



TRATOS*FLEX*

TRATOS
CAVI

october 2004

TRATOS *FLEX*





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PRODUCT RANGE

CONTROL CABLES	Rubber Insulation & Sheath	Standard VDE 0250 t. 814	TRATOSFLEX- NSHTÖU-JZ	Standard cable	10
			TRATOSFLEX- NSHTÖU-JZK	Standard cable for low temperature	10
		Standard CEI 20.13	TRATOSMART	Reduced dimension	12
	Thermoplastic Insulation & Sheath		TRATOSLIGHT	Very low weight & dimension	14
POWER L.V.	Thermoplastic Insulation & Sheath		TRATOSLIGHT	Very low weight & dimension	16
	Rubber Insulation & Sheath	Standard VDE 0250 t. 814	TRATOSFLEX - NSHTÖU-J	Standard cable	18
			TRATOSFLEX- NSHTÖU-JK	Standard cable for low temperature	18
		Standard CEI 20.13	TRATOSMART	Reduced dimension	20
	POWER M.V.	Rubber Insulation & Sheath	Standard VDE 0250 t. 813	TRATOSFLEX-OCS	Overall Copper Screen
NEW TRATOSFLEX-ES *				Extruded Screen Reduced weight and dimension	24
TRATOSFLEX-FO OCS				Overall Copper Screen	26
NEW TRATOSFLEX-FO ES **				Extruded Screen Reduced weight and dimension	28
TRATOSFLAT					30
			TRATOSFIBRE		32

* Cables manufactured according to CEI 20-13 & VDE 0250 TEIL 813 (as applicable) & HD 620 S1 p.9

** Cables manufactured according to CEI 20-13 & VDE 0250 TEIL 813 (as applicable) & HD 620 S1 p.9

CABLES TAYLOR MADE UPON REQUEST

- 1) Low toxicity and fumes (e.g. for tunnels, buildings...): Halogen Free Type
- 2) Fire retardance (bunched low voltage cables)
- 3) Improved characteristic to chemical aggression
- 4) Improved resistance to low temperatures (up to -50°C only for black outer sheath)
- 5) Composed Cables (e.g. power and control cores screened or not)

TRATOS CAVI S.p.A. reserves the right to make at any time and without previous notice, variations on products described in this catalogue. Moreover TRATOS CAVI S.p.A. shall not have responsibility for improper use of its electrical cables.

october 2004

TRATOSFLEX

1. Selection of cable type in relation to use

In relation to the type of application the cable designs shall adopt construction characteristics required to give the cable the best performance in relation to its application.

Other important factors which are also considered for all the types are:

- Operating temperature;
- Tensile Stress;
- Bending Radius;
- Operating speed.

Table 1a Different cables

TYPES OF CABLES					
				Operating Temp. Min. value	Max. Tensile Load N/mm²
CONTROL CABLES	Rubber Insulation & Sheath	Standard VDE 0250 t. 814	TRATOSFLEX- NSHTÖU-JZ	-25 °C	15
			TRATOSFLEX- NSHTÖU-JZK	-40 °C	15
		Standard CEI 20.13	TRATOSMART	-25°C	15
	Thermoplastic Insulation & Sheath		TRATOSLIGHT	-30°C	20
POWER L.V.	Thermoplastic Insulation & Sheath		TRATOSLIGHT	-30°C	20
	Rubber Insulation & Sheath	Standard VDE 0250 t. 814	TRATOSFLEX - NSHTÖU-J	-25°C	20
			TRATOSFLEX- NSHTÖU-JK	-40°C	20
		Standard CEI 20.13	TRATOSMART	-25 °C	15
POWER M.V.	Rubber Insulation & Sheath	Standard VDE 0250 t. 813	TRATOSFLEX-OCS	-30°C	20
			NEW TRATOSFLEX-ES	-30°C	20
			TRATOSFLEX-FO OCS	-30°C	20
			NEW TRATOSFLEX-FO ES	-30°C	20
			TRATOSFLAT	-30°C	20
			TRATOSFIBRE	-25°C	

2. Recommended Bending Radius

The recommended values for different uses are given in Table 2.

Table 2

	APPLICATIONS				
TYPES OF CABLES	Festoons	Reels		Cable Carrier Chains	Fixed Installation
		monospyral	cylindrical		
L. V. up to 1 kV	5 X O.D.	6 X O.D.	5 X O.D.	10 X O.D.	4 X O.D.
M. V. over 1 kV	10 X O.D.	12 X O.D.	10 X O.D.	10 X O.D.	6 X O.D.

Where the OD is the overall diameter in mm.

Smaller bending radius values may be tolerated especially for low speed operations.



Table 1b Different cables

	Reels					Festoons	Cable Tender System	Cable Carrier Chains	Guide Pulley Systems	
	Cable Laid on Ground									
DESIGN										
Operating max speed (Mt./min.)	60	180	60	180	180	180	210	160	120	160
CONTROL CABLES										
TRATOSFLEX-NSHTÖU-JZ		o		o	x		o			
TRATOSFLEX-NSHTÖU-JZK		o		o	x		o			
TRATOSMART		o				o				
TRATOSLIGHT	o		o					o	x	o
POWER L.V.										
TRATOSLIGHT	o		o					o	x	o
TRATOSFLEX-NSHTÖU-J		o		o	x		o			
TRATOSFLEX-NSHTÖU-JK		o		o	x		o			
TRATOSMART		o				o				
POWER M.V.										
TRATOSFLEX-OCS	o		o		x					
NEW TRATOSFLEX-ES		o		o	o					
TRATOSFLEX-FO OCS	o		o		x					
NEW TRATOSFLEX-FO ES		o		o	o					
TRATOSFLAT		o								
TRATOSFIBRE						o				

o = Main Application
x = Suitable



TRATOS FLEX

3. Current carrying capacities for continuous operation (at 30°C): 3 core cables + earth conductor

Table 3 The values are given by VDE 0298 P. 4

Cross section mm ²	One cable	Festoon	Multi spire reels					Mono spire reels	
	Layd on ground A	Suspended freely in air A	Reeled in 1 layer A	Reeled in 2 layers A	Reeled in 3 layers A	Reeled in 4 layers A	Reeled in 5 layers A	Round cables A	Flat cables A
	(Factor 1)*	(1.05)*	(0.80)*	(0.61)*	(0.49)*	(0.42)*	(0.34)*	(0.80)*	(0.50)*
1	18	19	14	11	9	8	6	14	9
1,5	23	24	18	14	11	10	8	18	11
2,5	30	32	24	18	15	13	10	24	15
4	41	43	33	25	20	17	14	33	21
6	53	56	42	32	26	22	18	42	28
10	74	78	59	45	36	31	25	59	39
16	99	104	79	60	49	42	34	79	52
25	131	138	105	80	64	55	45	105	65
35	162	170	130	99	79	68	55	130	81
50	202	212	162	123	99	85	69	162	101
70	250	263	200	153	123	105	85	200	125
95	301	316	241	184	147	126	102	241	155
120	352	370	282	215	172	148	120	282	176
150	404	424	323	246	198	170	137	323	202
185	461	484	369	281	226	194	157	369	230
240	540	567	432	329	265	227	184	432	270
300	620	651	496	378	304	260	211	496	310

* Correction factor

Table 3a CURRENT-CARRING CAPACITY - Correction factor for ambient temperatures other than 30°C

Ambient Temperature °C	10	20	25	35	40	45	50	55	60	65	70	75
Correction Factor	1,18	1,10	1,05	0,95	0,89	0,84	0,77	0,71	0,63	0,55	0,45	0,32

Table 3b CURRENT-CARRING CAPACITY - Correction factor for different multicore cables

Number of conductor loaded	5	7	10	14	19	24	40
Correction Factor	0,75	0,65	0,55	0,50	0,45	0,40	0,35

4. Current carrying capacities for intermittent operation

In case of intermittent operation, for example, period of 10 minutes of full load is followed by a longer period with no load. These 10 minutes taken as percentage of total duration DT of the cycle provides a percentage load factor.

$$\text{Load factor FC \%} = (10\text{mi} / \text{DT}) \times 100$$

In this case the current carrying capacity as calculated using table 1, can be increased using factors given in table 4.

Table 4

Cable cross section (mm ²)	1,5	2,5	4	6	10	16	25	35	50	70	95	120	150	185	240	300
Load Factor (FC %)	Correction factors															
60%	1,00	1,00	1,00	1,00	1,03	1,07	1,10	1,13	1,16	1,18	1,20	1,21	1,22	1,23	1,24	1,25
40%	1,00	1,00	1,03	1,04	1,09	1,16	1,23	1,28	1,34	1,38	1,42	1,44	1,46	1,48	1,49	1,50
25%	1,00	1,02	1,05	1,13	1,21	1,34	1,45	1,53	1,62	1,69	1,74	1,78	1,81	1,82	1,85	1,87
20%	1,00	1,04	1,11	1,18	1,31	1,45	1,59	1,69	1,79	1,87	1,93	1,97	2,01	2,04	2,10	2,15
15%	1,00	1,08	1,19	1,27	1,44	1,62	1,79	1,90	2,03	2,13	2,21	2,26	2,30	2,32	2,36	2,39



5. Three phase voltage drop

Table 5 Factor calculation of voltage drop

Nominal cable	Operating electrical resistance (R) at 80°C	Reactance (x) at 50 Hz for three core + earth cables at operating voltage of:						Voltage drop
Cross section	A.C. 50 Hz	up to 1kV	3 kV	6 kV	10 kV	15 kV	20 kV	factor K
mm ²	(Ohm / km)	(Ohm / km)	(Ohm / km)	(Ohm / km)	(Ohm / km)	(Ohm / km)	(Ohm / km)	(cos = 0,8)
		(indicative value) kA						m V/A m
1,5	16,950	0,103						23,5
2,5	10,150	0,109						14,2
4	6,290	0,095						8,8
6	4,200	0,090						5,93
10	2,410	0,087	0,0970					3,45
16	1,540	0,086	0,0950	0,105	0,118			2,24
25	0,986	0,081	0,0900	0,102	0,110	0,124		1,46
35	0,700	0,078	0,0870	0,097	0,108	0,121	0,131	1,06
50	0,490	0,077	0,0830	0,094	0,103	0,114	0,123	0,77
70	0,345	0,076	0,0800	0,090	0,095	0,108	0,113	0,57
95	0,260	0,075	0,0790	0,088	0,093	0,104		0,45
120	0,205	0,074	0,0770	0,085	0,091			0,36
150	0,163	0,074	0,0760	0,083	0,089			0,3
185	0,134	0,073	0,0740	0,081				0,26
240	0,101	0,072	0,0740					0,22

The value is calculated by multiplying the factors K (mV/Am) given in the table by effective current capacity I (A) of the cable then by the length of the connection L (in km):

$$\text{Voltage drop (v)} = I \text{ (A)} \times L \text{ (km)} \times K \text{ (mV/Am)}$$

The factors have been calculated using the formula:

$$K \text{ (mV/Am)} = 1.73 \times (R \cos \phi + X \sin \phi)$$

Where:

R = resistance of the conductor (Ohm/km) at operating temperature of 80°C and frequency of 50 Hz

X = Cable reactance (Ohm/km) at 50 Hz

6. Short circuit Current

Short circuit current (Thermal limit of short circuit) in duty mobile service cables, must be calculated using the following reference values (VDE 0250 c.8/75)

Initial = 80°C (cable under full load)

Final short circuit temperature = 200°C

The short circuit currents (thermal limit) given in the below table have been calculated using these values and are valid for a base time of 1 sec.

