

## (N)TSCGEWOU TENAX TTS-LWL

### Medium voltage reeling cable with fibre-optics



#### Application

Flexible medium voltage reeling cable with integrated fibre-optics for the combined transmission of energy and data, for application under high mechanical stresses, e.g. high travel speeds, dynamic tensile loads, multiple changes of direction into different planes, churning on running over rollers and torsional stresses.

Mainly for mobile equipment, e.g. fast-moving container cranes and large moving equipment.

#### Global data

Brand	TENAX-TTS
Type designation	(N)TSCGEWOU
Standard	Based on DIN VDE 0250-813

#### Design features

Conductor	Plain copper, fine stranded class 5 according to DIN EN 60228 / VDE 0295																																								
Insulation	Rubber, compound type EPR-SHS EI6, super-clean																																								
Electrical field control	Inner and outer layer of semiconductive rubber compound																																								
Optical Fiber	12 fibers, 50/125 $\mu$ or 62.5/125 $\mu$ or E9/125 $\mu$ , within protection jacket.																																								
	<table> <thead> <tr> <th>Fibre class:</th> <th>G50/125<math>\mu</math></th> <th>G62,5/125<math>\mu</math></th> <th>E9/125<math>\mu</math></th> </tr> <tr> <th>Type:</th> <td>Graded-index fibre</td> <td>Graded-index fibre</td> <td>Monomode fibre</td> </tr> </thead> <tbody> <tr> <td>- Attenuation at 850 nm:</td> <td>&lt;2,8 dB/km</td> <td>&lt;3,3 dB/km</td> <td>-</td> </tr> <tr> <td>- Attenuation at 1300 nm:</td> <td>&lt;0,8 dB/km</td> <td>&lt;0,9 dB/km</td> <td>&lt;0,4 dB/km</td> </tr> <tr> <td>- Attenuation at 1550 nm:</td> <td>-</td> <td>-</td> <td>&lt;0,3 dB/km</td> </tr> <tr> <td>- Bandwidth at 850 nm:</td> <td>&gt;400 MHz</td> <td>&gt;200 MHz</td> <td>-</td> </tr> <tr> <td>- Bandwidth at 1300 nm:</td> <td>&gt;1200 MHz</td> <td>&gt;500 MHz</td> <td>-</td> </tr> <tr> <td>- Numerical aperture:</td> <td>0,2 <math>\pm</math> 0,02</td> <td>0,27 <math>\pm</math> 0,02</td> <td>-</td> </tr> <tr> <td>- Chromatic dispersion at 1300 nm:</td> <td>-</td> <td>-</td> <td>&lt;3,5 ps/nm km</td> </tr> <tr> <td>- Chromatic dispersion at 1550 nm:</td> <td>-</td> <td>-</td> <td>&lt;18 ps/nm km</td> </tr> </tbody> </table>	Fibre class:	G50/125 $\mu$	G62,5/125 $\mu$	E9/125 $\mu$	Type:	Graded-index fibre	Graded-index fibre	Monomode fibre	- Attenuation at 850 nm:	<2,8 dB/km	<3,3 dB/km	-	- Attenuation at 1300 nm:	<0,8 dB/km	<0,9 dB/km	<0,4 dB/km	- Attenuation at 1550 nm:	-	-	<0,3 dB/km	- Bandwidth at 850 nm:	>400 MHz	>200 MHz	-	- Bandwidth at 1300 nm:	>1200 MHz	>500 MHz	-	- Numerical aperture:	0,2 $\pm$ 0,02	0,27 $\pm$ 0,02	-	- Chromatic dispersion at 1300 nm:	-	-	<3,5 ps/nm km	- Chromatic dispersion at 1550 nm:	-	-	<18 ps/nm km
Fibre class:	G50/125 $\mu$	G62,5/125 $\mu$	E9/125 $\mu$																																						
Type:	Graded-index fibre	Graded-index fibre	Monomode fibre																																						
- Attenuation at 850 nm:	<2,8 dB/km	<3,3 dB/km	-																																						
- Attenuation at 1300 nm:	<0,8 dB/km	<0,9 dB/km	<0,4 dB/km																																						
- Attenuation at 1550 nm:	-	-	<0,3 dB/km																																						
- Bandwidth at 850 nm:	>400 MHz	>200 MHz	-																																						
- Bandwidth at 1300 nm:	>1200 MHz	>500 MHz	-																																						
- Numerical aperture:	0,2 $\pm$ 0,02	0,27 $\pm$ 0,02	-																																						
- Chromatic dispersion at 1300 nm:	-	-	<3,5 ps/nm km																																						
- Chromatic dispersion at 1550 nm:	-	-	<18 ps/nm km																																						
Core arrangement	Cores layed up around conductive filler with aramid rope in the center																																								
Inner sheath	Rubber, special compound, mechanical properties acc. to 5GM3																																								
Reinforcement	Polyester anti-torsion braid																																								
Outer sheath	Abrasion and tear proof special rubber compound, quality at least 5GM5 acc. to DIN VDE 0207 part 21, resistance to ozone, UV and oil. Sheath colour: red or black with yellow stripe																																								
Marking	Embossed: (N)TSCGEWOU (number of cores) x (cross-section) (rated voltage) DRAKA DE VDE (Year of manufacture) TENAX TTS																																								

