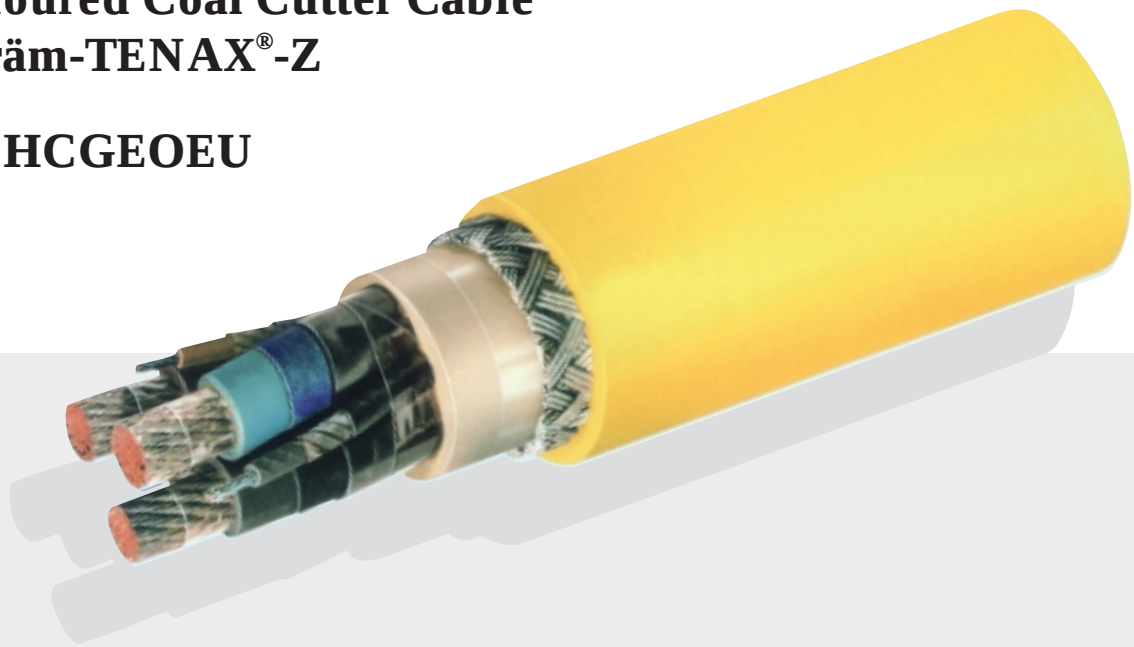
Rated voltage U_0 / U	0.6 / 1 kV
Permissible temperature on cable surface	
static	-40°C / +80°C
flexing	-25°C / +80°C
Smallest permissible bending radius	
static	1.5 D*
flexing	2.5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Phase-monitor appr. µF/km
NSSHKCGEOEU	3 x 16 + 3 x (ST + 16 / 3)	34 - 37.5	1820	0.118	0.38
	3 x 25 + 3 x (ST + 16 / 3)	39 - 42	2400	0.108	0.42
	3 x 35 + 3 x (ST + 16 / 3)	42 - 45	2910	0.102	0.49
	3 x 50 + 3 x (ST + 25 / 3)	48.5 - 51.5	3960	0.101	0.52
	3 x 70 + 3 x (ST + 35 / 3)	52.5 - 56	5010	0.095	0.61
	3 x 95 + 3 x (ST + 50 / 3)	59 - 62.5	6430	0.092	0.61

Armoured Coal Cutter Cable Schräm-TENAX®-Z

NSSHCGEOEU



NSSHCGEOEU
acc. to DIN VDE 0250, Part 812

Construction:

Particularly fine stranded conductor of tinned copper wires in special flexible design,

insulation of heat-resistant 3GI3 rubber mixture on EPR basis with particularly high mechanical properties, coloured, wrapped with rubberized textile tape, layer of conductive rubber compound.

Pilot cores with copper and steel conductors capable of expansion and compression and insulating covering on EPR basis (3GI3), monitoring conductor similar to the control cores, but with covering of conductive rubber compound.

Cores laid up, the pilot cores and monitoring conductor being laid in the outer interstices,

film wrapping,

inner sheath of GM1 b rubber compound of high mechanical strength,

concentric earth conductor as tensile-stress-resistant braided armour of combined copper-steel wires,

outer sheath of chlorinated rubber compound 5GM5, yellow, abrasion and tear-resistant, oil-resistant and flame retardant.

The cable can also be supplied with three control cores. In this case, the monitoring conductor is located, inductively balanced, as a spiral of tin-coated copper wires over the insulating coverings of the control cores.

Application:

For the connection of mobile machines under extremely high mechanical loads, predominantly in mining situations, e.g. for coal-cutting machines, particularly suitable for extreme bending loads, high tensile stress, and impact and crushing loads.

The torsion and tensile-stress-resistant armour, in conjunction with the high flexibility of the cable, also allows the cable to be operated via guide pulleys (cable cars) or used as a reeling cable (LHD). The phase-concentric monitoring shield and the common-concentric earth conductor, in conjunction with appropriate monitoring equipment, make it possible to monitor the cable for insulation faults and damage resulting from external influences.

Technical Data:

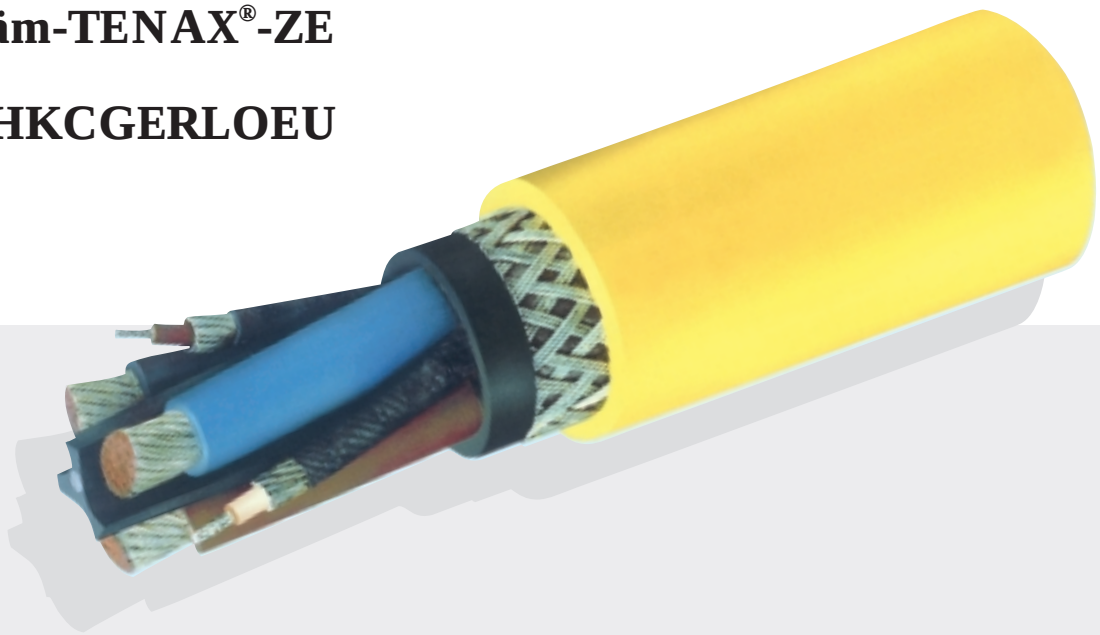
Rated voltage U_0 / U	0.6 / 1 kV
Permissible temperature on cable surface	
static	-40°C / +80C
flexing	-25°C / +80C
Smallest permissible bending radius	
static	2 D*
flexing	3 D*
in guide pulleys and on drums	4.5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor Monit. Core appr. µF/km	Braid tensile strength appr. kN
NSSHCGEOEU	3 x 16 / 16 KON + 2 ST + ÜL	38.5 - 41.5	2430	0.105	0.30	55
	3 x 25 / 16 KON + 2 ST + ÜL	41 - 44.5	3050	0.097	0.38	55
	3 x 35 / 16 KON + 2 ST + ÜL	44.5 - 48	3620	0.093	0.42	55
	3 x 50 / 25 KON + 2 ST + ÜL	50 - 54	4810	0.090	0.47	80
	3 x 70 / 35 KON + 2 ST + ÜL	54.5 - 58.5	5890	0.087	0.54	80
	3 x 95 / 50 KON + 2 ST + ÜL	62.5 - 66.5	7800	0.086	0.55	110
	3 x 35 / 16 KON + 3 ST + 3 ÜL	44.5 - 48	3860	0.093	0.42	55
	3 x 50 / 25 KON + 3ST + 3ÜL	50 - 54	5050	0.090	0.47	80
	3 x 70 / 35 KON + 3 ST + 3 ÜL	54.5 - 58.5	6000	0.087	0.54	80
	3 x 95 / 50 KON + 3 ST + 3 ÜL	62.5 - 66.5	8050	0.086	0.55	110
	3 x 120 / 70 KON +3 ST + 3ÜL	67.5 - 72.0	9380	0.084	0.61	95
	3 x 150 / 70 KON +3 ST + 3ÜL	74.5 - 79	11120	0.083	0.63	95

Armoured Coal Cutter Cable
Schräm-TENAX®-ZE

NSSHKCGERLOEU



NSSHKCGERLOEU
acc. to DIN VDE 0250, Part 812

Construction:

Particularly fine stranded conductor of tinned copper wires in special flexible design.

Insulation of heat-resistant 3GI3 rubber compound on EPR basis with particularly high mechanical strength, coloured,

wrapped with rubberized textile tape. Pilot cores with copper / steel conductors capable of expansion and compression and insulating covering of EPR based 3GI3.

Earth conductor distributed as strands of very fine copper wire around pilot core insulation, and as fine stranded tinned copper, accommodated in the cradle separator.

Cores laid up over a central cradle separator made of conducting rubber, with pilot / earth-units in the interstices,

inner sheath of conducting rubber compound, taping, steel wire braid.

Outer sheath of yellow chlorinated rubber compound 5GM5, abrasion and tear-resistant, oil-resistant and flame retardant.

Application:

For the connection of mobile machines under very high mechanical loads, predominantly for mining applications, e.g. for coal cutting machines, particularly suitable for extreme bending loads, high mechanical tension, as well as impact and squeezing.

The torsion and tensile-stress-resistant armour, in conjunction with the high flexibility of the cable, also allows the cable to be operated via guide pulleys (cable cars) or used as a reeling cable (LHD).

