N2 NEPTUNE

beyond anything

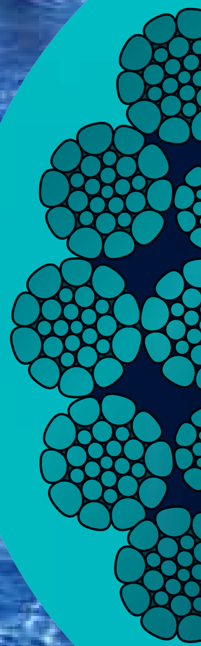
OFFSHORE ROPES

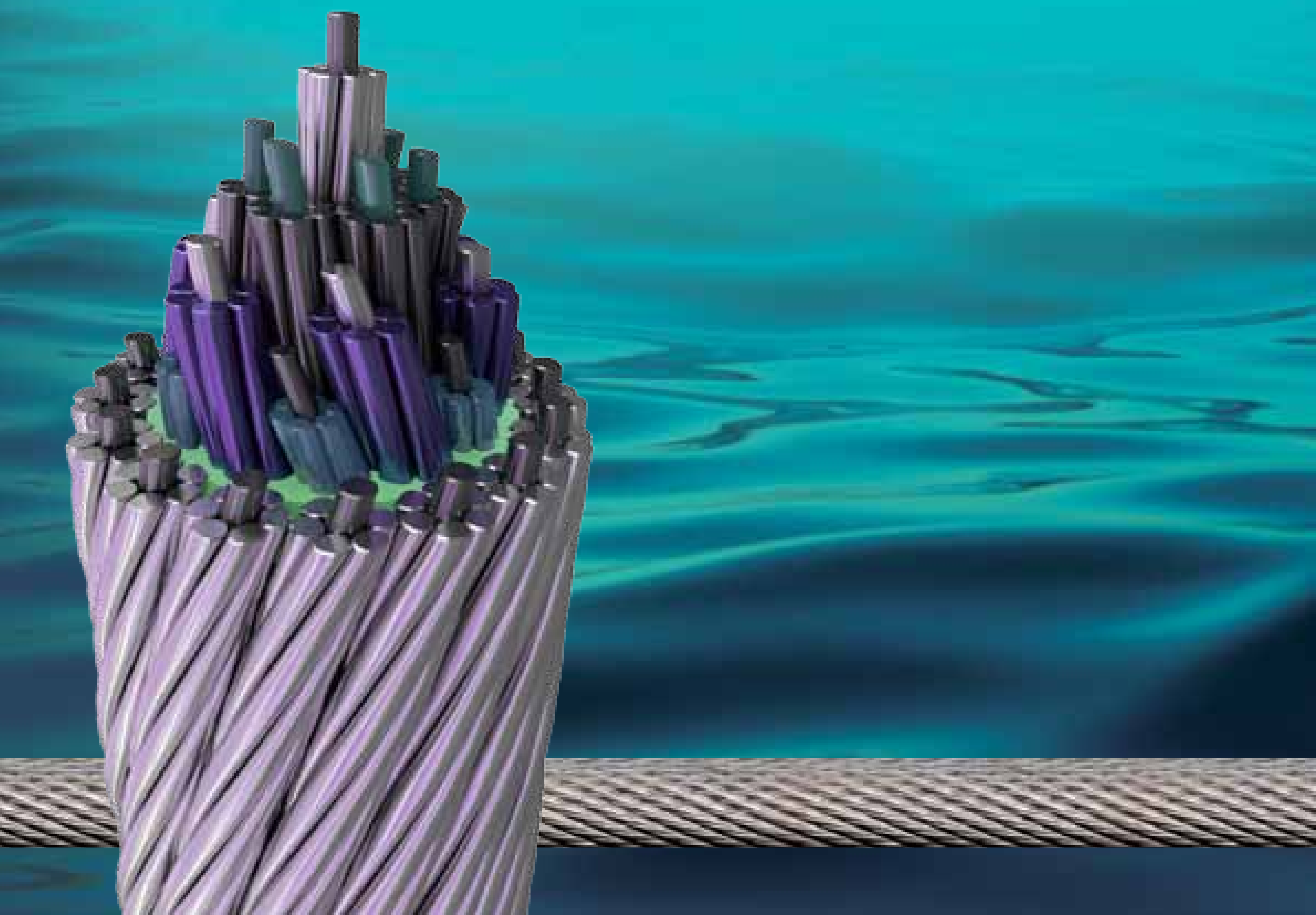
Subsea Hoisting Ropes - Crane Ropes - Anchor/Mooring Ropes - Drill Lines - Riser Tensioner Lines - Towing Ropes

Kiswire

KISWIRE has been manufacturing a special range of offshore ropes for the global market for decades. Today the company produces 140.000 metric tons of wire rope annually, 40 000 tons of which find its way into the offshore sector in the form of special, large diameter rope for cranes, winches, anchor lines, mooring systems, subsea hoisting and other demanding applications.

In the Autumn of 2012, a brand new wire rope plant in Johor on the Malaysian coast has been taken into use. The plant is called NEPTUNE 2 – N2 for short. This new plant designs and produces 6 and 8 strand ropes as well as N2 multi strand, non-rotating ropes in diameters ranging from 50 to 180 mm. a wide variety of N2 rope types will be available, with features including zinc/aluminium coating (Alumar®), plastic infill, variable strand compaction, special lubricants, and more.






KISWIRE

N2 HYROPE

beyond anything

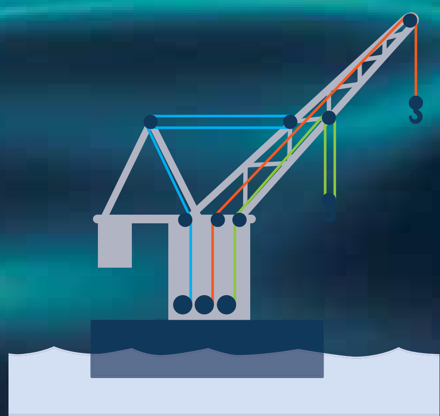
Kiswire is the largest wire rope producer in the world. Annually, about 140.000 tons of wire rope is delivered, worldwide. For decades, Kiswire is specializing in the development and production of wire rope. Meanwhile, the company has acquired a reputable and leading position in a great variety of markets, in literally all corners of the world. The offshore industry is one is a main market for Kiswire since 25 years, meanwhile.

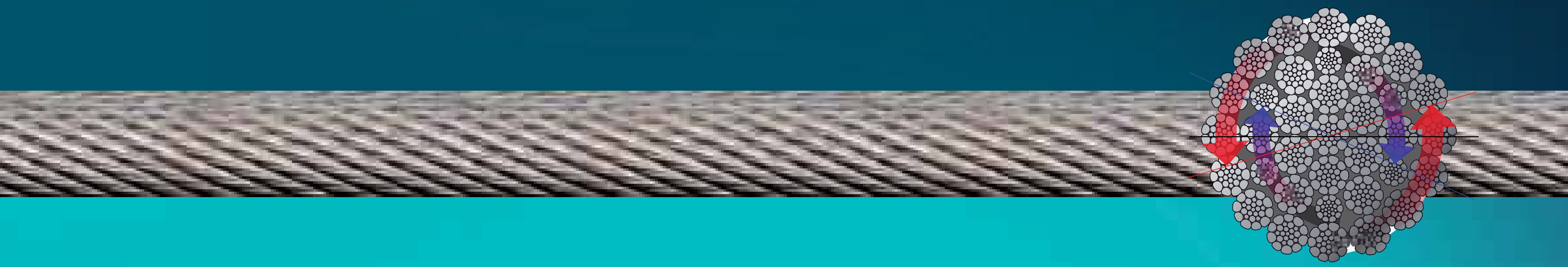
Crane Ropes

Single and multiple part reeving
Pedestal cranes may come in different ways as to rope reeving lay outs. We are speaking of multiple part reeved ropes and single part reeved main hoist and whip hoist systems.
The multiple part systems may allow to be equipped with six or eight strand ropes in right and left lay version in a tandem, whereas single part systems are almost exclusively equipped with multi strand non rotating ropes.

Compacted crane ropes
By compacting hoist ropes the resistance to crushing improves substantially. Especially on multi layer drums, wire ropes could interlock between the different layers. By compacting a wire rope, one makes the surface of the outer layers (outer wires) of the rope more flat. This flatter surface leaves the rope with less grip to get hold of. Consequently, layers slide more smooth along each other. Besides, compacted ropes perform better on the surface pressure issue and brings consequently a higher resistance to fatigue.

Plastic infill
In order to improve constructional stability of a rope, the IWRC is extruded with a special plastic medium. When eventually the strands are laid around the IWRC, the plastic finds its final position between strands and IWRC and strands among each other. The plastic infill prevents excessive internal rope wear and prevents dirt and water to penetrate into the rope, at the same time.





Special lubricants
For a perfect conservation of wire ropes in harsh environments, it is recommended to protect the rope from corrosion by providing the rope with a special sea water resistant lubricant. Wire rope lubricants are applied to smoothen rope bending and axial torsion as well. Contact between rope and sheave or drum is enhanced by rope lubricants too.

ALUMAR® aluminised ropes
The aluminizing of steel wire and steel wire ropes is made by KISWIRE under the brand name ALUMAR®. We apply this technology for about 10 years now, it started in 1999. Initially, the ALUMAR technology was developed for products applied in the aviation and car industry – the core demand was to extend the life time of the wires by sustaining the steel wire quality! Apart from many different kinds of improvement we could establish in this respect, it was obvious that an important improvement was to be made by protecting the wires from corrosion as long as possible. The ALUMAR zinc/aluminium coating was developed as an alternative for the regular galvanizing of wire. Many tests have been done in the meantime, showing that the ALUMAR wires stay corrosion free 3,8 times longer than galvanized products. Third party Salt Spray Tests are available.

The offshore industry, both oil and gas as well as fishing, could benefit from ALUMAR ropes substantially, as sea water is a corrosive environment.

BOOM HOIST ROPES
6x36WS+IWRC / 8x36WS+IWRC

MAIN HOIST ROPES
6X36WS+IWRC / 8x36WS+IWRC

N2 HYROPE
35xK7, 40xK7 / 55xK7 / 67xK7
N2 HYROPE
35xK19S / 35xK26WS

WHIP HOIST ROPES
N2 HYROPE
35xK7 / 40xK7 / 55xK7 / 67xK7
N2 HYROPE
35xK19S / 35xK26WS

Average torque factors for the following rope constructions are:

35xK7 and 40xK7 torque factor 0.0080
55xK7 and 67xK7 torque factor 0.0050

N2
HYROPE

Crane Ropes

N2 Hyrope Catalogue Data (35XK7)

Nominal Rope Diameter		Unit Weight (Kg/m)		Minimum Breaking Force (Fmin)				Max Lenght (m)	Axial stiffness (MN)	Torque at 20% load (N.m)		Metallic Cross section (mm^2)
				N Grade		S Grade						
mm	inches	In air	In Seawater	M/Ton	kN	M/Ton	kN			Lang's	Regular	
50,8	2	12,9	11,2	229	2250	241	2360	23200	150	342	274	1390
52,0		13,4	11,7	240	2360	253	2480	22300	158	368	294	1460
54,0	2 1/8	14,6	12,7	259	2540	273	2680	20500	170	412	330	1580
56,0		15,7	13,7	278	2730	293	2870	19100	183	459	367	1690
57,2	2 1/4	16,3	14,2	285	2790	300	2940	18400	191	480	384	1770
58,0		16,9	14,7	294	2880	309	3030	17700	196	501	401	1820
60,3	2 3/8	18,2	15,8	314	3080	331	3250	16400	212	558	446	1960
62,0		19,4	16,9	335	3290	353	3460	15400	224	612	489	2080
63,5	2 1/2	20,2	17,6	352	3460	371	3640	14800	235	658	527	2180
64,0		20,2	17,6	357	3500	376	3690	14800	239	673	538	2210
66,0		21,5	18,7	380	3730	400	3920	13900	254	738	590	2350
66,7	2 5/8	22,2	19,3	388	3800	408	4000	13500	259	761	609	2400
68,0		22,9	19,9	404	3960	425	4170	13100	269	808	646	2500
69,9	2 3/4	24,4	21,2	426	4180	448	4400	12200	285	876	701	2640
72,0		25,8	22,4	452	4430	476	4670	11600	301	957	766	2790
73,0	2 7/8	26,7	23,2	465	4560	489	4800	11200	309	998	799	2870
74,0		27,4	23,8	478	4690	503	4930	10900	318	1040	832	2950
76,0		29,0	25,2	504	4940	530	5200	10300	335	1130	901	3110
76,2	3	29,0	25,2	504	4940	530	5200	10300	335	1130	903	3110
79,4	3 1/8	31,5	27,4	541	5310	570	5590	9500	366	1260	1010	3390
82,0		33,9	29,5	568	5570	598	5860	8800	390	1370	1100	3620
82,6	3 1/4	34,1	29,7	568	5570	598	5860	8700	396	1380	1100	3670
84,0		34,9	30,4	588	5770	619	6070	8500	410	1450	1160	3800
85,7	3 3/8	36,7	31,9	613	6010	645	6320	8100	427	1540	1240	3950
88,0		38,4	33,4	646	6330	679	6660	7800	450	1670	1340	4170
88,9	3 1/2	39,5	34,4	658	6450	693	6790	7500	459	1720	1380	4250
90,0		39,5	34,4	658	6450	693	6790	7500	470	1740	1390	4360

N2 Hyrope Catalogue Data (40XK7)

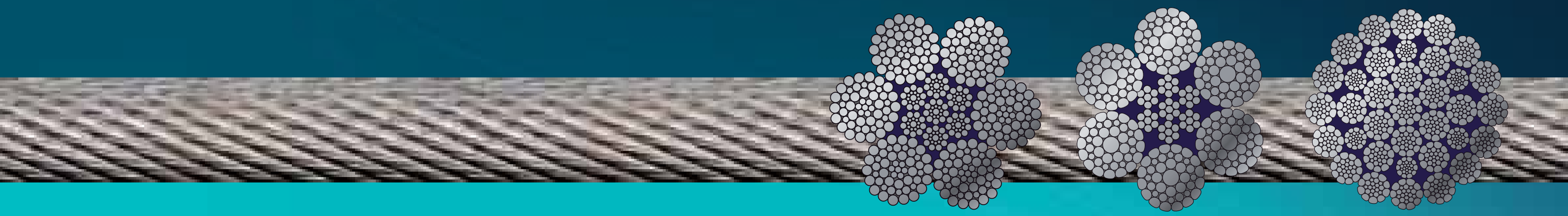
Nominal Rope Diameter		Unit Weight (Kg/m)		Minimum Breaking Force (Fmin)				Max Lenght (m)	Axial stiffness (MN)	Torque at 20% load (N.m)		Metallic Cross section (mm²)
				N Grade		S Grade						
mm	inches	In air	In Seawater	M/Ton	kN	M/Ton	kN			Lang's	Regular	
82,0		33,9	29,5	587	5760	618	6060	8800	399	850	661	3700
82,6	3 1/4	34,1	29,7	587	5760	618	6060	8700	405	856	666	3750
84,0		34,9	30,4	608	5960	640	6280	8500	419	902	701	3880
85,7	3 3/8	36,7	31,9	637	6250	671	6580	8100	436	964	750	4040
88,0		38,4	33,4	660	6470	695	6820	7800	461	1030	798	4270
88,9	3 1/2	39,5	34,4	691	6770	727	7130	7500	471	1080	843	4360
90,0		39,5	34,4	691	6770	727	7130	7500	482	1100	853	4470
92,0		41,3	35,9	722	7080	760	7450	7200	492	1170	912	4560
94,0		43,1	37,5	745	7300	784	7690	6900	514	1240	961	4760
95,3	3 3/4	45,4	39,5	755	7410	795	7800	6600	528	1270	988	4900
96,0		46,4	40,4	767	7520	807	7910	6400	536	1300	1010	4970
98,0		48,3	42,0	805	7890	847	8310	6200	559	1390	1080	5180
100		50,3	43,8	831	8150	875	8580	9900	582	1470	1140	5390
102	4	51,6	44,9	865	8480	910	8920	9600	600	1560	1210	5570
104		53,6	46,6	899	8820	946	9280	9300	629	1650	1280	5830
106		55,7	48,5	935	9160	984	9650	8900	654	1750	1360	6060
108	4 1/4	58,3	50,7	969	9500	1020	10000	8500	678	1850	1440	6290
110		60,5	52,6	998	9790	1050	10300	8200	704	1940	1510	6520
112		62,8	54,6	1030	10100	1080	10600	7900	719	2040	1580	6670
114	4 1/2	65,3	56,8	1070	10500	1130	11100	7600	745	2150	1670	6910
116		67,6	58,8	1090	10700	1150	11300	7300	772	2230	1740	7150
120		72,4	63,0	1170	11500	1230	12100	6900	826	2480	1930	7660

