



NEPTUNE

STEEL WIRE ROPES

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Providing strength to access oil and gas reserves
in the deepest waters

KISWIRE LOCAL DISTRIBUTOR



High strength wire rope for the offshore oil & gas industry

The NEPTUNE product range includes:

Anchor Lines

A & R Winch Ropes

Drilling Lines

Marine Riser Tensioner Lines

Large Diameter Offshore Crane Ropes

KISWIRE LTD

The World's largest manufacturer of steel wire rope.

Kiswire was established in 1945 in Busan, Korea. The company has grown into a major international operation with a global sales and marketing presence and manufacturing facilities in Korea, Malaysia, China and the USA.

NEPTUNE Wire Ropes

In 1997 KISWIRE established a dedicated manufacturing operation in Johor, Malaysia for a complete range of wire ropes for use by the oil and gas industry, with unit weights for 6-strand rope up to 120t.

Through continuous improvement, product development and expansion, NEPTUNE wire ropes have grown into leading products for use Offshore

Planned investment will see NEPTUNE unit weights go beyond 300t. and its manufacturing capacity double.



Key Product Features:

The highest breaking strengths and fatigue resistance in round and compacted strand rope made possible by the use of special, high quality steel; high technology wire drawing machinery coupled with special die and lubrication practices; optimum rope designs to minimise spinning loss.

Outstanding resistance to corrosion through heavy, uniform thickness zinc and zinc aluminium alloy (ALUMAR) coatings in combination with highly effective water repellent blocking compounds developed specifically for use with NEPTUNE products.

Excellent packaging and product protection by careful control of rope spooling and the use of strong steel reels and protective wrapping.

Rigorous quality assurance through procedures and practices strictly applied according to Internationally accredited standards.

Wire Rope Selection

When replacing a wire rope, refer to the relevant Original Equipment Manufacturers recommendation and rope test certification.

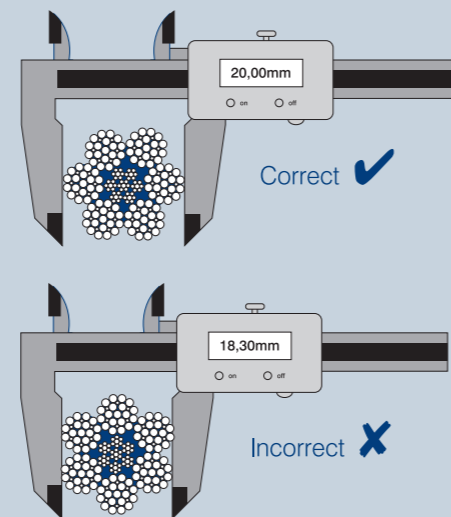
To ensure safe and efficient operation, replacement ropes should conform to the specified nominal rope diameter and be at least equal to the required strength originally specified. Additionally, the wire rope construction selected should provide similar or improved working properties for resistance to rotation, bend fatigue, crushing, abrasion and corrosion.

Where an original wire rope is to be supplied, or where the required working conditions have changed, KISWIRE should be consulted to obtain the best possible advice and recommendations.

Rope Diameter

Correct and consistent rope diameter is essential for optimum working performance. Ensure that the rope diameter is correctly measured and that the resulting diameter is appropriate for the working system.

Incorrect diameter can reduce performance and cause unsafe working conditions.



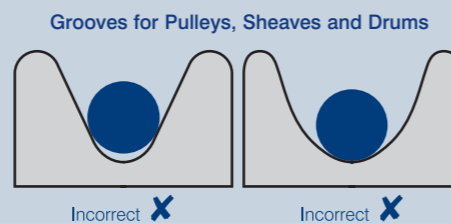
Strength

Rope strength should be specified as Minimum Breaking Strength or Minimum Breaking Force.

The breaking strength of the rope is determined by the wire tensile strength and steel cross sectional area.

The steel fill factor and rope construction can be varied to suit the operating conditions.

Strand compaction can be used for increased rope strength and service life.



