

SPECIFICATIONS FOR PC STRAND



SPECIFICATIONS FOR PC STRAND

LMK

The strands are made of high tensile strength steel produced by low relaxation process, consisted of 7-steel wires (one central and six helically wrapped) having 13 mm (0.5") or 15 mm (0,6") nominal diameter and characteristics listed in the Tables.

The strands are generally supplied already stabilized (low relaxation) and certified according to standards in testing labs factory facilities (EN & ASTM). They are usually shipped in coils having the following typical dimensions:

- Outer diameter: 1,2-1,5 m
- Inner diameter: 0,7-0,8 m
- Width: 0,7-0,75 m
- Weight: 3-4 ton

LMK can use any type of pc strand meeting the project requirements. When needed, oiled, greased or waxed/gelled strands can be applied using plastic sheath (PP or PE), i.e., in case of external post-tensioning or in unbonded applications. If required, strands can also be supplied galvanized, considering different mechanical properties in comparison with common strand types.

Tendons are consisted of a specific number of wire strands according to the design. The number of strands defines usually the type of anchorage (LMK typical range of production from 1 up to 37 strands). All types of strands are following the common stress-strain diagram. The yield point of the steel is the reaching of an irreversible plastic strain of 0.1%, defined as $f_{p0,1}$.



(0,6'') M15	prEN 10138						ASTM A416						
	Y177057	Y186057	Kg/m	Y177057	Y186057	Kg/m	Grade 250	Kg/m	Grade 270	Kg/m	Grade 270	Kg/m	
	15.2	15.3		15.7	1.172								15.2
	A (mm ²)	139	1.086	140	1.093	150	1.172	139.4	1.094	140	1.102	150	1.200
	Strands / tendon	STRAND DATA - 15mm (0,6'')											
Nos.	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	
1	139	1.09	140	1.09	150	1.17	139	1.09	140	1.10	150	1.20	
2	278	2.17	280	2.19	300	2.34	279	2.19	280	2.20	300	2.40	
3	417	3.26	420	3.28	450	3.52	418	3.28	420	3.31	450	3.60	
4	556	4.34	560	4.37	600	4.69	558	4.38	560	4.41	600	4.80	
5	695	5.43	700	5.47	750	5.86	697	5.47	700	5.51	750	6.00	
6	834	6.52	840	6.56	900	7.03	836	6.56	840	6.61	900	7.20	
7	973	7.60	980	7.65	1050	8.20	976	7.66	980	7.71	1050	8.40	
8	1112	8.69	1120	8.74	1200	9.38	1115	8.75	1120	8.82	1200	9.60	
9	1251	9.77	1260	9.84	1350	10.55	1255	9.85	1260	9.92	1350	10.80	
10	1390	10.86	1400	10.93	1500	11.72	1394	10.94	1400	11.02	1500	12.00	
11	1529	11.95	1540	12.02	1650	12.89	1533	12.03	1540	12.12	1650	13.20	
12	1668	13.03	1680	13.12	1800	14.06	1673	13.13	1680	13.22	1800	14.40	
13	1807	14.12	1820	14.21	1950	15.24	1812	14.22	1820	14.33	1950	15.60	
14	1946	15.20	1960	15.30	2100	16.41	1952	15.32	1960	15.43	2100	16.80	
15	2085	16.29	2100	16.40	2250	17.58	2091	16.41	2100	16.53	2250	18.00	
16	2224	17.38	2240	17.49	2400	18.75	2230	17.50	2240	17.63	2400	19.20	
17	2363	18.46	2380	18.58	2550	19.92	2370	18.60	2380	18.73	2550	20.40	
18	2502	19.55	2520	19.67	2700	21.10	2509	19.69	2520	19.84	2700	21.60	
19	2641	20.63	2660	20.77	2850	22.27	2649	20.79	2660	20.94	2850	22.80	
20	2780	21.72	2800	21.86	3000	23.44	2788	21.88	2800	22.04	3000	24.00	
21	2919	22.81	2940	22.95	3150	24.61	2927	22.97	2940	23.14	3150	25.20	
22	3058	23.89	3080	24.05	3300	25.78	3067	24.07	3080	24.24	3300	26.40	
23	3197	24.98	3220	25.14	3450	26.96	3206	25.16	3220	25.35	3450	27.60	
24	3336	26.06	3360	26.23	3600	28.13	3346	26.26	3360	26.45	3600	28.80	
25	3475	27.15	3500	27.33	3750	29.30	3485	27.35	3500	27.55	3750	30.00	
26	3614	28.24	3640	28.42	3900	30.47	3624	28.44	3640	28.65	3900	31.20	
27	3753	29.32	3780	29.51	4050	31.64	3764	29.54	3780	29.75	4050	32.40	
28	3892	30.41	3920	30.60	4200	32.82	3903	30.63	3920	30.86	4200	33.60	
29	4031	31.49	4060	31.70	4350	33.99	4043	31.73	4060	31.96	4350	34.80	
30	4170	32.58	4200	32.79	4500	35.16	4182	32.82	4200	33.06	4500	36.00	
31	4309	33.67	4340	33.88	4650	36.33	4321	33.91	4340	34.16	4650	37.20	
32	4448	34.75	4480	34.98	4800	37.50	4461	35.01	4480	35.26	4800	38.40	
33	4587	35.84	4620	36.07	4950	38.68	4600	36.10	4620	36.37	4950	39.60	
34	4726	36.92	4760	37.16	5100	39.85	4740	37.20	4760	37.47	5100	40.80	
35	4865	38.01	4900	38.26	5250	41.02	4879	38.29	4900	38.57	5250	42.00	
36	5004	39.10	5040	39.35	5400	42.19	5018	39.38	5040	39.67	5400	43.20	
37	5143	40.18	5180	40.44	5550	43.36	5158	40.48	5180	40.77	5550	44.40	

