KTL OFFSHORE
PTE LTD

WIRE ROPE, RIGGING AND MOORING FOR OFFSHORE CONSTRUCTION

A Subsidiary of KTL Global Ltd

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INTRODUCTION

At KTL Offshore we understand that the offshore construction and installation market is comprised of a group of customers who face a set of demands and challenges that are unique from everyone else. That is why we tailor our offer of products and services specifically to cater for this market segment.

With dedicated personnel and the world's best brands along with one of the best quality systems in the industry, KTL Offshore has established a reputation for being a world class provider of rigging equipment and services. In addition, our new facility at Tuas in Singapore is one of the largest rigging facilities in the industry and is equipped with some of the biggest and best facilities available.

In this brochure, we highlight our products and services which are designed to solve problems encountered in the construction and installation industry.

KTL Offshore's products and services at a glance:

- Over 6,000 metric tons of steel wire rope in stock (up to 6" diameter).
- The largest Crosby distributor outside the USA.
- Up to WLL 1550t Crosby Wide Body shackles in stock.
- The Kimtest 3000 tensile testing machine—one of the largest in the industry.
- Huge inventory of compacted crane wire rope brands from Europe.
- Manufacturer of heavy lift cable laid and braided slings (up to 24" in diameter) and grommets (up to 16" in diameter).
- Plasma high performance synthetic rope (HMPE)
- One of the most comprehensive product ranges in the rigging industry.
- Full range of technical services including spooling, testing, inspection and wire rope lubrication.

KTL Offshore is proud to be a member of the following professional organizations:

AWRF MEMBER

IMCA

LEEA

STEEL WIRE ROPE FOR OFFSHORE CONSTRUCTION

Anchor Wire And Winch Wire

A Huge Inventory

KTL Offshore maintains an inventory of over 6,000 metric tons of the world's premium wire rope brands such as **KISWIRE**, **Usha Martin** and **DSR**.

Tensile grades include EIPS and EEIPS as well as the latest ultra high-strength grades such as KISWIRE's Alpha and Delta grades and Usha Martin's Super Titan and Titan Max grades. These grades have a rated strength well in excess of the standard EEIPS grade.

Wire Rope Construction

Anchor and winch wire rope is subjected to heavy abrasion, fatigue, mechanical handling and corrosion damage. For all wire rope for offshore use we recommend a drawn galvanized surface finish. The zinc coating is applied prior to wire drawing and hence provides protection against corrosion while also retaining the required mechanical properties in the steel wire.

To achieve the optimum balance between fatigue and abrasion resistance, the following table provides a guide for the correct rope construction:

(Above and below) 90 metric ton reels of 3" diameter wire rope for the world's largest Derrick Lay Barges, such as DB101 and Semac 1. Ordered by KTL Offshore to the latest international standards.

usha martin KISWIRE DSR

Rope Size	Construction
Up to 2" (50mm)	6x25 and 6x36
2" to 3" (50mm to 76mm)	6x36 and 6x41
3" to 3-1/2" (76mm to 90mm)	6x41, 6x47, 6x49 and 6x52
3-3/4" (96mm) and above	6x49, 6x52, 6x55 and 6x61

KTL Offshore Value Added Service:

KTL Offshore operates a fleet of constant-tension spooling machines and a Technical Services Department that is dedicated to providing offshore services including installation of wire rope. We can install wire rope reels with an individual weight of up to 120 metric tons.

Our inventory includes wire rope for anchor line purposes from 1-1/2" (38mm) up to 6" (152mm) in diameter—one the most comprehensive ranges available in the world.

Certification

Our wire rope is ordered and supplied with mill and third party certification such as ABS, DNV and LR. The wire rope is manufactured in the largest and most sophisticated rope mills in the world to latest international standards such as the ANSI/API 9A (2004) and ISO 10425 (2003) combined specification.

Worldwide Delivery

KTL Offshore will arrange the transportation and necessary documentation to deliver wire ropes to virtually any location worldwide, with project management services included.

