1 - STRAND

1.1 - STRAND PROPERTIES 13mm (0.5")

Strand type			prEN 10138 – 3 (2006) Y1860S7		ASTM A 416-06 Grade 270
Nominal diameter	d	(mm)	12.5	12.9	12.7
Nominal cross section	A_p	(mm^2)	93	100	98.7
Nominal mass	M	(kg/m)	0.726	0.781	0.775
Nominal yield strength	$f_{p0,1k}$	(MPa)	1634[1]	1640[1]	1675[2]
Nominal tensile strength	f_{pk}	(MPa)	1860	1860	1860
Specif./min. breaking load	F_{pk}	(kN)	173	186	183.7
Young's modulus		(GPa)	approx. 195		
Relaxation[3] after 1000 h at 20°C and 0.7 x F_{pk}		(%)	max. 2.5		

1) Characteristic value measured at 0.1% permanent extension
2) Minimum load at 1% extension for low-relaxation strand
3) Valid for relaxation class acc. to prEN 10138-3 or low-relaxation grade acc. to ASTM A 416-06

1.2 - TENDON PROPERTIES 13mm (0.5")

Unit	Strands numbers	Steel area			Breaking load			Corrugated steel duct[3] (recommended)		Corrugated plastic duct VSL PT-PLUS®		Steel pipes
		A_p acc. to prEN		ASTM	Y1860S7 (prEN)		Grade 270 (ASTM)	$Ø_i$ / $Ø_e$	e	$Ø_i$ / $Ø_e$	e	Ø ext x t
		d=12.5 mm A_p=93 mm^2	d=12.9 mm A_p=100 mm^2	d=12.7 mm A_p=100 mm^2	d=12.5 mm A_p=93 mm^2	d=12.9 mm A_p=100 mm^2	d=12.7 mm A_p=98.7 mm^2					
		[mm^2]	[mm^2]	[mm^2]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
5-1	1	93	100	98.7	173	186	183.7	20/25	3	22/25	6	25.0 x 2.0
5-2	2	186	200	197	346	372	367	35/40	8	76/25[2]	-	31.8 x 2.0/2.5/3.0
5-3	3	279	300	296	519	558	551	35/40	6	76/25[2]	-	33.7 x 2.0/2.5/3.0
5-4	4	372	400	395	692	744	735	40/45[1]	7	76/25[2]	-	42.4 x 2.0/2.5/3.0
5-7	5	465	500	494	865	930	919	45/50	8	58/63	14	60.3 x 2.0/2.5/3.0
|	6	558	600	592	1038	1116	1102	45/50	6	58/63	12	|
5-7	7	651	700	691	1211	1302	1286	50/57	7	58/63	11	60.3 x 2.0/2.5/3.0
5-12	8	744	800	790	1384	1488	1470	55/62	9	58/63	10	70.0 x 2.0/2.5/3.0
|	9	837	900	888	1557	1674	1653	55/62	8	58/63	9	|
|	10	930	1000	987	1730	1860	1837	60/67	10	58/63	9	|
|	11	1023	1100	1086	1903	2046	2021	60/67	9	58/63	8	|