Grooves for Pulleys, Sheaves and Drums

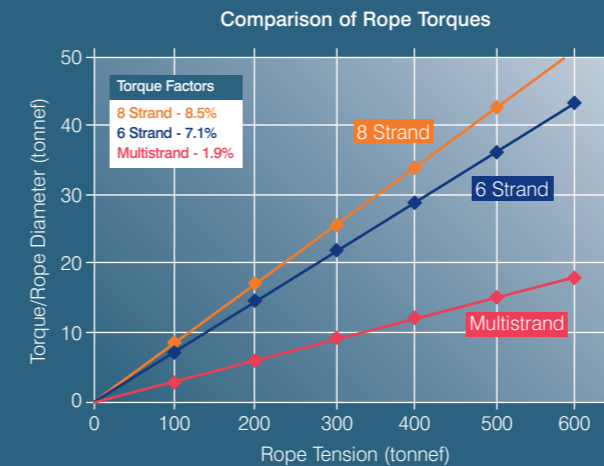
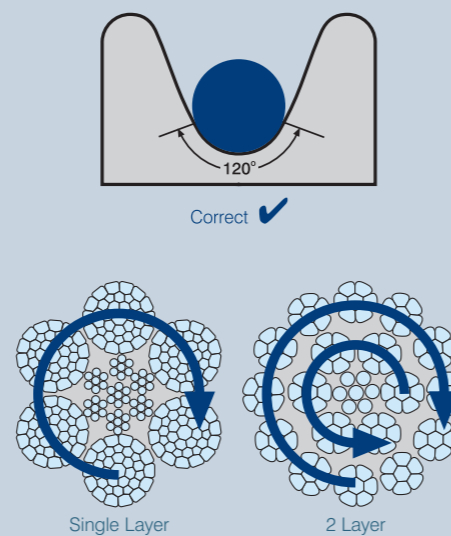
Rope Torsion

All wire ropes have inherent rotation characteristics that will produce a turning moment in the rope. With both rope ends fixed and unable to rotate, the turning moment will generate a TORQUE force 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.

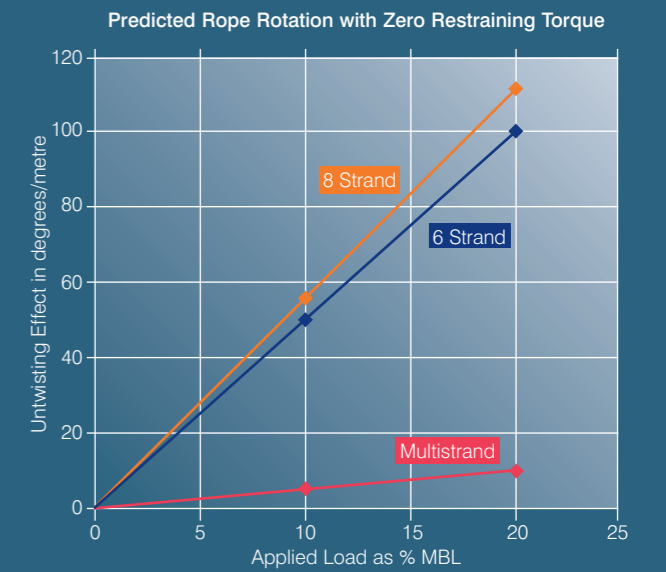
Wire ropes can be designed to achieve the desired rotational properties required by the application.

Single Layer ropes such as the 6 and 8 strand have a much greater tendency to rotate under load, whereas Multistrand ropes, which depend upon the opposing torsional values of the various layers of strands, offer much greater torsional stability.

As the wire rope construction options are numerous, KISWIRE would be pleased to offer technical advice on rope selection.



The torque generated is the torque factor (%) multiplied by the rope diameter multiplied by the applied load.



Axial Stiffness (EA)

Axial Stiffness (EA) is determined by $E \times A \times 10^{-3}$, in MN, where:

- E** - is the apparent modulus of the rope in kN/mm^2 , shown below for 6x37 IWRC group constructions.
- A** - is the cross sectional area of the circumscribed circle (mm^2) based on the nominal rope diameter.