Wire Rope For Pipe Lay Operations

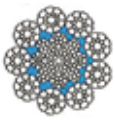
KTL Offshore Offers Years Of Experience In This Demanding Field

Special Wire Rope For A&R Applications

Wire rope for A&R winches is fast evolving into a highly specialised product that only a few manufacturers can provide.

Depending upon water depth, the wire rope may be a **standard construction**, a **low rotation** type or **rotation resistant** type. At KTL Offshore, we can evaluate your operating conditions to recommend the correct type of wire rope. State-of-the-art CAD is used to conduct the evaluation, and recommendations are provided after consultation with our principles.

6x36
(Standard Rope)



Spin 9KP
(Rotation Resistant)

35xk7
(Low Rotation)

A **standard 6x36** construction is very robust but has limited resistance to rotation and may cause complications because of twisting and eventual kinking of the wire rope. **The 35xk7 low rotation rope** has the best resistance to rotation and twisting. It is very rugged in the compacted form; as such, it is an excellent rope for use in A&R operations. The **Spin 9KP** rope has improved rotation resistance compared to the 6x36 type. Yet, it retains much of the abrasion resistance thanks to the nine compacted strands. It is a good option when the rope is for meant for dedicated use in A&R applications only.

(Left) 84mm diameter x 1,200 metres low rotation A&R wire rope supplied by KTL Offshore. The rope was manufactured by Redaelli in Italy.

Wire Rope For Shore Pull Applications

When specified at the time of order, we are able to direct our wire rope manufacturer to design and supply steel reels that can handle the high back-tension forces exerted in a shore pull (beach pull) operation. As a value added service, we also engineer and modify existing steel reels to meet shore pull requirements.

KTL Offshore Value Added Services:

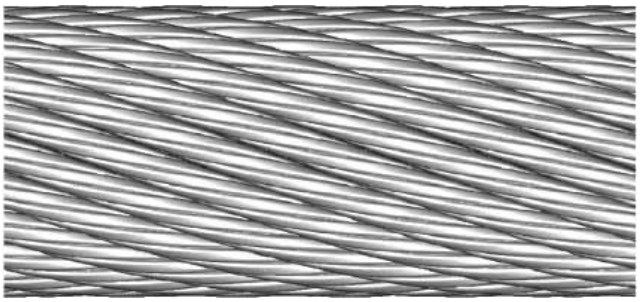
- KTL Offshore can provide a Load vs Twist evaluation to demonstrate how the proposed wire rope will rotate and twist when loaded and lowered to a certain water depth.
- The steel reels supplied with the wire rope are critical, especially when used in beach pull operations. KTL Offshore can provide the strength and design calculations to assess strength and back-tension requirements, as well as modify and strengthen existing reels to meet the same criteria.

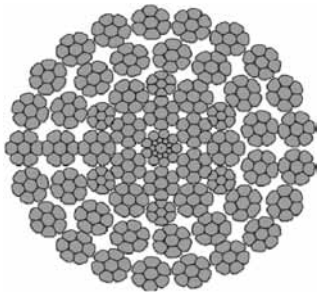
Table Of Minimum Breaking Load (MBL) For Steel Wire Rope Standard 6-strand Wire Rope Construction: Bright (Ungalvanised) And Drawn Galvanised