Table 6

Nominal cable Cross section mm ²	One second Thermal Limit for all voltages kA	Dynamic limit for three cores cables					
		up to 1kV	3 kV	6 kV	10 kV	15 kV	20 kV
		indicative value (1) kA					
1,5	0,20						
2,5	0,32						
4	0,51						
6	0,77						
10	1,29						
16	2,06	30	40	45	50	55	
25	3,22	35	43	50	55	60	
35	4,50	40	48	53	60	65	75
50	6,43	45	50	58	63	70	80
70	9,00	50	55	63	68	75	83
95	12,20	55	60	70	75	75	
120	15,40	60	65	72	78	80	
150	19,30	65	68	75	80		
185	23,80	70	72	80	84		
240	31,00	80					

For a different Initial and final temperature (for example 90° C Initial and 250°C Final temperature admissible for our cable EPR insulated) . The thermal limits are calculated with

$$I_{cc}(a) = \frac{K_{cc} \times \text{conductor cross section (mm}^2\text{)}}{\sqrt{t \text{ (sec)}}}$$

Where the coefficient Kcc assumes the following values:

Final short circuit Temperature ° C	Initial short circuit temperature (of the conductor)						
	30 ° C	40 ° C	50 ° C	60 ° C	70 ° C	80 ° C	90 ° C
160	143	136	129	122	115	107	100
200	159	153	147	141	135	128	122
250	176	170	165	159	154	148	143

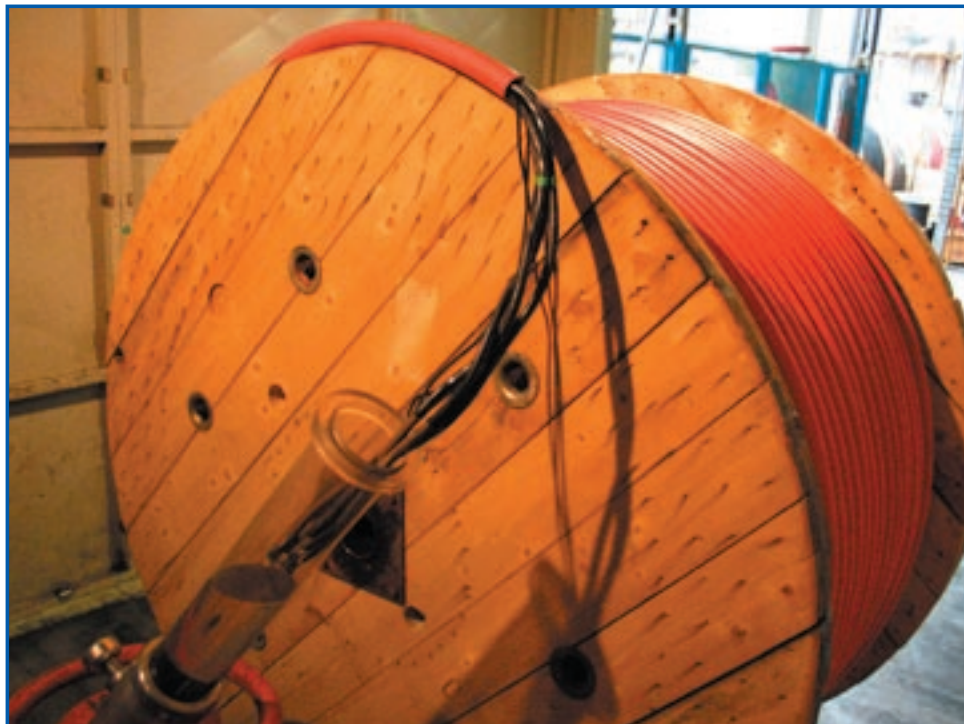
(1) Indicative value because in flexible cables only a very special construction (e.g. pitch conductors, cores assembly...) reduce the electrodynamic forces from separating the grouped cores.



7. General recommendations

To avoid:

- Misalignment in order to avoid cable torsion
- Sudden changes of bending radius
- Overtension of the cable
- Change of direction within a distance of less than 20 times cable O.D.
- Use of sheaves not Having a flat profile



TRATOSFLEX

8. CONTROL CABLES 0,6/1 kV according to VDE 0250 part 814

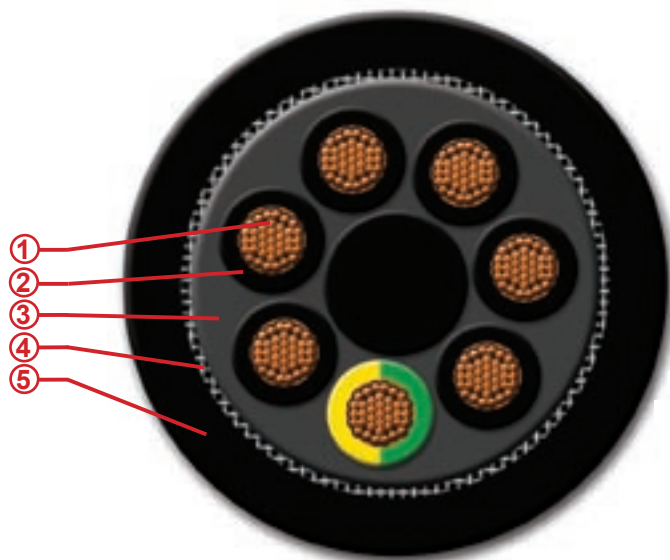
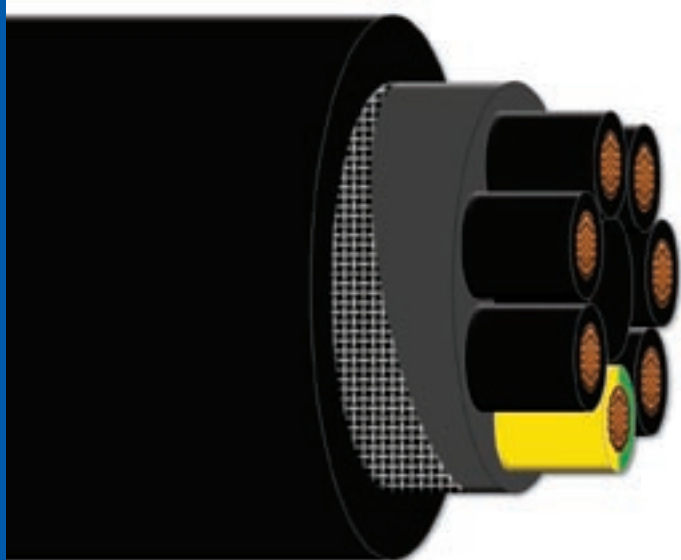
TRATOSFLEX - NSHTÖU-JZ

TRATOSFLEX - NSHTÖU-JZK ⁽¹⁾

FEATURES AND PERFORMANCES

Rated Voltage 06/1 kV
Max Voltage AC 0,7/1,2 kV
AC Voltage Test 2.5 kV

- 1- Tinned flexible conductor Cl. 5 VDE 0295
- 2- EPR insulation type 3GI3
- 3- Inner Sheath PCP
- 4- Antitorsional protection
- 5- Outer sheath 5GM3



Installation Temperature:	
Fixed Installation	- 35 °C
Mobile Installation	- 25 °C TRATOSFLEX-JZ
	- 40 °C TRATOSFLEX-JZ-K ⁽¹⁾

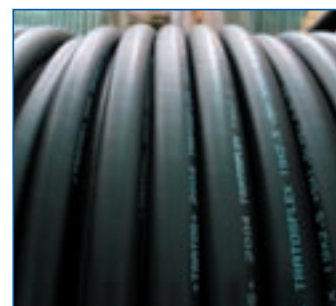
Travel Condition:	Suitable
	mt / minute max
FESTOON	210
MONOSPIRAL REEL	180
CYLINDRICAL REEL	180

(1) Produced on request


 Table 8 - **TRATOSFLEX** NSHTÖU-JZ & **TRATOSFLEX** NSHTÖU-JZK ⁽¹⁾

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
7X1,5	0,26	0,6/1 kV	90	200	157	17,0	19,5	0,500
12X1,5	0,26	0,6/1 kV	90	200	270	20,5	23,0	0,700
18X1,5	0,26	0,6/1 kV	90	200	405	22,5	25,5	0,900
24X1,5	0,26	0,6/1 kV	90	200	540	26,5	29,5	1,100
30X1,5	0,26	0,6/1 kV	90	200	675	28,0	31,5	1,300
36X1,5	0,26	0,6/1 kV	90	200	810	30,0	33,0	1,600
7X2,5	0,26	0,6/1 kV	90	200	262	19,5	21,5	0,600
12X2,5	0,26	0,6/1 kV	90	200	450	23,0	25,2	0,900
18X2,5	0,26	0,6/1 kV	90	200	675	27,0	30,0	1,200
24X2,5	0,26	0,6/1 kV	90	200	900	31,0	34,0	1,600
30X2,5	0,26	0,6/1 kV	90	200	1125	32,5	36,0	1,900
36X2,5	0,26	0,6/1 kV	90	200	1350	35,5	39,0	2,200