The cable complies with the requirements of the Draft DIN VDE Test Standard 0472 Part 818 "Behaviour under Squeezing Stress". It ensures that damage caused by squeezing is detected as earth faults with the highest possible reliability.

Technical Data:

Rated voltage U_0 / U	0.6 / 1 kV
Permissible temperature on cable surface	
static	-40°C / +80C
flexing	-25°C / +80C
Smallest permissible bending radius	
static	2 D*
flexing	3 D*
in guide pulleys and on drums	4.5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Phase-monitor appr. µF/km	Tensile strength of the braid appr. kN
NSSHKCGERLOEU	3 x 16 + 3 x (ST + 16 / 3)	37 - 40.5	2130	0.118	0.38	57
	3 x 25 + 3 x (ST + 16 / 3)	41.5 - 45	2730	0.108	0.42	57
	3 x 35 + 3 x (ST + 16 / 3)	44.5 - 48	3240	0.102	0.49	57
	3 x 50 + 3 x (ST + 25 / 3)	51 - 55	4420	0.101	0.52	85
	3 x 70 + 3 x (ST + 35 / 3)	55 - 59	5470	0.095	0.61	85
	3 x 95 + 3 x (ST + 50 / 3)	62 - 66	6890	0.092	0.61	85
	3 x 150 + 3 x (ST + 70 / 3)	71.5 - 75.5	9750	0.087	0.70	85



High-voltage Trailing Cable with Monitoring Shield TENAX®-H,TENAX®-HP

NTSCGECWOEU
NTSCGECCWOEU



NTSCGECWOEU
NTSCGECCWOEU
acc. to DIN VDE 0250, Part 813

Construction:

Fine stranded conductor of tinned copper wires,

conductor smoothing via conductive rubber layer,

insulation of heat-resistant 3GI3 rubber compound on EPR basis,

field limiting via outer conductive rubber layer,

earth conductor as spiral of tinned copper wires over the outer semi-conductive layer of the cores,

pilot cores in flexible design with coloured EPR insulation (3GI3),

cores laid up, the pilot cores being laid in the outer interstices,

film wrapping,

inner sheath of GM1 b rubber compound of high mechanical strength, monitoring shield of conductive rubberized textile tape and spiral of copper and steel wires,

intermediate sheath of GM1 b rubber compound of high mechanical strength,

overall sheath of chlorinated rubber compound 5GM5, red, abrasion and tear-resistant, oil-resistant and flame retardant (NTSCGECWOEU-TENAX-H).

In the case of particularly high mechanical loads, the cable can be provided with a braided armour of galvanised steel wires below the outer sheath. This armouring also forms a external, earthed shield (NTSCGECCWOEU-TENAX-HP).

The cables are usually supplied in matched lenghts of 100 m or 200 m. Both cable ends are equipped with terminations which are adapted to the entry fitting in the high-voltage connection box.

Application:

For the connection of electrical equipment, in mines and underground excavations with hazardous environments under particularly high mechanical loads, e.g. high-voltage transformers on power lines in underground mining and tunnelling. The flexibility of the cable allows operating equipment to be moved while running.

The phase-concentric earth conductor and the common-concentric monitoring shield, e.g. in conjunction with a high-voltage protection circuit, make it possible to monitor the cable for insulation faults and damage resulting from external influences.

Technical Data:

Rated voltage U_0 / U:	3.6 / 6 kV 6 / 10 kV
Permissible temperature on cable surface	
static	-40°C / +80°C
flexing	-25°C / +80°C
Smallest permissible bending radius:	
static	4 D*
during operation-related transportation and installation	
mobile application	7,5 D*

*D = cable diameter

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/ km	Capacitance Conductor Earth etwa µF/ km
NTSCGECWOEU 3.6/6 kV	3 x 25 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	54 - 59	4100	0.117	0.34
TENAX-H	3 x 35 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	57 - 62	4620	0.111	0.38
	3 x 50 + 3 x 25 / 3E + 3 x 2.5 ST + ÜL	61 - 67	5570	0.105	0.42
	3 x 70 + 3 x 35 / 3E + 3 x 2.5 ST + ÜL	66 - 72	6690	0.099	0.48
	3 x 95 + 50 / 3E + 3 x 2.5 ST + ÜL	70 - 77	7920	0.095	0.53
NTSCGECCWOEU 3.6/6 kV	3 x 25 + 3 x 16 / 3E + 3 x 2.5 ST+ ÜL	58 - 63	4920	0.121	0.34
TENAX-HP	3 x 35 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	60 - 66	5540	0.115	0.38
	3 x 5o + 3 x 25 / 3E + 3 x 2.5 ST + ÜL	65 - 71	6580	0.109	0.42
	3 x 70 + 3 x 35 / 3E + 3 x 2.5 ST + ÜL	69 - 75	7750	0.103	0.48
	3 x 95 + 3 x 50 / 3E + 3 x 2.5 ST + ÜL	75 - 82	9250	0.099	0.53
NTSCGECWOEU 6/10 kV	3 x 25 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	56 - 61	4290	0.120	0.31
TENAX-H	3 x 35 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	60 - 66	4970	0.114	0.34
	3 x 50 + 3 x 25 / 3E + 3 x 2.5 ST + ÜL	63 - 69	5800	0.107	0.38
NTSCGECCWOEU 6/10 kV	3 x 25 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	59 - 64	5140	0.124	0.31
TENAX-HP	3 x 35 + 3 x 16 / 3E + 3 x 2.5 ST + ÜL	63 - 69	5900	0.118	0.34
	3 x 50 + 3 x 25 / 3E + 3 x 2.5 ST + ÜL	66 - 72	6810	0.111	0.38

Rubber-insulated Flexible Cable for Hoisting and Hauling Equipment TENAX®-K, TENAX®-KS, TENAX®-KV, TENAX®-KT

NSHTOEU



NSHTOEU
acc. to DIN VDE 0250, Part 814

Standard construction TENAX-K:

Fine stranded tinned Cu conductor (class 5 acc. to DIN VDE 0295), insulation of EPR compound 3GI3, up to 5 cores coloured, thereafter black with numbers.

Cables manufactured by us have insulation coverings made of an ozone and suncheck-resistant EPR compound (3GI3); additional protection for the cores at the connection ends is therefore unnecessary.

The inner sheath of the signalling and control types and small power sizes is of GM1 b, otherwise of chlorinated rubber compound 5GM3.

Protection against torsion through counterwound taping or fibre glass braiding.

Outer sheath of highly flexible black CSP grade 5GM3, oil resistant and flame retardant. Depending on use, special construction types are possible, partly with additional constituents, such as:

TENAX-KS,

with heavy duty outer sheath of chlorinated rubber compound 5GM5, abrasion and tear-resistant, oil-resistant and flame retardant, with vulcanized fibre-glass braid for anti-twist protection.

TENAX-KT,

featuring a central steel rope for strain relief, for bigger self-supporting lengths or similar.

TENAX-KV,

with steel-reinforced conductors, for instance for high-speed cable cars.
The types TENAX-KV and TENAX-KT can optionally be provided with 5GM5 sheath.

Application:

For the connection of hoisting and hauling systems and similar equipment using positive cable guidance, under high mechanical loads in dry and damp areas, outdoors and in areas with a high risk of explosions. Their special design features make these cables particularly suitable for operations involving frequent reeling and unreeling or where cables are constantly deflected over pulleys (cable tenders). Cables must be connected free of torsion. Tensile stresses arising at the cable ends during operation must be suitably relieved and conducted to the tensile elements within the cable.
Stationary pulleys bearing two turns of cable have proved well suited for this purpose. S-shaped turns should be avoided wherever possible both during laying and within the cable guidance system.

Code	No. of cores/ Nominal cross section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km
NSHTOEU TENAX-K	4 x 2.5	14. 5 - 17.5	390	0.101
	4 x 4	17,5 - 20.5	540	0.097
	4 x 6	19.5 - 22.5	670	0.091
	4 x 10	23 - 26.5	980	0.089
	4 x 16	28 - 31.5	1450	0.085
	4 x 25	34.5 - 38.5	2300	0.083
	4 x 35	38 - 42	2890	0.082
	4 x 50	45 - 49.5	4010	0.081
	4 x 70	50 - 55	5210	0.078
	4 x 95	57.5 - 63	6780	0.078
	4 x 120	63.5 - 69.5	8450	0.076
	12 x 1.5	19.5 - 23	670	0.105
	24 x 1.5	25.5 - 29.5	1180	0.105
	7 x 2.5	19 - 22.5	670	0.101
	12 x 2.5	22 - 26	890	0.101
	18 x 2.5	26.5 - 30.5	1260	0.101
	24 x 2.5	30 -34.5	1650	0.101
	30 x 2.5	31.5 - 36	1830	0.101
	25 x 1.5 + 5 x 1 (CE)	29.5 - 33.5	1500	-
	19 x 2.5 + 5 x 1.5 (CE)	31.5 - 36	1730	-
	25 x 2.5 + 5 x 1.5 (CE)	34.5 - 39.5	2080	-
	12 x 1.5 (CE)	26 - 30	1020	-
	24 x 1.5 (CE)	36.5 - 41.5	2130	_
	36 x 1.5 (CE)	42 - 47	2840	-

(Data for the TENAX-KS, TENAX-KT, TENAX-KV available on request

Technical Data:

Rated voltage U_0 / U 0.6 / 1 kV

Permissible temperature on cable surface
- static -40°C / +80°C
- flexing -25°C / +80°C

Smallest permissible bending radius
- static 4 D*
- on drums:
  - up to 20 mm cable diameter 5 D*
  - over 20 mm cable diameter 6 D*
- on guide pulleys 7.5 D*
- on cable cars 5 D*

*D = cable diameter

Maximum permissible tensile load based on the overall cross-section of the main cores
- static 15 N / mm²
- dynamic peaks 25 N / mm²







Rubber Sheathed FO Cable for Optical Data Transmission

TENAX®-LWL



Construction:

2 to 12 graded index fibres 50/125 µm accommodated in two plastic tubes filled with jelly,

twisted tubes embedded in Kevlar rovings,

inner sheath of synthetic rubber EM1 acc. to DIN VDE 0207 Part 21,

anti-twist protection by counterwound double taping of rubberized fabric (optionally glass-fibre for extreme torsional stress),

outer sheath of CSP compound EM5 acc, to DIN VDE 0207 Part 21.

Application:

For the transfer of data and signals in severe operating conditions, for example on materials handling devices or alongside conveyors.