Crane Ropes

N2 Hyrope Catalogue Data (55XK7, 67XK7)

Nominal Rope Diameter		Unit Weight (Kg/m)		Minimum Breaking Force (Fmin)				Max Lenght (m)	Axial stiffness (MN)	Torque at 20% load (N.m)		Metallic Cross section (mm²)
				N Grade		S Grade						
mm	inches	In air	In Seawater	M/Ton	kN	M/Ton	kN			Lang's	Regular	
112		59,5	51,8	1000	9810	1060	10400	10000	660	3730	3080	6730
114	4 1/2	62,0	53,9	1050	10300	1100	10800	9600	683	3990	3290	6970
116		64,2	55,9	1070	10500	1130	11100	9300	708	4140	3410	7210
120		68,7	59,8	1140	11200	1200	11800	8700	757	4560	3760	7720
121	4 3/4	69,1	60,1	1150	11300	1210	11900	8600	770	4640	3820	7850
122		70,2	61,1	1180	11600	1240	12200	8500	783	4800	3950	7980
124		72,6	63,2	1220	12000	1280	12600	8200	809	5040	4150	8240
126		74,9	65,2	1260	12400	1320	12900	8000	835	5290	4360	8510
127	5	76,6	66,6	1280	12600	1340	13100	7800	848	5420	4460	8650
128		77,8	67,7	1280	12600	1350	13200	7700	862	5460	4500	8780
130		80,3	69,9	1320	12900	1390	13600	7400	889	5720	4710	9060
132		82,8	72,0	1360	13300	1430	14000	7200	916	5990	4930	9340
133	5 1/4	84,4	73,4	1390	13600	1460	14300	7100	930	6160	5080	9480
134		85,7	74,6	1400	13700	1470	14400	7000	944	6260	5150	9630
136		88,3	76,8	1430	14000	1510	14800	6700	973	6480	5340	9920
138		90,9	79,1	1470	14400	1550	15200	6600	1000	6760	5570	10200
140	5 1/2	92,6	80,6	1520	14900	1600	15700	6400	1030	7100	5840	10500
142		95,3	82,9	1570	15400	1650	16200	6200	1060	7430	6120	10800
144		98,0	85,3	1610	15800	1690	16600	6100	1090	7730	6370	11100
146	5 3/4	101,0	87,9	1650	16200	1740	17100	5900	1120	8030	6610	11400
148		104,0	90,5	1690	16600	1780	17500	5700	1150	8340	6870	11700
150		107,0	93,1	1740	17100	1830	17900	5600	1180	8700	7170	12100
152	6	110,0	95,7	1790	17600	1880	18400	5400	1210	9070	7470	12400
154		112,0	97,4	1820	17800	1920	18800	5300	1250	9350	7700	12700
156		115,0	100,0	1860	18200	1960	19200	5200	1280	9670	7970	13000
158		118,0	103,0	1900	18600	2000	19600	5000	1310	10000	8240	13400
159	6 1/4	120,0	104,0	1920	18800	2020	19800	5000	1330	10200	8380	13600
160		121,0	105,0	1950	19100	2050	20100	4900	1350	10400	8570	13700
162	6 3/8	124,0	108,0	1990	19500	2100	20600	4800	1380	10700	8850	14100
165	6 1/2	129,0	112,0	2070	20300	2180	21400	4600	1430	11400	9380	14600
171	6 3/4	140,0	122,0	2240	22000	2350	23000	4200	1540	12800	10500	15700

Torque generated based on 2160 grade
Estimated Rope Mass in Sea Water = 0.87 x Rope Mass.
All ropes manufactured in accordance with API/EN Standards.



Pedestal Crane Ropes											
6x36WS+IWRC / 8x36WS+IWRC											
Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	inch	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	11,3	11,5	197	1931	226	2216	233	2285	243	2383
54,0	2 1/8	12,8	13,0	220	2160	241	2363	252	2471	263	2579
57,2	2 1/4	14,3	14,5	247	2420	275	2697	289	2834	301	2952
60,3	2 3/8	15,7	15,9	275	2697	306	3005	322	3158	335	3289
63,5	2 1/2	17,8	18,1	301	2951	336	3295	353	3462	368	3609
66,7	2 5/8	19,7	20,0	330	3236	370	3628	389	3815	406	3979
69,9	2 3/4	21,4	21,7	360	3530	409	4011	429	4207	448	4393
73,0	2 7/8	23,5	23,9	392	3844	447	4384	469	4599	490	4805
76,2	3	25,4	25,8	425	4168	491	4815	516	5060	538	5276
79,4	3 1/8	27,6	28,0	458	4491	522	5119	548	5374	572	5609
82,6	3 1/4	29,9	30,3	494	4844	557	5462	585	5737	611	5992
85,7	3 3/8	32,2	32,7	528	5178	607	5953	637	6247	666	6531
88,9	3 1/2	34,8	35,3	563	5521	659	6463	692	6786	723	7090
95,3	3 3/4	39,9	40,5	640	6276	714	7002	750	7355	785	7698
101,6	4	45,3	46,0	720	7061	796	7806	836	8198	873	8561
108,0	4 1/4	51,1	51,9	788	7728	845	8287	887	8698	926	9081
114,3	4 1/2	57,4	58,3	876	8591	939	9208	986	9669	1029	10091
120,7	4 3/4	63,9	64,9	967	9483	1036	10160	1088	10670	1136	11140
127,0	5	70,8	71,9	1064	10434	1138	11160	1195	11719	1248	12239
133,4	5 1/4	76,2	77,3	1138	11159	1217	11935	1278	12533	1335	13088
139,7	5 1/2	84,4	85,7	1223	11994	1308	12828	1374	13471	1435	14068
146,1	5 3/4	91,8	93,2	1315	12894	1406	13790	1477	14481	1542	15123
152,4	6	99,5	101,0	1410	13823	1508	14785	1583	15525	1653	16214
158.8	6 1/4	*	109,7	1497	14682	1601	15704	1682	16490	1756	17222
161.9	6 3/8	*	114,0	1539	15092	1646	16141	1728	16950	1805	17702

Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air. All Ropes manufactured in accordance with API/EN Standards

Crane Ropes

Pedestal Crane Ropes

6xK36WS+IWRC / 8xK36WS+IWRC compacted

Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	inch	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	12,1	12,2	218	2138	246	2412	259	2540	270	2648
54,0	2 1/8	13,8	13,9	244	2393	267	2618	280	2746	284	2785
57,2	2 1/4	15,5	15,7	274	2687	305	2991	321	3148	326	3197
60,3	2 3/8	16,9	17,1	305	2994	340	3333	358	3507	363	3562
63,5	2 1/2	19,1	19,3	334	3275	373	3658	392	3844	398	3903
66,7	2 5/8	21,1	21,3	367	3599	411	4031	432	4236	439	4305
69,9	2 3/4	23,1	23,3	400	3923	454	4452	476	4668	484	4746
73,0	2 7/8	25,2	25,5	435	4266	496	4864	521	5109	529	5188
76,2	3	27,4	27,7	472	4629	545	5345	573	5619	581	5698
79,4	3 1/8	29,8	30,1	508	4982	579	5678	608	5962	618	6061
82,6	3 1/4	32,3	32,6	548	5374	618	6061	649	6365	660	6472
85,7	3 3/8	34,8	35,1	586	5747	674	6610	707	6933	719	7051
88,9	3 1/2	37,6	38,0	625	6129	732	7178	768	7532	781	7659
95,3	3 3/4	43,0	43,4	711	6973	793	7777	833	8169	848	8316
101,6	4	48,9	49,4	799	7836	884	8669	928	9101	943	9248
108,0	4 1/4	53,1	53,6	884	8669	978	9591	1027	10068	1043	10231
114,3	4 1/2	59,7	60,3	971	9520	1074	10532	1127	11057	1146	11235
120,7	4 3/4	66,5	67,2	1059	10386	1172	11491	1230	12063	1250	12258
127,0	5	*	74,4	1149	11264	1271	12462	1334	13082	1356	13294
133,4	5 1/4	*	82,0	1232	12081	1363	13366	1431	14031	1454	14258
139,7	5 1/2	*	90,0	1322	12962	1462	14341	1535	15055	1560	15298
146,1	5 3/4	*	98,4	1419	13915	1570	15395	1648	16162	1675	16423

Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air. All Ropes manufactured in accordance with API/EN Standards

N2
HYROPE

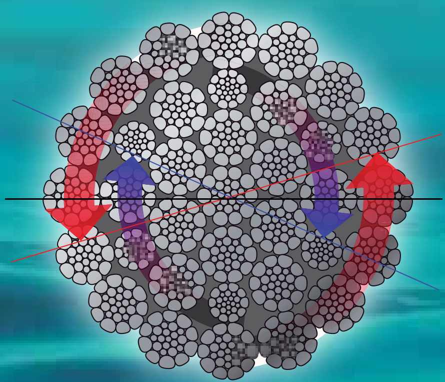
beyond anything

Kiswire is the largest wire rope producer in the world. Annually, about 140.000 tons of wire rope is delivered, worldwide. For decades, Kiswire is specializing in the development and production of wire rope. Meanwhile, the company has acquired a reputable and leading position in a great variety of markets, in literally all corners of the world. The offshore industry is one is a main market for Kiswire since 25 years, meanwhile.

SubSea Hoisting Ropes

Pipe Lay Barges manufacture oil and gas pipes, which are laid on the bottom of the sea. For several reasons, the manufactured pipe has to be disconnected from the barge, and laid down on the seabed for a certain time(abandon) once in a while. Eventually, the same pipe needs to be taken up from the seabed and lifted onboard again to continue the manufacturing process (recovery). Both S-lay and J-lay barges operate with A&R systems as described. Depending on water depth and subsequently the length of A&R ropes required, a choice of rope is made out of the following available rope constructions..

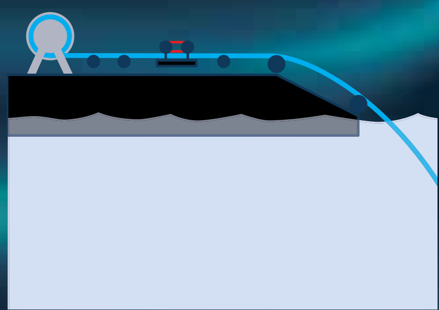
6x36WS+IWRC in single or dual use. Dual use of A&R ropes consist of a right and a left laid rope, operating as a pair. In the event of greater working depths, multi strand, low rotating ropes are applied. For instance, 35xK7, 35xK19S, 35xK26WS, 55xK7, 55xK19S, 55xK26WS, 55xK31WS.



Single layer ropes, such as 6 and 8 strand constructions, have a much greater tendency to rotate under load than multi strand ropes. In fact, a multi strand rope is designed and manufactured to not to rotate at all, or minimal.

The longer the ropes, the deeper the operation depths, the higher the tendency to rotate.

Torque
All wire ropes have inherent rotation characteristics that will produce a turning moment in the rope. With both ends fixed and unable to rotate, the turning moment will generate a TORQUE at the fixed points. Whereas, if one end of the rope is free to rotate, the generated force will result in rope TURN and therefore load rotation.



Kiswire

www.kiswire.com

Average torque factors for the following rope constructions are :

35xK7 and 40xK7 torque factor 0.0080
55xK7 and 67xK7 torque factor 0.0050

Torque calculation
The formula to calculate the torque of a certain rope is: applied load x torque factor x diameter of rope = absolute torque

Example: the applied load 1500kN (20% of its MBL) x 0.0080 (torque factor) x 96 mm (d) = 1.152 MN.

Traction winches

The A&R winch ropes are commonly stored on a storage drum onboard the vessel. To generate the power to abandon and recover the pipe, traction winches are applied.
A twin drum winch device, requiring precise diameter/groove ratios, stabile rope constructions, superior rope bending fatigue properties, excellent resistance to abrasion and rope crushing.

ALUMAR® aluminised ropes

The aluminizing of steel wire and steel wire ropes is made by KISWIRE under the brand name ALUMAR®. We apply this technology for about 10 years now, it started in 1999. Initially, the ALUMAR technology was developed for products applied in the aviation and car industry – the core demand was to extend the life time of the wires by sustaining the steel wire quality ! Apart from many different kinds of improvement we could establish in this respect, it was obvious that an important improvement was to be made by protecting the wires from corrosion as long as possible. The ALUMAR® zinc/aluminium coating was developed as an alternative for the regular galvanizing of wire. Many tests have been done in the meantime, showing that the ALUMAR® wires stay corrosion free 3,8 times longer than galvanized products. Third party Salt Spray Tests are available.

The offshore industry, both oil and gas as well as fishing, could benefit from ALUMAR® ropes substantially, as sea water is a corrosive environment.