(1) Produced on request



TRATOSFLEX

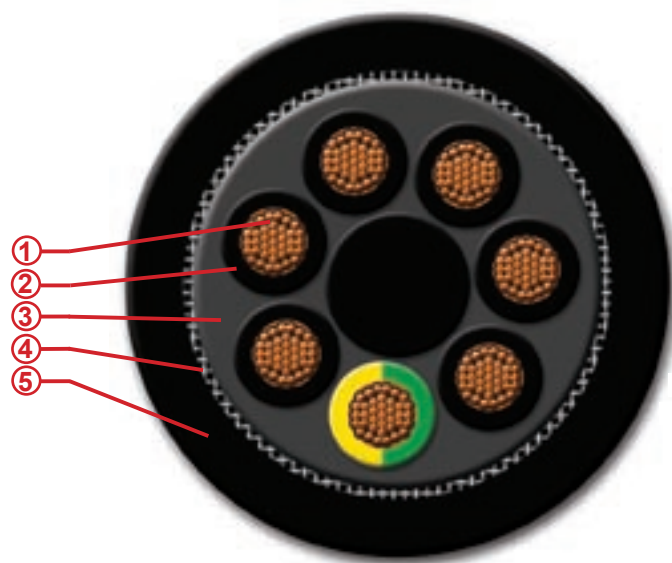
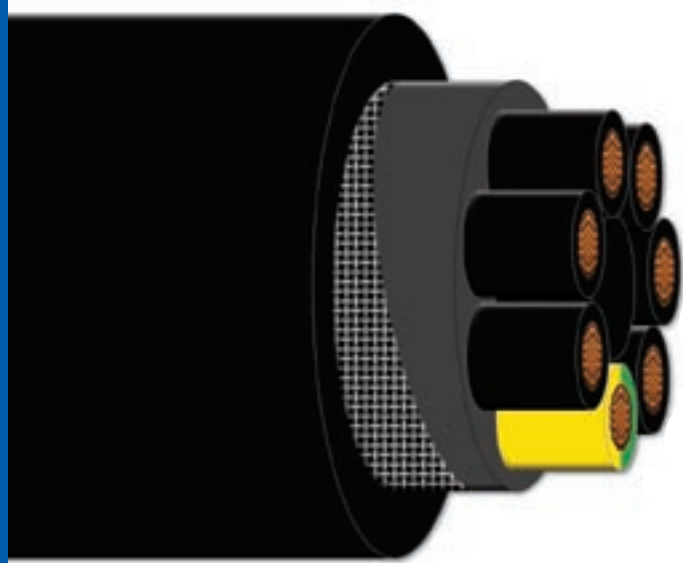
9. CONTROL CABLES 0,6/1 kV according to standard CEI 20-13 1999-05

TRATOSMART

FEATURES AND PERFORMANCES

Rated Voltage 0,6/1 kV
Max Voltage AC 0,7/1,2 kV
AC Voltage Test 2.5 kV

- 1- Tinned flexible conductor cl. 5 IEC228
- 2- Special HEPR
- 3- Inner Sheath KZ (black PCP)-5GM3
- 4- Antitorsional protection
- 5- Outer sheath KZ (black PCP)-5GM3

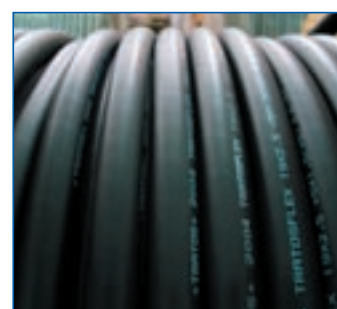


Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 25 ° C

Travel Condition:	Suitable
	mt / minute max
FESTOON	180
MONOSPIRAL REEL	120


 Table 9 - **TRATOSMART**

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
7X1,5	0,26	0,6/1 kV	90	200	157	15,0	17,5	0,400
12X1,5	0,26	0,6/1 kV	90	200	270	20,8	22,8	0,680
18X1,5	0,26	0,6/1 kV	90	200	405	21,0	23,0	0,630
24X1,5	0,26	0,6/1 kV	90	200	540	24,6	26,6	0,950
30X1,5	0,26	0,6/1 kV	90	200	675	26,0	28,0	1,100
36X1,5	0,26	0,6/1 kV	90	200	810	28,0	30,5	1,300
7X2,5	0,26	0,6/1 kV	90	200	262	17,0	19,5	0,540
12X2,5	0,26	0,6/1 kV	90	200	450	23,5	25,5	0,900
18X2,5	0,26	0,6/1 kV	90	200	675	24,0	26,0	1,000
24X2,5	0,26	0,6/1 kV	90	200	900	27,8	29,8	1,380
30X2,5	0,26	0,6/1 kV	90	200	1125	29,0	31,0	1,650
36X2,5	0,26	0,6/1 kV	90	200	1350	32,0	35,0	1,870



TRATOSFLEX

10. LOW VOLTAGE CONTROL CABLES 0,6/1 kV

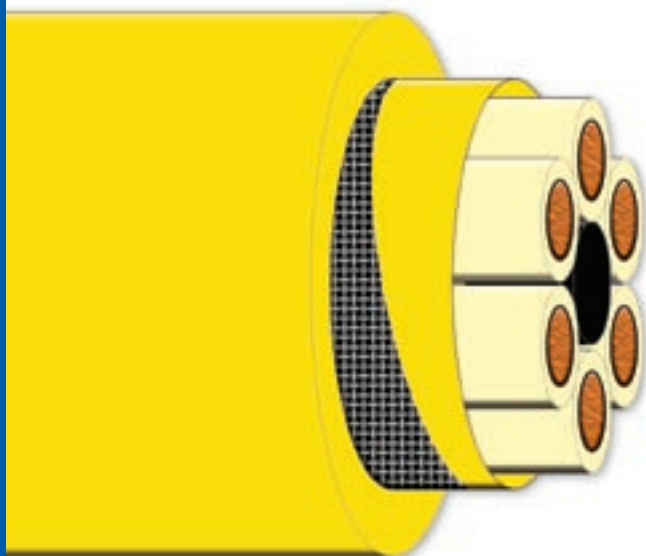
TRATOSLIGHT

HALOGEN FREE

FEATURES AND PERFORMANCES

Rated Voltage 06/1 kV
Max Voltage AC 0,7/1,2 kV
AC Voltage Test 2.5 kV

Conductor: Very fine plain copper cl. 6 VDE 0295
Insulation: Thermoplastic material
Global assembly: Short pitch and wrapped
Inner Sheath: Thermoplastic material
Braid: Antitorsional embedded in between inner and outer sheath
Outer Sheath: Polyurethane



Installation Temperature:	
Fixed Installation	- 50 ° C
Mobile Installation	- 30 ° C

Travel Condition:	Suitable	Tensile Load
	mt / minute max	N / mm ²
CABLE TENDER SYSTEM	160	20
GUIDE PULLEY SYSTEMS	160	20


 Table 10 - **TRATOSLIGHT**

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
7X1,5	0,16	0,6/1 kV	80	200	157	14,5	16,0	0,300
12X1,5	0,16	0,6/1 kV	80	200	270	17,2	18,7	0,430
20X1,5	0,16	0,6/1 kV	80	200	405	20,0	21,5	0,600
24X1,5	0,16	0,6/1 kV	80	200	540	23,0	25,0	0,740
30X1,5	0,16	0,6/1 kV	80	200	675	24,0	26,0	0,900
36X1,5	0,16	0,6/1 kV	80	200	810	25,0	28,0	1,050
7X2,5	0,16	0,6/1 kV	80	200	262	16,5	18,0	0,380
12X2,5	0,16	0,6/1 kV	80	200	450	19,5	21,5	0,600
20X2,5	0,16	0,6/1 kV	80	200	675	22,0	24,0	0,800
24X2,5	0,16	0,6/1 kV	80	200	900	26,0	28,0	1,050
30X2,5	0,16	0,6/1 kV	80	200	1125	27,0	29,5	1,270
36X2,5	0,16	0,6/1 kV	80	200	1350	29,0	32,0	1,500



TRATOSFLEX

10. LOW VOLTAGE POWER CABLES 0,6/1 kV

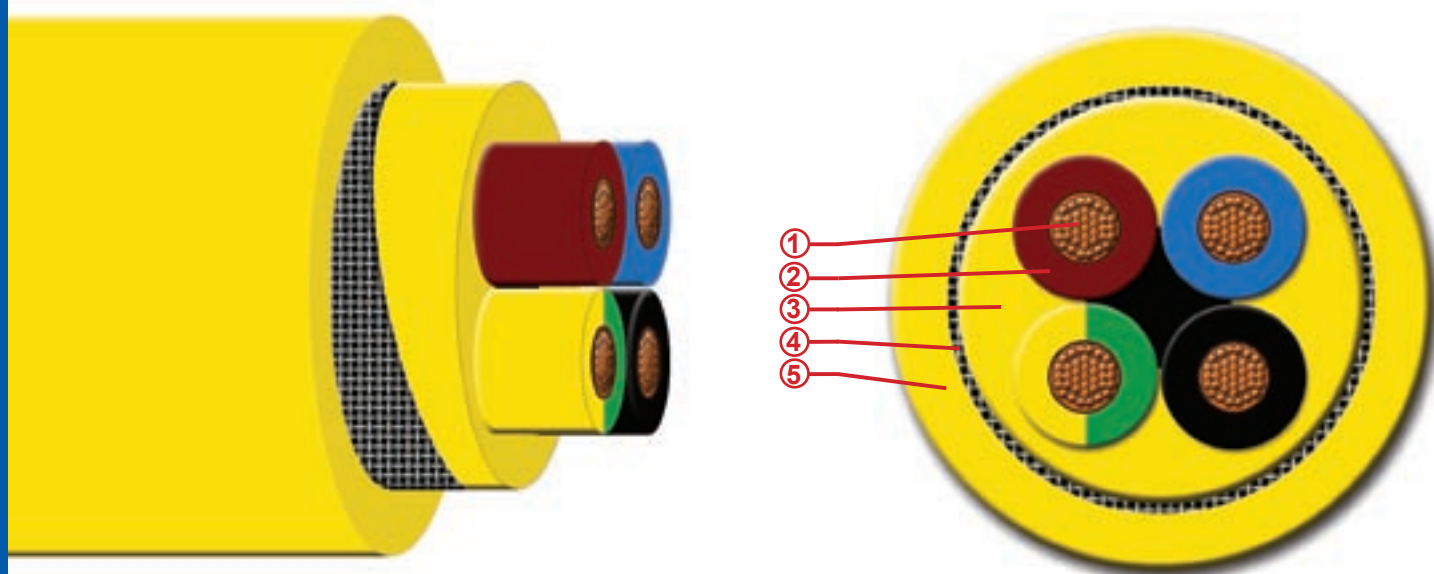
TRATOSLIGHT

HALOGEN FREE

FEATURES AND PERFORMANCES

Rated Voltage 0,6/1 kV
Max Voltage AC 0,7/1,2 kV
AC Voltage Test 2.5 kV

- 1 - Plain copper conductor cl. 5 VDE 0295
- 2 - Insulation special thermoplastic material
- 3 - Inner sheath thermoplastic material
- 4 - Antitorsional protection
- 5 - Outer sheath polyurethane



Installation Temperature:	
Fixed Installation	- 50 ° C
Mobile Installation	- 30 ° C

Travel Condition:	Suitable	Tensile Load
	mt / minute max	N / mm ²
REELING OR TRAILING OPERATION ON REELS - ESCAVATORS - DRAGLINE - JUMBOS	60	20