Technical Data:

Diameter:	appr. 9-11 mm
Weight:	appr. 0,13 kg/m
Smallest permissible bending radius:	
static	105mm
flexing	130mm
Maximum tensile strain depending on type	2000 N
Permissible temperature:	
static	-40°C/+80°C
flexing	-30°C/+60°C

Optical Fibre Elements:

up to 12 graded index fibres 50/125 µm (62.5/125 µm available on request)

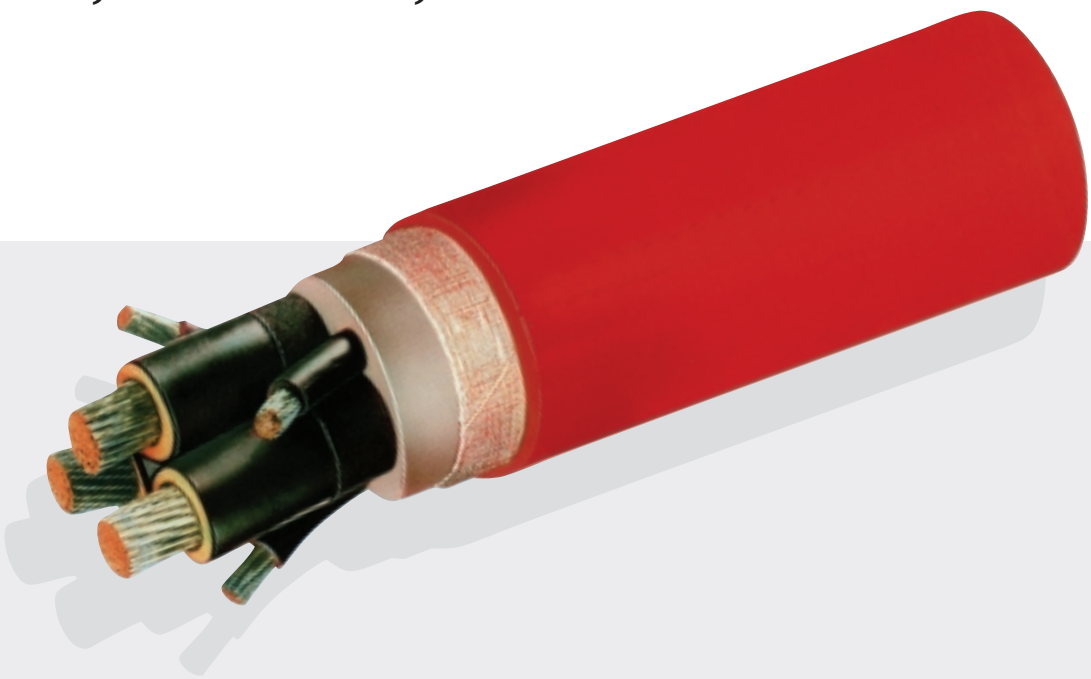
Typical attentuation:	
at 850 nm	3.0 dB/km
at1300nm	0.5-1.0 dB/km
Typical bandwidth:	
at 850 nm	400 MHz km
at1300nm	600-1500 MHz km
Numerical aperture:	0.20 ± 0.02

Termination:
Optionally with OF plug connectors or pigtails fitted in our premises

Typical attenuation per plug connection:	0.5-1.0 dB

Trailing Cable, New Generation

TENAX®-TS, TENAX®-TTS,



(N)TS...WOEU
acc. to DIN VDE 0250, Part 813

Construction of the standard reeling cable **TENAX-T**:

Fine stranded conductor of tinned copper (class 5 ace. to DIN VDE 0295). EPR insulation 3GI3 ace. to DIN VDE 0207, Part 20, an inner semi-conducting layer is normally included to reduce electrical stress on the insulation of 3 kV and above, with an additional outer semi-conducting layer for field limiting for rated voltages of 6 kV and above. Together with the insulation, the semiconducting layers form a void-free radial field.

Inner sheath of synthetic rubber GM1 b ace. to DIN VDE 0207, Part 21.

Outer sheath of chlorinated red rubber compound 5GM3 acc. to DIN VDE 0207, Part 21, oil resistant and flame retardant.

The earth conductor can be incorporated as a fourth core or distributed within the outer interstices. In special cases, e.g. for use at floating dredges or as emergency cables, the earth conductor is split up and placed over the outer semi-conductive layers (e.g.**TENAX-N**).

Depending on application, special designs are also possible, for example:

TENAX-TT with twist protection for guiding systems with deflections in several planes or with reel axis in direction of travel.

TENAX-TZ with strain relief and improved flexibility for applications with increased mechanical tension.

TENAX-N as emergency power supply cable with continuous protection between inner and outer sheath against accidental touching.

It is also possible to produce special versions with braided armour for pull and pressure loads in trailing operation, and with waterproof inner sheath for permanent operation in water.

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor-Earth appr. µF/km
(N)TSCGEWOEU 3.6/6 kV	3 x 25 + 3 x 25 / 3	39 - 42	2410	0.102	0.38
	3 x 35 + 3 x 25 / 3	42 - 45	2995	0.097	0.43
	3 x 50 + 3 x 25 / 3	45 - 48	3645	0.092	0.49
	3 x 70 + 3 x 35 / 3	50 - 54	4760	0.088	0.55
	3 x 95 + 3 x 50 / 3	54 - 58	5580	0.084	0.62
	3 x 120 + 3 x 70 / 3	58 - 62	6690	0.082	0.67
	3 x 150 + 3 x 70 / 3	63 - 67	7990	0.080	0.73
	3 x 185 + 3 x 95 / 3	67 - 72	9330	0.078	0.79
(N)TSCGEWOEU 6/10 kV	3 x 25 + 3 x 25 / 3	40 - 43	2450	0.104	0.35
	3 x 35 + 3 x 25 / 3	43 - 46	3035	0.099	0.39
	3 x 50 + 3 x 25 / 3	46 - 49	3690	0.094	0.45
	3 x 70 + 3 x 35 / 3	51 - 55	4800	0.090	0.51
	3 x 95 + 3 x 50 / 3	55 - 59	5620	0.086	0.58
	3 x 120 + 3 x 70 / 3	59 - 63	6740	0.084	0.63
	3 x 150 + 3 x 70 / 3	64 - 68	8040	0.082	0.69
	3 x 185 + 3 x 95 / 3	69 - 74	9380	0.080	0.75
(N)TSCGEWOEU 12/20 kV	3 x 25 + 3 x 25 / 3	46 - 49	3050	0.115	0.24
	3 x 35 + 3 x 25 / 3	49 - 52	3490	0.109	0.27
	3 x 50 + 3 x 25 / 3	53 - 57	4340	0.103	0.30
	3 x 70 + 3 x 35 / 3	57 - 61	5320	0.098	0.34
	3 x 95 + 3 x 50 / 3	61 - 65	6360	0.094	0.38
	3 x 120 + 3 x 70 / 3	67 - 71	7810	0.091	0.41
	3 x 150 + 3 x 70 / 3	70 - 74	8900	0.089	0.45
	3 x 185 + 3 x 95 / 3	76 - 80	10700	0.086	0.49
(N)TSCGEWOEU 18/30kV	3 x 25 + 3 x 25 / 3	55 - 59	3960	0.126	0.18
	3 x 35 + 3 x 25 / 3	58 - 62	4550	0.119	0.20
	3 x 50 + 3 x 25 / 3	63 - 67	5510	0.113	0.23
	3 x 70 + 3 x 35 / 3	66 - 70	6560	0.107	0.26
	3 x 95 + 3 x 50 / 3	71 - 75	7850	0.102	0.28
	3 x 120 + 3 x 70 / 3	76 - 80	9410	0.099	0.31
	3 x 150 + 3 x 70 / 3	80 - 84	10690	0.096	0.33
	3 x 185 + 3 x 95 / 3	86 - 90	12550	0.093	0.36

Technical Data:

Rated voltage U_0 / U:

0.6 / 1 kV	12 / 20 kV
1.8 / 3 kV	14 / 25 kV
3.6 / 6 kV	18 / 30 kV
6 / 10 kV	20 / 35 kV
8.7 / 15 kV	

Smallest permissible bending radius

	1 kV	> 1 kV
fixed installation:	4 D*	6 D*
on drums:	6 D*	12 D*
on deflection pulleys:	7,5 D*	15 D*
moving freely:	5 D*	10 D*

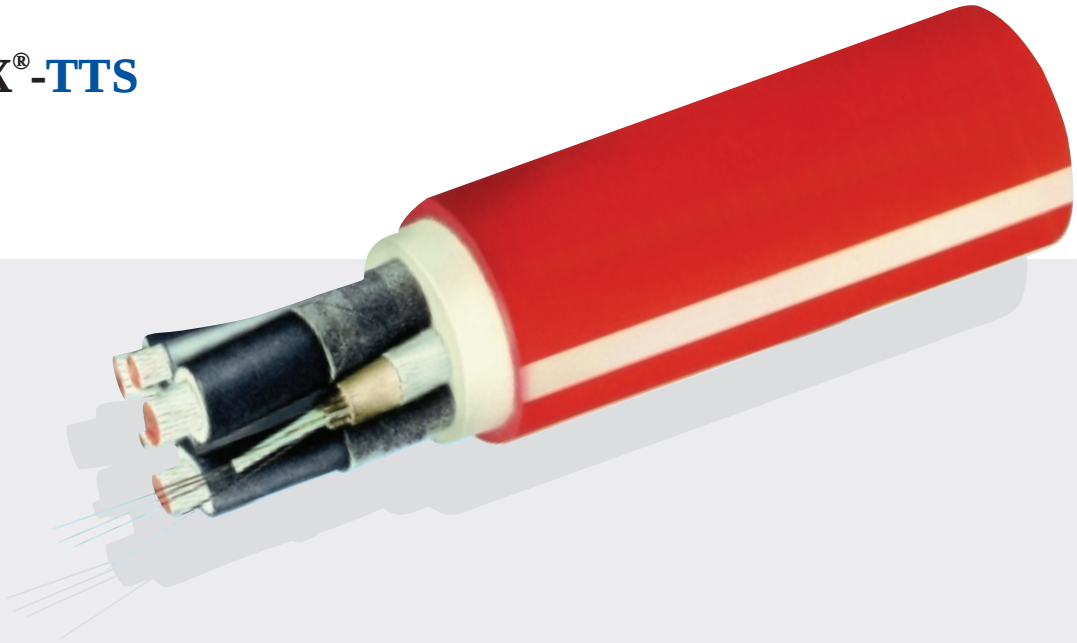
Permissible temperature on cable surface:

static	-40°C / +80°C
flexing	-25°C / +80°C

*D = cable diameter

Trailing Cables
New Generation with Integrated Optical Fibres

TENAX®-TTS



(N)TS...WOEU
acc. to DIN VDE 0250, Part 813
Construction:

Conductor of fine stranded (DIN VDE 0295, class 5) copper wires. Insulation 3GI3 based on Ethylene-propylene rubber acc. to DIN VDE 0207, Part 20.
For rated voltages of 3 kV and above an inner semi-conducting layer is normally included to smooth the conductor surface, an additional outer semi-conductive layer for field limiting is simultaneously extruded for rated voltages of 6 kV and higher. The void-free conductive layers form a homogeneous electrical field in the insulation.