N2
HYROPE

Subsea Hoisting Ropes

N2 Hyrope Catalogue Data (35XK7)

Nominal Rope Diameter		Unit Weight (Kg/m)		Minimum Breaking Force (Fmin)				Max Lenght (m)	Axial stiffness (MN)	Torque at 20% load (N.m)		Metallic Cross section (mm²)
				N Grade		S Grade						
mm	inches	In air	In Seawater	M/Ton	kN	M/Ton	kN			Lang's	Regular	
50,8	2	12,9	11,2	229	2250	241	2360	23200	150	342	274	1390
52,0		13,4	11,7	240	2360	253	2480	22300	158	368	294	1460
54,0	2 1/8	14,6	12,7	259	2540	273	2680	20500	170	412	330	1580
56,0		15,7	13,7	278	2730	293	2870	19100	183	459	367	1690
57,2	2 1/4	16,3	14,2	285	2790	300	2940	18400	191	480	384	1770
58,0		16,9	14,7	294	2880	309	3030	17700	196	501	401	1820
60,3	2 3/8	18,2	15,8	314	3080	331	3250	16400	212	558	446	1960
62,0		19,4	16,9	335	3290	353	3460	15400	224	612	489	2080
63,5	2 1/2	20,2	17,6	352	3460	371	3640	14800	235	658	527	2180
64,0		20,2	17,6	357	3500	376	3690	14800	239	673	538	2210
66,0		21,5	18,7	380	3730	400	3920	13900	254	738	590	2350
66,7	2 5/8	22,2	19,3	388	3800	408	4000	13500	259	761	609	2400
68,0		22,9	19,9	404	3960	425	4170	13100	269	808	646	2500
69,9	2 3/4	24,4	21,2	426	4180	448	4400	12200	285	876	701	2640
72,0		25,8	22,4	452	4430	476	4670	11600	301	957	766	2790
73,0	2 7/8	26,7	23,2	465	4560	489	4800	11200	309	998	799	2870
74,0		27,4	23,8	478	4690	503	4930	10900	318	1040	832	2950
76,0		29,0	25,2	504	4940	530	5200	10300	335	1130	901	3110
76,2	3	29,0	25,2	504	4940	530	5200	10300	335	1130	903	3110
79,4	3 1/8	31,5	27,4	541	5310	570	5590	9500	366	1260	1010	3390
82,0		33,9	29,5	568	5570	598	5860	8800	390	1370	1100	3620
82,6	3 1/4	34,1	29,7	568	5570	598	5860	8700	396	1380	1100	3670
84,0		34,9	30,4	588	5770	619	6070	8500	410	1450	1160	3800
85,7	3 3/8	36,7	31,9	613	6010	645	6320	8100	427	1540	1240	3950
88,0		38,4	33,4	646	6330	679	6660	7800	450	1670	1340	4170
88,9	3 1/2	39,5	34,4	658	6450	693	6790	7500	459	1720	1380	4250
90,0		39,5	34,4	658	6450	693	6790	7500	470	1740	1390	4360

N2 Hyrope Catalogue Data (40XK7)

Nominal Rope Diameter		Unit Weight (Kg/m)		Minimum Breaking Force (Fmin)				Max Lenght (m)	Axial stiffness (MN)	Torque at 20% load (N.m)		Metallic Cross section (mm^2)
				N Grade		S Grade						
mm	inches	In air	In Seawater	M/Ton	kN	M/Ton	kN			Lang's	Regular	
82,0		33,9	29,5	587	5760	618	6060	8800	399	850	661	3700
82,6	3 1/4	34,1	29,7	587	5760	618	6060	8700	405	856	666	3750
84,0		34,9	30,4	608	5960	640	6280	8500	419	902	701	3880
85,7	3 3/8	36,7	31,9	637	6250	671	6580	8100	436	964	750	4040
88,0		38,4	33,4	660	6470	695	6820	7800	461	1030	798	4270
88,9	3 1/2	39,5	34,4	691	6770	727	7130	7500	471	1080	843	4360
90,0		39,5	34,4	691	6770	727	7130	7500	482	1100	853	4470
92,0		41,3	35,9	722	7080	760	7450	7200	492	1170	912	4560
94,0		43,1	37,5	745	7300	784	7690	6900	514	1240	961	4760
95,3	3 3/4	45,4	39,5	755	7410	795	7800	6600	528	1270	988	4900
96,0		46,4	40,4	767	7520	807	7910	6400	536	1300	1010	4970
98,0		48,3	42,0	805	7890	847	8310	6200	559	1390	1080	5180
100		50,3	43,8	831	8150	875	8580	9900	582	1470	1140	5390
102	4	51,6	44,9	865	8480	910	8920	9600	600	1560	1210	5570
104		53,6	46,6	899	8820	946	9280	9300	629	1650	1280	5830
106		55,7	48,5	935	9160	984	9650	8900	654	1750	1360	6060
108	4 1/4	58,3	50,7	969	9500	1020	10000	8500	678	1850	1440	6290
110		60,5	52,6	998	9790	1050	10300	8200	704	1940	1510	6520
112		62,8	54,6	1030	10100	1080	10600	7900	719	2040	1580	6670
114	4 1/2	65,3	56,8	1070	10500	1130	11100	7600	745	2150	1670	6910
116		67,6	58,8	1090	10700	1150	11300	7300	772	2230	1740	7150
120		72,4	63,0	1170	11500	1230	12100	6900	826	2480	1930	7660

Subsea Hoisting Ropes

N2 Hyrope Catalogue Data (55XK7, 67XK7)

Nominal Rope Diameter		Unit Weight (Kg/m)		Minimum Breaking Force (Fmin)				Max Lenght (m)	Axial stiffness (MN)	Torque at 20% load (N.m)		Metallic Cross section (mm^2)
				N Grade		S Grade						
mm	inches	In air	In Seawater	M/Ton	kN	M/Ton	kN			Lang's	Regular	
112		59,5	51,8	1000	9810	1060	10400	10000	660	3730	3080	6730
114	4 1/2	62,0	53,9	1050	10300	1100	10800	9600	683	3990	3290	6970
116		64,2	55,9	1070	10500	1130	11100	9300	708	4140	3410	7210
120		68,7	59,8	1140	11200	1200	11800	8700	757	4560	3760	7720
121	4 3/4	69,1	60,1	1150	11300	1210	11900	8600	770	4640	3820	7850
122		70,2	61,1	1180	11600	1240	12200	8500	783	4800	3950	7980
124		72,6	63,2	1220	12000	1280	12600	8200	809	5040	4150	8240
126		74,9	65,2	1260	12400	1320	12900	8000	835	5290	4360	8510
127	5	76,6	66,6	1280	12600	1340	13100	7800	848	5420	4460	8650
128		77,8	67,7	1280	12600	1350	13200	7700	862	5460	4500	8780
130		80,3	69,9	1320	12900	1390	13600	7400	889	5720	4710	9060
132		82,8	72,0	1360	13300	1430	14000	7200	916	5990	4930	9340
133	5 1/4	84,4	73,4	1390	13600	1460	14300	7100	930	6160	5080	9480
134		85,7	74,6	1400	13700	1470	14400	7000	944	6260	5150	9630
136		88,3	76,8	1430	14000	1510	14800	6700	973	6480	5340	9920
138		90,9	79,1	1470	14400	1550	15200	6600	1000	6760	5570	10200
140	5 1/2	92,6	80,6	1520	14900	1600	15700	6400	1030	7100	5840	10500
142		95,3	82,9	1570	15400	1650	16200	6200	1060	7430	6120	10800
144		98,0	85,3	1610	15800	1690	16600	6100	1090	7730	6370	11100
146	5 3/4	101,0	87,9	1650	16200	1740	17100	5900	1120	8030	6610	11400
148		104,0	90,5	1690	16600	1780	17500	5700	1150	8340	6870	11700
150		107,0	93,1	1740	17100	1830	17900	5600	1180	8700	7170	12100
152	6	110,0	95,7	1790	17600	1880	18400	5400	1210	9070	7470	12400
154		112,0	97,4	1820	17800	1920	18800	5300	1250	9350	7700	12700
156		115,0	100,0	1860	18200	1960	19200	5200	1280	9670	7970	13000
158		118,0	103,0	1900	18600	2000	19600	5000	1310	10000	8240	13400
159	6 1/4	120,0	104,0	1920	18800	2020	19800	5000	1330	10200	8380	13600
160		121,0	105,0	1950	19100	2050	20100	4900	1350	10400	8570	13700
162	6 3/8	124,0	108,0	1990	19500	2100	20600	4800	1380	10700	8850	14100
165	6 1/2	129,0	112,0	2070	20300	2180	21400	4600	1430	11400	9380	14600
171	6 3/4	140,0	122,0	2240	22000	2350	23000	4200	1540	12800	10500	15700

Torque generated based on 2160 grade
Estimated Rope Mass in Sea Water = 0.87 x Rope Mass.
All ropes manufactured in accordance with API/EN Standards.

A & R Winch Ropes											
6x36WS+IWRC / 8x36WS+IWRC											
Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	inch	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	11,3	11,5	197	1931	226	2216	233	2285	243	2383
54,0	2 1/8	12,8	13,0	220	2160	241	2363	252	2471	263	2579
57,2	2 1/4	14,3	14,5	247	2420	275	2697	289	2834	301	2952
60,3	2 3/8	15,7	15,9	275	2697	306	3005	322	3158	335	3289
63,5	2 1/2	17,8	18,1	301	2951	336	3295	353	3462	368	3609
66,7	2 5/8	19,7	20,0	330	3236	370	3628	389	3815	406	3979
69,9	2 3/4	21,4	21,7	360	3530	409	4011	429	4207	448	4393
73,0	2 7/8	23,5	23,9	392	3844	447	4384	469	4599	490	4805
76,2	3	25,4	25,8	425	4168	491	4815	516	5060	538	5276
79,4	3 1/8	27,6	28,0	458	4491	522	5119	548	5374	572	5609
82,6	3 1/4	29,9	30,3	494	4844	557	5462	585	5737	611	5992
85,7	3 3/8	32,2	32,7	528	5178	607	5953	637	6247	666	6531
88,9	3 1/2	34,8	35,3	563	5521	659	6463	692	6786	723	7090
95,3	3 3/4	39,9	40,5	640	6276	714	7002	750	7355	785	7698
101,6	4	45,3	46,0	720	7061	796	7806	836	8198	873	8561
108,0	4 1/4	51,1	51,9	788	7728	845	8287	887	8698	926	9081
114,3	4 1/2	57,4	58,3	876	8591	939	9208	986	9669	1029	10091
120,7	4 3/4	63,9	64,9	967	9483	1036	10160	1088	10670	1136	11140
127,0	5	70,8	71,9	1064	10434	1138	11160	1195	11719	1248	12239
133,4	5 1/4	76,2	77,3	1138	11159	1217	11935	1278	12533	1335	13088
139,7	5 1/2	84,4	85,7	1223	11994	1308	12828	1374	13471	1435	14068
146,1	5 3/4	91,8	93,2	1315	12894	1406	13790	1477	14481	1542	15123
152,4	6	99,5	101,0	1410	13823	1508	14785	1583	15525	1653	16214
158.8	6 1/4	*	109,7	1497	14682	1601	15704	1682	16490	1756	17222
161.9	6 3/8	*	114,0	1539	15092	1646	16141	1728	16950	1805	17702

Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air. All Ropes manufactured in accordance with API/EN Standards

Subsea Hoisting Ropes

A & R Winch Ropes											
6xK36WS+IWRC / 8xK36WS+IWRC compacted											
Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	inch	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	12,1	12,2	218	2138	246	2412	259	2540	270	2648
54,0	2 1/8	13,8	13,9	244	2393	267	2618	280	2746	284	2785
57,2	2 1/4	15,5	15,7	274	2687	305	2991	321	3148	326	3197
60,3	2 3/8	16,9	17,1	305	2994	340	3333	358	3507	363	3562
63,5	2 1/2	19,1	19,3	334	3275	373	3658	392	3844	398	3903
66,7	2 5/8	21,1	21,3	367	3599	411	4031	432	4236	439	4305
69,9	2 3/4	23,1	23,3	400	3923	454	4452	476	4668	484	4746
73,0	2 7/8	25,2	25,5	435	4266	496	4864	521	5109	529	5188
76,2	3	27,4	27,7	472	4629	545	5345	573	5619	581	5698
79,4	3 1/8	29,8	30,1	508	4982	579	5678	608	5962	618	6061
82,6	3 1/4	32,3	32,6	548	5374	618	6061	649	6365	660	6472
85,7	3 3/8	34,8	35,1	586	5747	674	6610	707	6933	719	7051
88,9	3 1/2	37,6	38,0	625	6129	732	7178	768	7532	781	7659
95,3	3 3/4	43,0	43,4	711	6973	793	7777	833	8169	848	8316
101,6	4	48,9	49,4	799	7836	884	8669	928	9101	943	9248
108,0	4 1/4	53,1	53,6	884	8669	978	9591	1027	10068	1043	10231
114,3	4 1/2	59,7	60,3	971	9520	1074	10532	1127	11057	1146	11235
120,7	4 3/4	66,5	67,2	1059	10386	1172	11491	1230	12063	1250	12258
127,0	5	*	74,4	1149	11264	1271	12462	1334	13082	1356	13294
133,4	5 1/4	*	82,0	1232	12081	1363	13366	1431	14031	1454	14258
139,7	5 1/2	*	90,0	1322	12962	1462	14341	1535	15055	1560	15298
146,1	5 3/4	*	98,4	1419	13915	1570	15395	1648	16162	1675	16423

Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air. All Ropes manufactured in accordance with API/EN Standards

N2 NEPTUNE

beyond anything

Kiswire is the largest wire rope producer in the world. Annually, about 140.000 tons of wire rope is delivered, worldwide. For decades, Kiswire is specializing in the development and production of wire rope. Meanwhile, the company has acquired a reputable and leading position in a great variety of markets, in literally all corners of the world. The offshore industry is one is a main market for Kiswire since 25 years, meanwhile.

Anchor Lines & Mooring Ropes

The use of Anchor and Mooring ropes is as old as the shipping industry. Every floating vehicle shall be anchored or moored at a certain point of time. We need ropes for that. Larger ships are anchored or moored with steel wire ropes. Winch systems, sheaves, rope length, rope diameter and other device designs determine the type of rope required. The most common types of anchor lines used nowadays, are the 6x36WS constructions. Alternatives are 6x41WS, 6x49WS. And, 8x31WS and 8x41WS.

Availability

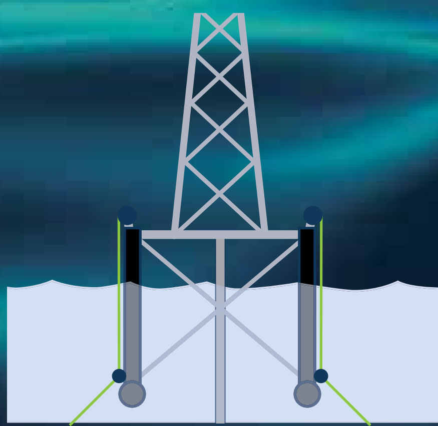
Commonly the Offshore Industry applies Anchor Lines in SIX strand construction. Such due to the better availability of 6 strand ropes and secondly because any deviation from the basic 6 strand Anchor Lines means more investment in sales, purchasing, and know how to install and handle an Anchor Line. One could benefit from substantial higher efficiency and lower cost, though, if the alternative types of Anchor Lines were explored.

Installation of Anchor Lines

The full length, say 3000 meter 77 mm, is spooled from the steel storage reel on to the barge' winch drum. The Anchor Handling Tug takes the outer end of the rope on board and pulls the entire 3000 meter out, under approximately 5 to 10 tons tension. Then, the barge winch pulls the Anchor Line back in over the full length.
This operation is repeated one or two more times. The result is that the wire rope has bedded in sufficiently before the real work starts which appears to be of extreme importance for the problem free functioning of the Anchor Line, during its entire life time. Besides the life time of the Anchor Line improves considerably by this warming up.

Main risk

Most of all Anchor Lines are damaged and/or destroyed by wrong handling. Often the anchor, when lifted from the seabed, is turned one or more times. With the turning of the anchor, the Anchor Line turns. If the anchor is put into the seabed afterwards, and the rope is put under tension again, this torque can not get out of the rope. Severe damage or destruction of the Anchor Line are often the result.