 Table 11 - **TRATOSLIGHT**

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
4X2,5	0,26	0,6/1 kV	85	200	200	12,6	14,5	0,230
4X4	0,31	0,6/1 kV	85	200	320	14,7	16,7	0,340
4X6	0,31	0,6/1 kV	85	200	480	17,0	19,0	0,450
4X10	0,41	0,6/1 kV	85	200	800	20,2	22,2	0,700
4X16	0,41	0,6/1 kV	85	200	1280	23,5	25,5	1,050
4X25	0,41	0,6/1 kV	85	200	2000	27,5	30,0	1,500
4X35	0,41	0,6/1 kV	85	200	2800	30,5	33,0	1,950
3X50+3X25/3	0,51/0,41	0,6/1 kV	85	200	3000	34,5	37,0	2,400
3X70+3X35/3	0,51/0,41	0,6/1 kV	85	200	4200	39,5	42,0	3,300
3X95+3X50/3	0,51/0,41	0,6/1 kV	85	200	5700	42,5	45,5	4,250
3X120+3X70/3	0,51/0,41	0,6/1 kV	85	200	7200	47,0	50,0	5,400
3X150+3X70/3	0,51/0,41	0,6/1 kV	85	200	9000	51,0	54,0	6,400
3X185+3X95/3	0,51/0,41	0,6/1 kV	85	200	11100	56,5	59,5	8,000
3X240+3X120/3	0,51/0,41	0,6/1 kV	85	200	14400	63,5	66,5	9,900

 Table 12 - **TRATOSLIGHT FO**

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
3X50+2X25/2+6FO	0,51/0,41	0,6/1 kV	85	200	3000	37,5	40,5	2,900
3X70+2X35/2+6FO	0,51/0,41	0,6/1 kV	85	200	4200	40,0	43,0	3,500
3X95+2X50/2+6FO	0,51/0,41	0,6/1 kV	85	200	5700	46,0	49,0	4,550



TRATOSFLEX

12. LOW VOLTAGE POWER CABLES 0,6/1 kV according to VDE 0250 part 814

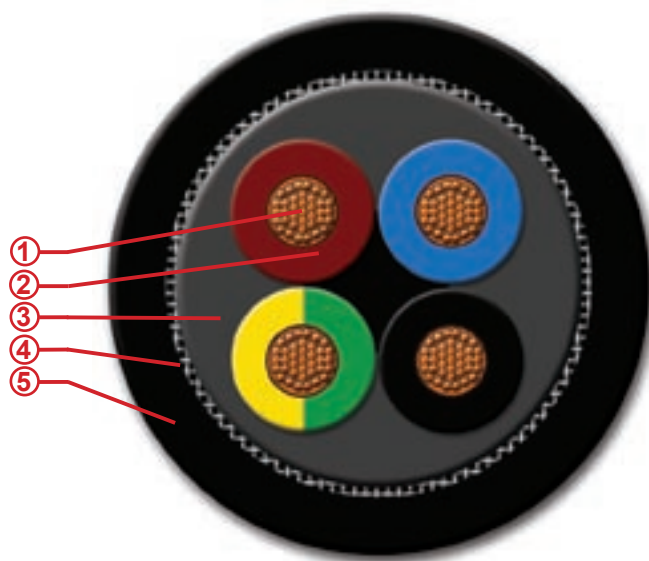
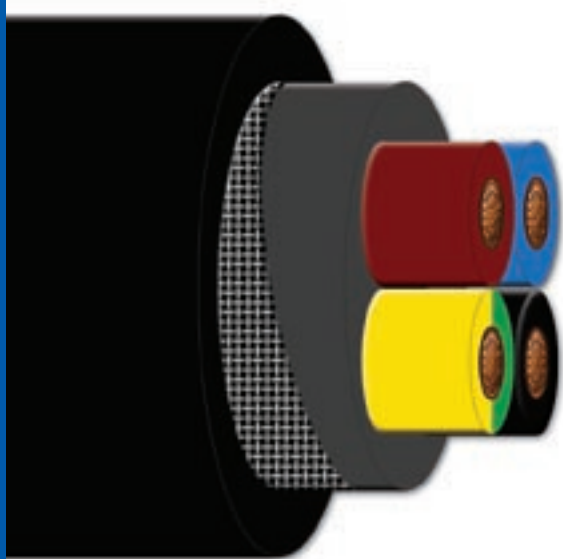
TRATOSFLEX - NSHTÖU-J

TRATOSFLEX - NSHTÖU-JK ⁽¹⁾

FEATURES AND PERFORMANCES

Rated Voltage 06/1 kV
Max Voltage AC 0,7/1,2 kV
AC Voltage Test 2.5 kV

- 1 - Tinned flexible conductor Cl. 5 VDE 0295
- 2 - EPR insulation type 3GI3
- 3 - Inner sheath PCP
- 4 - Antitorsional protection
- 5 - Outer sheath 5GM3



Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 25 ° C TRATOSFLEX
	- 40 ° C TRATOSFLEX - K (1)

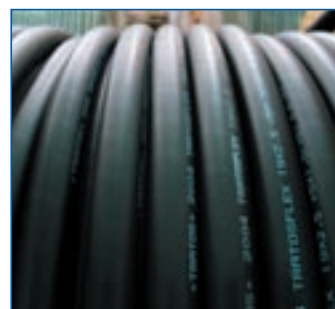
Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	180
CYLINDRICAL REEL	180

(1) Produced on request


 Table 13 - **TRATOSFLEX** NSHTÖU-J & **TRATOSFLEX** NSHTÖU-JK (1)

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
4X1,5	0,26	0,6/1 kV	90	200	120	12,5	14,5	0,300
4X2,5	0,26	0,6/1 kV	90	200	200	15,0	17,5	0,400
4X4	0,31	0,6/1 kV	90	200	320	17,2	20,0	0,500
4X6	0,31	0,6/1 kV	90	200	480	18,7	21,5	0,700
4X10	0,41	0,6/1 kV	90	200	800	23,0	26,0	1,000
4X16	0,41	0,6/1 kV	90	200	1280	26,5	29,5	1,400
4X25	0,41	0,6/1 kV	90	200	2000	32,0	35,0	2,000
4X35	0,41	0,6/1 kV	90	200	2800	36,0	39,0	2,800
4X50	0,41	0,6/1 kV	90	200	4000	41,0	45,0	3,600
4X70	0,51	0,6/1 kV	90	200	5600	47,0	51,0	4,600
4X95	0,51	0,6/1 kV	90	200	7600	53,0	57,0	6,200
4X120	0,51	0,6/1 kV	90	200	9600	59,5	63,5	8,100
3X70+3X35/3	0,51/0,41	0,6/1 kV	90	200	4200	45	49,5	4,300
3X95+3X50/3	0,51/0,41	0,6/1 kV	90	200	5700	47,5	51,5	5,500
3X120+3X70/3	0,51/0,41	0,6/1 kV	90	200	7200	55	59	6,800
3X150+3X70/3	0,51/0,41	0,6/1 kV	90	200	9000	58,0	62,0	8,100
3X185+3X95/3	0,51/0,41	0,6/1 kV	90	200	11100	63,0	67,5	9,500
3X240+3X120/3	0,51/0,41	0,6/1 kV	90	200	14400	71,0	75	12,600
5X1,5	0,26	0,6/1 kV	90	200	150	13,5	16,0	0,300
5X2,5	0,26	0,6/1 kV	90	200	250	16,0	19,0	0,500
5X4	0,31	0,6/1 kV	90	200	400	18,5	21,5	0,600
5X6	0,31	0,6/1 kV	90	200	600	21,0	23,5	0,800
5X10	0,41	0,6/1 kV	90	200	1000	25,0	28,0	1,200
5X16	0,41	0,6/1 kV	90	200	1600	29,0	32,0	1,700

(1) Produced on request



TRATOSFLEX

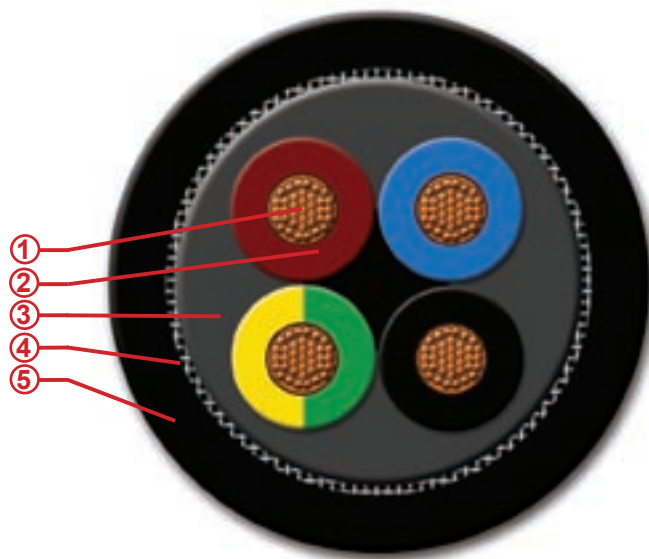
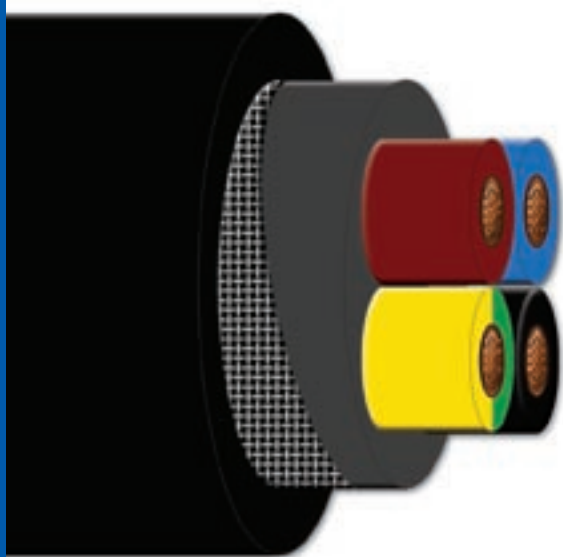
13. LOW VOLTAGE POWER CABLES 0,6/1 kV according to CEI 20-13 1999-05

TRATOSMART

FEATURES AND PERFORMANCES

Rated Voltage 0,6/1 kV
Max Voltage AC 0,7/1,2 kV
AC Voltage Test 2.5 kV

- 1 - Tinned flexible conductor cl. 5 IEC 228
- 2 - Special HEPR
- 3 - Inner Sheath KZ (black PCP)-5GM3
- 4 - Antitorsional protection
- 5 - Outer sheath KZ (black PCP)-5GM3

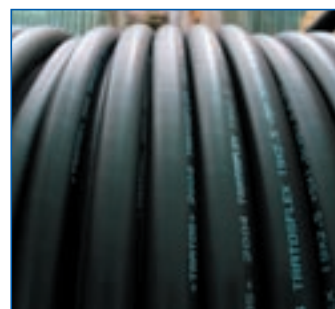
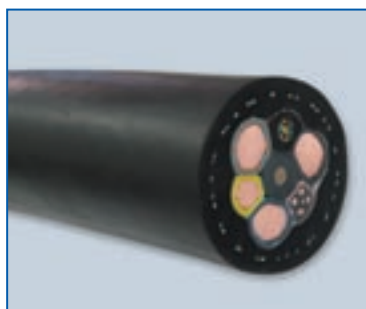


Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 25 ° C

Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	180
FESTOONS	180


 Table 14 - **TRATOSMART**

Cross Section	Maximum Diameter of Single Wires	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	mm	U ₀ /U	°C	°C	N	mm	mm	Kg/m
4X1,5	0,26	0,6/1 kV	90	200	90	12,5	14,5	0,288
4X2,5	0,26	0,6/1 kV	90	200	150	14,0	16,0	0,350
4X4	0,31	0,6/1 kV	90	200	240	16,0	18,0	0,470
4X6	0,31	0,6/1 kV	90	200	360	16,5	19,0	0,600
4X10	0,41	0,6/1 kV	90	200	600	21,0	23,5	0,940
4X16	0,41	0,6/1 kV	90	200	960	24,0	26,5	1,260
4X25	0,41	0,6/1 kV	90	200	1500	28,0	31,0	1,850
4X35	0,41	0,6/1 kV	90	200	2100	32,5	35,0	2,540
4X50	0,41	0,6/1 kV	90	200	3000	37,0	40,0	3,250
4X70	0,51	0,6/1 kV	90	200	4200	42,5	45,5	4,200
4X95	0,51	0,6/1 kV	90	200	5700	48,0	51,0	5,600
4X120	0,51	0,6/1 kV	90	200	7200	53,5	57,0	7,300
3X50+3X25/3	0,51/0,41	0,6/1 kV	90	200	2250	35,5	38,5	2,750
3X70+3X35/3	0,51/0,41	0,6/1 kV	90	200	3150	40,5	43,5	3,950
3X95+3X50/3	0,51/0,41	0,6/1 kV	90	200	4275	44,5	47,5	5,100
3X120+3X70/3	0,51/0,41	0,6/1 kV	90	200	5400	50,0	54,0	6,350
3X150+3X70/3	0,51/0,41	0,6/1 kV	90	200	6750	54,0	58,0	7,600
3X185+3X95/3	0,51/0,41	0,6/1 kV	90	200	8325	59,0	63,0	9,000
3X240+3X120/3	0,51/0,41	0,6/1 kV	90	200	10800	66,0	70,0	12,000
5X1,5	0,26	0,6/1 kV	90	200	112	13,5	15,5	0,320
5X2,5	0,26	0,6/1 kV	90	200	187	15,0	17,0	0,380
5X4	0,31	0,6/1 kV	90	200	300	17,0	19,5	0,500
5X6	0,31	0,6/1 kV	90	200	450	19,0	21,5	0,700
5X10	0,41	0,6/1 kV	90	200	750	23,5	26,0	1,090
5X16	0,41	0,6/1 kV	90	200	1200	26,0	22,5	1,600



TRATOSFLEX

14. MEDIUM VOLTAGE POWER CABLES (N)TSCGECWÖU VDE 0250 p. 813 (as applicable)

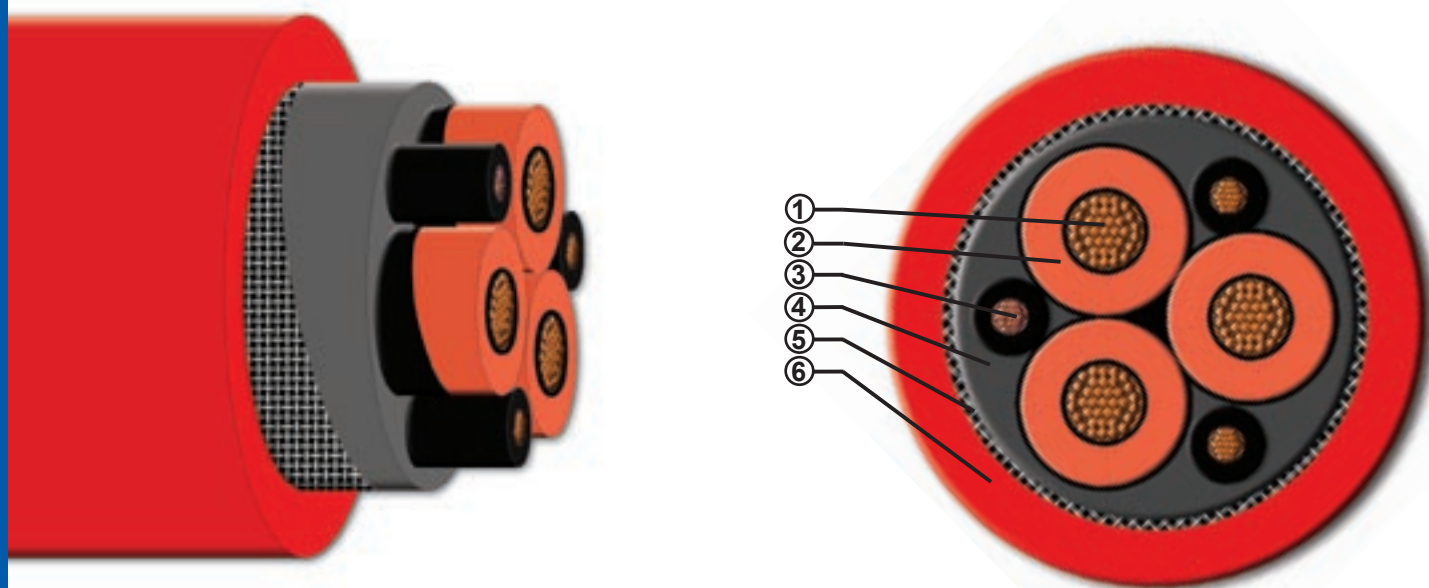
TRATOSFLEX - OCS (Overall Copper Screen)

FEATURES AND PERFORMANCES

Rated Voltage	3,6/6 Kv	6/10kV	8,7/15kV	12/20kV
Max Voltage AC	7,2	12	18	24
AC Voltage Test	11	17	24	32

- 1- Tinned phase conductor more flexible than Cl. 5 VDE 0295
- 2- Semiconducting layer + EPR insulation + semiconducting layer
- 3- Ground conductor

- 4- Inner Sheath Semiconductive compound
- 5- mixed copper/textile braid overall screen
- 6- Outer sheath 5GM3 red colour



Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 30 ° C

Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	60
CYLINDRICAL REEL	60


 Table15 - **TRATOSFLEX** OCS (Overall Copper Screen)

Cross Section	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	U ₀ /U	°C	°C	N	mm	mm	Kg/m
3X25+3X10	3,6/6kV	90	200	1500	45,0	49,0	3,100
3X35+3X10	3,6/6kV	90	200	2100	48,0	52,0	3,600
3X50+3X10	3,6/6kV	90	200	3000	52,0	56,0	4,300
3X70+3X16	3,6/6kV	90	200	4200	56,0	60,7	5,500
3X95+3X16	3,6/6kV	90	200	5700	60,7	64,5	7,000
3X120+3X25	3,6/6kV	90	200	7200	66,0	70,7	8,500
3X150+3X25	3,6/6kV	90	200	9000	70,8	74,8	9,500
4X25	3,6/6kV	90	200	2000	48,0	53,0	3,600
4X35	3,6/6kV	90	200	280	55,0	58,0	4,600
4X50	3,6/6kV	90	200	4000	58,0	62,5	5,400
4X70	3,6/6kV	90	200	5600	63,0	68,0	6,900
3X25+3X10	6/10kV	90	200	1500	48,0	52,0	3,200
3X35+3X10	6/10kV	90	200	2100	49,0	54,0	3,700
3X50+3X10	6/10kV	90	200	3000	55,0	59,0	4,500
3X70+3X16	6/10kV	90	200	4200	59,0	64,0	5,700
3X95+3X16	6/10kV	90	200	5700	63,0	68,0	7,000
3X120+3X25	6/10kV	90	200	7200	67,5	72,0	8,500
3X150+3X25	6/10kV	90	200	9000	72,0	76,0	9,500
4X25	6/10kV	90	200	2000	50,0	54,0	3,600
4X35	6/10kV	90	200	280	56,0	60,0	4,600
4X50	6/10kV	90	200	4000	59,0	63,5	5,400
4X70	6/10kV	90	200	5600	65,0	70,0	6,900
3X25+3X10	8,7/15kV	90	200	1500	53,0	57,0	4,000
3X35+3X10	8,7/15kV	90	200	2100	57,0	61,0	4,500
3X50+3X10	8,7/15kV	90	200	3000	60,0	64,0	5,100
3X70+3X16	8,7/15kV	90	200	4200	65,0	69,0	6,500
3X95+3X16	8,7/15kV	90	200	5700	70,0	74,0	7,600
3X25+3X10	12/20kV	90	200	1500	58,0	63,0	4,400
3X35+3X10	12/20kV	90	200	2100	62,0	66,0	4,900
3X50+3X10	12/20kV	90	200	3000	65,0	69,0	6,000
3X70+3X16	12/20kV	90	200	4200	69,0	73,5	7,100
3X95+3X16	12/20kV	90	200	5700	73,0	77,5	8,100

Cables for rated voltage >= 18/30 kV are produced upon request.

TRATOSFLEX

NEW

15. MEDIUM VOLTAGE POWER CABLES - (N) TSCGEWÖU VDE 0250 p. 813 (as applicable) & HD 620 S1 p.9

TRATOSFLEX - ES (Extruded Screen) - Reduced weight and dimension

FEATURES AND PERFORMANCES

Rated Voltage	3,6/6 Kv	6/10kV	8,7/15kV	12/20kV
Max Voltage AC	7,2	12	18	24
AC Voltage Test	11	17	24	32