Construction	6x37 IWRC API classification	E kN/mm^2
6x36, 6x41 and 6x49		58.86
6xK36, 6xK41 and 6xK49		63.77

e.g. EA for 76.2mm dia. 6x36: $58.86 \times 4560 \times 10^{-3} = 268 \text{ MN}$

Flexural Stiffness (EI)

Flexural Stiffness (EI) is determined by $E \times I \times 10^{-6}$, in N.m^2 , where:

- E** - is the Stiffness Factor in N/mm^2 , shown below for appropriate 6x37 IWRC group constructions.
- I** - is the Second Moment of Area of the rope (d^4), using Nominal Diameter d.

Construction	6x37 IWRC API classification	Stiffness Factor N/mm^2
6x36		15.6
6xK36		18.8
6x41		14.5
6xK41		17.6
6x49		12.6
6xK49		14.4

e.g. EI for 76.2mm dia. 6x36: $15.6 \times 76.2^4 \times 10^{-6} = 526 \text{ N.m}^2$

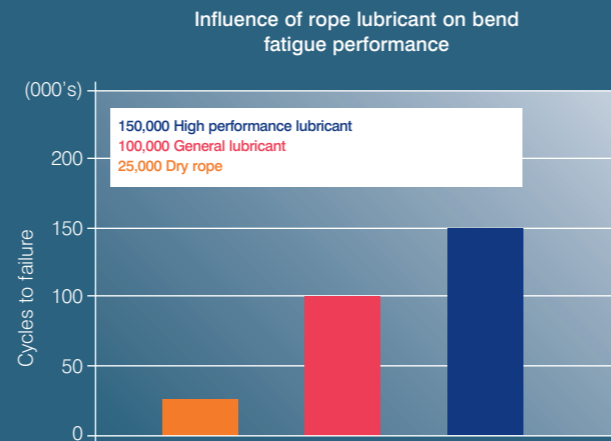
N.B. In both cases the Stiffness values apply to new rope with little or no applied load. On all technical queries and parameters, it is always best to verify your requirements with the KISWIRE QA Dept.

Rope Lubrication

Effective rope lubrication during manufacture by the selection and application of the optimum lubricant can increase fatigue life, minimise wear and provide corrosion resistance to extend the service life of wire rope.

All Neptune ropes are filled with an impermeable, semi solid, anti corrosion blocking compound. This provides lubrication for the rope which reduces internal abrasion damage, as well as increasing rope service life through resistance to penetration of the rope by seawater.

A range of manufacturing lubricants is available to satisfy particular seawater salinity and temperature.



Corrosion

Where the rope is working in a corrosive environment, protection of the individual wires should be considered, especially if the rope life is expected to be in excess of 12 months. In such cases, it is essential to safeguard the integrity of the smaller, inner wires of the rope in order to maintain the constructional stability and also the working safety of the rope. Zinc has been the conventional coating on wire, but KISWIRE is now offering a much superior coating based on a Zinc/Aluminum alloy – ALUMAR, (see the details overleaf).

In applications such as Riser Lines, additional corrosion protection can be achieved by the use of a plastic impregnated core. The plastic will give added protection to the centre wires and also offer greater support to the outer strands, resulting in extended rope life.

All information and data provided are for guidance only and it is recommended that individual requirements be discussed with KISWIRE.

Neptune Alumar

Neptune ALUMAR provided by the special zinc/aluminum alloy coating.

Neptune ALUMAR is an exciting new development, stemming from a major investment programme led by KISWIRE's R&D Center.

Neptune ALUMAR has excellent corrosion resistance and superior rope fatigue performance compared to conventional galvanising.

The special, ductile zinc/aluminum coating, combined with highly effective, water repellent blocking compounds, provide three times greater life in sea water than the conventional product.

This powerful combination of corrosion resistance, durability and highest strength rope, significantly extends useful life of rope in a marine environment.