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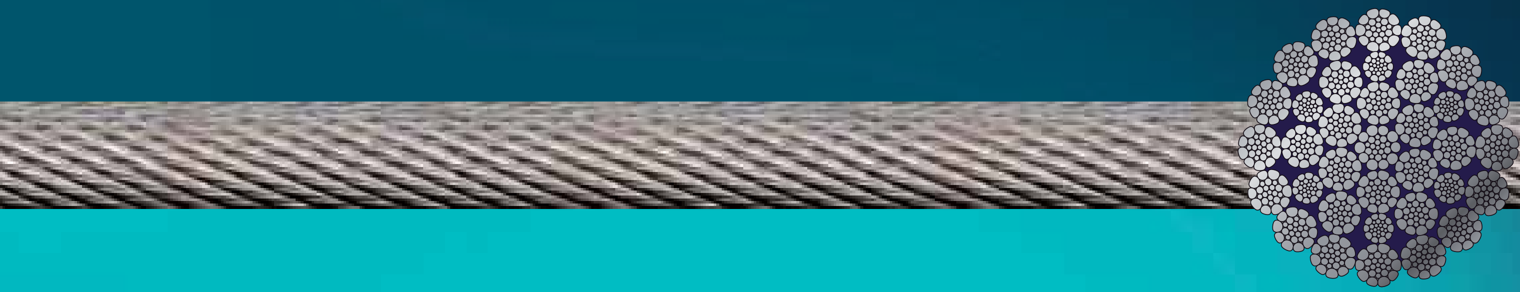


Anchor Lines & Mooring Ropes

Corrosion
Corrosion is a serious threat to the quality of Anchor or Mooring ropes. The offshore environment is a harsh one. Steel is effected quickly by it. Corrosion is the most regular and obvious phenomenon.
In order to avoid, or to postpone corrosion and the risks that corrosion brings along, KISWIRE produces Anchor and Mooring Lines in the unique ALUMAR® version. In this case, the wire ropes are coated with a zinc/aluminium layer, which protects 4 times longer against corrosion.

Crushing and abrasion features
By compacting our ropes the resistance to crushing improves substantially. Especially on multi layer drums, wire ropes could interlock between the different layers. By compacting a wire rope, one makes the surface of the outer layers (outer wires) of the rope more flat. This flatter surface leaves the rope with less grip to get hold of. Consequently, layers slide more smooth along each other.

Maintenance
It is recommended to lubricate Anchor Lines periodically. A well lubricated wire rope performs better and longer. A wire rope in service bends and rotates continuously, causing a permanent sliding of wires along each other in the rope. This causes friction, friction causes wearing. Lubricant enhances a smoother sliding area and gives consequently less friction and wearing.
Any Anchor or Mooring Line shall be lubricated during production. A range of sophisticated lubricants are available.

The secondary feature of lubricant on wire rope is the protection from corrosion.

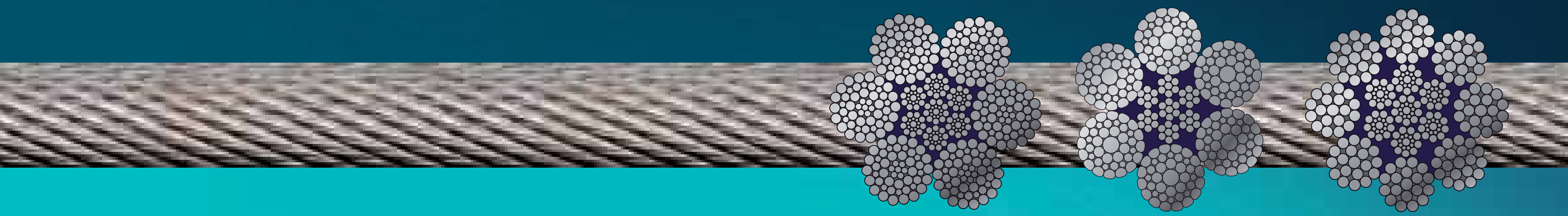
Swivels
Basically, the use of a swivel interferes with the regular behaviour of a rope in such a way, that it often distorts the rope construction, and causes premature rope failure. Hence, the use of swivels shall be avoided or used in consult with a wire rope engineer. Particularly, a swivel shall not be used when installing a rope, nor during anchoring and mooring.

Storage
Neptune Anchor Lines and Mooring Ropes are delivered on a steel reel. The ropes are lubricated well with special offshore bitumen based lubricant. On the reel, the rope is wrapped with a special polypropylene cloth, giving best protection from weather influences. This way, these reels can be stored outside for some time. In the event of longer storage of wire rope outside than one year, certain metallurgical issues may become of influence to the quality of wire rope. One of these phenomenon's is called strain aging. It is recommended to test a wire rope prior to take it into use, when stored outside longer than one year. A breaking load test should be sufficient.

Anchor Lines & Mooring Ropes

Anchor & Mooring Ropes											
6x36WS+IWRC / 8x36WS+IWRC											
Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	inch	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	11,3	11,5	197	1931	226	2216	233	2285	243	2383
54,0	2 1/8	12,8	13,0	220	2160	241	2363	252	2471	263	2579
57,2	2 1/4	14,3	14,5	247	2420	275	2697	289	2834	301	2952
60,3	2 3/8	15,7	15,9	275	2697	306	3005	322	3158	335	3289
63,5	2 1/2	17,8	18,1	301	2951	336	3295	353	3462	368	3609
66,7	2 5/8	19,7	20,0	330	3236	370	3628	389	3815	406	3979
69,9	2 3/4	21,4	21,7	360	3530	409	4011	429	4207	448	4393
73,0	2 7/8	23,5	23,9	392	3844	447	4384	469	4599	490	4805
76,2	3	25,4	25,8	425	4168	491	4815	516	5060	538	5276
79,4	3 1/8	27,6	28,0	458	4491	522	5119	548	5374	572	5609
82,6	3 1/4	29,9	30,3	494	4844	557	5462	585	5737	611	5992
85,7	3 3/8	32,2	32,7	528	5178	607	5953	637	6247	666	6531
88,9	3 1/2	34,8	35,3	563	5521	659	6463	692	6786	723	7090
95,3	3 3/4	39,9	40,5	640	6276	714	7002	750	7355	785	7698
101,6	4	45,3	46,0	720	7061	796	7806	836	8198	873	8561
108,0	4 1/4	51,1	51,9	788	7728	845	8287	887	8698	926	9081
114,3	4 1/2	57,4	58,3	876	8591	939	9208	986	9669	1029	10091
120,7	4 3/4	63,9	64,9	967	9483	1036	10160	1088	10670	1136	11140
127,0	5	70,8	71,9	1064	10434	1138	11160	1195	11719	1248	12239
133,4	5 1/4	76,2	77,3	1138	11159	1217	11935	1278	12533	1335	13088
139,7	5 1/2	84,4	85,7	1223	11994	1308	12828	1374	13471	1435	14068
146,1	5 3/4	91,8	93,2	1315	12894	1406	13790	1477	14481	1542	15123
152,4	6	99,5	101,0	1410	13823	1508	14785	1583	15525	1653	16214
158.8	6 1/4	*	109,7	1497	14682	1601	15704	1682	16490	1756	17222
161.9	6 3/8	*	114,0	1539	15092	1646	16141	1728	16950	1805	17702

Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air. All Ropes manufactured in accordance with API/EN Standards



Anchor & Mooring Ropes

6xK36WS+IWRC / 8xK36WS+IWRC compacted

Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	ins	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	12,1	12,2	218	2138	246	2412	259	2540	270	2648
54,0	2 1/8	13,8	13,9	244	2393	267	2618	280	2746	284	2785
57,2	2 1/4	15,5	15,7	274	2687	305	2991	321	3148	326	3197
60,3	2 3/8	16,9	17,1	305	2994	340	3333	358	3507	363	3562
63,5	2 1/2	19,1	19,3	334	3275	373	3658	392	3844	398	3903
66,7	2 5/8	21,1	21,3	367	3599	411	4031	432	4236	439	4305
69,9	2 3/4	23,1	23,3	400	3923	454	4452	476	4668	484	4746
73,0	2 7/8	25,2	25,5	435	4266	496	4864	521	5109	529	5188
76,2	3	27,4	27,7	472	4629	545	5345	573	5619	581	5698
79,4	3 1/8	29,8	30,1	508	4982	579	5678	608	5962	618	6061
82,6	3 1/4	32,3	32,6	548	5374	618	6061	649	6365	660	6472
85,7	3 3/8	34,8	35,1	586	5747	674	6610	707	6933	719	7051
88,9	3 1/2	37,6	38,0	625	6129	732	7178	768	7532	781	7659
95,3	3 3/4	43,0	43,4	711	6973	793	7777	833	8169	848	8316
101,6	4	48,9	49,4	799	7836	884	8669	928	9101	943	9248
108,0	4 1/4	53,1	53,6	884	8669	978	9591	1027	10068	1043	10231
114,3	4 1/2	59,7	60,3	971	9520	1074	10532	1127	11057	1146	11235
120,7	4 3/4	66,5	67,2	1059	10386	1172	11491	1230	12063	1250	12258
127,0	5	*	74,4	1149	11264	1271	12462	1334	13082	1356	13294
133,4	5 1/4	*	82,0	1232	12081	1363	13366	1431	14031	1454	14258
139,7	5 1/2	*	90,0	1322	12962	1462	14341	1535	15055	1560	15298
146,1	5 3/4	*	98,4	1419	13915	1570	15395	1648	16162	1675	16423

Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air. All Ropes manufactured in accordance with API/EN Standards

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Towing Lines

Late sixties and further on during the seventies, the first high powered, ocean going tug boats were designed and built. The famous Dutch SMIT family took a lead in the global ocean towing market by expanding its fleet with the tug boat series - Smit Rotterdam, Smit London, Smit Singapore, and more. Nowadays, the availability of very powerful, modern towing vessels is large.

Regular towing rope constructions
The early generations ocean going tow vessels were equipped with towing ropes like 1.000 meter to 1.500 meter length, in diameter range of 50 to 70 mm, construction 6x36WS+IWRC, galvanized.
Today, the latest version tug vessels work with 1.500 to 2.500 meter ropes in diameters of 76 to 90 mm. Galvanized, 6x36WS or 6x41WS or 6x49WS+IWRC. Not seldom, the contemporary towing lines are coming in a compacted version. To protect from early corrosion of the ropes, and consequently, early deterioration of the steel, many NEPTUNE towing lines are ALUMAR coated – a zinc/aluminium based coating.

The next description of tug boat and towing rope criteria is a classical one.

Safety factor – MBL Towing wires.
This example towing system is based on the weak link principle, which means we use a shorter piece of wire rope (25 to 50 meters.),named pennant wire, with a lower breaking strength in our towing line configuration to avoid breakage of the main towing rope Our main towing line is 1.400 meters long. Based on this principle, the MBL of the main towing line is 10% higher than the MBL of the pennant wire (weak link). This 10% is a regular criteria.

MBL – Bollard Pull
When tugs are involved in towages, normally the warranty surveyors have to approve the tug/towing connection and the tow. So, based on this, tugs and towing gear have to be approved by warranty surveyors before tugs can commence a towage.
Different warranty survey bureau's have different rules. For instance, the rules/criteria of DNV and Noble Denton are good and often applied. DNV advises a factor of 2.2, which means, that the MBL of the towing line has to 2.2 x Bollard Pull of the tug. Noble Denton has various factors, which are depending on the size of the tug.

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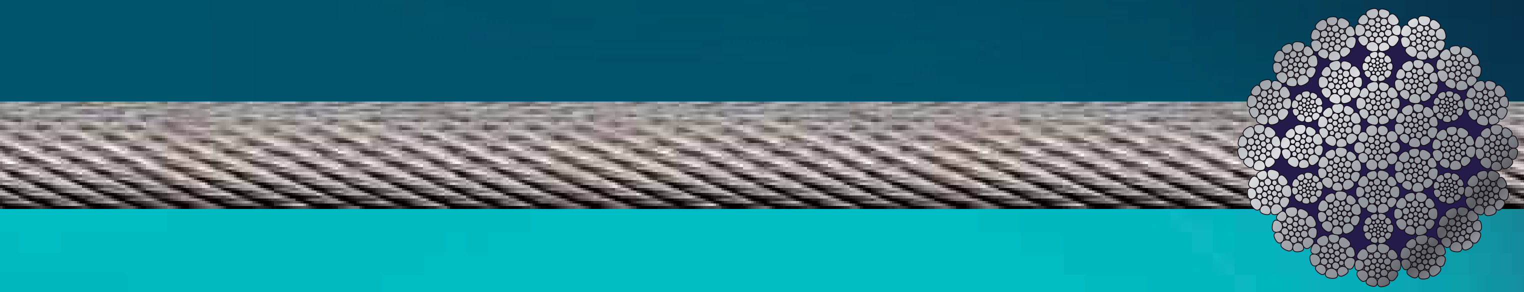

Towing Lines

Examples :
Bollard pull < 40 tons :
MBL towing line = 3.0 x Bollard pull.

Bollard pull > 40 and < 90 tons :
MBL towing line = (3.8 - BP/50) x Bollard pull.

Bollard pull > 90 tons :
MBL towing wire = 2.0 x Bollard Pull.

As you can see for DNV the factor 2.2 is used and for Noble Denton a factor of 2.0 multiplied by the Bollard Pull.

Obviously, as one works with a weak link system, this MBL x Safety Factor calculation is applicable for the weak ink or pennant wire. Not for the main towing line. The MBL of main towing line is 10% higher.

Hence, the MBL of the towing line is related to the Bollard Pull, but always a safety factor (3.0 or 2.2 or 2.0 or another factor) is used to determine the Safe Working Load of the towing line.

Use of stretchers
Quite often, so called stretchers are used in the towing line configuration as shock-absorbers during the towages. The MBL of the stretchers is a lot higher than the MBL of the main towing lines.
Some type of stretchers are grommets of 19 -21 inch circumference (single), and have an MBL of approximately 720 metric tons, whilst the main towing lines in the same arrangement have a MBL of around 400 metric tons.

Not all tug boat companies use stretchers. An average 20 inch circumference stretcher (diameter 160 mm) could be 20 to 55 meters long. Handling and storage are often criteria not to use stretchers.

Life time of towing lines
The life time of towing lines is commonly based on the number of towing miles the wire was operational. Roughly, a towing line should make approximately 55.000 towing miles. When a tug boat operates on its average efficiency, these 55.000 miles are reached within approximately 2 and a half years.

Besides, the life time, or service life of a towing line depends on a few other things as well. Weather conditions during towing is an important factor. If rough weather occurs, the towing arrangement can be subjected to shock loading, which is a destructive phenomenon to ropes.

Inspection of quality of towing lines
With regular intervals, towing lines shall be checked upon its quality. Visual inspection is one. Another one is to cut of a piece of the towing line and subject this piece of rope to an extensive, internal check. Last but not least, one can carry out a break test on the rope to determine the actual breaking load.

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Towing Lines

Compacted towing ropes

By compacting towing ropes the resistance to crushing improves substantially. Especially on multi layer drums, wire ropes could interlock between the different layers. By compacting a wire rope, one makes the surface of the outer layers (outer wires) of the rope more flat. This flatter surface leaves the rope with less grip to get hold of. Consequently, layers slide more smooth along each other. Besides, compacted ropes perform better on the surface pressure issue and brings consequently a higher resistance to fatigue.