1- Conductor more flexible than Cl. 5 VDE 0295

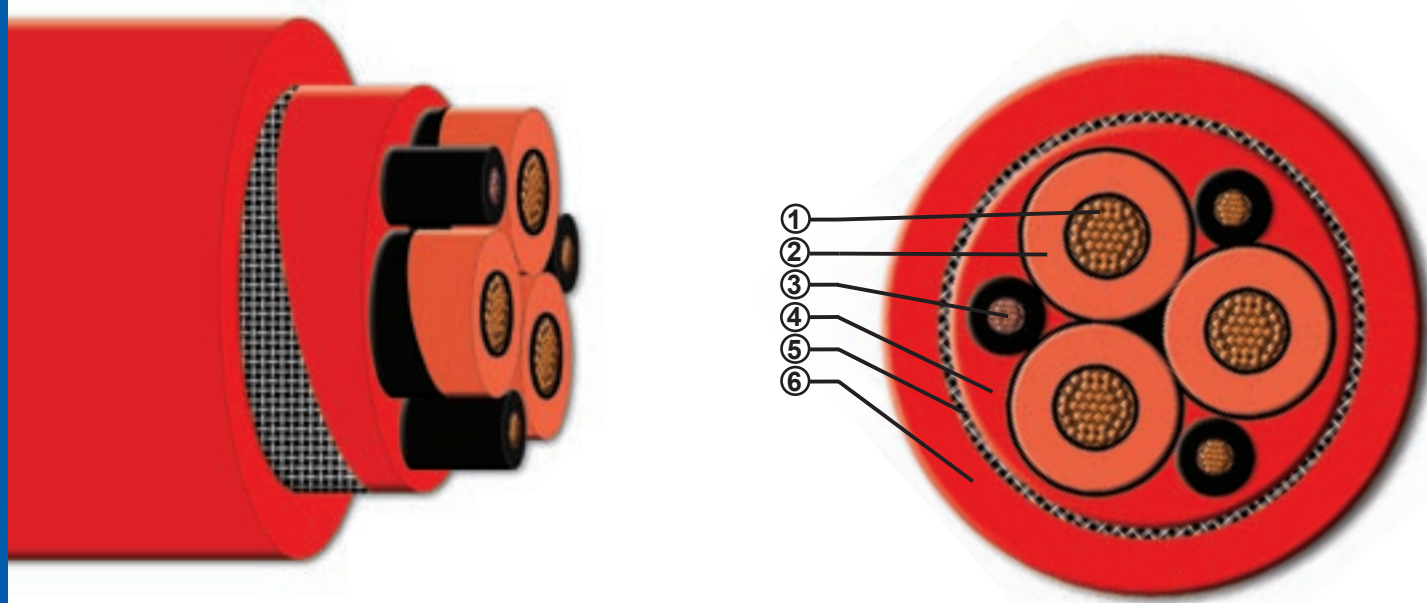
2- Semiconducting layer + HEPR insulation + **semiconducting layer****

3- **Ground conductor with semiconducting layer**

4- Inner Sheath polychloroprene

5- antitorsional protection

6- Outer sheath 5GM3 red colour polychloroprene



Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 30 ° C

Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	180
CYLINDRICAL REEL	180

**** very special semiconducting compound which acts as a screen: the resistance between the ground conductor and semiconductive external layer of phase conductor must be maximum 500 Ohm measured according to VDE 0472 part 512**


 Table 16 - **NEW TRATOSFLEX ES** (Extruded Screen) - Reduced weight and dimension

Cross Section	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	U ₀ /U	°C	°C	N	mm	mm	Kg/m
3X25+3X10	3.6/6kV	90	200	1500	37,5	40,5	2,400
3X35+3X10	3.6/6kV	90	200	2100	40,3	43,3	2,900
3X50+3X10	3.6/6kV	90	200	3000	44,7	47,7	3,600
3X70+3X16	3.6/6kV	90	200	4200	49,5	52,5	4,670
3X95+3X16	3.6/6kV	90	200	5700	54,0	57,0	5,800
3X120+3X25	3.6/6kV	90	200	7200	57,5	60,5	7,000
3X150+3X25	3.6/6kV	90	200	9000	62,0	66,0	7,800
3X185+3X35	3.6/6kV	90	200	11100	66,0	70,0	9,700
3X25+3X10	6/10kV	90	200	1500	41,0	44,0	2,800
3X35+3X10	6/10kV	90	200	2100	44,0	47,0	3,300
3X50+3X10	6/10kV	90	200	3000	48,0	51,0	3,950
3X70+3X16	6/10kV	90	200	4200	53,0	56,0	5,000
3X95+3X16	6/10kV	90	200	5700	57,0	61,0	6,000
3X120+3X25	6/10kV	90	200	7200	61,5	65,5	7,300
3X150+3X25	6/10kV	90	200	9000	66,0	70,0	8,650
3X185+3X35	6/10kV	90	200	11100	70,0	74,0	10,000
3X25+3X10	8,7/15kV	90	200	1500	45,0	48,0	3,100
3X35+3X10	8,7/15kV	90	200	2100	48,0	51,0	3,750
3X50+3X10	8,7/15kV	90	200	3000	52,5	55,5	4,450
3X70+3X16	8,7/15kV	90	200	4200	57,0	61,0	5,600
3X95+3X16	8,7/15kV	90	200	5700	62,0	66,0	6,800
3X120+3X25	8,7/15kV	90	200	7200	67,0	71,0	8,000
3X25+3X10	12/20kV	90	200	1500	52,0	55,0	3,700
3X35+3X10	12/20kV	90	200	2100	53,7	56,7	4,200
3X50+3X10	12/20kV	90	200	3000	56,2	60,2	4,880
3X70+3X16	12/20kV	90	200	4200	61,0	65,0	6,000
3X95+3X16	12/20kV	90	200	5700	67,0	71,0	7,300
3X120+3X25	12/20kV	90	200	7200	70,0	74,0	9,000

 Cables for rated voltage $\geq 18/30$ kV are produced upon request.


TRATOSFLEX

16. MEDIUM VOLTAGE POWER CABLES (N) TSCGECWÖU + LWL VDE 0250 p. 813 (as applicable)

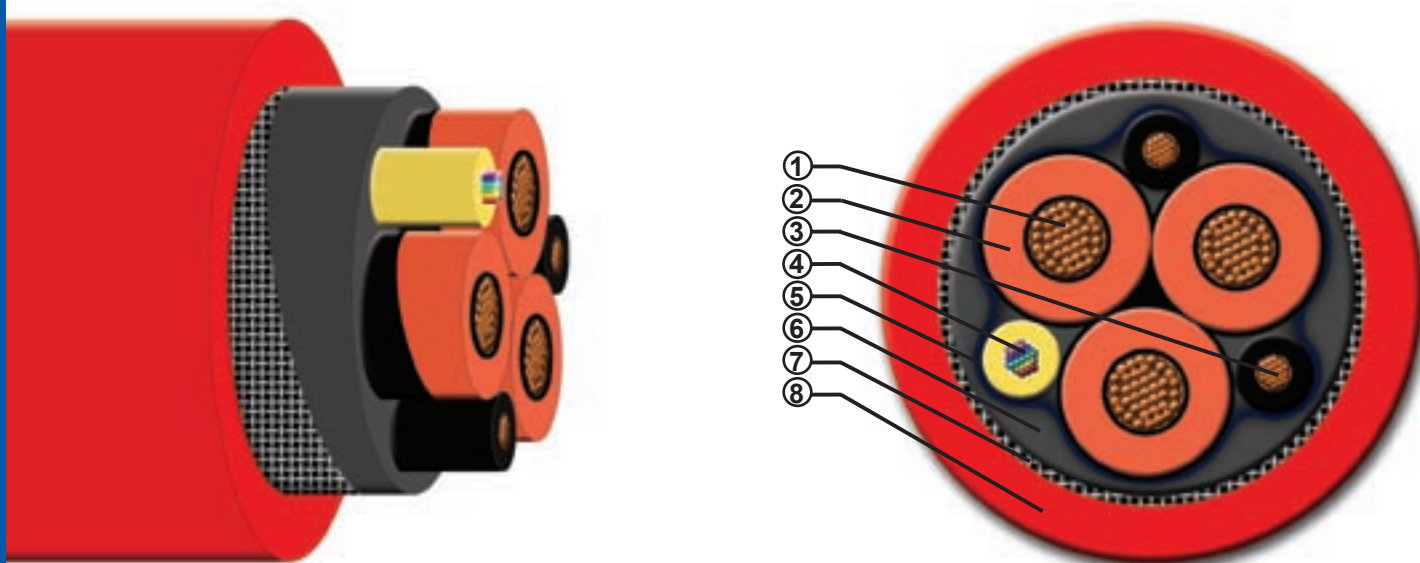
TRATOSFLEX - FO OCS (Overall Copper Screen)

FEATURES AND PERFORMANCES

Rated Voltage	3,6/6 Kv	6/10kV	8,7/15kV	12/20kV
Max Voltage AC	7,2	12	18	24
AC Voltage Test	11	17	24	32

- 1- Phase conductor more flexible than Cl. 5 (DIN VDE 0295)
- 2- Semic. layer + EPR insulation + Second. layer
- 3- Ground conductor
- 4- Optical Fibre cable

- 5- Tape over assembled cores
- 6- Inner sheath semiconductive compound
- 7- Mixed copper/textile braid overall screen
- 8- Outer sheath 5GM3 red colour Polychloroprene



Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 30 ° C

Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	60
CYLINDRICAL REEL	60

(1) Produced on request


 Table 16 - **TRATOSFLEX** FO OCS (Overall Copper Screen)

Cross Section	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	U ₀ /U	°C	°C	N	mm	mm	Kg/m
3X25+2X16+ 6FO (1)	3,6/6kV	90	200	1500	47,0	50,5	3,200
3X35+2X16+ 6FO	3,6/6kV	90	200	2100	50,0	53,5	3,600
3X50+2X16+ 6FO	3,6/6kV	90	200	3000	52,5	56,5	4,400
3X70+2X25+ 6FO	3,6/6kV	90	200	4200	57,8	62,0	5,500
3X95+2X25+ 6FO	3,6/6kV	90	200	5700	62,7	66,7	6,600
3X25+2X16+ 6FO (1)	6/10kV	90	200	1500	48,0	52,0	3,400
3X35+2X16+ 6FO	6/10kV	90	200	2100	51,5	55,5	3,800
3X50+2X16+ 6FO	6/10kV	90	200	3000	55,5	59,5	4,600
3X70+2X25+ 6FO	6/10kV	90	200	4200	60,0	64,0	5,700
3X95+2X25+ 6FO	6/10kV	90	200	5700	64,0	68,0	6,700
3X25+2X16+ 6FO	8,7/15kV	90	200	1500	54,0	58,0	4,000
3X35+2X16+ 6FO	8,7/15kV	90	200	2100	57,0	61,0	4,600
3X50+2X16+ 6FO	8,7/15kV	90	200	3000	60,5	64,5	5,300
3X70+2X25+ 6FO	8,7/15kV	90	200	4200	66,0	70,0	6,500
3X95+2X25+ 6FO	8,7/15kV	90	200	5700	70,0	74,0	7,600
3X25+2X16+ 6FO	12/20kV	90	200	1500	59,0	63,5	4,500
3X35+2X16+ 6FO	12/20kV	90	200	2100	62,0	66,5	5,200
3X50+2X16+ 6FO	12/20kV	90	200	3000	66,5	70,5	6,000
3X70+2X25+ 6FO	12/20kV	90	200	4200	70,5	74,5	7,100
3X95+2X25+ 6FO	12/20kV	90	200	5700	74,5	78,5	8,100

(1) **NOTE:** STANDARD FIBRES TYPE 62,5/125 or 50/125 on request

Cables for rated voltage $\geq 18/30$ kV are produced upon request.