Nominal Diameter		Approximate Weight Per Metre		Minimum Breaking Load (metric tons)						
				ANSI/API 9A/ISO 10425 Specification		KISWIRE High Tensile Grades			USHA MARTIN High Tensile Grades	
(mm)	(inches)	(kg/m)	(lb/ft)	EIPS	EEIPS	Alpha	Delta	Omega	Super Titan	Titan Max
CLASS 6x19 & 6x37 Steel Core										
12.7	1/2	0.68	0.46	12.1	13.2	These grades are not available under 2" (52mm) diameter				
16	5/8	1.07	0.72	18.7	20.6					
19	3/4	1.55	1.04	26.7	29.4					
22	7/8	2.11	1.42	36.1	39.7					
26	1	2.75	1.85	46.9	51.6					
28	1-1-/8	3.48	2.34	59	64.8					
32	1-1/4	4.3	2.89	72.5	79.7					
35	1-3/8	5.21	3.50	87.1	96.1					
38	1-1/2	6.19	4.16	103	113.4					
42	1-5/8	7.26	4.88	120	132.5					
45	1-3/4	8.44	5.67	139	152.9					
48	1-7/8	9.67	6.50	158	174.3					
52	2	11.0	7.39	180	197	226	233	**	227	**
54	2-1/8	12.4	8.35	200	221	241	252	**	254	**
57	2-1/4	13.9	9.36	224	247	275	289	**	281	**
60	2-3/8	15.5	10.4	249	274	298	312	**	312	**
CLASS 6x37 Steel Core (API 9A - 1995)										
64	2-1/2	17.3	11.6	274	301	336	353	**	343	**
67	2-5/8	19.0	12.8	299	330	370	389	**	376	**
70	2-3/4	20.8	14.0	333	360	409	429	448	410	448
73	2-7/8	22.8	15.3	361	392	447	469	490	447	490
76	3	24.7	16.6	389	425	491	516	538	484	538
79	3-1/8	26.8	18.0	417	458	522	548	572	522	572
83	3-1/4	29.0	19.5	447	493	557	585	611	562	611
86	3-3/8	31.3	21.0	487	528	607	637	666	602	666
89	3-1/2	33.8	22.7	519	563	659	692	723	642	723
95	3-3/4	38.7	26.0	585	640	714	750	785	717	785
102	4	44.0	29.6	665	720	796	836	**	806	**
CLASS - Large Diameter Six Stranded Rope (ANSI/API 9A/ISO 10425 - August 2004)										
102	4	44.0	29.6	646		796	836	**	806	**
108	4-1/4	49.6	33.3	725		845	887	**	910	**
114	4-1/2	55.7	37.4	805		939	986	**	1004	**
121	4-3/4	62.1	41.7	890		1036	1088	**	**	**
127	5	68.8	46.2	978		1138	1195	**	1196	**
133	5-1/4	74.1	49.8	1015		1184	1243	**	**	**
140	5-1/2	81.1	54.5	1101		1288	1352	**	**	**
146	5-3/4	88.7	59.6	1193		1396	1466	**	**	**
152	6	96.7	65.0	1294		1508	1583	**	**	**

Redaelli
Wire Ropes

FLEXPACK 21





Diameter		Minimum Breaking Force			Mass	
mm	inch	kN	M.tons	S.tons	kg/m	lbs/ft
90		6830	696	768	40.5	18.3
92		7100	723	798	42.3	19.2
	3-5/8	7000	713	787	42.4	19.2
94		7380	752	830	44.2	20.0
	3-3/4	7500	764	843	45.4	20.5
96		7660	780	861	46.1	20.9
98		7950	810	894	48.0	21.7
	3-7/8	8000	815	900	48.4	21.9
100		8270	843	930	50.0	22.6
	4	8500	866	956	51.6	23.4
102		8590	875	966	52.0	23.5
104		8920	909	1003	54.1	24.5
	4-1/8	9000	917	1012	54.9	24.8
106		9250	942	1040	56.2	25.4
	4-1/4	9500	968	1068	58.3	26.4
108		9590	977	1078	58.3	26.4
110		9940	1013	1118	60.5	27.4
	4-3/8	10100	1020	1136	61.7	27.9
112		10200	1039	1147	62.7	28.4
114		10600	1080	1192	65.0	29.4
	4-1/2	10700	1090	1203	65.3	29.6
116		11000	1121	1237	67.3	30.4
	4-5/8	11200	1140	1260	69.0	31.2
118		11300	1151	1271	69.6	31.5
120		11700	1192	1316	72.0	32.6
	4-3/4	11800	1200	1327	72.8	32.9
122		12100	1233	1361	74.4	33.7
	4-7/8	12400	1260	1395	76.7	34.7
124		12500	1274	1406	76.9	34.8
126		12900	1314	1451	79.4	35.9