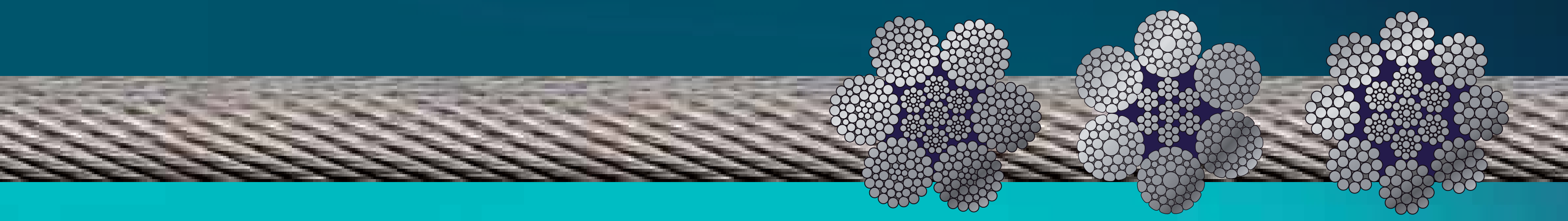
ALUMAR® aluminised towing lines

The aluminizing of steel wire and steel wire ropes is made by KISWIRE under the brand name ALUMAR®. We apply this technology for about 10 years now, it started in 1999. Initially, the ALUMAR technology was developed for products applied in the aviation and car industry – the core demand was to extend the life time of the wires by sustaining the steel wire quality ! Apart from many different kinds of improvement we could establish in this respect, it was obvious that an important improvement was to be made by protecting the wires from corrosion as long as possible. The ALUMAR zinc/aluminium coating was developed as an alternative for the regular galvanizing of wire. Many tests have been done in the meantime, showing that the ALUMAR wires stay corrosion free 3,8 times longer than galvanized products. Third party Salt Spray Tests are available.

The offshore industry, both oil and gas as well as the towing and fishing industry, could benefit from ALUMAR ropes substantially, as sea water is a corrosive environment.

Towing line maintenance

For a perfect conservation of wire ropes and maintenance in harsh environments, it is recommended to protect the rope from corrosion by providing the rope with a special sea water resistant lubricant. Wire rope lubricants are applied to smoothen rope bending and axial torsion as well. A smooth contact between rope and sheave or drum is enhanced by rope lubricants too.



Towing Lines											
6x36WS+IWRC / 8x36WS+IWRC											
Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	inch	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	11,3	11,5	197	1931	226	2216	233	2285	243	2383
54,0	2 1/8	12,8	13,0	220	2160	241	2363	252	2471	263	2579
57,2	2 1/4	14,3	14,5	247	2420	275	2697	289	2834	301	2952
60,3	2 3/8	15,7	15,9	275	2697	306	3005	322	3158	335	3289
63,5	2 1/2	17,8	18,1	301	2951	336	3295	353	3462	368	3609
66,7	2 5/8	19,7	20,0	330	3236	370	3628	389	3815	406	3979
69,9	2 3/4	21,4	21,7	360	3530	409	4011	429	4207	448	4393
73,0	2 7/8	23,5	23,9	392	3844	447	4384	469	4599	490	4805
76,2	3	25,4	25,8	425	4168	491	4815	516	5060	538	5276
79,4	3 1/8	27,6	28,0	458	4491	522	5119	548	5374	572	5609
82,6	3 1/4	29,9	30,3	494	4844	557	5462	585	5737	611	5992
85,7	3 3/8	32,2	32,7	528	5178	607	5953	637	6247	666	6531
88,9	3 1/2	34,8	35,3	563	5521	659	6463	692	6786	723	7090
95,3	3 3/4	39,9	40,5	640	6276	714	7002	750	7355	785	7698
101,6	4	45,3	46,0	720	7061	796	7806	836	8198	873	8561
108,0	4 1/4	51,1	51,9	788	7728	845	8287	887	8698	926	9081
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Towing Lines

Towing Lines											
6xK36WS+IWRC / 8xK36WS+IWRC compacted											
Grade				MBL							
nominal diameter		weight of rope		EEIPS		ALPHA		DELTA		OMEGA	
mm	ins	kg/m	kg/m	tonnes	kN	tonnes	kN	tonnes	kN	tonnes	kN
		6x36	8x36								
50,8	2	12,1	12,2	218	2138	246	2412	259	2540	270	2648
54,0	2 1/8	13,8	13,9	244	2393	267	2618	280	2746	284	2785
57,2	2 1/4	15,5	15,7	274	2687	305	2991	321	3148	326	3197
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76,2	3	27,4	27,7	472	4629	545	5345	573	5619	581	5698
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95,3	3 3/4	43,0	43,4	711	6973	793	7777	833	8169	848	8316
101,6	4	48,9	49,4	799	7836	884	8669	928	9101	943	9248
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120,7	4 3/4	66,5	67,2	1059	10386	1172	11491	1230	12063	1250	12258
127,0	5	*	74,4	1149	11264	1271	12462	1334	13082	1356	13294
133,4	5 1/4	*	82,0	1232	12081	1363	13366	1431	14031	1454	14258
139,7	5 1/2	*	90,0	1322	12962	1462	14341	1535	15055	1560	15298
146,1	5 3/4	*	98,4	1419	13915	1570	15395	1648	16162	1675	16423

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DRILL LINES for land - and offshore drill rigs.

Since decades, drill lines are produced and applied in the constructions 6x19Seale+IWRC and 6x26 WarringtonSeale+IWRC. The choice between these 2 types depend on the wish for more flexibility and diameter range of the drill lines needed. The 6x26 type is more flexible than the 6x19 type. In larger diameters, from 1 ¾ inch and up, the 6x26 type is more applied than the 6x19 type.

Crown block
An assembly of sheaves or pulleys mounted on beams at the top of the derrick. The drilling line is run over the sheaves down to the draw works.

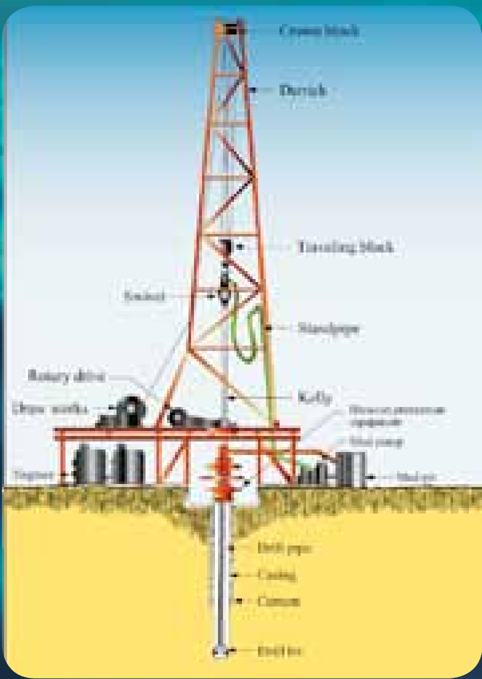
Derrick
a large load-bearing structure, usually bolted construction of metal beams. In drilling, the standard derrick has four legs standing at the corners of the substructure and reaching to the crown block. The substructure is an assembly of heavy beams used to elevate the derrick and provide space underneath to install the blowout preventer, casing head, and other equipment.

Traveling block
an arrangement of pulleys or sheaves which moves up or down in the derrick through which the drilling cable is strung to the rotary drive.

Swivel
a mechanical device that suspends the weight of the drill pipe, provides for the rotation of the drill pipe beneath it while keeping the upper portion stationary, and permits the flow of drilling mud from the standpipe without leaking.

Standpipe
a rigid metal conduit that provides the pathway for drilling mud to travel about one-third of the way up the derrick, where it connects to a flexible hose (kelly hose), which the connects to the swivel.

Kelly
the heavy square or hexagonal steel member suspended from the swivel through the rotary table and connected to the topmost section of drill pipe to turn the drill pipe as the rotary table turns.



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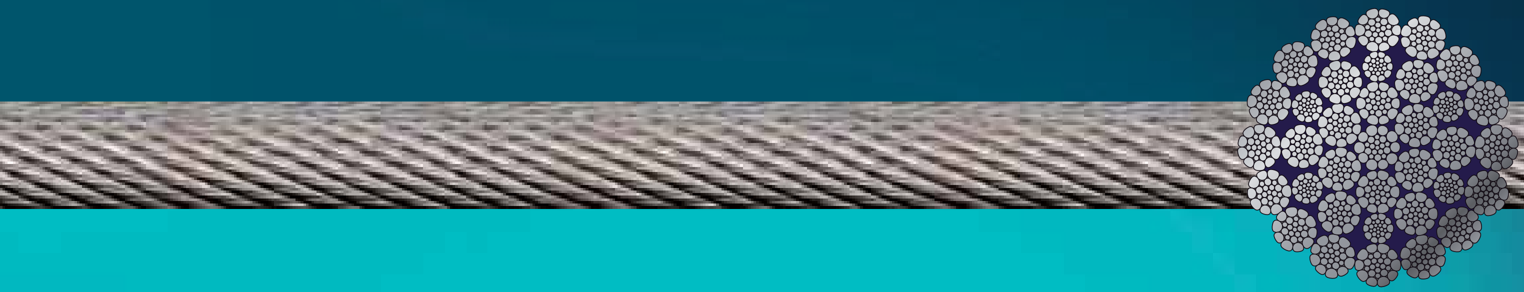

DRILL LINES for land - and offshore drill rigs.

Rotary drive
the machine used to impart rotational power to the drill string while permitting vertical movement of the pipe for drilling. Modern rotary machines have a special component, the rotary or master bushing, to turn the kelly bushing, which permits up and down movement of the kelly while the drill pipe is turning.

Draw works
the hoisting mechanism on a drilling rig. It is a large winch that spools off or takes in the drilling cable or line, which raises or lowers the drill pipe and drill bit.

Blowout prevention equipment
the assembly of well control equipment including preventers, spools, valves, and nipples connected to the top of the wellhead to prevent the uncontrolled escape of oil or gas during drilling operations.
Mud pump: a large, high-pressure reciprocating pump used to circulate the mud on a drilling rig.

Engines
any of various types of power units such as a hydraulic, internal combustion, air, or electric motor that develops energy or imparts rotary motion that can be used to power other machines.

Mud pit
originally, an open pit dug in the ground to hold drilling mud or waste materials such as well bore cuttings or mud sediments. Steel tanks are much more commonly used for these purposes now, but they are still usually referred to as pits.

Drill pipe
the heavy seamless steel tubing used to rotate the drill bit and circulate the drilling mud. Each section of drill pipe is about 30 feet long and is fastened together by means of threaded tool joints.

Casing
heavy steel pipe that lines the walls of the hole to prevent the wall of the hole from caving in, to prevent movement of fluids from one formation to another, and to aid in well control.

Cement
used to fill the space between the wall of the hole and the casing. Together with the casing, this prevents caving of the hole, prevents movement of fluids (water, oil, or gas) between rock layers, confines production to the well bore, and provides a means to controls pressure.

Drill bit
the cutting or boring element used in drilling oil and gas wells. Most bits used in rotary drilling are roller-cone bits. The bit consists of the cutting elements and the circulating element. The circulating element permits the passage of drilling fluid and uses the hydraulic force of the drilling mud to improve drilling rates.

Crushing and abrasion features
By compacting our ropes the resistance to crushing improves substantially. Especially on multi layer drums, wire ropes could interlock between the different layers.
By compacting a wire rope, one makes the surface of the outer layers (outer wires) of the rope more flat. This flatter surface leaves the rope with less grip to get hold of. Consequently, layers slide more smooth along each other.

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DRILL LINES for land - and offshore drill rigs.

Installation instructions
Treatment of drill Lines shall be done as any other crane rope – with much care and knowhow. Here is a summary of issues :
Order the right diameter of rope for the drill rig. Check grooves of drums and sheaves prior to installing the drill line. When spooling the drill line from factory reel to draw-works storage reel, make sure it is done according to the general rules for such spooling. For instance, over-wind to over-wind and under-wind to under-wind spooling.
Commonly, the new drill line is spooled by connecting it to the old one. Be sure to make this connection strong enough, for instance by welded links.
Any drill line shall be spooled and installed 100% rotation free.
To guarantee a rotation free spooling it is recommended to unroll the drill line on a clean floor, make sure it is rotation free, and colour the rope with paint on the topside of the rope. When spooling the rope on the rig, one can now notice any possible twist occurring. Let this twist out before fixing the ends in the machine.

The travelling block in the rig shall be aligned with the crown cluster block sheaves, as well as it shall be hung off, to prevent any movement of the travelling block.
The drill line shall be spooled under tension. Special tensioning tools to perform this job are available. Give attention to the position of possible cylinders when installing the drill line. Wrong cylinder positions could upset the tensioning during reeving the rope. Slack of rope could be the result. Finally, when the drill line has been installed, the system shall be lifted and lowered under working tensions, several times, in order to let the rope bed in.

Slip & Cut of Drill Lines
The life of a drill line can be increased dramatically by using and following a planned cut-off program based on work performed. Such a plan moves the rope through the system so that the wear is spread uniformly along the entire length of the rope, enabling the line to be removed from the drawworks drum end when it has reached the end of its useful service life. As the rope is cut off the drawworks drum end, new rope is fed into the system from the storage drum on the dead line side.

The art of slip and cut is to be prepared, have all the needed equipment ready and the number of rapes you intend to remove/slip worked out.

Use the hang off line to hold the block and TDS weight before you remove the pigtail clamp on the dead man.

When making a cut and slipping never be pulled through a loosened dead man clamp this could put a twist in the rope. The clamp should be completely removed and inspected. If worn or damaged, replace.

Once ready, spool the amount of new line from the storage drum onto the drawworks drum, insure the line moves freely throughout the system, modern rigs have a rotating center drum on the dead man if yours doesn't use a little oil to lubricate the wire so it slide freely around the dead man.

Once you have transferred the amount of wire need across to the drawworks put the clamp back on the pigtail With the clamp holding on the dead man you can now start to remove the wire you intend to cut off, mark the number of reps you need to cut off, count from the drawworks clamp in,

Using an air tugger with a sheave hoist the wire you intend to put back on the drum after the cut up the derrick, drive the wire from the drum,

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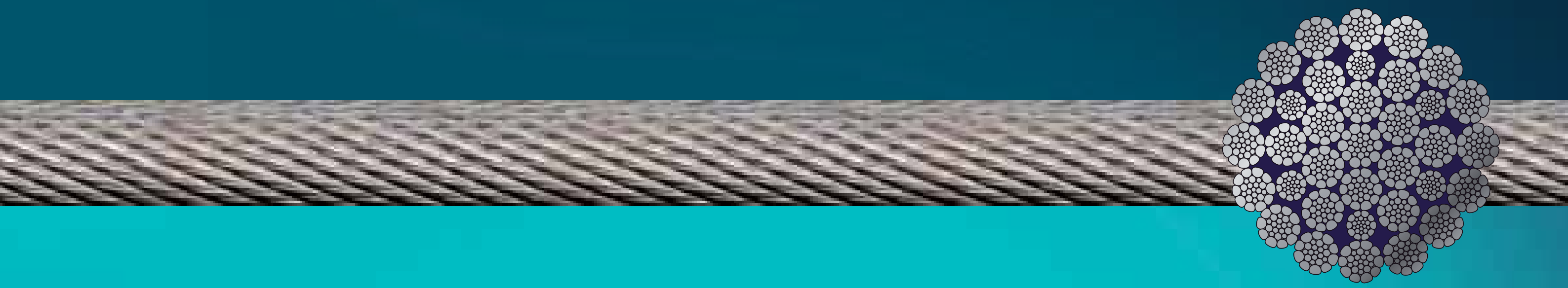

do not pull it off with the tugger, (8 raps a min is about as fast as you should reverse the drum any fast and the crew will not be able to keep up) the idea of taking it up the derrick is to keep it from picking up rubbish that it would do if it were laid out on the floor.