Neptune ALUMAR provides a 21st century solution for the offshore oil and gas industry:-

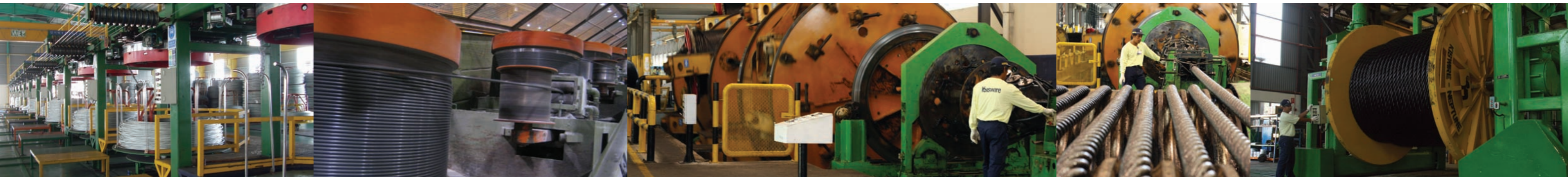
- Unparalleled high strength to weight ratio
- Extended tension-tension and bend fatigue life
- Remarkable corrosion resistance

A quality assured product from design through to installation.



Coating	Coat Loss in g/m ² /year			
	Rural	Industrial	Marine	Severe Marine
ALUMAR	7	9	10	12
Galvanised	14	21	19	24





- Dedicated inside rod storage provides protection against pitting corrosion and coil handling damage.
- State-of-the-art ALUMAR coating line for Neptune products.
- Efficient cooling in drawing to maximise ductility, aided by special drawing die technology and lubrication.
- Efficient, well controlled stranding for complex constructions.
- Large rope closing machine provides options for 6, 8 and 9 strand constructions.
- Take up unit capable of handling very large rope pieces enabling excellent package quality.



- Durable reels for world wide transportation.
- Support cradles to distribute weight.
- Robust polymer wrap protecting against corrosion and mechanical damage.
- Clear customer ID and shipping documentation.

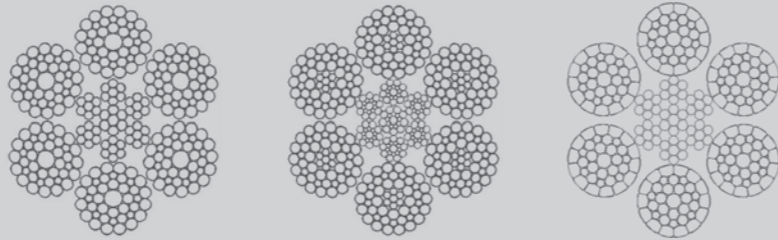
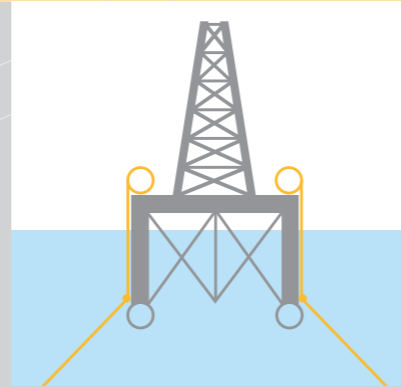
Anchor Lines

Rope construction:
Class 6x36 IWRC and greater.

Large diameter outer wires for optimum
resistance to wear and corrosion.

Wire protection by galvanising or ALUMAR.

Compact strand (CMP) for increased
strength, improved contact area, reduced
tread pressures and sheave wear.



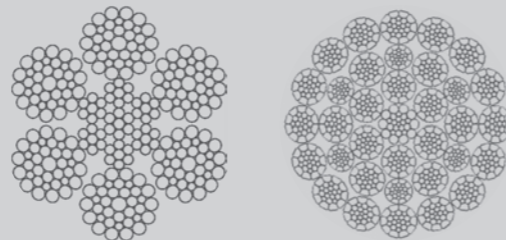
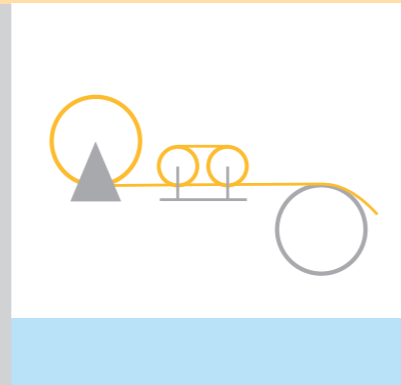
A&R Winch Ropes

Optimum flexibility to allow efficient rope
operation around sheaves, drums and
capstans.