The cores are twisted, with split earth cores are put in two of the 3 interstices, the suitably protected FO element is accommodated in the 3rd.

The FO element normally contains 36 graded index fibres 50 / 125 µm, 62.5 / 125 and 9 / 125 µm

Inner sheath of GM1 b rubber compound ace. to DIN VDE 0207, Part 21.

Outer sheath of red chlorinated rubber 5GM3 ace. to DIN VDE 0207, Part 21, oil-resistant and flame retardant, reinforced by an embedded anti-twist braid of fibre-glass.

Operating conditions may require the provision of special features such as particularly abrasion and tear-resistant outer sheath compounds, strainer elements, water-proof inner sheath compounds, etc.

Application:

For the connection of large mobile equipment, such as excavators, spreaders, gantry cranes, etc., suitable for motorised reeling on monospiral or level-wind reelers.
The integrated fibre optics provide numerous advantages for effective communication and control of and between mobile equipment:

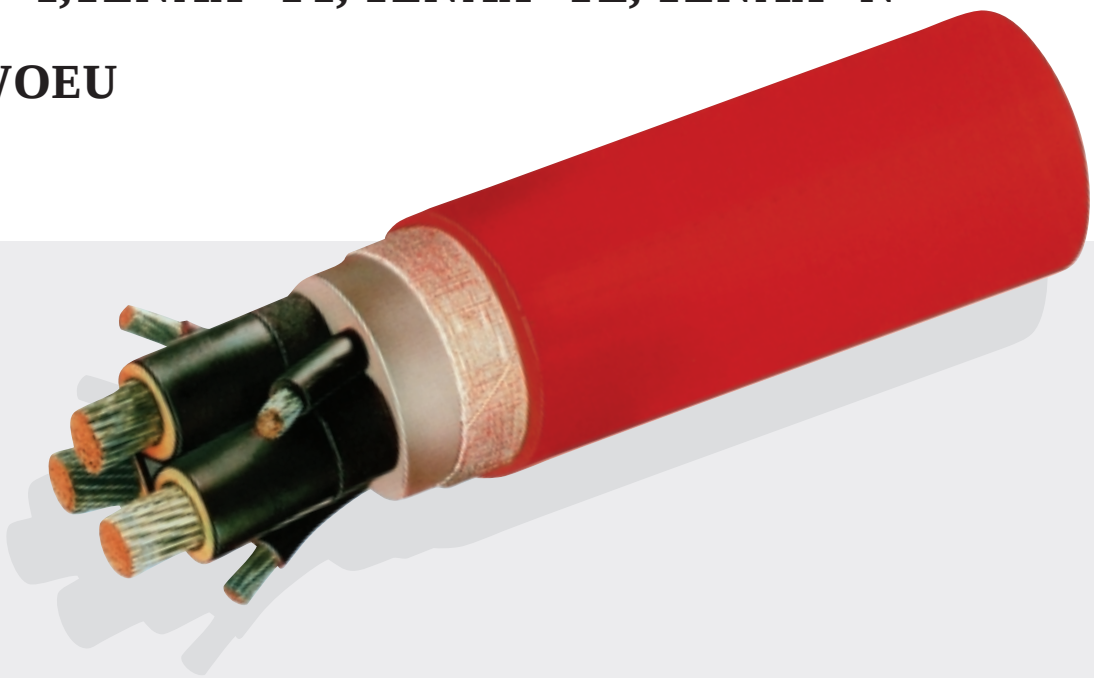
- Large bandwidth and high transmission rate
- Immunity from electromagnetic interference, no cross-talk
- Freedom from metallic links between transmitter and receiver
- Data transmission integrated in a trailing cable designed to withstand severe mechanical stress. Separate control and data transmission cables not required.
- Electrical and optical terminations can if requested be fitted in our workshop. Type and core lengths to be specified by the customer.

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor-Earth appr. µF/km
NTSCGEWOEU 3.6/6 kV	3 x 25 + 2 x 25 / 2 + 12 x LWL	39 - 42	2410	0.102	0.38
	3 x 35 + 2 x 25 / 2 + 12 x LWL	42 - 45	2995	0.097	0.43
	3 x 50 + 2 x 25 / 2 + 12 x LWL	45 - 48	3645	0.092	0.49
	3 x 70 + 2 x 35 / 2 + 12 x LWL	50 - 54	4760	0.088	0.55
	3 x 95 + 2 x 50 / 2 + 12 x LWL	54 - 58	5580	0.084	0.62
	3 x 120 + 2 x 70 / 2 + 12 x LWL	58 - 62	6690	0.082	0.67
	3 x 150 + 2 x 70 / 2 + 12 x LWL	63 - 67	7990	0.080	0.73
	3 x 185 + 2 x 95 / 2 + 12 x LWL	67 - 72	9330	0.078	0.79
(N)TSCGEWOEU 6/10 kV	3 x 25 + 2 x 25 / 2 + 12 x LWL	40 - 43	2450	0.104	0.35
	3 x 35 + 2 x 25 / 2 + 12 x LWL	43 - 46	3035	0.099	0.39
	3 x 50 + 2 x 25 / 2 + 12 x LWL	46 - 49	3690	0.094	0.45
	3 x 70 + 2 x 35 / 2 + 12 x LWL	51 - 55	4800	0.090	0.51
	3 x 95 + 2 x 50 / 2 + 12 x LWL	55 - 59	5620	0.086	0.58
	3 x 120 + 2 x 70 / 2 + 12 x LWL	59 - 63	6740	0.084	0.63
	3 x 150 + 2 x 70 / 2 + 12 x LWL	64 - 68	8040	0.082	0.69
	3 x 185 + 2 x 95 / 2 + 12 x LWL	68 - 72	9380	0.080	0.75
(N)TSCGEWOEU 12/20 kV	3 x 25 + 2 x 25 / 2 + 12 x LWL	46 - 49	3050	0.115	0.24
	3 x 35 + 2 x 25 / 2 + 12 x LWL	49 - 52	3490	0.109	0.27
	3 x 50 + 2 x 25 / 2 + 12 x LWL	53 - 57	4340	0.103	0.30
	3 x 70 + 2 x 35 / 2 + 12 x LWL	57 - 61	5320	0.098	0.34
	3 x 95 + 2 x 50 / 2 + 12 x LWL	61 - 65	6360	0.094	0.38
	3 x 120 + 2 x 70 / 2 + 12 x LWL	67 - 71	7810	0.091	0.41
	3 x 150 + 2 x 70 / 2 + 12 x LWL	70 - 74	8900	0.089	0.45
	3 x 185 + 2 x 95 / 2 + 12 x LWL	76 - 80	10700	0.086	0.49
(N)TSCGEWOEU 18/30 kV	3 x 25 + 2 x 25 / 2 + 12 x LWL	55 - 59	3960	0.126	0.18
	3 x 35 + 2 x 25 / 2 + 12 x LWL	58 - 62	4550	0.119	0.20
	3 x 50 + 2 x 25 / 2 + 12 x LWL	63 - 67	5510	0.113	0.23
	3 x 70 + 2 x 35 / 2 + 12 x LWL	66 - 70	6560	0.107	0.26
	3 x 95 + 2 x 50 / 2 + 12 x LWL	71 - 75	7850	0.102	0.28
	3 x 120 + 2 x 70 / 2 + 12 x LWL	76 - 80	10690	0.099	0.31
	3 x 185 + 2 x 95 / 2 + 12 x LWL	86 - 90	12550	0.093	0.36

Trailing Cable

TENAX®-T,TENAX®-TT, TENAX®-TZ, TENAX®-N

NTS...WOEU



NTS...WOEU
acc. to DIN VDE 0250, Part 813

Construction of the standard reeling cable **TENAX-T**:

Fine stranded conductor of tinned copper (class 5 acc. to DIN VDE 0295). EPR insulation 3GI3 acc. to DIN VDE 0207, Part 20, an inner semi-conducting layer is normally included to reduce electrical stress on the insulation of 3 kV and above, with an additional outer semi-conducting layer for field limiting for rated voltages of 6 kV and above. Together with the insulation, the semiconducting layers form a void-free radial field.

Inner sheath of synthetic rubber GM1 b acc. to DIN VDE 0207, Part 21.

Outer sheath of chlorinated red rubber compound 5GM3 acc. to DIN VDE 0207, Part 21, oil resistant and flame retardant.

The earth conductor can be incorporated as a fourth core or distributed within the outer interstices. In special cases, e.g. for use at floating dredges or as emergency cables, the earth conductor is split up and placed over the outer semi-conductive layers (e.g.**TENAX-N**).

Depending on application, special designs are also possible, for example:

TENAX-TT with twist protection for guiding systems with deflections in several planes or with reel axis in direction of travel.

TENAX-TZ with strain relief and improved flexibility for applications with increased mechanical tension.

TENAX-N as emergency power supply cable with continuous protection between inner and outer sheath against accidental touching.

It is also possible to produce special versions with braided armour for pull and pressure loads in trailing operation, and with waterproof inner sheath for permanent operation in water.

Application:

For the connection of large mobile equipment such as excavators and spreaders, loading bridges, gantry cranes, construction machines, etc. Under very high mechanical loads, in dry or damp areas, also in environments with high explosion risks, particularly in lignite and underground coal mines, salt and metal mines, sand and gravel quarries, limestone mines, shipyards and ports, container terminals, heavy industry, metallurgical plants, public utilities and construction sites. The particular features of the cable can be modified to suit different operational modes. It is therefore important when placing orders to state the proposed type of cable guidance system, e.g. trailing, reeling or other systems where positive guidance is involved.

DIN VDE-specification 0168 lays down the following operating conditions for reeling cables:

Diameter of drum core: at least 25 x the diameter of the cable.

Bending radius on guide and deflection pulleys: at least 15 x the diameter of the cable.

The distance between two curves in an S-shaped deflection or a deflection to another plane has to be at least 20 x the diameter of the cable.

When using deflection pulleys, the distance between the individual pulleys must be narrow enough to ensure that the cable does not become misshaped even under maximum permissible tensile stress.