#### Electrical parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV
AC test voltage	11 kV	17 kV	24 kV	29 kV
Current Carrying Capacity description	According to DIN VDE 0298 Part 4			

#### Thermal parameters

Max. permissible temperature at conductor	90 °C
Max. short circuit temperature of the conductor	250 °C
Ambient temperature for fixed installation	min -40 °C ; max +80 °C
Ambient temperature in fully flexible operation	min -25 °C ; max +80 °C

### Mechanical parameters

Max. tensile load on the conductor	20 N/mm <sup>2</sup>
Max. tensile load on the conductor during acceleration	25 N/mm <sup>2</sup>
Torsional stress	± 50 °/m
Min. bending radius	Acc. to DIN VDE 0298 part 3
Min. distance with S-type directional changes	20 X D
Travel speed	- Reeling operation: up to 180 m/min

### Rated voltage 3.6/6 kV

Number of cores x cross section	Conductor diameter max. mm	Outer diameter min. mm	Outer diameter max. mm	Bending radius free moving min. mm	Weight (ca.) kg/km	Permissible tensile force max. N	Dynamic tensile force max. N	Conductor resistance at 20°C max. Ω/km	Nom. operating capacitance μF/km	Inductive Reactance (at 50Hz) Ω/km	Current carrying capacity (1) A	Short Circuit Current (conductor) kA
3x25 + 2x25/2 + 1x(12G62,5)	6.2	38.5	41.5	415	2380	1500	1875	0.78	0.38	0.102	131	3.58
3x35 + 2x25/2 + 1x(12G62,5)	7.7	41.5	44.5	445	2750	2100	2625	0.55	0.49	0.092	202	5.01
3x50 + 2x25/2 + 1x(12G62,5)	9.3	44.5	47.5	475	3100	3000	3750	0.39	0.49	0.092	202	7.15
3x70 + 2x35/2 + 1x(12G62,5)	11.5	50	54	540	4400	4200	5250	0.27	0.55	0.088	250	10.01
3x95 + 2x50/2 + 1x(12G62,5)	12.8	54	58	580	5300	5700	7125	0.21	0.62	0.084	301	13.59
3x150 + 2x70/2 + 1x(12G62,5)	16.5	63	67	670	7600	9000	11250	0.13	0.73	0.08	404	21.45
3x185 + 2x95/2 + 1x(12G62,5)	18.5	67	72	720	9200	11100	13875	0.11	0.79	0.078	461	26.46

(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15).

Rated voltage 6/10 kV

Number of cores x cross section	Part number	Conductor diameter max. mm	Outer diameter min. mm	Outer diameter max. mm	Bending radius free moving min. mm	Weight (ca.) kg/km	Permissible tensile force max. N	Dynamic tensile force max. N	Conductor resistance at 20°C max. Ω/km	Nom. operating capacitance μF/km	Inductive Reactance (at 50Hz) Ω/km	Current carrying capacity (1) A	Short Circuit Current (conductor) kA
3x25 + 2x25/2 + 1x(12G62,5)	20091982	6.2	40	43	430	2480	1500	1875	0.78	0.35	0.104	131	3.58
3x35 + 2x25/2 + 1x(12G62,5)	20074719	7.7	42	45	450	2950	2100	2625	0.55	0.39	0.099	162	5.01
3x50 + 2x25/2 + 1x(12G62,5)	20096115	9.3	45	48	480	3480	3000	3750	0.39	0.45	0.094	202	7.15
3x70 + 2x35/2 + 1x(12G62,5)	20092017	11.5	51	55	550	4710	4200	5250	0.27	0.51	0.09	250	10.01
3x95 + 2x50/2 + 1x(12G62,5)	20086347	12.8	55	59	590	5550	5700	7125	0.21	0.58	0.086	301	13.59
3x120 + 2x70/2 + 1x(12G62,5)		14.9	58.5	62.5	625	6700	7200	9000	0.16	0.63	0.084	352	17.16
3x150 + 2x70/2 + 1x(12G62,5)		16.5	63	67	670	7600	9000	11250	0.13	0.69	0.082	404	21.45
3x240 + 2x120/2 + 1x(12G62,5)		21	73	78	780	12400	14400	18000	0.08	1.05	0.08	540	34.32