5-12	12	1116	1200	1184	2076	2232	2204	60/67	8	58/63	7	70.0 x 2.0/2.5/3.0
5-15	13	1209	1300	1283	2249	2418	2388	65/72	9	76/81	14	82.5 x 2.0/2.5/3.0
|	14	1302	1400	1382	2422	2604	2572	65/72	8	76/81	13	|
5-15	15	1395	1500	1481	2595	2790	2756	70/77	9	76/81	12	82.5 x 2.0/2.5/3.0
5-19	16	1488	1600	1579	2768	2976	2939	70/77	9	76/81	12	88.9 x 2.5/3.0/3.5
|	17	1581	1700	1678	2941	3162	3123	75/82	11	76/81	11	|
|	18	1674	1800	1777	3114	3348	3307	75/82	10	76/81	10	|
5-19	19	1767	1900	1875	3287	3534	3490	75/82	9	76/81	9	88.9 x 2.5/3.0/3.5
5-22	20	1860	2000	1974	3460	3720	3674	80/87	10	100/106	20	88.9 x 2.5/3.0/3.5
|	21	1953	2100	2073	3633	3906	3858	80/87	9	100/106	19	|
5-22	22	2046	2200	2171	3806	4092	4041	80/87	8	100/106	18	88.9 x 2.5/3.0/3.5
5-27	23	2139	2300	2270	3979	4278	4225	85/92	12	100/106	19	101.6 x 3.0/4.0/5.0
|	24	2232	2400	2369	4152	4464	4409	85/92	11	100/106	18	|
|	25	2325	2500	2468	4325	4650	4593	90/97	14	100/106	19	|
|	26	2418	2600	2566	4498	4836	4776	90/97	13	100/106	18	|
5-27	27	2511	2700	2665	4671	5022	4960	95/102	15	100/106	17	101.6 x 3.0/4.0/5.0
5-31	28	2604	2800	2764	4844	5208	5144	95/102	14	100/106	16	108.0 x 3.0/4.0/5.0
|	29	2697	2900	2862	5017	5394	5327	95/102	13	100/106	15	|
|	30	2790	3000	2961	5190	5580	5511	95/102	12	100/106	14	|
5-31	31	2883	3100	3060	5363	5766	5695	95/102	11	100/106	13	108.0 x 3.0/4.0/5.0
5-37	32	2976	3200	3158	5536	5952	5878	100/107	13	115/121	20	114.3 x 3.0/4.0/5.0
|	33	3069	3300	3257	5709	6138	6062	100/107	12	115/121	19	|
|	34	3162	3400	3356	5882	6324	6246	100/107	12	115/121	19	|
|	35	3255	3500	3455	6055	6510	6430	110/117	17	115/121	19	|
|	36	3348	3600	3553	6228	6696	6613	110/117	17	115/121	19	|
5-37	37	3441	3700	3652	6401	6882	6797	110/117	16	115/121	18	114.3 x 3.0/4.0/5.0
5-43	43	3999	4300	4244	7439	7998	7899	120/127	18	130/136	23	127.0 x 3.0/4.0/5.0
5-55	55	5115	5500	5429	9515	10230	10104	130/137	17	130/136	17	139.7 x 3.0/4.0/5.0