The maximum long-term tensile load based on the overall cross-section of the phase conductors, is:

15 N / mm² for **TENAX-TS**
20 N / mm² for **TENAX-TTS**

Dynamic peak loads should not exceed 25 N / mm².

Technical Data:

Rated voltage U_0 / U:

0.6 / 1 kV	12 / 20 kV
1.8 / 3 kV	14 / 25 kV
3.6 / 6 kV	18 / 30 kV
6 / 10 kV	20 / 35 kV
8.7 / 15 kV	

Smallest permissible bending radius

	1 kV	> 1 kV
fixed installation:	4 D*	6 D*
on drums:	6 D*	12 D*
on deflection pulleys:	7,5 D*	15 D*
moving freely:	5 D*	10 D*

Cables designed specially for trailing operations allow small bending radii during free movement.
The values depend on the design and should therefore be requested separately.

Permissible temperature on cable surface:

static	-40°C / +80°C
flexing	-25°C / +80°C

*D = cable diameter



Reeling Cable

TENAX®-T
TENAX®-TT

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor-Earth appr. µF/km
NTSWOEU-J 0.6/1 kV	3 x 95 + 3 x 50 / 3	52 - 57	5680	0.080	-
	3 x 120 + 3 x 70 / 3	57 - 62	7150	0.077	-
	3 x 150 + 3 x 70 / 3	61 - 67	8280	0.076	-
	3 x 185 + 3 x 95 / 3	66 - 72	9650	0.075	-
NTSCGEWOEU 3.6/6 kV	3 x 16 / 16	47 - 52	3240	0.121	0.29
	3 x 25 / 25	50 - 55	3870	0.112	0.34
	3 x 35 / 35	55 - 60	4780	0.107	0.38
	3 x 50 / 50	59 - 64	5700	0.101	0.42
	3 x 70 / 70	64 - 70	7000	0.096	0.48
	3 x 25 + 3 x 25 / 3	46 - 51	3390	0.112	0.34
	3 x 35 + 3 x 25 / 3	49 - 54	3920	0.107	0.38
	3 x 50 + 3 x 25 / 3	54 - 59	4870	0.101	0.42
	3 x 70 + 3 x 35 / 3	58 - 63	5940	0.096	0.48
	3 x 95 + 3 x 50 / 3	62 - 68	7010	0.092	0.53
	3 x 120 + 3 x 70 / 3	68 - 74	8640	0.089	0.59
NTSCGEWOEU 6/10 kV	3 x 16 / 16	49 - 54	3450	0.122	0.27
	3 x 25 / 25	54 - 59	4350	0.115	0.31
	3 x 35 / 35	57 - 62	5050	0.109	0.34
	3 x 25 + 3 x 25 / 3	48 - 53	3580	0.115	0.31
	3 x 35 + 3 x 25 / 3	50 - 55	4100	0.109	0.34
	3 x 50 + 3 x 25 / 3	56 - 61	5110	0.103	0.38
	3 x 70 + 3 x 35 / 3	60 - 66	6180	0.098	0.44
	3 x 95 + 3 x 50 / 3	64 - 70	7280	0.094	0.48
	3 x 120 + 3 x 70 / 3	70 - 76	8930	0.090	0.53
NTSCGEWOEU 12/20 kV	3 x 25 / 25	66 - 72	6140	0.129	0.22
	3 x 35 / 35	69 - 75	6900	0.122	0.24
	3 x 25 + 3 x 25 / 3	59 - 64	5030	0.129	0.22
	3 x 35 + 3 x 25 / 3	61 - 67	5640	0.122	0.24
	3 x 50 + 3 x 25 / 3	67 - 73	6780	0.115	0.26
	3 x 70 + 3 x 35 / 3	71 - 77	7980	0.109	0.30
NTSCGEWOEU 15/25 kV	3 x 50 / 50	81 - 88	9600	0.122	0.23
	3 x 70 / 70	86 - 93	11100	0.115	0.26
	3 x 95 / 95	92 - 99	13020	0.110	0.28
	3 x 95 + 3 x 50 / 3	82 - 89	10740	0.110	0.28
	3 x 120 + 3 x 70 / 3	86 - 94	12220	0.106	0.30

Reeling Cable

TENAX®-T
TENAX®-TT

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor-Earth appr. µF/km
NTSCGEWOEU 18/30 kV	3 x 70 / 70	93 - 100	12780	0.120	0.23
	3 x 95 / 95	97 - 104	14350	0.115	0.25
	3 x 50 + 3 x 25 / 3	79 - 85	9160	0.127	0.20
	3 x 95 + 3 x 50 / 3	87 - 94	11810	0.115	0.25
	3 x 120 + 3 x 70 / 3	93 - 100	13760	0.110	0.27
	3 x 185 + 3 x 95 / 3	103 - 111	17160	0.103	0.30
NTSCGEWOEU 20/35 kV	3 x 70 / 70	102 - 110	14950	0.126	0.20
	3 x 95 / 95	106 - 114	16540	0.120	0.22
	3 x 95 + 3 x 50 / 3	95 - 102	13670	0.120	0.22
	3 x 120 + 3 x 70 / 3	101 - 109	15760	0.115	0.24

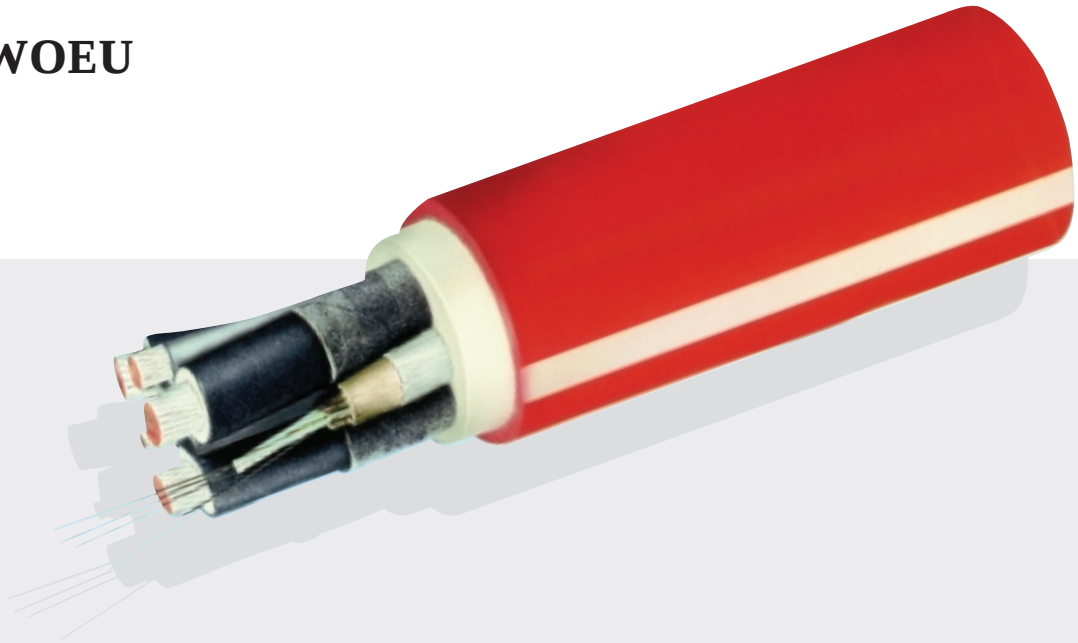
Emergency Power Supply Cable

TENAX®-N

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor-Earth appr. µF/km
NTSCGERLWOEU 6/10 kV	3 x 25 + 3 x 16 / 3E	54 - 60	5450	0.132	0.31
	3 x 35 + 3 x 16 / 3E	59 - 65	6420	0.125	0.35
	3 x 50 + 3 x 25 / 3E	62 - 68	7360	0.118	0.39
NTSCGERLWOEU 12/20 kV	3 x 25 + 3 x 16 / 3E	65 - 71	7250	0.146	0.22
	3 x 25 + 3 x 16 / 3E	68 - 74	8070	0.137	0.24
	3 x 50 + 3 x 25 / 3E	73 - 79	9450	0.131	0.27

Trailing Cables with Integrated Optical Fibres TENAX®-TT

NTS...WOEU



NTS...WOEU
acc. to DIN VDE 0250, Part 813
Construction:

Conductor of fine stranded (DIN VDE 0295, class 5) copper wires. Insulation 3GI3 based on Ethylene-propylene rubber acc. to DIN VDE 0207, Part 20.
For rated voltages of 3 kV and above an inner semi-conducting layer is normally included to smooth the conductor surface, an additional outer semi-conductive layer for field limiting is simultaneously extruded for rated voltages of 6 kV and higher. The void-free conductive layers form a homogeneous electrical field in the insulation.

The cores are twisted, with split earth cores are put in two of the 3 interstices, the suitably protected FO element is accommodated in the 3rd.

The FO element normally contains 2 to 12 graded index fibres 50/125 µm (other type or number of fibres on request).

Inner sheath of GM1 b rubber compound acc. to DIN VDE 0207, Part 21.

Outer sheath of red chlorinated rubber 5GM3 acc. to DIN VDE 0207, Part 21, oil-resistant and flame retardant, reinforced by an embedded anti-twist braid of fibre-glass.

Operating conditions may require the provision of special features such as particularly abrasion and tear-resistant outer sheath compounds, strainer elements, water-proof inner sheath compounds, etc.

Application:

For the connection of large mobile equipment, such as excavators, spreaders, gantry cranes, etc., suitable for motorised reeling on monospiral or level-wind reelers.
The integrated fibre optics provide numerous advantages for effective communication and control of and between mobile equipment:

- Large bandwidth and high transmission rate
- Immunity from electromagnetic interference, no cross-talk
- Freedom from metallic links between transmitter and receiver
- Data transmission integrated in a trailing cable designed to withstand severe mechanical stress. Separate control and data transmission cables, not required.
- Electrical and optical terminations can if requested be fitted in our workshop. Type and core lengths to be specified by the customer.