Diameter		Minimum Breaking Force			Mass	
mm	inch	kN	M.tons	S.tons	kg/m	lbs/ft
	5	13100	1330	1473	80.6	36.5
128		13300	1355	1496	81.9	37.1
130		13700	1396	1541	84.5	38.2
	5-1/8	13700	1390	1541	84.7	38.3
132		14100	1437	1586	87.1	39.4
	5-1/4	14400	1460	1620	88.9	40.2
134		14500	1478	1631	89.8	40.6
136		14900	1518	1676	92.5	41.9
	5-3/8	15000	1520	1687	93.2	42.2
138		15300	1559	1721	95.2	43.1
	5-1/2	15700	1600	1766	97.6	44.2
140		15800	1610	1777	98.0	44.3
142		16200	1651	1822	100.8	45.6
	5-5/8	16400	1670	1845	102.1	46.2
144		16600	1692	1867	103.7	46.9
146		17100	1743	1923	106.6	48.2
	5-3/4	17100	1740	1923	106.7	48.3
148		17500	1783	1968	109.5	49.6
	5-7/8	17800	1810	2002	111.3	50.4
150		18000	1834	2025	112.5	50.9
152		18500	1885	2081	115.5	52.3
	6	18500	1880	2081	116.1	52.6
154		18900	1926	2126	118.6	53.7
	6-1/4	19300	1960	2171	121.0	54.8
156		19400	1977	2182	121.7	55.1
158		19900	2028	2239	124.8	56.5
	6-1/4	20100	2040	2261	126.0	57.0
160		20400	2079	2295	128.0	57.9
	6-3/8	20800	2120	2340	131.1	59.3
162		20800	2120	2340	131.2	59.4

*Comparison Of Physical Properties Of Flexpack And Standard Wire Rope

Type of Rope	Cross Section	Modulus of Elasticity (kN/mm^2)	Torque Factor (at 20% of Rope MBL)	Rotation Factor (degrees/1000.d.MPa)
FLEXPACK (35xk7)		130	0.025	0.20
6x36+IWRC		110	0.078	24

***Note: These factors are non-linear and may vary with rope MBL and diameter.**
For an accurate calculation of rope twist vs load for any particular application, please contact KTL Offshore.

FLEXPACK is the registered trademark of Redaelli Tecnacordati (Italy), one of KTL Offshore's principle manufacturers.

Redaelli
Wire Ropes

Redaelli Steel Wire Rope – manufacturing low rotation wire rope with an individual reel weight of up to 500 metric Tons – the heaviest rope in the world!

Wire Rope For Cranes

Heavy Lift Mast (HLM) Cranes

The latest concept in heavy lift cranes for offshore operations is the Heavy Lift Mast Crane. Popular brands include Huisman, Seatracks and Amclyde.

These cranes use the latest in wire rope designs to achieve the high breaking load and safety factors of the upgraded API 8C specification.

The modern HLM crane demands wire rope having extremely tight tolerances on specification – it is very important that careful consideration is given to the correct rope construction and brand before selecting the replacement wire rope. KTL Offshore recommends only Redaelli (Italy) for HLM crane applications.

Redaelli
Wire Ropes

KTL Offshore maintains an impressive inventory of these two brands of wire rope.

Main, Auxiliary And Whip (Fly) Hoist Wire Rope

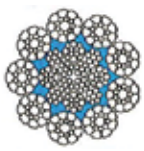
Depending upon crane design, wire rope for main, auxiliary and whip (fly) hoist duty may either be a low rotation or non-rotation resistant construction. When a double drum hoisting system is deployed, a left hand and right hand non-rotation resistant combination is usually used. For single drum applications, a low rotation wire rope is often recommended by the crane designer. Consult KTL Offshore for the correct selection of wire rope.