Effective protection of all wires by
galvanising/ALUMAR.

Appropriate lubrication during manufacture.

Rope selection should be determined through
consultation with KISWIRE.



Anchor Lines & A&R Winch Ropes

Nominal Rope Diameter		Estimated Rope Mass in air		EEIPS			ALPHA			DELTA			OMEGA		
				Minimum Breaking Force											
mm	ins	kg/m	lb/ft	kN	metric tonnes	short tons	kN	metric tonnes	short tons	kN	metric tonnes	short tons	kN	metric tonnes	short tons
Neptune Conventional - Large Diameter Six Strand Rope															
50.8	2	11.3	7.6	1930	197	217	2216	226	249	2285	233	257	2384	243	268
54.0	2 1/8	12.8	8.6	2160	220	243	2363	241	266	2471	252	278	2578	263	290
57.2	2 1/4	14.3	9.6	2420	247	272	2697	275	303	2834	289	319	2957	302	332
63.5	2 1/2	17.8	11.9	2950	301	332	3295	336	370	3462	353	389	3612	369	406
66.7	2 5/8	19.7	13.2	3240	330	364	3629	370	408	3815	389	429	3980	406	448
69.9	2 7/8	21.4	14.4	3530	360	397	4011	409	451	4207	429	473	4394	448	494
73.0	2 7/8	23.5	15.8	3840	392	432	4384	447	493	4599	469	517	4805	490	540
76.2	3	25.4	17.1	4170	425	469	4815	491	541	5060	516	569	5276	538	593
79.4	3 1/8	27.6	18.5	4490	458	505	5119	522	575	5374	548	604	5610	572	630
82.6	3 1/4	29.9	20.1	4840	494	544	5462	557	614	5737	585	645	5992	611	673
85.7	3 3/8	32.2	21.6	5180	528	582	5953	607	669	6247	637	702	6531	666	734
88.9	3 1/2	34.8	23.4	5520	563	620	6463	659	726	6786	692	763	7090	723	797
95.3	3 7/8	39.9	26.8	6280	640	706	7002	714	787	7355	750	827	7698	785	865
102.0	4	45.3	30.5	7060	720	794	7806	796	877	8199	836	922	8554	873	962
108.0	4 1/4	51.1	34.3	7730	788	869	8287	845	931	8699	887	978	9076	926	1021
114.0	4 1/2	57.4	38.6	8590	876	966	9209	939	1035	9670	986	1087	10089	1029	1134
121.0	4 7/8	63.9	42.9	9480	967	1066	10160	1036	1142	10670	1088	1199	11132	1136	1252
127.0	5	70.8	47.5	10430	1064	1172	11160	1138	1254	11719	1195	1317	12226	1248	1375
Neptune CMP - Large Diameter Six Strand Rope															
50.8	2	12.1	8.1	2141	218	241	2458	251	276	2535	259	285	2575	263	290
54.0	2 1/8	13.8	9.3	2396	244	269	2621	267	295	2741	280	308	2784	284	313
57.2	2 1/4	15.5	10.4	2684	274	302	2992	305	336	3144	321	353	3193	326	359
63.5	2 1/2	19.1	12.8	3272	334	368	3655	373	411	3840	392	432	3901	398	439
66.7	2 5/8	21.1	14.2	3594	367	404	4025	411	453	4232	432	476	4299	439	483
69.9	2 7/8	23.1	15.5	3916	400	440	4449	454	500	4667	476	525	4742	484	533
73.0	2 7/8	25.2	16.9	4260	435	479	4863	496	547	5101	521	574	5186	529	583
76.2	3	27.4	18.4	4626	472	520	5341	545	601	5613	573	631	5694	581	640
79.4	3 1/8	29.8	20.0	4981	508	560	5678	579	639	5961	608	670	6055	618	681
82.6	3 1/4	32.3	21.7	5369	548	604	6059	618	681	6364	649	716	6467	660	727
85.7	3 3/8	34.8	23.4	5746	586	646	6603	674	743	6929	707	779	7049	719	793
88.9	3 1/2	37.6	25.3	6123	625	689	7169	732	806	7527	768	846	7652	781	860
95.3	3 7/8	43.0	28.9	6966	711	783	7767	793	873	8159	833	917	8308	848	934
102.0	4	48.9	32.9	7831	799	881	8659	884	974	9095	928	1023	9238	943	1039