1.3 - STRAND PROPERTIES 15mm (0.6")

Strand type			prEN 10138 – 3 (2006) Y1860S7		ASTM A 416-06 Grade 270
Nominal diameter	d	(mm)	15.3	15.7	15.24
Nominal cross section	A_p	(mm^2)	140	150	140
Nominal mass	M	(kg/m)	1.093	1.172	1.102
Nominal yield strength	$f_{p0,1k}$	(MPa)	1636[1]	1640[1]	1676[2]
Nominal tensile strength	f_{pk}	(MPa)	1860	1860	1860
Specif./min. breaking load	F_{pk}	(kN)	260	279	260.7
Young's modulus		(GPa)	approx. 195		
Relaxation[3] after 1000 h at 20°C and 0.7 x F_{pk}		(%)	max. 2.5		

1) Characteristic value measured at 0.1% permanent extension
2) Minimum load at 1% extension for low-relaxation strand
3) Valid for relaxation class acc. to prEN 10138-3 or low-relaxation grade acc. to ASTM A 416-06

1.4 - TENDON PROPERTIES 15mm (0.6")

Unit	Strands numbers	Steel area			Breaking load			Corrugated steel duct[3] (recommended)		Corrugated plastic duct VSL PT-PLUS®		Steel pipes
		A_p acc. to prEN		ASTM	Y1860S7 (prEN)		Grade 270 (ASTM)	$Ø_i$ / $Ø_e$	e	$Ø_i$ / $Ø_e$	e	Ø ext. x t
		d=15.3 mm A_p=140 mm^2	d=15.7 mm A_p=150 mm^2	d=15.24 mm A_p=140 mm^2	d=15.3 mm A_p=140 mm^2	d=15.7 mm A_p=150 mm^2	d=15.24 mm A_p=140 mm^2					
		[mm^2]	[mm^2]	[mm^2]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]
6-1	1	140	150	140	260	279	260.7	25/30	5	22/25	4	25.0 x 2.0
6-2	2	280	300	280	520	558	521	40/45	9	76/25[2]	-	42.4 x 2.0/2.5/3.0
6-3	3	420	450	420	780	837	782	40/45	6	76/25[2]	-	42.4 x 2.0/2.5/3.0
6-4	4	560	600	560	1040	1116	1043	45/50[1]	7	76/25[2]	-	48.3 x 2.0/2.5/3.0
6-7	5	700	750	700	1300	1395	1304	50/57	8	58/63	13	76.1 x 2.0/2.5/3.0
|	6	840	900	840	1560	1674	1564	55/62	9	58/63	11	|
6-7	7	980	1050	980	1820	1953	1825	55/62	7	58/63	9	76.1 x 2.0/2.5/3.0
6-12	8	1120	1200	1120	2080	2232	2086	65/72	11	76/81	18	80.0 x 2.0/.2.5
|	9	1260	1350	1260	2340	2511	2346	65/72	9	76/81	16	|
|	10	1400	1500	1400	2600	2790	2607	70/77	11	76/81	15	|
|	11	1540	1650	1540	2860	3069	2868	70/77	9	76/81	13	|
6-12	12	1680	1800	1680	3120	3348	3128	75/82	11	76/81	12	80.0 x 2.0/.2.5
6-15	13	1820	1950	1820	3380	3627	3389	80/87	13	100/106	25	101.6 x 3.0/4.0/5.0
|	14	1960	2100	1960	3640	3906	3650	80/87	11	100/106	24	|
6-15	15	2100	2250	2100	3900	4185	3911	80/87	10	100/106	23	101.6 x 3.0/4.0/5.0
6-19	16	2240	2400	2240	4160	4464	4171	85/92	12	100/106	22	101.6 x 3.0/4.0/5.0
|	17	2380	2550	2380	4420	4743	4432	85/92	11	100/106	20	|
|	18	2520	2700	2520	4680	5022	4693	90/97	13	100/106	19	|
6-19	19	2660	2850	2660	4940	5301	4953	90/97	12	100/106	18	101.6 x 3.0/4.0/5.0
6-22	20	2800	3000	2800	5200	5580	5214	100/107	17	100/106	17	114.3 x 3.0/4.0/5.0
|	21	2940	3150	2940	5460	5859	5475	100/107	16	100/106	16	|
6-22	22	3080	3300	3080	5720	6138	5735	100/107	15	100/106	15	114.3 x 3.0/4.0/5.0
6-27	23	3220	3450	3220	5980	6417	5996	100/107	14	115/121	22	114.3 x 3.0/4.0/5.0
|	24	3360	3600	3360	6240	6696	6257	100/107	13	115/121	22	|
|	25	3500	3750	3500	6500	6975	6518	110/117	18	115/121	21	|
|	26	3640	3900	3640	6760	7254	6778	110/117	17	115/121	21	|
6-27	27	3780	4050	3780	7020	7533	7039	110/117	16	115/121	20	114.3 x 3.0/4.0/5.0
6-31	28	3920	4200	3920	7280	7812	7300	110/117	15	130/136	27	127.0 x 3.0/4.0/5.0
|	29	4060	4350	4060	7540	8091	7560	120/127	21	130/136	27	|
|	30	4200	4500	4200	7800	8370	7821	120/127	20	130/136	26	|
6-31	31	4340	4650	4340	8060	8649	8082	120/127	19	130/136	25	127.0 x 3.0/4.0/5.0
6-37	32	4480	4800	4480	8320	8928	8342	120/127	18	130/136	24	139.7 x 3.0/4.0
|	33	4620	4950	4620	8580	9207	8603	120/127	17	130/136	23	|
|	34	4760	5100	4760	8840	9486	8864	120/127	16	130/136	22	|
|	35	4900	5250	4900	9100	9765	9125	130/137	22	130/136	22	|
|	36	5040	5400	5040	9360	10044	9385	130/137	21	130/136	21	|
6-37	37	5180	5550	5180	9620	10323	9646	130137	20	130/136	20	139.7 x 3.0/4.0
6-43	43	6020	6450	6020	11180	11997	11210	140/147	21	150/157	27	152.4 x 3.0/4.0/5.0
6-55	55	7700	8250	7700	14300	15345	14339	160/167	26	150/157	21	168.3 x 3.0/4.0