Trailing Cables

TENAX®-TT
with Integrated Optical Fibres

Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km	Capacitance Conductor-Earth appr. µF/km
NTSCGEWOEU 3.6/6 kV	3 x 25 + 2 x 25/2 + 6 x LWL	46 - 51	3390	0.112	0.34
	3 x 35 + 2 x 25/2 + 6 x LWL	49 - 54	3920	0.107	0.38
	3 x 50 + 2 x 25/2 + 6 x LWL	54 - 59	4870	0.101	0.42
	3 x 70 + 2 x 35/2 + 6 x LWL	58 - 63	5940	0.096	0.48
	3 x 95 + 2 x 50/2 + 6 x LWL	62 - 68	7010	0.092	0.53
	3 x 120 + 2 x 70/2 + 6 x LWL	68 - 74	8640	0.089	0.59
NTSCGEWOEU 6/10 kV	3 x 25 + 2 x 25/2 + 6 x LWL	48 - 53	3580	0.115	0.31
	3 x 35 + 2 x 25/2 + 6 x LWL	50 - 55	4100	0.109	0.34
	3 x 50 + 2 x 25/2 + 6 x LWL	56 - 61	5110	0.103	0.38
	3 x 70 + 2 x 35/2 + 6 x LWL	60 - 66	6180	0.098	0.44
	3 x 95 + 2 x 50/2 + 6 x LWL	64 - 70	7280	0.094	0.48
	3 x 120 + 2 x 70/2 + 6 x LWL	70 - 76	8930	0.090	0.53
	3 x 150 + 2 x 70/2 + 6 x LWL	73 - 79	10220	0.086	0.57
	3 x 185 + 2 x 95/2 + 6 x LWL	80 - 86	12000	0.083	0.62
NTSCGEWOEU 12/20 kV	3 x 25 + 2 x 25/2 + 6 x LWL	59 - 64	5030	0.129	0.22
	3 x 35 + 2 x 25/2 + 6 x LWL	61 - 67	5640	0.122	0.24
	3 x 50 + 2 x 25/2 + 6 x LWL	67 - 73	6780	0.115	0.26
	3 x 70 + 2 x 35/2 + 6 x LWL	71 - 77	7980	0.109	0.30
NTSCGEWOEU 18/30 kV	3 x 50 + 2 x 25/2 + 6 x LWL	79 - 85	9160	0.127	0.20
	3 x 95 + 2 x 50/2 + 6 x LWL	87 - 94	11810	0.115	0.25
	3 x 120 + 2 x 70/2 + 6 x LWL	93 - 100	13760	0.110	0.27

Characteristics:

Rated voltage U_0/U:

0.6/1 kV	12/20KV
1.8/3kV	14/25kV
3.6/6 kV	18/30kV
6/1 OkV	20/35 kV
8.7/15 kV	

Permissible temperature on cable surface:

static	-40°C/+80°C
flexing	-25°C/+80°C

Smallest permissible bending radius

static	6 D*
on drum	12 D*
on deflection pulleys	15 D*

*D = cable diameter

Optical Data:

Typical attenuation

50/125 µm graded index fibres:

at 850 nm	3.0 dB/km
at 1300nm	0.5-1.0 dB/km

9/125 µm single mode fibres:

at1310nm	0.4-0.6 dB/km

Terminations

optical plug connectors or pigtails, on request fitted in our workshop.

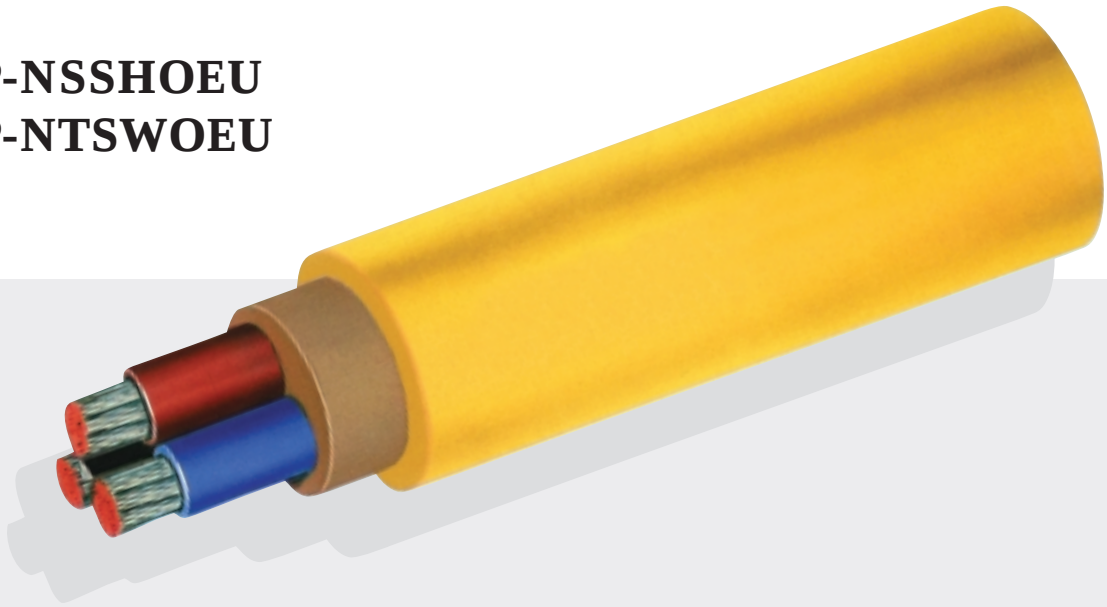
Typical attentuation of a plug connection 0.5-1.0 dB

Typical bandwidth/dispersion

at 850 nm	400 MHz km
at 1300 nm	600-1500 MHz km
at 1310 nm	5 ps/nm km

Submersible Cable up to 6 kV Rated Voltage
TENAX®-TMP

TMP-NSSHOEU
TMP-NTSWOEU



NSSHOEU
NTSWOEU
acc. to DIN VDE 0250,
Parts 812 and 813

Construction:

Fine stranded conductor of tinned copper wires (class 5 acc. to DIN VDE 0295),

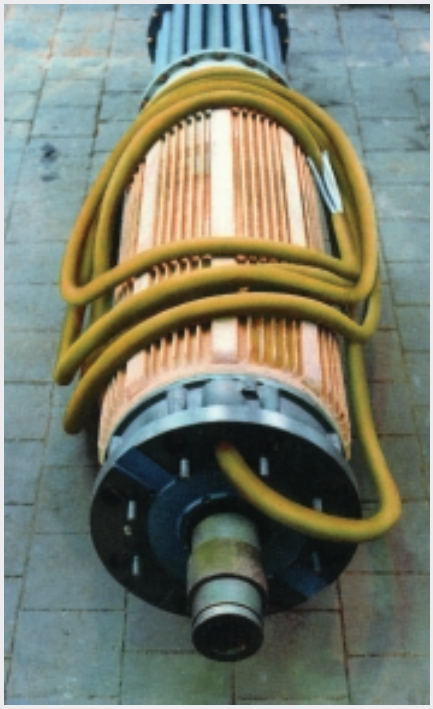
insulation of heat resistant EPR compound, in 1 kV cables colour coded,

inner sheath of butyle rubber compound GM1 b with particularly low water absorption and water vapour permeability,

TMP-NSSHOEU flexible cables have a yellow outer sheath of chlorinated rubber compound 5GM5, abrasion and tear-resistant, oil-resistant and flame retardant. TMP-NTSWOEU flexible cables have a red outer sheath of chlorinated rubber compound 5GM3, oil-resistant and flame retardant.

Application:

For the connection of electrical operating equipment in industrial water, notably for submersible pumps.
3-core cables without earth cores are used where the ascending pipe serves as earth conductor.



Technical Data:

Rated voltage U_0 / U	
TMP-NSSHOEU	0.6 / 1 kV
TMP-NTSWOEU	1.8 / 3 kV
	3.6 / 6 kV
Permissible temperature on cable surface	
static	-40 °C / + 80 °C
flexing	-25 °C / + 80 °C
Smallest permissible static bending radius for fixed installation	
for TMP-NSSHOEU	4 D*
for TMP-NTSWOEU	6 D*
for mobile application	
for TMP-NSSHOEU	5 D*
for TMP-NTSWOEU	10 D*

*D - cable diameter

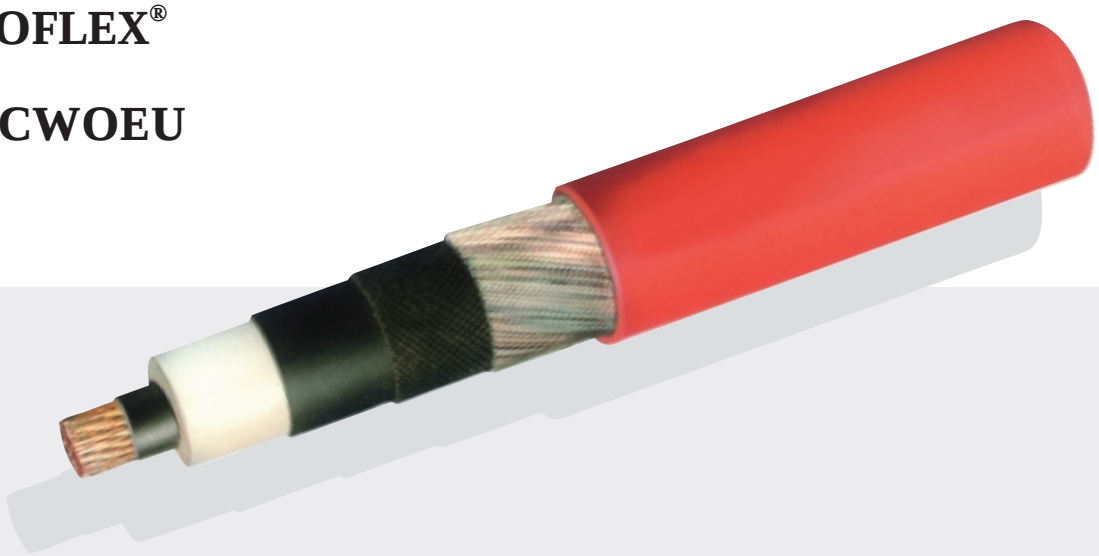
Code	No. of cores/ Nominal cross-section mm²	Outer-Ø appr. mm	Weight appr. kg/km	Inductive resistance at 50 Hz appr. Ω/km
TMP-NSSHOEU	3 x 4	17	400	0.097
	3 x 10	22	720	0.089
	3 x 16	26	1050	0.082
	3 x 25	31	1500	0.081
	3 x 35	35	2050	0.078
	3 x 50	41	2820	0.077
	3 x 70	45	3540	0.075
	3 x 95	52	4750	0.074
	4 x 25	35	2010	0.081
	4 x 35	38	2530	0.078
	4 x 50	45	3500	0.077
	3 x 70 / 35	49	4190	0.075
TMP-NTSWOEU 1.8/3 kV	3 x 25	35	1840	0.098
	3 x 35	39	2410	0.093
	3 x 50	43	3040	0.089
	3 x 70	48	3920	0.085
	3 x 95	53	4950	0.084
TMP-NTSWOEU 3.6/6 kV	3 x 25	45	2690	0.105
	3 x 35	47	3180	0.100
	3 x 50	51	3860	0.095
	3 x 70	56	4870	0.090
	3 x 95	60	5870	0.087

Specials designs upon request, e.g. armoured high-voltage cables for use on off-shore drilling rigs and for extreme submersion depths of up 1000m.