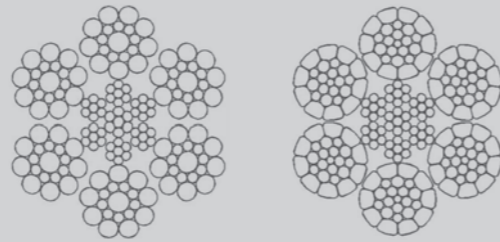
*Estimated Rope Mass in Sea Water = 0.87x Rope Mass in Air.
All Ropes manufactured in accordance with API Standards.*

Drilling Lines

Rope construction:
6x19 and 6x26 for constructional stability.

Compacted strand (CMP) provides:

- Improved spooling on the drawworks
- Greater contact area for reduced sheave and groove wear
- High resistance to abrasion and pressure
- Higher strength
- Improved fatigue life

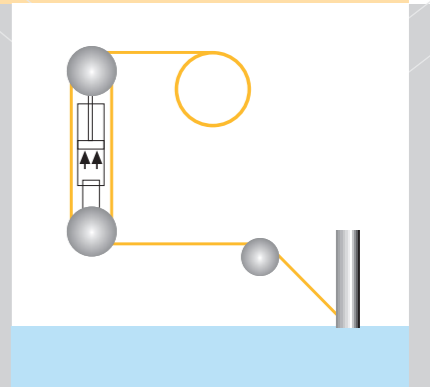


Marine Riser Tensioner Lines

Rope construction:
Flexible constructions (6x41 and 6x49) to achieve optimum fatigue life.

Lang's lay to provide improved wear resistance to rope and sheaves.

Corrosion protection by galvanising or ALUMAR.

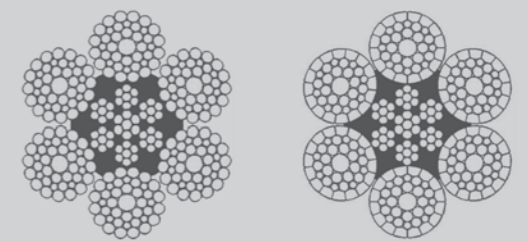


The IWRC can be Plastic impregnated to:

- Protect the inner small wires
- Improve strand support and reduce internal wire stresses

Compact Strand (CMP) offers:

- Greater contact area
- Reduced tread pressures and sheave wear



Nominal Rope Diameter		Estimated Rope Mass in air		EIPS			EEIPS			ALPHA		
				Minimum Breaking Force								
mm	ins	kg/m	lb/ft	kN	metric tonnes	short tons	kN	metric tonnes	short tons	kN	metric tonnes	short tons
Neptune Conventional - Class 6x19 Steel Core												
25.4	1	2.8	1.91	460	47	52	506	52	57	575	59	65
28.6	1 1/4	3.6	2.41	578	59	65	636	65	71	723	74	81
31.8	1 1/4	4.4	2.98	711	73	80	782	80	88	889	91	100
34.9	1 3/8	5.3	3.59	854	87	96	943	96	106	1072	109	120
38.1	1 1/2	6.4	4.28	1010	103	114	1110	113	125	1259	128	142
41.3	1 5/8	7.5	5.03	1170	119	132	1300	133	146	1471	150	165
44.5	1 7/8	8.7	5.83	1360	139	153	1500	153	169	1697	173	191
47.6	1 7/8	9.9	6.68	1550	158	174	1710	174	192	1932	197	217
50.8	2	11.3	7.61	1760	180	198	1930	197	217	2216	226	249
54.0	2 1/8	12.8	8.59	1970	201	221	2160	220	243	2363	241	266
57.2	2 1/4	14.3	9.63	2200	224	247	2420	247	272	2697	275	303
63.5	2 1/2	17.8	11.95	2655	271	298	2950	301	332	3295	336	370
Neptune CMP - Class 6x19 Steel Core												
25.4	1	3.05	2.05	475	48	53	523	53	59	594	61	67
28.6	1 1/4	3.79	2.54	597	61	67	657	67	74	747	76	84
31.8	1 1/4	4.85	3.25	734	75	83	808	82	91	919	94	103
34.9	1 3/8	5.90	3.96	882	90	99	974	99	109	1108	113	124
38.1	1 1/2	6.64	4.45	1043	106	117	1147	117	129	1301	133	146
41.3	1 5/8	7.90	5.30	1211	123	136	1345	137	151	1520	155	171
44.5	1 7/8	9.20	6.17	1454	148	163	1604	164	180	1812	185	204
47.6	1 7/8	10.60	7.11	1688	172	190	1862	190	209	2104	215	237
50.8	2	12.10	8.12	1948	199	219	2136	218	240	2414	246	271
54.0	2 1/8	13.70	9.19	2206	225	248	2419	247	272	2733	279	307
57.2	2 1/4	15.50	10.40	2463	251	277	2709	276	304	3061	325	358
63.5	2 1/2	19.10	12.82	2974	303	334	3304	337	371	3734	418	461