prEN 10138						ASTM A416					
Y177057	Y186057	Y177057	Y186057	Y177057	Y186057	Grade 250	Grade 270	Grade 250	Grade 270	Grade 250	Grade 270
Tensile Strength (N/mm ²)											
1770	1860	1770	1860	1770	1860	1725	1860	1725	1860	1725	1860
Breaking Load (KN) (F _{pk})											
246	259	248	260	266	279	240	261	240	261	240	279
KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
246	259	248	260	266	279	240	261	240	261	240	279
492	518	496	520	532	558	480	521	480	521	480	558
738	777	744	780	798	837	721	782	721	782	721	837
984	1036	992	1040	1064	1116	961	1043	961	1043	961	1116
1230	1295	1240	1300	1330	1395	1201	1304	1201	1304	1201	1395
1476	1554	1488	1560	1596	1674	1441	1564	1441	1564	1441	1674
1722	1813	1736	1820	1862	1953	1681	1825	1681	1825	1681	1953
1968	2072	1984	2080	2128	2232	1922	2086	1922	2086	1922	2232
2214	2331	2232	2340	2394	2511	2162	2346	2162	2346	2162	2511
2460	2590	2480	2600	2660	2790	2402	2607	2402	2607	2402	2790
2706	2849	2728	2860	2926	3069	2642	2868	2642	2868	2642	3069
2952	3108	2976	3120	3192	3348	2882	3128	2882	3128	2882	3348
3198	3367	3224	3380	3458	3627	3123	3389	3123	3389	3123	3627
3444	3626	3472	3640	3724	3906	3363	3650	3363	3650	3363	3906
3690	3885	3720	3900	3990	4185	3603	3911	3603	3911	3603	4185
3936	4144	3968	4160	4256	4464	3843	4171	3843	4171	3843	4464
4182	4403	4216	4420	4522	4743	4083	4432	4083	4432	4083	4743
4428	4662	4464	4680	4788	5022	4324	4693	4324	4693	4324	5022
4674	4921	4712	4940	5054	5301	4564	4953	4564	4953	4564	5301
4920	5180	4960	5200	5320	5580	4804	5214	4804	5214	4804	5580
5166	5439	5208	5460	5586	5859	5044	5475	5044	5475	5044	5859
5412	5698	5456	5720	5852	6138	5284	5735	5284	5735	5284	6138
5658	5957	5704	5980	6118	6417	5525	5996	5525	5996	5525	6417
5904	6216	5952	6240	6384	6696	5765	6257	5765	6257	5765	6696
6150	6475	6200	6500	6650	6975	6005	6518	6005	6518	6005	6975
6396	6734	6448	6760	6916	7254	6245	6778	6245	6778	6245	7254
6642	6993	6696	7020	7182	7533	6485	7039	6485	7039	6485	7533
6888	7252	6944	7280	7448	7812	6726	7300	6726	7300	6726	7812
7134	7511	7192	7540	7714	8091	6966	7560	6966	7560	6966	8091
7380	7770	7440	7800	7980	8370	7206	7821	7206	7821	7206	8370
7626	8029	7688	8060	8246	8649	7446	8082	7446	8082	7446	8649
7872	8288	7936	8320	8512	8928	7686	8342	7686	8342	7686	8928
8118	8547	8184	8580	8778	9207	7927	8603	7927	8603	7927	9207
8364	8806	8432	8840	9044	9486	8167	8864	8167	8864	8167	9486
8610	9065	8680	9100	9310	9765	8407	9125	8407	9125	8407	9765
8856	9324	8928	9360	9576	10044	8647	9385	8647	9385	8647	10044
9102	9583	9176	9620	9842	10323	8887	9646	8887	9646	8887	10323