TRATOSFLEX

NEW

17. MEDIUM VOLTAGE POWER CABLES (N)TSCGEWÖU+LWL VDE 0250 p. 813 (as applicable) & HD 620 S1 p.9

TRATOSFLEX - FO ES (Extruded Screen) - Reduced weight and dimension

FEATURES AND PERFORMANCES

Rated Voltage	3,6/6 Kv	6/10 Kv	8,7/15 Kv	12/20 Kv
Max Voltage AC	7,2	12	18	24
AC Voltage Test	11	17	24	32

1- Tinned phase conductor more flexible than Cl. 5 VDE 0295

2- Semiconducting layer + HEPR insulation + **semiconducting layer****

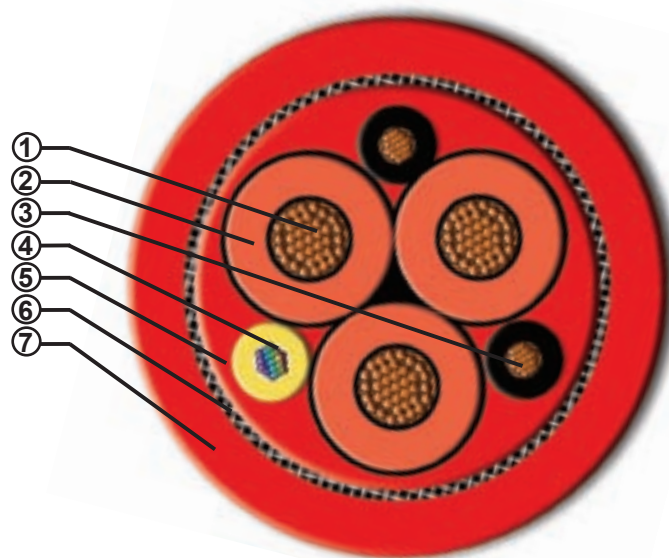
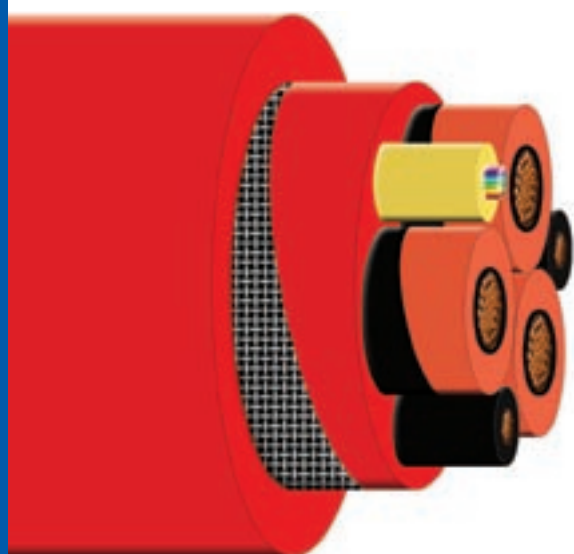
3- **Ground conductor with semiconducting layer**

4- Optical Fibre cable

5- Inner sheath Polychloroprene

6- Antitorsional protection

7- Outer sheath 5GM3 red colour polychloroprene



Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 30° C

Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	180
CYLINDRICAL REEL	180

**** very special semiconducting compound which acts as a screen: the resistance between the ground conductor and semiconductive external layer of phase conductor must be maximum 500 Ohm measured according to VDE 0472 part 512**


 Table 17 - **NEW TRATOSFLEX** FO ES (Extruded Screen) - Reduced weight and dimension

Cross Section	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Minimum Overall Diameter	Maximum Overall Diameter	Nominal Cable Weight
mm ²	U ₀ /U	°C	°C	N	mm	mm	Kg/m
3X25+2X25/2+ 6FO (1)	3.6/6kV	90	200	1500	37,5	40,5	2,400
3X35+2X25/2+ 6FO	3.6/6kV	90	200	2100	40,3	43,3	2,900
3X50+2X25/2+ 6FO	3.6/6kV	90	200	3000	44,7	47,7	3,600
3X70+2X35/2+ 6FO	3.6/6kV	90	200	4200	49,5	52,5	4,670
3X95+2X50/2+ 6FO	3.6/6kV	90	200	5700	54,0	57,0	5,800
3X120+2X70/2+ 6FO	3.6/6kV	90	200	7200	57,5	60,5	7,000
3X150+2X70/2+ 6FO	3.6/6kV	90	200	9000	62,0	66,0	7,800
3X185+2X95/2+ 6FO	3.6/6kV	90	200	11100	66,0	70,0	9,700
3X25+2X25/2+ 6FO (1)	6/10kV	90	200	1500	41,0	44,0	2,800
3X35+2X25/2+ 6FO	6/10kV	90	200	2100	44,0	47,0	3,300
3X50+2X25/2+ 6FO	6/10kV	90	200	3000	48,0	51,0	3,950
3X70+2X35/2+ 6FO	6/10kV	90	200	4200	53,0	56,0	5,000
3X95+2X50/2+ 6FO	6/10kV	90	200	5700	57,0	61,0	6,000
3X120+2X70/2+ 6FO	6/10kV	90	200	7200	61,5	65,5	7,300
3X150+2X70/2+ 6FO	6/10kV	90	200	9000	66,0	70,0	8,650
3X185+2X95/2+ 6FO	6/10kV	90	200	11100	70,0	74,0	10,000
3X25+2X25/2+ 6FO (1)	8,7/15kV	90	200	1500	45,0	48,0	3,100
3X35+2X25/2+ 6FO	8,7/15kV	90	200	2100	48,0	51,0	3,750
3X50+2X25/2+ 6FO	8,7/15kV	90	200	3000	52,5	55,5	4,450
3X70+2X35/2+ 6FO	8,7/15kV	90	200	4200	57,0	61,0	5,600
3X95+2X50/2+ 6FO	8,7/15kV	90	200	5700	62,0	66,0	6,800
3X120+2X70/2+ 6FO	8,7/15kV	90	200	7200	67,0	71,0	8,000
3X25+2X25/2+ 6FO (1)	12/20kV	90	200	1500	52,0	55,0	3,700
3X35+2X25/2+ 6FO	12/20kV	90	200	2100	53,7	56,7	4,200
3X50+2X25/2+ 6FO	12/20kV	90	200	3000	56,2	60,2	4,880
3X70+2X35/2+ 6FO	12/20kV	90	200	4200	61,0	65,0	6,000
3X95+2X50/2+ 6FO	12/20kV	90	200	5700	67,0	71,0	7,300
3X120+2X70/2+ 6FO	12/20kV	90	200	7200	70,0	74,0	9,000

(1) NOTE: STANDARD FIBRES TYPE 62,5/125

 Cables for rated voltage $\geq 18/30$ kV are produced upon request.


TRATOSFLEX

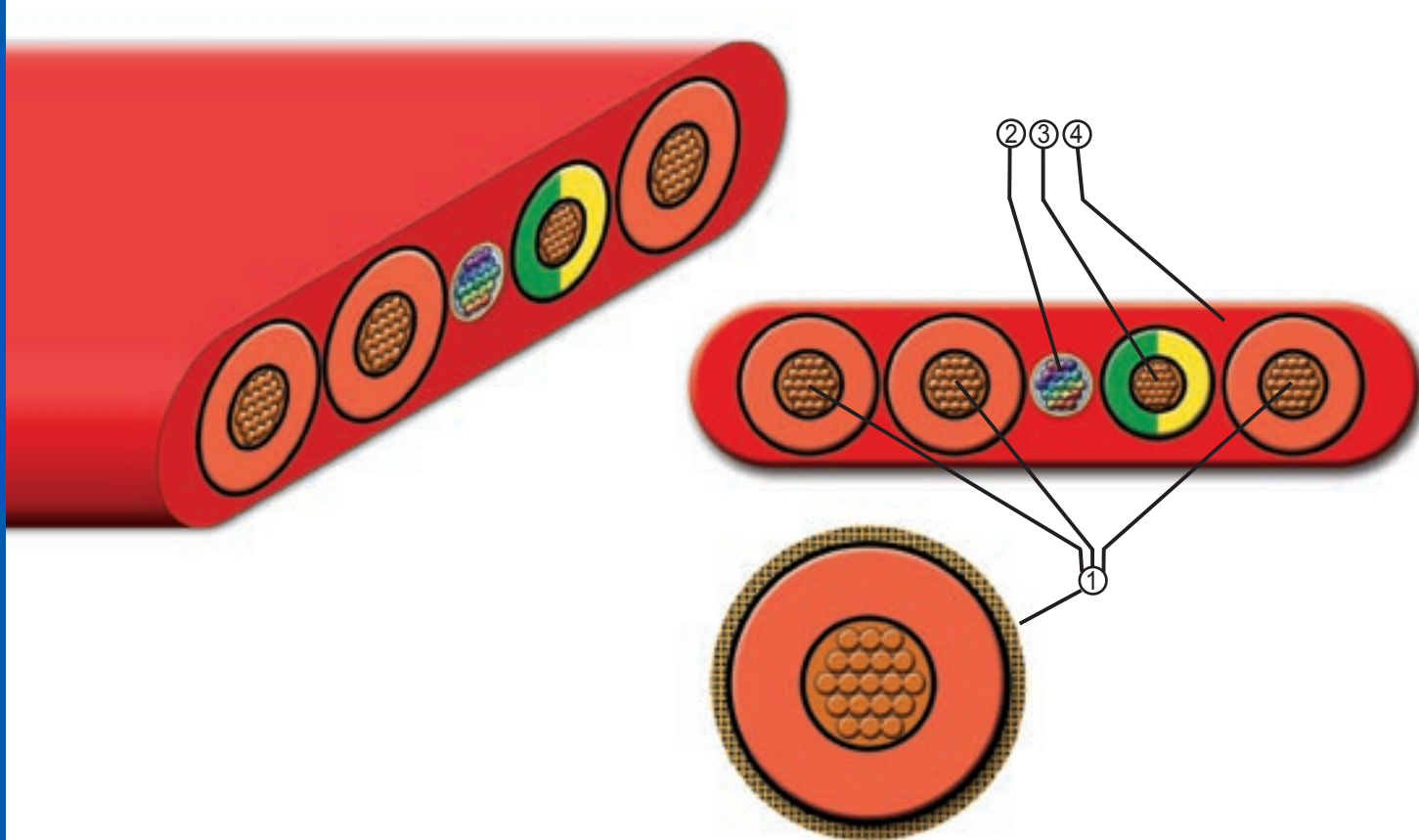
18. MEDIUM VOLTAGE FLAT CABLE FOR REELING APPLICATION

TRATOSFLAT TRATOSFLAT - FO

FEATURES AND PERFORMANCES

Rated Voltage	1,8/3 Kv	3,6/6 Kv
Max Voltage AC	3,6	7,2
AC Voltage Tes	8	11

- 1- Screened phase conductors
- 2- Optical Fibre cable
- 3- Yellow-green earth conductor
- 4- Red 5GM3 Polychloroprene sheath