Cable Connections up to 35 kV

FELTOFLEX®

NTMCWOEU



FELTOFLEX cables constitute a highly flexible connection for minisubs, switch-gear, transformers, generators and motors in the medium voltage range. The cables are in single core screened version for 10 or 20 kV (max. continuous 12 resp. 24 kV) ratings, and can be supplied ready for connection, fitted with plugs or sealing ends. Thanks to their high flexibility they are particularly suitable for confined connection spaces, where small bending radius is required.

Design:

The single core cables are manufactured to comply with DIN VDE 0250 chapter 813. The surface of the fine stranded tinned copper conductors is smoothed with a conductive rubber layer.
Next to it comes the insulation sheath of quality degree 3GI3 to VDE 0207 chapter 20, based on Ethylene Propylene Rubber (EPR).

The radial electric field is limited by another layer of conductive rubber. Inner layer, insulation and outer layer are brought about by a triple extrusion process. As a result, this arrangement is free of partial discharges.

Screening consists of a close spiral wrap of tinned copper wires.
A red polychloroprene jacket of quality degree 5GM3 to DIN VDE 0207 chapter 21 provides the exterior protection.

Standard sizes in both mentioned nominal voltages are shown on the table overleaf, giving all dimensions and technical data.

The short circuit current for 1 s refers to a conductor temperature of 90 deg C before and 250 deg C after the short circuit. This temperature limit is permissible for the insulating material EPR, same as for XLPE.
Thermal short circuit capacity of FELTOFLEX is therefore identical to that of XLPE cable.
Since differences in terms of rated current are also negligible, FELTOFLEX connection cables can be chosen in same cross-sections as XLPE-cables.

Accessories:

FELTOFLEX cables can be fitted and supplied with plug connectors as well as slip-on sealing ends. Electrical tests to VDE 0278 chapter 4 column 1 have been carried out for 20 kV rated voltage on a cable sample of 35 sqmm fitted with Draka indoor sealing ends.
All tests were passed safely.
Under cyclic current load, an AC voltage was applied continuously to the sample. Starting at 35 kV, the voltage was increased weekly by 5 kV, finishing at 85 kV without damage to cable or terminations. During this test the cable was laid in a bend corresponding to 5 times outer diameter.

Bending radius:

Minimum values are 5 times overall cable dia, in line with the described test. When laying the cable, care should be taken to keep the cable bending uniform.

Dimensions:

Cross-section/ cond./screen mm^2	Wire dia. mm	Conductor dia. appr. mm	Insulation thickness mm	Dia. of insulated core mm	Thickness of outer jacket mm	Overall cable dia. appr. mm	Weight appr. kg/m
Rated voltage 10 kV							
1 x 16 / 16	0.4	5.6	3.4	14.0 - 15.0	2.2	22.0	0.76
1 x 25 / 16	0.4	7.0	3.4	15.3 - 16.3	2.2	23.5	0.91
1 x 35 / 16	0.4	8.3	3.4	16.6 - 17.6	2.2	24.5	1.04
1 x 50 / 16	0.4	9.9	3.4	18.2 - 19.2	2.5	27.0	1.26
1 x 70 / 16	0.5	11.8	3.4	20.0 - 21.0	2.5	28.5	1.53
1 x 95 / 16	0.5	13.6	3.4	21.8 - 22.8	2.5	30.5	1.77
1 x 120 / 16	0.5	15.3	3.4	23.7 - 24.7	3.0	33.5	2.18
1 x 150 / 25	0.5	17.0	3.4	25.4 - 26.4	3.0	35.0	2.55
1 x 185 / 25	0.5	18.8	3.4	27.2 - 28.2	3.0	37.0	2.90
1 x 240 / 25	0.5	21.6	3.4	30.0 - 31.0	3.0	41.0	3.59
Rated voltage 20 kV							
1 x 25 / 16	0.4	7.0	5.5	19.5 - 20.5	2.5	28.0	1.18
1 x 35 / 16	0.4	8.3	5.5	20.8 - 21.8	2.5	29.5	1.32
1 x 50 / 16	0.4	9.9	5.5	22.4 - 23.4	2.5	31.5	1.56
1 x 70 / 16	0.5	11.8	5.5	24.2 - 25.2	3.0	34.0	1.92
1 x 95 / 16	0.5	13.6	5.5	26.0 - 27.0	3.0	36.0	2.19
1 x 120 / 16	0.5	15.3	5.5	27.9 - 28.9	3.0	38.0	2.46
1 x 150 / 25	0.5	17.0	5.5	29.6 - 30.6	3.5	40.0	2.99
1 x 185 / 25	0.5	18.8	5.5	31.4 - 32.4	3.5	42.0	3.35
1 x 240 / 25	0.5	21.6	5.5	34.2 - 35.2	3.5	45.0	3.99

Technical Data:

Cross-section cond./screen mm^2	DC-resistance Ω/km	Operat. capacity µF/km	Rated current in air at 30°C A	short circuit current 1 sec. kA	Test voltage AC/DC kV	Bending radius mm
Rated voltage 10 kV						
1 x 16 / 16	1.24	0.26	138	2.3	17 / 42.5	110
1 x 25 / 16	0.795	0.29	183	3.6	17 / 42.5	115
1 x 35 / 16	0.565	0.32	228	5.0	17 / 42.5	120
1 x 50 / 16	0.393	0.36	283	7.2	17 / 42.5	135
1 x70 / 16	0.277	0.42	349	10.0	17 / 42.5	140
1 x 95 / 16	0.210	0.46	421	13.6	17 / 42.5	150
1 x 120 / 16	0.164	0.51	492	17.2	17 / 42.5	165
1 x 150 / 25	0.132	0.57	559	21.5	17 / 42.5	175
1 x 185 / 25	0.108	0.62	630	26.5	17 / 42.5	185
1 x 240 / 25	0.0817	0.69	745	34.3	17 / 42.5	205
Rated voltage 20 kV						
1 x 25 / 16	0.795	0.21	194	3.6	29 / 72.5	140
1 x 35 / 16	0.565	0.23	240	5.0	29 / 72.5	145
1 x 50 / 16	0.393	0.26	300	7.2	29 / 72.5	155
1 x 70 / 16	0.277	0.29	371	10.0	29 / 72.5	170
1 x 95 / 16	0.210	0.32	446	13.6	29 / 72.5	180
1 x 120 / 16	0.164	0.35	520	17.2	29 / 72.5	190
1 x 150 / 25	0.132	0.38	592	21.5	29 / 72.5	200
1 x 185 / 25	0.108	0.41	668	26.5	29 / 72.5	210
1 x 240 / 25	0.0817	0.46	790	34.3	29 / 72.5	225

Special-purpose Flexible Cables according to Customer Specifications



In addition to the flexible cable types presented in this catalogue, we also manufacture cables according to national specifications and customer specifications. Our engineers develop cables in close cooperation with the user.

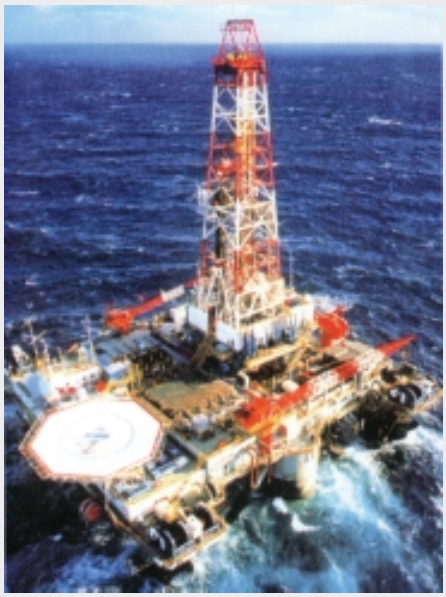
Besides the continuously expanding range of flexible cables with integrated fibre optics, we should like to mention the following examples:

Armoured cables for LHD in ore and salt mines, cables with a tension-proof braid similar to that of the TENAX-ZE (page **26**) have been optimized for these special operating conditions.
Their environmental friendliness and life expectancy gives electric LHD an economic advantage over diesel-driven counterparts.

Special cables for underground coal mining and for off-shore applications, armoured 6-core coal cutter cables, with integrated cores for data transmission have been developed for high-performance machines in underground mines.

Trailing cables with particularly tear-resistant outer sheaths, have been developed for various equipment used in open-cast mining in rocky areas and where there is prolonged exposure to sunlight. These cables possess mechanical properties which far exceed the requirements of offical standards.

Waterproof armoured high-voltage trailing cables are supplied for submersible pumps e.g. in underground mines as well as on oil drilling and processing rigs, also for use in extraordinary depth.



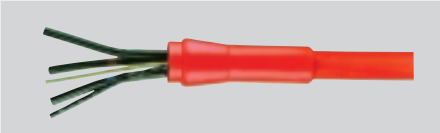


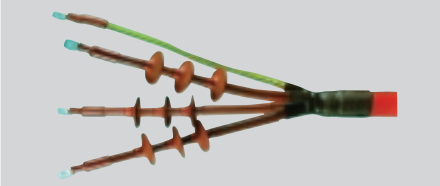
Special cables for local public transport, we produce single core screened flexible cables type **GGSG**, for the electricity supply for railways, with sheaths made of very tear-resistant and abrasion resistant compounds.

DC High-voltage cables, in addition our product range includes different types of X-ray cables, for medical and materials testing applications, up to 250 kV DC, and high-voltage instrumentation cables.