prEN 10138						ASTM A416					
Y177057	Y186057	Y177057	Y186057	Y177057	Y186057	Grade 250	Grade 270	Grade 250	Grade 270	Grade 250	Grade 270
Yield Strength (N/mm ²)											
1554	1640	1557	1636	1560	1640	1550	1676	1550	1676	1550	1676
Proof load (KN) (F _{p0.1k})											
216	228	218	229	234	246	216	235	216	235	216	251
KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
216	228	218	229	234	246	216	235	216	235	216	251
432	456	436	458	468	492	432	469	432	469	432	503
648	684	654	687	702	738	649	704	649	704	649	754
864	912	872	916	936	984	865	938	865	938	865	1006
1080	1140	1090	1145	1170	1230	1081	1173	1081	1173	1081	1257
1296	1368	1308	1374	1404	1476	1297	1408	1297	1408	1297	1508
1512	1596	1526	1603	1638	1722	1513	1642	1513	1642	1513	1760
1728	1824	1744	1832	1872	1968	1730	1877	1730	1877	1730	2011
1944	2052	1962	2061	2106	2214	1946	2111	1946	2111	1946	2263
2160	2280	2180	2290	2340	2460	2162	2346	2162	2346	2162	2514
2376	2508	2398	2519	2574	2706	2378	2581	2378	2581	2378	2765
2592	2736	2616	2748	2808	2952	2594	2815	2594	2815	2594	3017
2808	2964	2834	2972	3042	3198	2811	3050	2811	3050	2811	3268
3024	3192	3052	3206	3276	3444	3027	3284	3027	3284	3027	3520
3240	3420	3270	3435	3510	3690	3243	3519	3243	3519	3243	3771
3456	3648	3488	3664	3744	3936	3459	3754	3459	3754</		

(0.5") M13	Y177057	Y186057	Kg/m		Y177057	Y186057	Kg/m		Grade 250	Kg/m		Grade 270	Kg/m			
	d (mm)	12.5	0.726	12.9	0.781	12.7	0.730	12.7	0.775	A (mm ²)	93	100	0.781	92.9	0.730	98.7
Strands / tendon	STRAND DATA - 13mm (0.5")															
Nos.	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m	mm ²	kg/m		
1	93	0.726	100	0.781	93	0.730	99	0.775								
2	186	1.452	200	1.562	186	1.460	197	1.550								
3	279	2.178	300	2.343	279	2.190	296	2.325								
4	372	2.904	400	3.124	372	2.920	395	3.100								
5	465	3.630	500	3.905	465	3.650	494	3.875								
6	558	4.356	600	4.686	557	4.380	592	4.650								
7	651	5.082	700	5.467	650	5.110	691	5.425								
8	744	5.808	800	6.248	743	5.840	790	6.200								
9	837	6.534	900	7.029	836	6.570	888	6.975								
10	930	7.260	1000	7.810	929	7.300	987	7.750								
11	1023	7.986	1100	8.591	1022	8.030	1086	8.525								
12	1116	8.712	1200	9.372	1115	8.760	1184	9.300								
13	1209	9.438	1300	10.153	1208	9.490	1283	10.075								
14	1302	10.164	1400	10.934	1301	10.220	1382	10.850								
15	1395	10.890	1500	11.715	1394	10.950	1481	11.625								
16	1488	11.616	1600	12.496	1486	11.680	1579	12.400								
17	1581	12.342	1700	13.277	1579	12.410	1678	13.175								
18	1674	13.068	1800	14.058	1672	13.140	1777	13.950								
19	1767	13.794	1900	14.839	1765	13.870	1875	14.725								
20	1860	14.520	2000	15.620	1858	14.600	1974	15.500								
21	1953	15.246	2100	16.401	1951	15.330	2073	16.275								
22	2046	15.972	2200	17.182	2044	16.060	2171	17.050								
23	2139	16.698	2300	17.963	2137	16.790	2270	17.825								
24	2232	17.424	2400	18.744	2230	17.520	2369	18.600								
25	2325	18.150	2500	19.525	2323	18.250	2468	19.375								
26	2418	18.876	2600	20.306	2415	18.980	2566	20.150								
27	2511	19.602	2700	21.087	2508	19.710	2665	20.925								
28	2604	20.328	2800	21.868	2601	20.440	2764	21.700								
29	2697	21.054	2900	22.649	2694	21.170	2862	22.475								
30	2790	21.780	3000	23.430	2787	21.900	2961	23.250								
31	2883	22.506	3100	24.211	2880	22.630	3060	24.025								
32	2976	23.232	3200	24.992	2973	23.360	3158	24.800								
33	3069	23.958	3300	25.773	3066	24.090	3257	25.575								
34	3162	24.684	3400	26.554	3159	24.820	3356	26.350								
35	3255	25.410	3500	27.335	3252	25.550	3455	27.125								
36	3348	26.136	3600	28.116	3344	26.280	3553	27.900								
37	3441	26.862	3700	28.897	3437	27.010	3652	28.675								