All Ropes manufactured in accordance with API Standards.

Nominal Rope Diameter		Estimated Rope Mass in air		EIPS			EEIPS			ALPHA		
				Minimum Breaking Force								
mm	ins	kg/m	lb/ft	kN	metric tonnes	short tons	kN	metric tonnes	short tons	kN	metric tonnes	short tons
Neptune Conventional - Class 6x36 Steel Core												
44.5	1 3/4	8.7	5.83	1360	138.7	153	1500	153.0	169	1695	173	191
50.8	2	11.3	7.61	1760	179.5	198	1930	196.9	217	2216	226	249
54.0	2 1/8	12.8	8.59	1970	200.9	221	2160	220.3	243	2363	241	266
57.2	2 1/4	14.3	9.63	2200	224.4	247	2420	246.8	272	2697	275	303
63.5	2 1/2	17.8	11.95	2682	273.5	301	2950	300.9	332	3295	336	370
66.7	2 5/8	19.6	13.18	2945	300.4	331	3240	330.5	364	3629	370	408
69.9	2 7/8	21.5	14.42	3209	327.3	361	3530	360.0	397	4011	409	451
73.0	2 7/8	23.5	15.76	3491	356.1	392	3840	391.7	432	4384	447	493
76.2	3	25.4	17.10	3782	385.7	425	4160	424.3	468	4815	491	541
Neptune CMP - Class 6x36 Steel Core												
44.5	1 3/4	9.2	6.0	1448	147.6	163	1608	164	181	1812	185	204
50.8	2	12.1	7.9	1924	196.2	216	2138	218	240	2414	246	271
54.0	2 1/8	13.8	9.0	2180	222.3	245	2422	247	272	2733	279	307
57.2	2 1/4	15.5	10.1	2436	248.4	274	2707	276	304	3061	312	344
63.5	2 1/2	19.1	12.4	2974	303.3	334	3305	337	371	3734	381	420
66.7	2 5/8	21.1	13.7	3257	332.1	366	3619	369	407	4088	417	459
69.9	2 7/8	23.1	15.0	3548	361.8	399	3942	402	443	4452	454	500
73.0	2 7/8	25.2	16.4	3831	390.6	430	4256	434	478	4814	491	541
76.2	3	27.4	17.8	4140	422.1	465	4599	469	517	5195	530	584

All Ropes manufactured in accordance with API Standards.

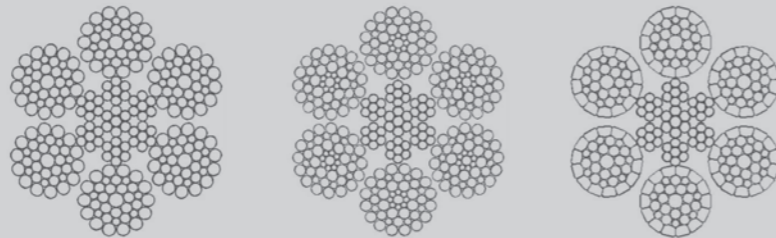
Large Diameter Crane Ropes

Appropriate rope constructions to achieve optimum fatigue life.