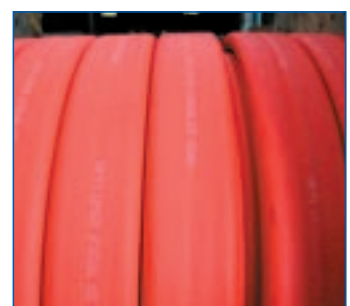
Installation Temperature:	
Fixed Installation	- 35 ° C
Mobile Installation	- 30 ° C

Travel Condition:	Suitable
	mt / minute max
MONOSPIRAL REEL	180

Table 19 - **TRATOSFLAT & TRATOSFLAT FO**

Cross Section	Rated Voltage	Maximum Temperature of the Conductor During Operation	Maximum Temperature of the Conductor During Short Circuit	Max. tensile Load During Installation and Operation	Maximum Dimension	Nominal Cable Weight
mm ²	U _o /U	°C	°C	N	mm	Kg/m
4X35	1,8/3 kV	90	200	2100	72 X 29	4,000
4X50	1,8/3 kV	90	200	3000	78 X 31	5,300
4X70	1,8/3 kV	90	200	4200	86 X 32	5,900
4X35	3,6/6 kV	90	200	2100	89 X 32	4,800
4X50	3,6/6 kV	90	200	3000	96 X 33	5,800
4X70	3,6/6 kV	90	200	4200	102 X 35	7,000
4X35 + 6FO (1)	3,6/6 kV	90	200	2100	97 X 32	5,500
4X50 + 6FO	3,6/6 kV	90	200	4200	103 X 34	6,300

(1) NOTE: STANDARD FIBRES TYPE 62,5/125 OR 50/125 ON REQUEST



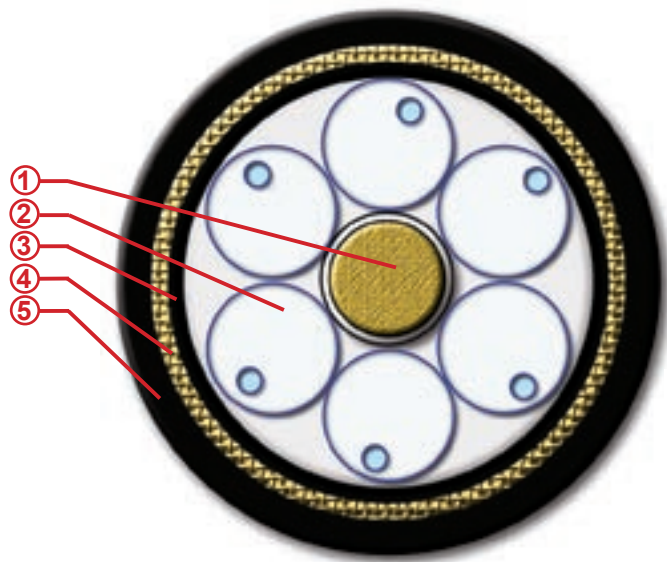
TRATOSFLEX

19. Fibre Cable

TRATOSFIBRE

FEATURES AND PERFORMANCES

- 1- Kevlar support
- 2- Tube of tecnopolymer containing 1FO
- 3- Tape and Inner sheath
- 4- Antitorsional braid
- 5- PCP outer sheath



N° of loose fibre optic tubes	Assembled Tubes diameter	Nominal Overall diameter	Weight for 1000 m	Maximum permissible Tensile Load	Minimum Bending Radius
	mm (approx)	mm	Kg/km	N	mm
6 FO	5.50	14.00	225	300	130


 Table 20 - **TRATOSFIBRE**

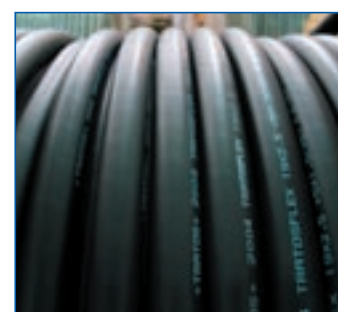
OPTICAL parameters	
Transmission data of the fibre-optics	type: 62,5/125 (1)
Max attenuation at wavelength 850 nm	≤ 3.00 dB/km
Max attenuation at wavelength 1300 nm	≤ 0.9 dB/km
Bandwidth at 850 nm	≥ 200 MHz/km
Bandwidth at 1300 nm	≥ 400 MHz/km
Numerical aperture	0.275 ± 0.015
Attenuation on completed cable	≤ 5 dB/km

THERMAL parameters	
Transmission data of the fibre-optics	type: 62,5/125 (1)
Fully flexible operation (ambient temperature)	-20 °C to +60 °C
Fixed installation	-40 °C to +80 °C

MECHANICAL parameters	
Transmission data of the fibre-optics	type: 62,5/125 (1)
Max tensile strength	300 N
Minimum bending radii: - fixed installation or festoon	130 mm
- cylindrical reel	250 mm
Travel speed: festoon systems	up to 240 n/min

CHEMICAL parameters	
Transmission data of teh fibre-optics	type: 62,5/125 (1)
Weather resistance	Resistant to ozone, UV and moisture
Resistance to oil	acc. to DIN VDE 0473

(1) **NOTE:** on request we can provide the same cable with 12FO



TRATOSFLEX

20. Special Cables Tailored

Below are showed some examples of special cables produced upon request

Table 21

CABLES TYPE			Nominal dimension (mm)	Nominal weight (Kg/mt)
CONTROL & TELECOMUNICATION	TRATOSFLEX	16x2,5 (C)	43,0	2,400
		19x2,5+5x1,5 (C)	33,5	1,650
		6x2,5+4x2,5 (C)	26,5	0,850
		3x(2,5x1,5) C	23,5	0,650
		6x(2,5x2,5) C	39,0	1,900
	TRATOSFLEX - VR	16x3x1	36,0	1,600
		4x5x2,5	33,5	1,700
	TRATOSFLAT	3x8x1,5	22x49	1,700
POWER L.V. 0,6/1 kV	TRATOSFLEX	4x16+3x(3x2,5) C	36,5	2,000
		4x50+(6x1,5) C	46,0	3,800
		4x70+12x2,5x(4x2,5) C	54,0	5,400
		3x70+35+(4x1,5)	50,0	4,500
		3x120+70x(4x1,5)+6FO	56,0	6,400





october 2004

CERTIFICATIONS

B · A · S · E · C
BRITISH APPROVALS SERVICE FOR CABLES

CERTIFICATE OF CONFORMITY

This is to certify that the

Quality Management System

of

Tratos Cavi S.p.A.

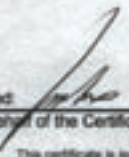
conforms to the requirements of

ISO 9001: 2000

in respect of the sites, products and or services specified in the attached schedule(s)

Schedule no's:-

CS1-044/001
CS1-044/002

Signed:  Date: 23 AGO 2002

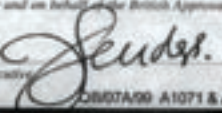
On behalf of the Certificate Holder

This certificate is issued subject to and in accordance with the Regulations made from time to time by BASEC.
By signature of this certificate we confirm our agreement to abide by the BASEC Regulations.

Certificate No: CS1-044 Issue date: 01/08/2002

Date of original certification: 13/04/1989 Date of next Triennial re-assessment: 03/2005

Continued certification is subject to the results of continual surveillance and the next triennial re-assessment.

 Signed for and on behalf of the British Approvals Service for Cables
 Date 1 August 2002
Chief Executive



000

© Prokey Way, Cornwall, Milton Keynes MK2 9BQ
Telephone: +44 (0)1908 267300-11 Email: basec@basec.org.uk
Website: www.basec.org.uk Email: info@basec.org.uk
This Certificate & Schedule remain the property of BASEC, and shall be returned when required.

CERTIFICATIONS





VDE Prüf- und Zertifizierungsinstitut

ZEICHENGENEHMIGUNG MARKS LICENCE

Tratos Cavi SpA
Via Stadio 2
52036 PIEVE S. STEFANO
ITALIEN

ist berechtigt, für ihr Produkt /
is authorized to use for their product

Gummischlauchleitung NSHTÖU
Rubber insulated flexible cable NSHTÖU

die hier abgebildeten markenrechtlich geschützten Zeichen
für die ab Blatt 2 aufgeführten Typen zu benutzen /
the legally protected Marks as shown below for the types referred to on page 2 ff.

<VDE> oder/oder <> oder/oder

Geprüft und zertifiziert nach /
Tested and certified according to

DIN VDE 0250 Teil 814:1985-02



VDE Prüf- und Zertifizierungsinstitut
VDE Testing and Certification Institute
Zertifizierungsstelle
Certification

Aktenzeichen: 915700-5130-0814 / 25806

File ref.:

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Licence No.

Blatt 1

Page

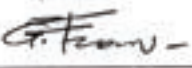
sonstige Bedingungen siehe Normen und Folienblätter /
further conditions see standards and following pages

Offenbach, 2003-05-06

VDE VERBAND DER ELEKTROTECHNIK
ELEKTRONIK INFORMATIONSTECHNIK & E



TRATOSFLEX

IMQ	Test Report n° 01SD00255	
PRODUCT DEPARTMENT INSULATED CABLES AND ADHESIVE TAPES LAB	PAGE: 1 OF 13	DATE: 12/12/2003
Type of product	Medium voltage reeling cable flexible power and control cables for mobile application and heavy duty service (Travelling railings machines and cranes)	
Cable Model	TRATOSFLEX - ES	
Cable Description	Medium Voltage-Three-phase flexible tinned conductors – extruded layer semiconductor screen – EPR insulation – outer extruded semiconductive layer – 3 earth conductors – PCP inner sheath – textile anti-twisting braid – PCP outer sheath Marking: TRATOS 2003 TRATOSFLEX – ES (N)TSCGEWOU 3x25+3x10 6/10KV	
Test required by	TRATOS CAVI S.p.A. Via Stadio 2 – 52036 Pieve S. Stefano (AR) ITALY	
Manufacturer	TRATOS CAVI S.p.A. Via Stadio 2 – 52036 Pieve S. Stefano (AR) ITALY	
Tests carried out by	IMQ S.p.A. Laboratorio cavi isolati e nastri adesivi Via Quintilano, 43 - 20138 MILANO	
Scope of the tests	Type tests	
Identification	Roll N° BL 16308744 - meters 150	
Date of starting tests	2003/11/18	Date of finishing tests 2003/12/04
This Test Report is composed by 13 pages, divided as follows: 13 report pages		
Cable Testing Lab Technician	Cable Testing Lab Head	
G. Franzin 	B. Testa 	
The results referred in this report are only relevant to the samples tested and described in this report. Only complete reproduction of this test report is permitted without written authorisation of IMQ		
IMQ S.p.A. - Via Quintilano 43 - 20138 MILANO		





october 2004



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