Once you get to the cut off point secure the hanging wire from pulling from the sheave, wrap the drill line at the point being cut with duct tape prior to making the cut to prevent un-laying.

Cut the line and remove it from the drum remove the holding camp and check the grip if they are used, get the junk wire off the floor before starting to install the loose wire back on the drum.

Line up the clamp hole on the drum so the restring wire is easy to work with, lower just enough wire from the derrick to go under the drum and back though the tie down clamp, tighten the clamp on the wire, once tight rest it back into its guide, pull the line tight but do not crimp the line by pulling on the tugger, reinstall the line back on the drawworks drum keeping the wire in the groves,

After making a cut, the dead wraps should be spooled on the drum with sufficient tension to prevent excessive drum crushing of the bottom layer. once done remove the tugger and take up the slack wire, once everything is ready remove the hang off line and tie back in the derrick

Lower the block so that the elevator tag the rotary (there must be a minimum of five raps left on the drum when the elevator tag the floor, some companies will ask for more) slowly pick back up to insure the line is spooling properly,

It is a good drilling practice to have pipe in the hole while cutting and slipping if you have done this you can use the string weight to test,

Ps: don't forget to use an inside BOP on the drill string if you are not using a TDS

Drilling Ton-Mile

Drilling Ton-Mile is the work of drilling line that is commonly measured as the cumulative of the load lifted in tons and the distance lifted or lowered in miles. When the predetermined ton-mile limit is reached, drilling contractors will perform slip and cut drilling line to prevent drilling line fatigue.

When drilling line is spooled on and off a drawworks drum during operation as drilling a well, running casing, coring, etc. The drilling line get worn out; therefore, drilling contractors must cut old section and replace with new section of drilling line at specific period based on ton mile calculation. The most worn area is the end of drilling line where is constantly spooled over the draw works drum. A section of drilling line, typically around 100 ft, is cut then the drilling line is re-attached to the draw works drum and the amount cut off is spooled back on the drum. This operation is called "slip and cut drilling line".

Note:

Ton-mile is the important figure that must be recorded correctly. However, the most important is to visually inspect drilling line all time to see if there is any worn out wire. If you see the worn out line, you need to cut the drilling line even though the drilling line does not reach ton-mile limit yet. All types of ton-mile service should be calculated and recorded in order to obtain a true picture of the total service received from the rotary drilling line. There are several types of ton miles as follows;

1. **Round trip ton-miles**
2. **Drilling or "connection" ton-miles**
3. **Coring ton-miles**
4. **Ton-miles setting casing**
5. **Short-trip ton-miles**

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DRILL LINES for land - and offshore drill rigs.

Drill Lines								
6x19S+IWRC / 6x26WS+IWRC								
Nominal rope		Weight of rope	EIPS		EEIPS		ALPHA	
Diameter			MBL		MBL		MBL	
mm	inch	kg/m	kN	metric tonnes	kN	metric tonnes	kN	metric tonnes
41,3	1 5/8	8	1167	119	1304	133	1471	150
44,5	1 3/4	8,7	1360	139	1500	153	1697	173
47,6	1 7/8	9,9	1549	158	1706	174	1932	197
50,8	2	11,3	1760	180	1931	197	2216	226
54	2 1/8	12,8	1970	201	2160	220	2363	241
57,2	2 1/4	14,3	2201	224	2420	247	2697	275

Drill Lines								
6xK19S/6xK26WS+IWRC compacted								
Nominal rope		Weight of rope	EIPS		EEIPS		ALPHA	
Diameter			MBL		MBL		MBL	
mm	inch	kg/m	kN	metric tonnes	kN	metric tonnes	kN	metric tonnes
41,3	1 5/8	8	1206	123	1344	137	1520	155
44,5	1 3/4	9,2	1451	148	1608	164	1814	185
47,6	1 7/8	10,6	1687	172	1863	190	2108	215
50,8	2	12,1	1951	199	2138	218	2412	246
54	2 1/8	13,8	2206	225	2393	244	2618	267
57,2	2 1/4	15,5	2461	251	2687	274	2991	305

All ropes manufactured according to API/EN Standards

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Riser Tensioner Lines

Riser tensioners being installed on a drilling platform. By changing the distance between sheaves, the tensioners compensate for wave-induced movement of the platform to maintain constant tension on the cables supporting the riser that extends from the platform to the seabed.

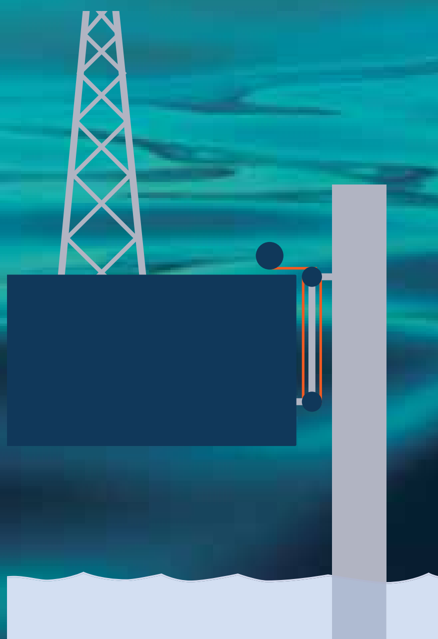
Criteria

The most applied Riser Tensioner ropes are in the constructions 6x41WS+IWRC in Lang lay version.
A Lang lay rope performs better on fatigue than a regular type. Nowadays, these ropes are often coming with a plastic infill between the IWRC and the outer strands. This infill avoids internal wear of the rope substantially.
Since tensioner lines come to the end of their service life due to fatigue, a better alternative would be the 8x31WS+IWRC construction.

This 8 strand type of rope, including a plastic infill would bring the highest resistance to fatigue. If laid out in Lang lay as well, this type of rope justifies high hopes and expectations on performance and life time.

Compacted Riser Tensioner ropes would bring advantages as to surface pressure performance.
On the other hand, compacted ropes are less flexible than regular round strand ropes.

See our data sheets for more detailed information.
Paragraph Surface Pressure.



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Riser Tensioner Ropes									
6x41WS+IWRC / 8x31WS+IWRC									
Grade				EIPS		EEIPS		ALPHA	
nominal diameter		weight of rope		MBL		MBL		MBL	
mm	inch	kg/m	kg/m	kN	tonnes	kN	tonnes	kN	tonnes
		6x41	8x31						
44,5	1 3/4	8,7	8,8	1360	139	1500	153	1697	173
50,8	2	11,3	11,5	1760	180	1931	197	2216	226
54,0	2 1/8	12,8	13,0	1970	201	2160	220	2363	241
57,2	2 1/4	14,3	14,5	2200	224	2420	247	2697	275
63,5	2 1/2	17,8	18,1	2682	274	2951	301	3295	336
66,7	2 5/8	19,7	20,0	2945	300	3236	330	3628	370
69,9	2 3/4	21,4	21,7	3209	327	3530	360	4011	409
73,0	2 7/8	23,5	23,9	3491	356	3844	392	4384	447
76,2	3	25,4	25,5	3782	386	4168	425	4815	491

Riser Tensioner Ropes									
6xK41WS+IWRC / 8xK31WS+IWRC compacted									
Grade				EIPS		EEIPS		ALPHA	
nominal diameter		weight of rope		MBL		MBL		MBL	
mm	inch	kg/m	kg/m	kN	tonnes	kN	tonnes	kN	tonnes
		6x41	8x31						
44,5	1 3/4	9,3	9,3	1451	148	1608	164	1814	185
50,8	2	12,1	12,2	1951	199	2138	218	2412	246
54,0	2 1/8	13,8	13,9	2206	225	2393	244	2618	267
57,2	2 1/4	15,5	15,7	2461	251	2687	274	2991	305
63,5	2 1/2	19,1	19,3	2971	303	3275	334	3658	373
66,7	2 5/8	21,1	21,3	3257	332	3599	367	4031	411
69,9	2 3/4	23,1	23,3	3548	362	3923	400	4452	454
73,0	2 7/8	25,2	25,5	3830	391	4266	435	4864	496
76,2	3	27,4	27,7	4139	422	4629	472	5345	545

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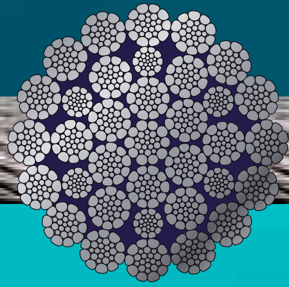
Technical Data Sheet 1



Kiswire is the largest wire rope producer in the world. Annually, about 140.000 tons of wire rope is delivered, worldwide. For decades, Kiswire is specializing in the development and production of wire rope. Meanwhile, the company has acquired a reputable and leading position in a great variety of markets, in literally all corners of the world. The offshore industry is one is a main market for Kiswire since 25 years, meanwhile.

Extreme strength and excellent ductility

KISWIRE is one of the largest and most specialized wire drawers in the world nowadays, featuring the making of wire qualities for high end markets, such as valve springs, and other automotive and aerospace applications. These N2 non rotating wire ropes are made of KISWIRE patented high ductile wires, guaranteeing an incomparable ratio between strength and flexibility, bending fatigue life and abrasion.

Length extensions

When a rope is loaded, constructional lengthening due to the bedding down of all the component wires in the rope, occurs. The precise lengthening due to constructional stretch is hard to calculate, as it depends on a variety of factors, such as : the type of construction of rope, the load amount, the frequency of loading. For a fact, wire rope with fibre cores lengthen more than those with steel cores, since steel cores perform a better bearing for the strands.

As a guidance, we can say that ropes with fibre cores lengthen due to constructional bedding from 0.25% of rope length to 2%, whereas steel core ropes lengthen from 0,125% to 1%.

Elastic length extension occurs due to the physical lengthening of steel under load. The more steel in a rope, the higher the lengthening. Elastic lengthening is not permanent. The precise elastic lengthening of a rope depends again on the same factors as given in the above chapter on constructional lengthening. To determine the exact elastic lengthening one would have to carry out sample tests. For approximate figures however, Hook's formula can be applied.

$$\frac{WL}{EA} = \text{mm lengthening}$$

W = load applied in kg
L = rope length in mm
E = elastic modulus in kg/mm²
A = circumscribed rope area in mm²

Length extension due to overloading of a rope, more than the yield point of the material, causes permanent extension. Another plastic lengthening of a rope occurs due to wear of wire to wire and strand to strand. Both phenomenon's demand attention whether the rope can be maintained or shall be rejected.

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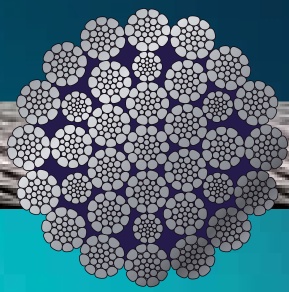
Technical Data Sheet 2



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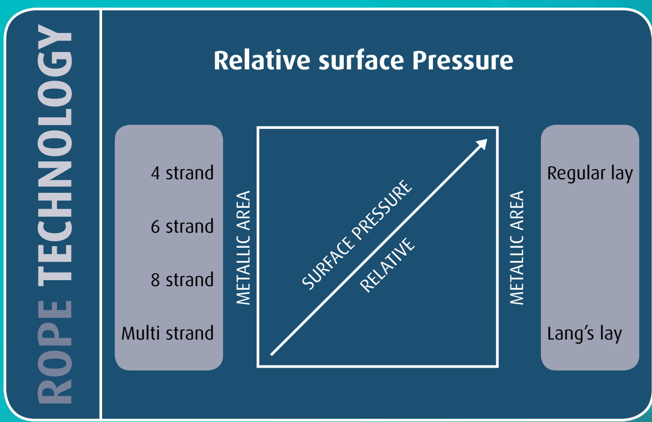
Surface pressure – between ropes and drum/sheave grooves

When a ropes passes the groove of a sheave or a drum, pressure between the 2 surfaces occurs, due to radial forces. The working life of a rope depends partly on the amount of this surface pressure. Much pressure causes more deterioration and fatigue. Here are some main criteria as to surface pressure. The more metallic area of the rope in contact with the groove, the lower the relative pressure will be. (1) Lang's Lay Wire Ropes have a **line contact** with the surface of sheaves and drums, whereas, Regular Lay Wire Ropes have **point contact** with the same. Hence, Lang's Lay Wire Ropes have more metallic area in contact with the sheave or drum than a Regular Lay Wire Rope. Assume, the absolute surface pressure is 100, while the contact metallic area of a regular lay wire rope is 20, the relative surface pressure becomes 100 : 20 = 5 Assume, the absolute surface pressure is 100, while the contact metallic area of a Lang's lay wire rope is 25, the relative surface pressure becomes 100 : 25 = 4



types of lay versus surface pressure

Be aware that Lang's lay wire ropes must be fixed at both ends of the rope, due to high torque characteristics.
(2) 8 strand (versus 6 strand wire ropes) have more metallic area to be in contact with sheaves and drums.
(3) Multi strand ropes expose the highest amount of groove contact. (4) Compacted ropes have an improved groove contact, hence compacted ropes show better surface pressure figures than regular round strand ropes.

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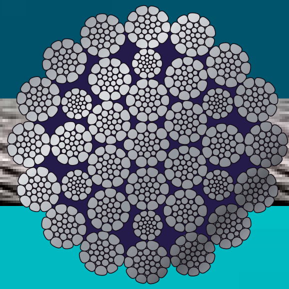
Technical Data Sheet 3



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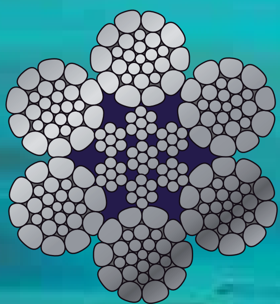
Crushing and abrasion features
By compacting our ropes the resistance to crushing improves substantially. Especially on multi layer drums, wire ropes could interlock between the different layers. By compacting a wire rope, one makes the surface of the outer layers (outer wires) of the rope more flat. This flatter surface leaves the rope with less grip to get hold of. Consequently, layers slide more smooth along each other.

Swivels
Just to avoid safety risks with rotating loads when they are lifted, the idea of using swivels has arisen. Basically, the use of a swivel interferes with the regular behaviour of a rope in such a way, that it often distorts the rope construction, and causes premature rope failure. Hence, the use of swivels shall be avoided or used in consult with a wire rope engineer. Particularly, a swivel shall not be used when installing a rope. Then again, it is recommended to use a swivel on non rotating wire ropes.