(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15).

Rated voltage 8.7/15 kV

Number of cores x cross section	Part number	Conductor diameter max. mm	Outer diameter min. mm	Outer diameter max. mm	Bending radius free moving min. mm	Weight (ca.) kg/km	Permissible tensile force max. N	Dynamic tensile force max. N	Conductor resistance at 20°C max. Ω/km	Nom. operating capacitance μF/km	Inductive Reactance (at 50Hz) Ω/km	Current carrying capacity (1) A	Short Circuit Current (conductor) kA
3x25 + 2x25/2 + 1x(12G62,5)		6.2	42	45	450	2700	1500	1875	0.78	0.3	0.11	139	3.58
3x35 + 2x25/2 + 1x(12G62,5)	20091668	7.7	45	49	490	2960	2100	2625	0.55	0.33	0.105	172	5.01
3x50 + 2x25/2 + 1x(12G62,5)		9.3	50	54	540	3960	3000	3750	0.39	0.37	0.099	215	7.15
3x70 + 2x35/2 + 1x(12G62,5)	20114426	11.5	53	57	570	4760	4200	5250	0.27	0.42	0.094	265	10.01
3x95 + 2x50/2 + 1x(12G62,5)	20153431	12.8	58	62	620	5760	5700	7125	0.21	0.48	0.089	319	13.59
3x120 + 2x70/2 + 1x(12G62,5)		14.9	64	68	680	7265	7200	9000	0.16	0.52	0.087	371	17.16
3x150 + 2x70/2 + 1x(12G62,5)		16.5	68	72	720	8500	9000	11250	0.13	0.57	0.085	428	21.45
3x185 + 2x95/2 + 1x(12G62,5)		18.5	72	77	770	9900	11100	13875	0.11	0.61	0.083	488	26.46

(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15).

Rated voltage 12/20 kV

Number of cores x cross section	Part number	Conductor diameter max, mm	Outer diameter min, mm	Outer diameter max, mm	Bending radius free moving min, mm	Weight (ca.) kg/km	Permissible tensile force max. N	Dynamic tensile force max. N	Conductor resistance at 20°C max, Ω/km	Nom. operating capacitance μF/km	Inductive Reactance (at 50Hz) Ω/km	Current carrying capacity (1) A	Short Circuit Current (conductor) kA
3x25 + 2x25/2 + 1x(12G62,5)	20076107	6,2	45	48	480	2890	1500	1875	0,78	0,24	0,115	139	3,58
3x35 + 2x25/2 + 1x(12G62,5)		7,7	47	50	500	3250	2100	2625	0,55	0,27	0,109	172	5,01
3x50 + 2x25/2 + 1x(12G62,5)		9,3	51	55	550	4050	3000	3750	0,39	0,3	0,103	215	7,15
3x70 + 2x35/2 + 1x(12G62,5)		11,5	56	60	600	4850	4200	5250	0,27	0,34	0,098	265	10,01
3x95 + 2x50/2 + 1x(12G62,5)		12,8	60	64	640	6450	5700	7125	0,21	0,38	0,094	319	13,59
3x120 + 2x70/2 + 1x(12G62,5)		14,9	66	70	700	7700	7200	9000	0,16	0,41	0,091	371	17,16
3x150 + 2x70/2 + 1x(12G62,5)		16,5	69	73	730	8550	9000	11250	0,13	0,45	0,089	428	21,45
3x185 + 2x95/2 + 1x(12G62,5)		18,5	75	79	790	10600	11100	13875	0,11	0,49	0,086	488	26,46

(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15).