Where the expected working life is in excess of 1 year, ALUMAR protection is recommended.

Compact Strand (CMP) offers:

- Higher strength and improved spooling properties
- Greater contact area for reduced sheave wear
- Improved fatigue performance



Nominal Rope Diameter		Estimated Rope Mass in air		EEIPS			ALPHA			DELTA			OMEGA		
mm	ins	kg/m	lb/ft	Minimum Breaking Force									kN	metric tonnes	short tons
				kN	metric tonnes	short tons	kN	metric tonnes	short tons	kN	metric tonnes	short tons	kN	metric tonnes	short tons
Neptune Conventional Rope - Class 6x36 Steel Core															
41.3	1 1/2	7.5	5.0	1300	133	146	1469	150	165	1547	158	174	1612	164	181
44.5	1 3/4	8.7	5.8	1500	153	169	1695	173	191	1785	182	201	1860	190	209
47.6	1 7/8	9.9	6.7	1710	174	192	1932	197	217	2035	208	229	2120	216	238
50.8	2	11.3	7.6	1930	197	217	2216	226	249	2285	233	257	2381	243	268
54.0	2 1/8	12.8	8.6	2160	220	243	2363	241	266	2471	252	278	2575	263	289
57.2	2 1/4	14.3	9.6	2420	247	272	2697	275	303	2834	289	319	2953	301	332
63.5	2 1/2	17.8	11.9	2950	301	332	3295	336	370	3462	353	389	3607	368	405
66.7	2 5/8	19.7	13.2	3240	330	364	3629	370	408	3815	389	429	3975	405	447
69.9	2 7/8	21.4	14.4	3530	360	397	4011	409	451	4207	429	473	4394	448	494
73.0	2 7/8	23.5	15.8	3840	392	432	4384	447	493	4599	469	517	4805	490	540
76.2	3	25.4	17.1	4170	425	469	4815	491	541	5060	516	569	5276	538	593
Neptune CMP Rope - Class 6x36 Steel Core															
41.3	1 1/2	7.9	5.3	1345	137	151	1520	155	171	1601	163	180	1668	170	187
44.5	1 3/4	9.2	6.2	1604	164	181	1812	185	204	1909	195	215	1989	203	224
47.6	1 7/8	10.6	7.1	1862	190	209	2104	215	237	2216	226	249	2309	235	260
50.8	2	12.2	8.2	2136	218	240	2414	246	271	2542	259	286	2649	270	298
54.0	2 1/8	13.7	9.2	2419	247	272	2733	279	307	2878	293	324	2999	306	337
57.2	2 1/4	15.5	10.4	2709	276	305	3061	312	344	3224	329	362	3359	343	378
63.5	2 1/2	19.0	12.8	3304	337	371	3734	381	420	3932	401	442	4097	418	461
66.7	2 5/8	21.0	14.1	3618	369	407	4088	417	460	4306	439	484	4486	457	504
69.9	2 7/8	23.1	15.5	3940	402	443	4452	454	500	4689	478	527	4886	498	549
73.0	2 7/8	25.2	16.9	4260	434	479	4814	491	541	5069	517	570	5282	539	594
76.2	3	27.4	18.4	4598	469	517	5195	530	584	5471	558	615	5701	581	641

All Ropes manufactured in accordance with API Standards.

Committed to supplying the highest possible quality across the full product range



KISWIRE is committed to supplying the highest possible quality across its full product range. This is achieved by strict adherence to ISO 9001 to which the whole of KISWIRE's operations are accredited.

KISWIRE maintains its QA programmes throughout its operations to ensure that products are manufactured under a documented and controlled system for consistency in workmanship standards.

The following quality systems have been integrated into KISWIRE's manufacturing operations and process control programmes:

- ISO 9001 Det Norske Veritas Management System
- API Certificate of Approval to use the official API Monogram
- Korean Register of Shipping
- ABS Certificate of Manufacturing Assessment
- ABS Certificate of Design Assessment
- ABS Certificate of Type Approval (AQS)
- Det Norske Veritas Approval of Manufacturer Certificate