Sockets
Many a rope is equipped with a rope termination. One of the most safe and secure rope terminations is a socket. The proper socket connection guarantees a 100% breaking load efficiency with the rope. Sockets come in 3 main types, i.e. the open spelter socket, the closed spelter socket and the special chain/rope socket, especially designed for the offshore industry. Apart from these regular products, sockets can be custom made for any special application. Today, most sockets are connected to the rope by casting them with a polyester based resin.



ALUMAR® aluminised ropes
The aluminizing of steel wire and steel wire ropes is made by KISWIRE under the brand name ALUMAR®. We apply this technology for about 10 years now, it started in 1999. Initially, the ALUMAR technology was developed for products applied in the aviation and car industry – the core demand was to extend the life time of the wires by sustaining the steel wire quality ! Apart from many different kinds of improvement we could establish in this respect, it was obvious that an important improvement was to be made by protecting the wires from corrosion as long as possible. The ALUMAR zinc/aluminium coating was developed as an alternative for the regular galvanizing of wire. Many tests have been done in the meantime, showing that the ALUMAR wires stay corrosion free 3,8 times longer than galvanized products. Third party Salt Spray Tests are available.

The offshore industry, both oil and gas as well as fishing, could benefit from ALUMAR ropes substantially, as sea water is a corrosive environment.

See specific catalogues of our low spin and non rotating Crane Ropes for detailed data.

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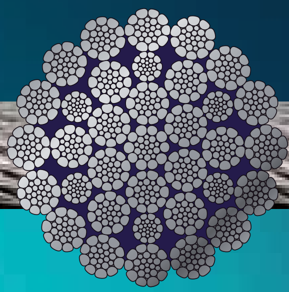
Technical Data Sheet 4



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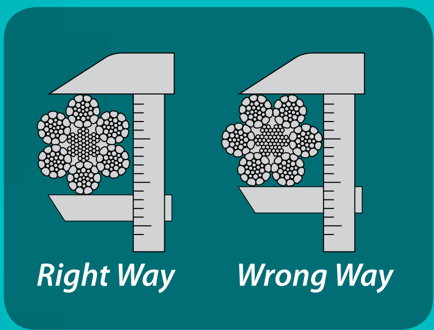
Measuring diameter

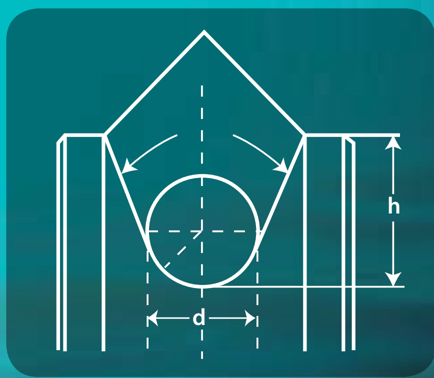


Hardness of rope and groove

An important factor in respect to surface pressure between rope and grooves, is the hardness of both the rope and the groove material. Groove hardness shall be slightly higher than the hardness of the wire rope. The other way around will cause damage to the grooves, which in return will damage the wire rope seriously. Formula to calculate surface pressure are available.

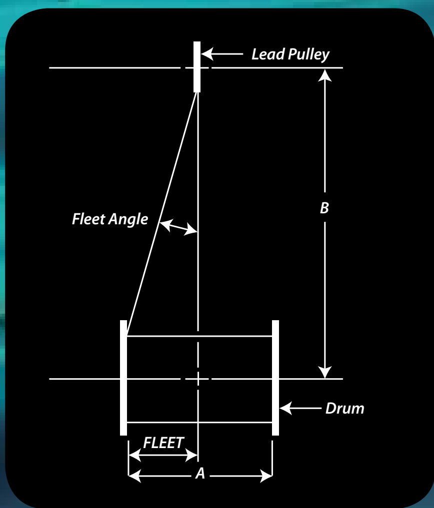
Groove dimensioning

Groove radius ® : minimum = 0.53 to 0.535 x d and maximum = 0.55 x d
Groove dept (h) : 1.5 x d
Throat angle : 35 to 45 degrees
(for normal applications)



Fleet angles

The angle under which a rope moves between a drum and a sheave shall be between 0.5 and 2.5 degrees. Fleet angle is calculated from the sheave centre to the flanges of the drum. Too small or too big fleet angles cause the rope spool improperly. Either layers pile up on top of each other or layers leave gaps between each other on the drum. Too small fleet angles may cause the interlocking of the rope layers, which causes serious damage to the rope. In order to reduce this interlocking risk, compacted ropes are recommended. Compacted ropes have smoother surfaces than regular round strand ropes, which enhances a smoother sliding of ropes against each other.



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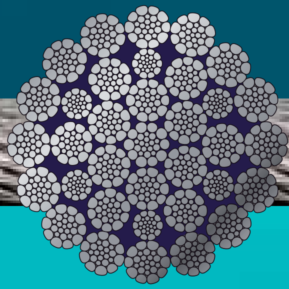
Technical Data Sheet 5



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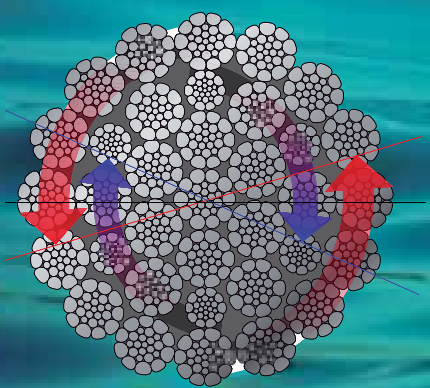
Spinning loss

In the beginning there was a parallel laid bundle of wires to lift or to pull, to move load. But the parallel bundle could not be bent over drums or sheaves.
Hence, one twisted or spinned the bundle into a helical shape in order to bend the bundle, the rope. The parallel bundle of wires had a strength (MBL) which was the sum of each individual wire (calculated breaking load) In case of the spinned rope spinning loss occurred. The average spinning loss is 18%. Calculated breaking load minus spinning loss is minimum breaking load.

Constructional torque and axial stiffness

Torsional torque occurs due to the above spinning.
When a spinned rope is put under load, the individual wires want to return to their original parallel laid shape. When the load is taken off the rope, all components return to their helical, spinned shape. This phenomenon implies that all ropes untwist or turn out under load and turn in again when load is released. Torsional torque is one of the most crucial issues related to the design, choice, use of wire rope.

Torsional torque is a phenomenon that goes with wire rope as rain and water ; any wire rope type except the perfect non rotating ones show torsional torque under load.
The amount of torque depends on the amount of load, type of construction and lifting speeds.
As a guide line torque values for each type of rope are available. Our N2 35X7 and 35x19S and 35x26WS have been indicated on the leaflets of these ropes. The same theory goes for axial stiffness. Data is shown in the tables of each catalogue.



Average torque factors for the following rope constructions are :

4x39WS+IWRC	torque 0.022
6x36WS+IWRC	torque 0.068
8x36WS+IWRC	torque 0.082
35xK7/40xK7/55xK7	torque 0.0065
35xK26WS.	torque 0.0050

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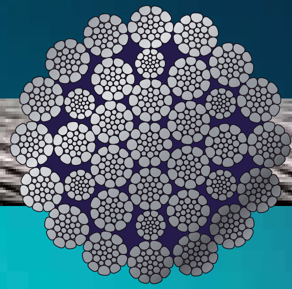

Technical Data Sheet 6

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Fatigue by bending

Almost any wire rope when used is bent over drums and sheaves. The number of bends (1), the types of bends (curves) (2), the load applied (3), the dimensions of the drums and sheaves (4), fleet angle, reeving arrangement, groove profile, are impacting factors on the service life of a rope. Ideal wire rope circumstances hardly exist. One shall attempt to create the best possible circumstances in order to optimize rope's service life and performance.

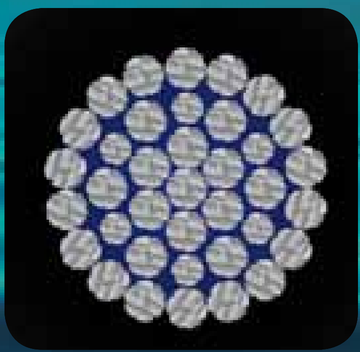
(1) The higher the number of bends of a rope, the higher its fatigue.

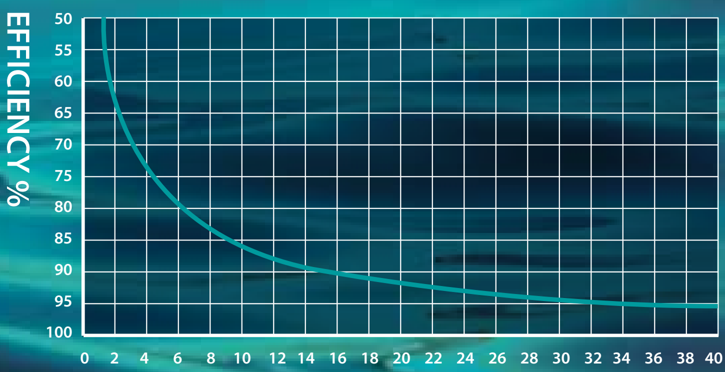
(2) Counter direction bends of rope in an installation complicate the performance of a rope substantially. The higher stress in the rope caused by complicated bends, shorten its service life and performance quality.

(3) The amount of load charged on a rope is of great impact on its service life. Within the maximum load allowed of 20% of the MBL of the rope, lower loading improves the fatigue life of the rope disproportionally.

A 10% less loading would result in a 20% better outcome. Be aware, that other issues are of impact as well. For instance, acceleration and deceleration (speed) of the rope. The slower the movement of a rope, the easier its going, the less risk on complications.

(4) The larger the drum and sheave bends, the better the performance and the longer the service life of the rope.





STRENGTH EFFICIENCY OF WIRE ROPE
WHEN BENT OVER PINS OR SHEAVES OF VARIOUS SIZES

$$\frac{D}{d} = \frac{\text{diameter of pin (or sheave)}}{\text{nominal diameter of rope}}$$

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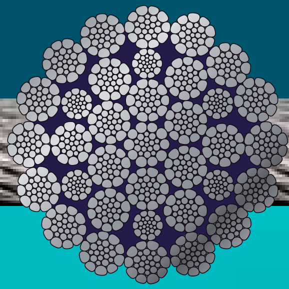
Technical Data Sheet 7



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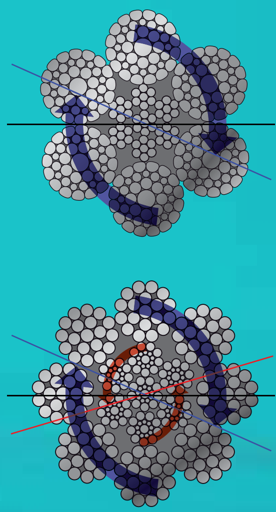
Axial stiffness (EA)



In more common terms Axial Stiffness is the (non) flexibility of a rope.
We calculate the stiffness or flexibility as follows :

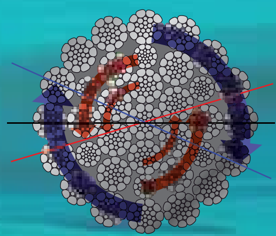
E x A x 10/4

E = the apparent modulus of the rope in kN/mm^2
A = the cross sectional area of the circumscribed circle in mm^2, based on the nominal rope diameter.

6x37 Class E modulus in kN/mm^2 is 58.86.
The same in compacted version is 63.77 kN/mm^2.

For example :
the EA for a 6x36WS+IWRC 76.2 mm wire rope is :
58.86 x 4560 x 10/4 = 268 MN (MN = Meter/Newton)

Flexural Stiffness (EI)



Flexural Stiffness is the Bending stiffness of a rope. It is calculated as follows :

E x I x 10/6

E = the stiffness in N/mm2 (see below table)
I = the Second Moment of Area of the rope (d/6)
(d is the nominal diameter)
Stiffness Factors of 6x37 Class are :
6x36 (15.6) 6xK36 (18.8) 6x41 (14.5) 6xK41 (17.6) 6x49 (12.6) 6xK49 (14.4)

For example :
the EI for a 6x36WS+IWRC 76.2 mm wire rope is : 15.6 x 76.2 x 10/6 = 526 N/m2

The above stiffness values are due for new wire rope, with little or no load applied.

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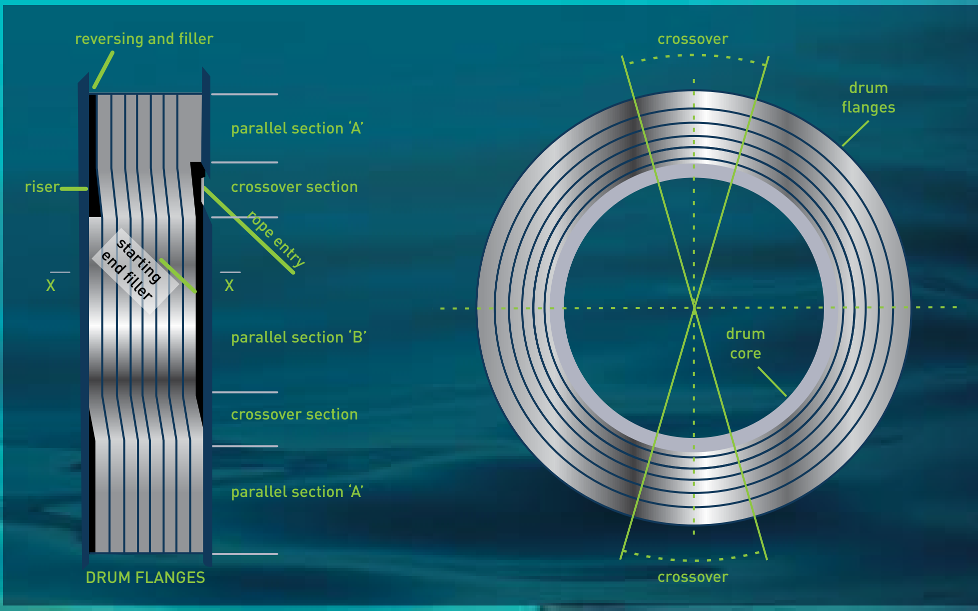
Technical Data Sheet 8

Kiswire is the largest wire rope producer in the world. Annually, about 140.000 tons of wire rope is delivered, worldwide. For decades, Kiswire is specializing in the development and production of wire rope. Meanwhile, the company has acquired a reputable and leading position in a great variety of markets, in literally all corners of the world. The offshore industry is one is a main market for Kiswire since 25 years, meanwhile.

LEBUS ROPE SPOOLING SYSTEM

The Lebus spooling system is designed for any hoisting and winching application that uses multiple layers of wire rope on a drum. The geometry of Lebus grooving, coupled with Lebus know-how, ensures that your wire rope spools smoothly onto and off the rope drum under total control - a dependable performance every time. Every Lebus drum is custom engineered. It is designed and produced specifically to meet the application for which it is used.
The groove pattern is engineered to suit the rope's length, diameter and construction type.
The Lebus system keeps the spooled rope in a uniformed pattern, evenly distributing the load between the individual layers of rope. This prevents lower layers being crushed or pinched by upper layers. Independent field tests have proved over the years that the Lebus system can extend rope life by more than 500%.