Y177057	Y186057	Y177057	Y186057	Grade 25	Grade 27
Tensile Strength (N/mm ²)					
1770	1860	1770	1860	1725	1860
Breaking Load (KN) (f _{pk})					
165	173	177	186	160.1	183.7
KN	KN	KN	KN	KN	KN
165	173	177	186	160	184
330	346	354	372	320	367
495	519	531	558	480	551
660	692	708	744	640	735
825	865	885	930	801	919
990	1038	1062	1116	961	1102
1155	1211	1239	1302	1121	1286
1320	1384	1416	1488	1281	1470
1485	1557	1593	1674	1441	1653
1650	1730	1770	1860	1601	1837
1815	1903	1947	2046	1761	2021
1980	2076	2124	2232	1921	2204
2145	2249	2301	2418	2081	2388
2310	2422	2478	2604	2241	2572
2475	2595	2655	2790	2401	2756
2640	2768	2832	2976	2562	2939
2805	2941	3009	3162	2722	3123
2970	3114	3186	3348	2882	3307
3135	3287	3363	3534	3042	3490
3300	3460	3540	3720	3202	3674
3465	3633	3717	3906	3362	3858
3630	3806	3894	4092	3522	4041
3795	3979	4071	4278	3682	4225
3960	4152	4248	4464	3842	4409
4125	4325	4425	4650	4003	4593
4290	4498	4602	4836	4163	4776
4455	4671	4779	5022	4323	4960
4620	4844	4956	5208	4483	5144
4785	5017	5133	5394	4643	5327
4950	5190	5310	5580	4803	5511
5115	5363	5487	5766	4963	5695
5280	5536	5664	5952	5123	5878
5445	5709	5841	6138	5283	6062
5610	5882	6018	6324	5443	6246
5775	6055	6195	6510	5604	6430
5940	6228	6372	6696	5764	6613
6105	6401	6549	6882	5924	6797

Y177057	Y186057	Y177057	Y186057	Grade 25	Grade 27
Yield Strength (N/mm ²)					
1559	1634	1560	1640	1551	1675
Proof load (KN) (f _{p0,1k})					
145	152	156	164	144.1	165.3
KN	KN	KN	KN	KN	KN
145	152	156	164	144	165
290	304	312	328	288	331
435	456	468	492	432	496
580	608	624	656	576	661
725	760	780	820	721	827
870	912	936	984	865	992
1015	1064	1092	1148	1009	1157
1160	1216	1248	1312	1153	1322
1305	1368	1404	1476	1297	1488
1450	1520	1560	1640	1441	1653
1595	1672	1716	1804	1585	1818
1740	1824	1872	1968	1729	1984
1885	1976	2028	2132	1873	2149
2030	2128	2184	2296	2017	2314
2175	2280	2340	2460	2162	2480
2320	2432	2496	2624	2306	2645
2465	2584	2652	2788	2450	2810
2610	2736	2808	2952	2594	2975
2755	2888	2964	3116	2738	3141
2900	3040	3120	3280	2882	3306
3045	3192	3276	3444	3026	3471
3190	3344	3432	3608	3170	3637
3335	3496	3588	3772	3314	3802
3480	3648	3744	3936	3458	3967
3625	3800	3900	4100	3603	4133
3770	3952	4056	4264	3747	4298
3915	4104	4212	4428	3891	4463
4060	4256	4368	4592	4035	4628
4205	4408	4524	4756	4179	4794
4350	4560	4680	4920	4323	4959
4495	4712	4836	5084	4467	5124
4640	4864	4992	5248	4611	5290
4785	5016	5148	5412	4755	5455
4930	5168	5304	5576	4899	5620
5075	5320	5460	5740	5044	5786
5220	5472	5616	5904	5188	5951
5365	5624	5772	6068	5332	6116