Service Preassembly

Trailing cables with rated voltages over 6 kV generally possess field-limiting outer semi-conductive layers. To ensure trouble-free operation, cables of this type must be equipped with suitable terminations. Damage arising due to the increased field intensity at the point of insulation preparation of the outer semi-conductive layer is thus avoided, and the intrusion of moisture into the cable ends is also prevented.
Terminations are manufactured by Draka in two types, one with resistive field stress control using shrink tubes, and the other with capacitive field stress control using wrapping with self-bonding tapes.
In both cases, the termination can be manufactured with cast resin in conical or cylindrical form or with a spacer cap shrunk on. The cylindrical cast-resin form and the termination with spacer cap create a termination diameter only slightly larger than the normal cable diameter. This allows terminations to be retrofitted into terminal housings (e.g. slipring assemblies) through suitable drillholes.
Additional insulation shields extending creepage distances are shrunk onto terminations destined for outdoor use.
In cables with integrated fibre optics (FO), the terminations are supplied with fusion spliced pigtails (sheathed FO with connecting plug).
Our cables can, if required, be equipped with plug connectors, enabling quick and versatile installation on site. Depending on the particular application, connectors with an outer or inner cone, or 3-phase connector units up to 15 kV with protection category IP 67 can be fitted.
Terminations are fitted both on our own premises, to customer specifications, and on site.In cases where assembly is to be carried out by the user, all the necessary materials can be supplied in kit form together with detailed assembly instructions.







Basic Materials

The most important elastomers

The basic materials used in our compounds chiefly include the following elastomers. Compound codes, basic materials and typical requirements are explained in the table below.

Ethylene propylene rubber (EPR)

This is an outstanding insulation for the medium-voltage range, further distinguished by its resistance to ozone and UV-radiation. The continuous temperature resistance of the vulcanised product lies between 80°C and 100°C.
Even peak temperatures of up to 250°C, arising e.g. from short circuits, cause no serious damage.

EPR is used in two forms, namely as copolymer EPM and terpolymer EPDM.

EPM can only be cross-linked with peroxide and features slightly higher continuous temperature resistance than does the terpolymer.

Thanks to the double linkage in its molecule, it is also possible to cross-link EPDM with sulphur.

Moreover, the use of EPDM leads to better bonding between linked and unlinked compounds, for example in the case of repairs.

Natural rubber (NR) und styrene butadiene rubber (SBR)

With their very similar properties, these two materials can be processed into compounds with very good flexibility. They are therefore a popular choice in applications requiring a mechanical cushioning effect, e.g. in inner sheaths. These materials also possess very good dielectric properties and are also suitable for use as insulating materials.

NR is a natural product obtained from the latex of rubber trees.
Its chemical definition is polyisoprene.

SBR is produced as a polymer from styrene and butadiene.

Polychloroprene (PCP)

Mechanically speaking, an extremely robust sheath material offering particularly high tear and abrasion resistance. The vulcanised product displays good resistance to oil, and their chlorine components also make them flame-retardant. Resistance to continuous temperature lies between 70°C and 90°C. With an appropriate compound, low-temperature flexibility down to minus 45°C can be achieved.

PCP is obtained from 2-chlorine butadiene via polymerisation.

Chlorosulphonated polyethylene (CSP)

These vulcanised products generally feature very similar properties to the polychloroprene mixtures, but are superior to these in terms of resistance to continuous temperature, light and ozone.
Their light resistance is particularly advantageous in situations where permanently colour-fast outer sheaths are desired.

CSP is produced by introducing chlorine and sulphonyle chloride groups into polyethylenes.

Chlorinated polyethylene (CM) is formed by introducing chlorine into polyethylene. Its molecular structure, similar to that of CSP, is responsible for its largely CSP-like characteristics.

	Insulation-		Sheath Compound							
Code of compound type	EI4	3GI3	EM1	EM2	EM3	EM5	GM1b	5GM3	5GM5	HM3
Material basis, generally	EPR	EPR NR	SBR	CR	EPR CSM	CR,CM,	SR	CR	CR	halogen-free polymeric compound
Specified for cables with max. permissible operating temperature in conductor °C	60	90	60	60	60	90	90	90	90	90
Mechanical properties before ageing										
Tensile strength min. N / mm²	5.0	4.2	7.0	10.0	7.0	10.0	4.2	10.0	15.0	10.0
Elongation at break min. %	200	200	300	300	250	300	200	300	300	125
Oil-resistant according to VDE 0472, Teil 803				●		●		●	●	●
Flameproof according to VDE 0472, Teil 804*				●		●		●	●	●
Abrasion and tear-resistant according to VDE 0472, Teil 605 und 613									●	

Letter Coding
Areas of Use

Additional letter codes for models NSSHOEU NTMWOEU and NTSWOEU	
K	Ruber centre space
C	Conductive metal covering above stranded cores or between inner and outer sheath
CG	Conductive non-metal covering above stranded cores or between inner and outer sheath
CE	Conductive metal covering above above live conductor insulation
CGE	Conductive non-metal covering above above live conductor insulation
R	Round-wire armouring
RL	Pliable wire armour or braided armour
/3	Earth conductor evenly distributed in interstices
/3E	Earth conductor evenly distributed above live conductor insulation
KON	Concentric earth conductor between inner and outer sheath
ST	Control cores within cable
FM	Telecommunication cores within cable
ÜL	Monitoring wire within cable

	Page	Rated voltage U_0/U					Permissible temperatures				Use in accordance with specifications					Mech. load in mobile use				For connection of (Example)						Particular properties			
							at conductor		at Cable surface																				
		300/500V	450/750V	0,6/1 kV	1,7/3 kV und 3,5/6 kV	≥ 6/10 kV	in operation	in sht. circuit*	fixed install.	mobile appl.	fixed installation	connection mobile units	in damp areas	outdoors	self suspended	low	medium	high	positive cable guid.	domestic & man. equip.	tools	large units & machines	welding electrodes	street lighting	oil-resistant	low flammability	abrasn & tear resistant	halogen-free
H07RN-F	4		●				+60	+200	+60/-40	+60/-25		●	●	●		●			●	●	●		●	●				
NSHTOEU	30		●									●	●	●	(X)			●	●		●	●			●	●	(X)	
NSSHOEU	12			●					+90 -40	+90 -25		●	●	●	(X)			●	(X)		●	●	●		●	●	●	
NTS...WOEU	34			●	●	●	+90	+200	+80/-40	+80/-25		●	●	●	(X)			●	●			●			●	●	(X)	
NSGAFOEU	8			●	●						●													●	●			●
NSHXAFOE	8			●	●						●													●	●		●	
H01N2	10						+80	+200	+85 -40	+85 -25		●	●	●			●					●		●	●			
NYNT	46	●					+70	+160	+70 -40	+70 +5	●			●	●									●		●		

* = the permissible short-circuit temperature is limited to 200°C for tin-coated conductor version and 160°C for softsoldered connections.

● = suitable

(X)= special version possible

Wire Diameters and Conductor Resistance of Fine and Very fine stranded Conductors For Single and Multi-core Cables (According to VDE 0295, Tables 3 and 4)

Conductor cross-section mm²	Largest wire diameter		D.C. resistance limits at 20°C	
	Fine stranded Conductor (Class 5) mm	Very fine stranded Conductor (Class 6) mm	bare wires Ω/km	Tinned wires Ω/km
1.5	0.26	0.16	13.3	13.7
2.5	0.26	0.16	7.98	8.21
4	0.31	0.16	4.95	5.09
6	0.31	0.21	3.30	3.39
10	0.41	0.21	1.91	1.95
16	0.41	0.21	1.21	1.24
25	0.41	0.21	0.780	0.795
35	0.41	0.21	0.554	0.565
50	0.41	0.31	0,386	0.393
70	0.51	0,31	0.272	0.277
95	0.51	0.31	0.206	0.210
120	0.51	0.31	0.161	0.164
150	0.51	0.31	0.129	0.132
185	0.51	0.41	0.106	0.108
240	0.51	0.41	0.0801	0.0817
300	0.51	0.41	0.0641	0.0654

Current-carrying Capacity of Cable Types NSSHOEU, NTS...WOEU and NTM...WOEU (According to DIN VDE 0298 Part 4)

Nominal cross-section mm2	Rated voltage up to 10 kV					Rated voltage over 10 kV				
	laid straight	reeled in 1 layer	2 layers	3 layers	laid 4 layers	laid straight	reeled in 1 layer	2 layers	3 layers	4 layers
2,5	30	-	-	-	-	-	-	-	-	-
4	41	33	25	20	17	-	-	-	-	-
6	53	42	32	26	22	-	-	-	-	-
10	74	59	45	36	31	-	-	-	-	-
16	99	79	60	49	42	105	84	64	51	44
25	131	105	80	64	55	139	111	85	68	58
35	162	130	99	79	68	172	138	105	84	72
50	202	162	123	99	85	215	172	131	105	90
70	250	200	153	123	105	265	212	162	130	111
95	301	241	184	147	126	319	255	195	156	134
120	352	282	215	172	148	371	297	226	182	156
150	404	323	246	198	170	428	342	261	210	180
185	461	369	281	226	194	488	390	298	239	205

Conversion factors for current-carrying capacity at ambient temperatures deviating from 30°C

Ambient temperature °C	20	25	30	35	40	45	50
Conversion factor	1.10	1.05	1.0	0.95	0.89	0.84	0.77

Current-carrying Capacity of Cables Types H07RN-F, A07RN-F (According to DIN VDE 0298, Part 4)

Cross-section mm²	For single core rubber-insulated cables overhead, hanging freely	For multi-core, rubber insulated cables with three loaded cores, lying on or against surfaces (except where used for domestic or manual equipment
1.5	24	18
2.5	32	26
4	42	34
6	54	44
10	73	61
16	98	82
25	129	108
35	158	135
50	198	168
70	245	207
95	292	250
120	344	292
150	391	335
185	448	382
240	528	453
300	608	523
400	726	-
500	830	-

Conversion factors for current-carrying capacity at ambient temperatures deviating from 30°C

Ambient temperature °C	20	25	30	35	40	45	50
Conversion factor	1.15	1.08	1.0	0.91	0.82	0.71	0.58

Short-circuit Capacity

Initial conductor temperature in °C	Short-circuit current density in A/mm² for 1 sec. at a final conductor temperature of 150°C	160°C	200°C	250°C
20	145	150	165	181
30	138	143	159	176
40	131	136	153	170
50	124	129	147	165
60	117	122	141	159
70	109	115	135	154
80	-	108	128	149
90	-	100	122	143

Conversion for tripping times t (t<5s)

$$I_t = \frac{I_1}{\sqrt{t}}$$

Insulation material	Permissible operation temperature/ °C	Permissible short-circuit temperature/ °C
NR / SR	60	200
PVC (flexible)	70	150
EPR	90	250
Tinned cond.		200
Soft soldered connection		160

Notes

The product descriptions in our publications arc correct to the best of our knowledge. They reflect the present state of the technology and our capabilities. The details are a general description of the characteristics of our products, which do not necessarily apply to every purpose or under all conditions. The descriptions do not release the user from the responsibility of testing the products for suitability for the specific purpose. In cases of doubt, please contact our Service Department.

Rubber cables - when flexibility counts