GEOMETRY
With the Lebus system, the continuous groove in the drum is parallel to the flange except for two crossover points on each revolution where the groove moves across the drum half a pitch to give a full pitch of movement for each revolution. With Lebus grooving it is possible to calculate exactly the direction of the forces that the rope imposes on the drum because the spooling is totally controlled. This is not possible with any other spooling system.



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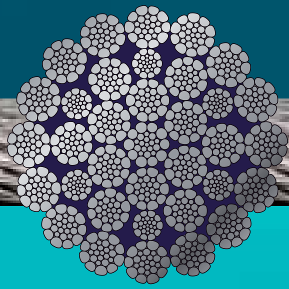
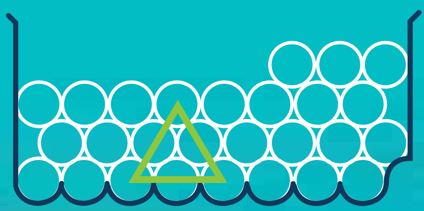


SPLIT SLEEVES

It is not always necessary to purchase a new drum. Lebus can supply its grooving system on outer sleeves that can be bolted or welded onto your old drum, no matter how old or worn it is. Lebus split sleeves can also be an economic option for new drums. If in future a different type or size of wire rope is used, the sleeve can be taken off and replaced with a new sleeve engineered for the new application. The Lebus system is so flexible that it can be individually adapted to any existing or new hoist system, even in extreme operating conditions and high loadings. The Lebus system can be installed either during the manufacturing process or later onsite. The cost benefit of the technology speaks for itself.

ROPE DRUMS, SPLIT SLEEVES AND SPOOLING ACCESSORIES

Rope drums - rope drums with grooves cut directly into them (with or without bolted or welded flanges, as required).
Split sleeves - machine-grooved split sleeves, supplied in two sections that can be placed over smooth ungrooved drums.
Split sleeves are a good solution for retrofitting and for applications where drums may require replacing in future



GROOVED SLEEVES

Sleeves are used to prevent damage to a drum. It is usually cheaper to replace a worn out sleeve instead of replacing or repairing the complete drum assembly. That is why grooved sleeves have become so popular.
The LeBus Grooving System involves a product made specifically for use on any or all types of hoisting drums requiring the use of wire rope or electro-mechanical cable. The LeBus grooves are made for the purpose of properly seating a specified size of wire rope and the proper movement of and spacing of the cable from flange to flange.

The material is supplied in cylindrical form, either from steel, fiberglass, or aluminum to fit over any existing or new drum core. Sizes range from 3 inches to over 18 feet in diameter and 4 to144 inches (or more) in width. The grooved cylinders are split in halves for easy installation either by welding or bolting to an existing drum core. After the installation has been accomplished, the grooves supplied by LeBus set a pattern whereby a repetitive action of layer to layer spooling can be controlled regardless of the number of layers or drum speed, size and load on the drum.

The primary purpose of the LeBus Spooling System is to spool wire rope or cable onto hoisting drums in a true and correct manner. In most spooling operations, you never encounter severe spooling problems when spooling only one layer of cable on your drum. In all other cases, your trouble will begin when you start the second layer and from there on up through your last layer.

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The LeBus System is the only system on the market that can eliminate the 360o continuous cross winding of the cable as found on smooth drums.
The LeBus System cuts down the cross winding to approximately 20% of the circumference of the drum while 80% of the wraps are parallel with the flanges. In view of this pattern, each layer of wire rope then becomes the groove pattern for each succeeding layer.

The LeBus pattern puts the same number of coils on each layer thereby eliminating the "cutting-in" of the cable. This severe scrubbing action can cause the wire rope to fail prematurely. The LeBus System is the only known method that can accomplish this feat. Therefore it creates a much safer environment.

Another benefit is increased wire rope life. Since the wire is not "cutting in" and scrubbing on itself, the true pyramid stacking pattern promotes long rope life.
Next are faster operations.
By eliminating manual spooling or mechanical devices, a drum with LeBus grooving can be operated at higher speeds.

Flexibility is an asset that cannot be overlooked. The sleeve can be added to the smooth drum either during original manufacturing or after the hoist is in the field.

Wire rope savings - Wire Rope is expensive. Anything that promotes the increased life of the rope can be a huge cost saving.
In order for the LeBus system to operate properly, certain parameters must be met. First, the drum flanges must be perpendicular to the drum barrel at all times, even under loaded conditions. Second, there must be sufficient tension on the wire rope to hold the wire firmly in the groove and keep it from skipping grooves or "back tracking". Third, the fleet angle must be kept between ¼° and 1 ¼° (If the parameters are such that this cannot be held, then a LeBus Fleet Angle Compensator can be used). This insures that the rope enters the grooving pattern at the most optimum angle for spooling. Fourth, the rope must go to a fixed point that is centered with the drum width. Last, the rope must retain its consistent and round shape even under maximum loading conditions. Given these conditions, a LeBus grooved sleeve should spool KISWIRE ropes in multiple layers without any problems.

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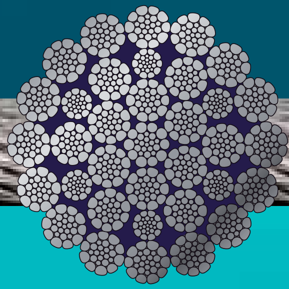

Technical Data Sheet 9

Kiswire is the largest wire rope producer in the world. Annually, about 140.000 tons of wire rope is delivered, worldwide. For decades, Kiswire is specializing in the development and production of wire rope. Meanwhile, the company has acquired a reputable and leading position in a great variety of markets, in literally all corners of the world. The offshore industry is one is a main market for Kiswire since 25 years, meanwhile.

STRAIN AGING

High Carbon Wire Rod

To reach higher as-drawn wire strengths for applications such as prestressed concrete tendons, higher starting rod strengths are required in the as-rolled condition. High strengths in pearlitic steels are obtained by maximizing the carbon level, and by producing as fine of a pearlite spacing as possible. The upper limit to the carbon level that can be used is dependent on the process capability of a given steel mill. The formation of a continuous grain boundary carbide film, usually in the segregated center of a billet or bloom cast steel, will determine the maximum carbon level that can be used. Typical maximum carbon levels for these applications are 0.82 to 0.85%. Since lead patenting is no longer a competitive alternative because of costs, additional strength is achieved by adding hardenability elements such as Mn and Cr to match hardenability to the controlled cooling capabilities of the rod rolling process.

The objective is to produce a fine pearlite similar to a lead patented structure.

With the limitations of the rod cooling process compared to lead patented rods, strengths will still fall short of lead patented rods. Additional strengthening is achieved by precipitation hardening of the soft constituent of pearlite, the ferrite. Vanadium is widely used as a pearlite strengthener in eutectoid CMn steels for wire rod applications. Strength increases of 10 to 16 MPa per 0.01% V added are reported. The high solubility of the vanadium allows additions over 0.10% V to be added with predictable strengthening results. Because of this predictability, vanadium is the element of choice to be used as the strength control element when refining steel to specific strength levels. Direct drawn wire applications that require maximum strength, such as prestressed concrete tendons, tire bead wire, and wire rope are common applications of vanadium micro alloyed pearlitic steels with eutectoid carbon levels.

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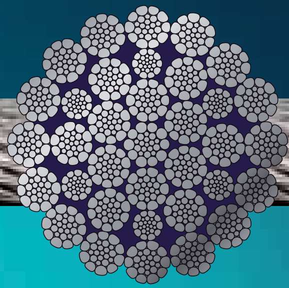


In addition, the addition of Vanadium will remove nitrogen from solid solution as V(C,N). Nitrogen in solid solution contributes to strain aging during wire drawing, resulting in reduced ductility of the finished wire. Higher ductility, usually measured by the wire torsion test, is reported using vanadium micro alloyed steels in direct drawn wire applications. Again, vanadium changes the nitrogen from an undesirable element to an integral part of the alloy system.

Strain Age

Strain ageing is associated with strain that results from plastic deformation which is more commonly known as cold working. Steel is an alloy of iron and carbon and contains other alloying elements which provide it with specific performance characteristics. Severe cold working of steel causes the migration of carbon atoms in the iron crystals and the segregation of these atoms at dislocations in the steel causes a reduction in ductility of the steel. The ageing process is a function of temperature and time and

occurs very slowly at ambient temperature but very rapidly at the 450-460°C temperatures of the galvanising process. Severe cold working of steel can be caused by hole punching in thicker sections, tight radius bending or rebending.

It should be noted that it is not the hot dip galvanising that is the cause of accelerating the strain ageing of the steel, but the heat of the process, so strain age embrittlement can be induced in any severely cold worked steel by heating and the tendency to embrittlement by strain ageing will always be present and its manifestation will simply be a matter of time.

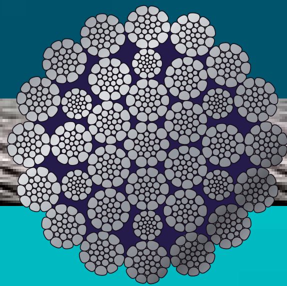
Avoiding Strain Age Embrittlement

To avoid the risk of strain aging embitterment, the following design criteria should be followed :

- use a bend radius of 3 times the diameter of the steel wire
- avoid cold strain. Bend and/or work the steel hot. When galvanizing, anneal at 650-815 degrees Celsius

It is these two effects, the increased strength and reduction in ductility and toughness from cold strain followed by an additional strength increase and toughness loss through aging, that are the primary elements in strain aging.

Technical Data Sheet 9



Practical comments

Until not so long ago, the world was not familiar with the phenomenon, called strain aging, occurring in wire rope. As far as science shows us, much of cause of strain aging in wire rope could be due to the increase of tensile strengths of the wires used, during the past decades. Was a 1570 N/mm² tensile the benchmark until 1975, since then it became 1770 until the nineties, whereas the standard tensile strength today, is 1960 N/mm².
The regular tensile strength is 1960, however, we see that much of the wire ropes are required with high(er) breaking strengths than 1960 grades allow. Hence, tensile grades of 2060, 2160 and 2.300 have become quite common, meanwhile.

The need of these high strength ropes (and tensiles) are the result of the industry's wish to design small, light and ethical cranes, devices, and appliances.

One of the main possible causes of susceptibility for strain aging, is a high carbon content in steel. A high breaking strength rope requires high carbon steel wires.
Details of the metallurgical chemistry, relating to strain aging and high carbon content, is given in above text.

KISWIRE, expert wire drawer

Of the total volume of delivered wire, being one million tonnes per year, 140.000 tonnes of wire rope, 400.000 tonnes of high ductile, oil tempered wire for the car industry, is produced. Another 500.000 tonnes of wire is made for the tyre industry and the conductor industry. Out of the 400.000 tonnes of car industry wires, 200.000 tonnes high carbon, high ductile, non strain aging susceptible, wire is drawn.
All wire rope is made to specific ordering. KISWIRE does not stock wire rope.

Conclusion and recommendation

Factors, which effect the susceptibility to Strain Aging of Wire Rope:

1. The chemical content of the steel used for the drawing of the wires (this chemical content impacts the mechanical characteristics of the wire)
2. Manufacturing process of steel.
3. One can minimize the risk of steel wire to strain age by choosing materials which are less susceptible to the phenomenon.
5. High(er) tensile strengths tend to be more susceptible to strain aging
6. Research and experience show that less than a promillage of all wire rope suffer from strain aging. Do not exaggerate the risks.
7. Average loss of strength by strain aging is under 5%
8. In the event, wire rope is stored longer than 12 months, one could break test the rope, prior to using it.

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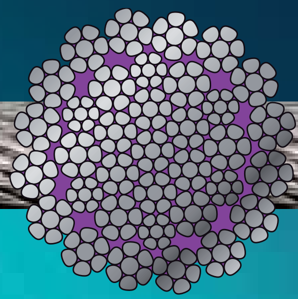
Technical Data Sheet (10)



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WIRE ROPE WITH PLASTIC INFILL

To make things easy, let's call the plastication of a IWRC (wire rope core) PLASTIC INFILL

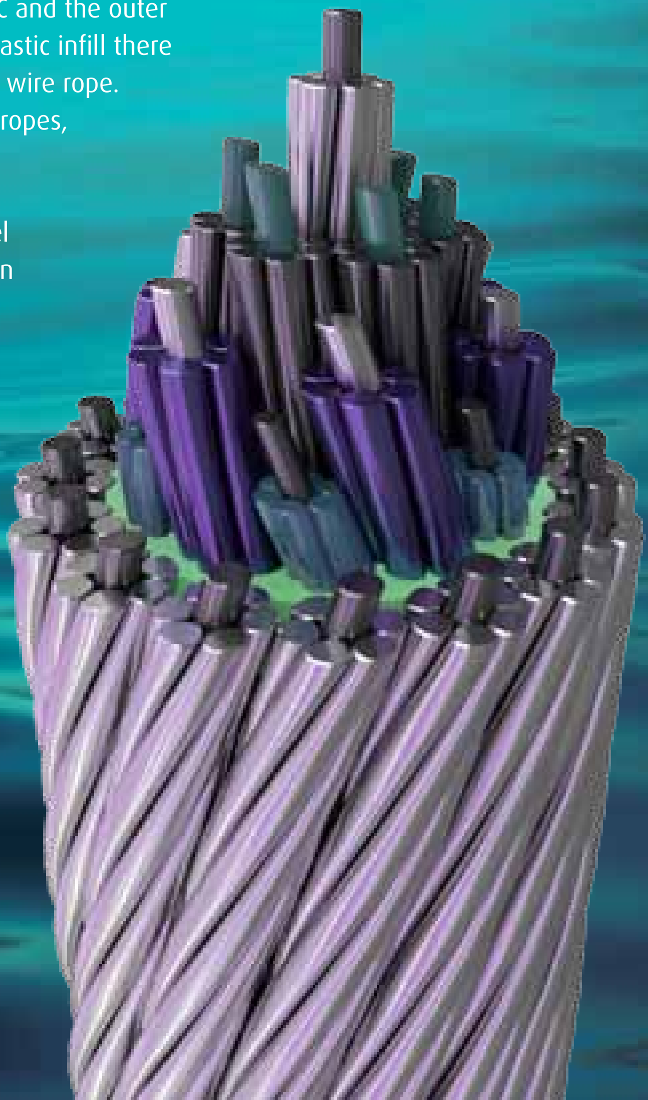
- Plastic infill improves the **STABILITY** of wire rope always, regardless the construction. This makes a wire rope less sensitive for deformation.

- Secondary, a plastic infill enhances the **COHERENCY** of the different rope parts, such as (1) the strands and (2) the IWRC (core). It is essential that wire ropes are a 100% coherent entity. If that would not be the case, loads could be absorbed unequally over the different parts, which would certainly end a rope's service life, prematurely.

- Plastic infill avoids internal wear and friction between the IWRC and the outer strand layers, plus friction between the strands. Hence, with plastic infill there will always be a better resistance to **WEAR** and **FATIGUE** of the wire rope. More bending cycles will be obtained with plastic infilled wire ropes, regardless the construction.

- The plastic infill avoids water and dirt to enter the layer of steel wires (IWRC) which lays under the plastic infill. Hence, corrosion from the inside (invisible) will be less or not occurring.

- Overall, a plastic infill would improve the service life of a wire rope due to higher **FATIGUE, STABILTY** and **COHERENCY** features by 125 to 200 %, provided the right type of rope is applied for the right application, and the wire rope is not coming to the end of its service life due to other causes.



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