Y177057	Y186057	Y177057	Y186057	Grade 25	Grade 27
Tensile strength under max force (N/mm ²)					
1403.1	1470.6	1404	1476	1380	1488
Anchorage indicative max force prior of seating as per EC2					
min {0,8 f _{pk} / 0,9 f _{p0,1k} }					
KN	KN	KN	KN	KN	KN
131	137	140	148	128	147
261	274	281	295	256	294
392	410	421	443	384	441
522	547	562	590	512	588
653	684	702	738	640	735
783	821	842	886	768	882
914	958	983	1033	897	1029
1044	1094	1123	1181	1025	1176
1175	1231	1264	1328	1153	1323
1305	1368	1404	1476	1281	1470
1436	1505	1544	1624	1409	1617
1566	1642	1685	1771	1537	1764
1697	1778	1825	1919	1665	1910
1827	1915	1966	2066	1793	2057
1958	2052	2106	2214	1921	2204
2088	2189	2246	2362	2049	2351
2219	2326	2387	2509	2177	2498
2349	2462	2527	2657	2305	2645
2480	2599	2668	2804	2434	2792
2610	2736	2808	2952	2562	2939
2741	2873	2948	3100	2690	3086
2871	3010	3089	3247	2818	3233
3002	3146	3229	3395	2946	3380
3132	3283	3370	3542	3074	3527
3263	3420	3510	3690	3202	3674
3393	3557	3650	3838	3330	3821
3524	3694	3791	3985	3458	3968
3654	3830	3931	4133	3586	4115
3785	3967	4072	4280	3714	4262
3915	4104	4212	4428	3842	4409
4046	4241	4352	4576	3970	4556
4176	4378	4493	4723	4099	4703
4307	4514	4633	4871	4227	4850
4437	4651	4774	5018	4355	4997
4568	4788	4914	5166	4483	5144
4698	4925	5054	5314	4611	5291
4829	5062	5195	5461	4739	5438

STANDARD DIAMETERS 7-WIRS STRANDS



prEN-10138

Diameter		Tensile Strength	Cross-Sectional Area	Characteristic Value of Maximum Force	Characteristic Value of 0.1% Proof Force
mm	inch	MPa	mm ²	KN	KN
12.5	1/2	1770	93	165	145
12.5	1/2	1860	93	173	152
12.5	1/2	1960	93	182	162
12.9	1/2S	1770	100	177	156
12.9	1/2S	1860	100	186	164
12.9	1/2S	1960	100	196	174
13	1/2S	1860	102	190	167
13	1/2S	1960	102	200	178
15.2	0.6	1770	139	246	216
15.2	0.6	1860	139	259	228
15.2	0.6	1960	139	272	242
15.3	0.6	1770	140	248	218
15.3	0.6	1860	140	260	229
15.3	0.6	1960	140	274	244
15.7	0.6S	1770	150	266	234
15.7	0.6S	1860	150	279	246
15.7	0.6S	1960	150	294	262

ASTM A416

Diameter		Tensile Strength	Cross-Sectional Area	Characteristic Value of Maximum Force	Characteristic Value of 0.1% Proof Force
mm	inch	Mpa (Ksi)	mm ²	KN	KN
12.7	1/2	1725 (250)	92.9	160	144.1
12.7	1/2	1860 (270)	98.7	184	165.3
15.2	0.6	1725 (250)	139	240	216.2
15.2	0.6	1860 (270)	140	261	234.6
15.7	0.6S	1860 (270)	150	279	251.4