A compact 35xk7 low rotation wire rope is the ideal choice for single-drum hoisting applications. Most HLM cranes use this type for the main and auxiliary hoist ropes.

For paired rope systems, robust non-rotation resistant types such as the 8- or 9-strand compacted wire rope with plastic impregnation are more suitable.

Boom Hoist (Luffing) And Topping Wire Rope

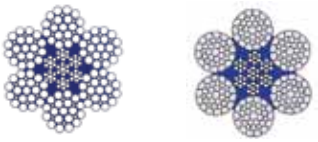
Compacted 8- or 9-strand wire rope with plastic impregnation is the ideal choice for demanding boom hoist (luffing) and topping applications. Double-parallel closed wire ropes are also used as they exhibit superior fatigue life and exceptionally high breaking loads.



Redaelli's Pack 9P offers increased fatigue life due to the 9 compacted outer strands. In addition, the plastic impregnation offers greater crushing, fatigue and shock loading ability.

Most derrick crane barges use the older, standard wire rope designs for crane applications. However, many operators are now replacing these designs with high performance wire rope such as compacted 6- and 8-strand, and compacted 35xK7 low rotation wire rope.

This is because the extreme crushing forces exerted on the boom rope in particular under conditions of multilayer coiling. Compacted 6-strand wire rope is very robust. Trials by one of the world's largest offshore construction and derrick crane barge operators have proven that the use of high performance wire rope greatly extends the rope life.



The standard 6x25Fi construction (left) may be replaced by the compact 6x36 type (right) for increased rope performance.

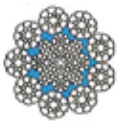
Offshore Pedestal Cranes

Pedestal cranes have a very high work ratio as they are most commonly used on offshore drilling rigs and small to medium derrick barges. As this application is extremely demanding, only wire rope of the highest quality is suitable.

Compact 35xK7: ideal for main, auxiliary and whip (fly) hoisting and pendant rope applications.

Compact 6x36: highly rugged construction that is suitable for boom (luffing) hoist duties.

Compact 8-strand with plastic impregnation: 8 strands and plastic layer increase fatigue, crushing and shock absorbing ability. It is ideal for boom (luffing) hoist duties.



Compact 9-strand with plastic impregnation: added fatigue and crushing resistance makes it the ultimate rope for boom (luffing) applications.

Davit Wire Rope

The davit is used to raise and lower equipment over the side of the vessel, sometimes in significant water depths. The reeving system is usually very simple, therefore for these reasons it is recommended to use standard or compacted 6-strand wire rope.

Dive Support Vessel (DSV) Crane Rope

The Dive Support Vessel (DSV) has unique requirements for wire rope used in the **bell hoist** application. At KTL Offshore our personnel understand these requirements and we are able to provide the additional value added services to ensure your operation runs trouble-free and safely.

KTL Offshore Value Added Services:

- We have qualified wire rope inspectors to carry out visual, non-destructive and destructive testing for bell wire.
- Destruction testing of bell wire requires special sample preparation as well as the right testing conditions for reliable and accurate test results. Our wire rope inspectors are highly trained in this area.

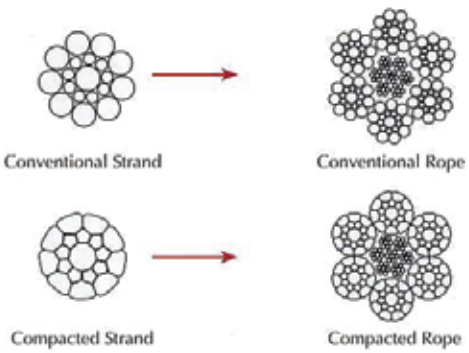
Mobile, Lattice, Container, Tower And Other Cranes

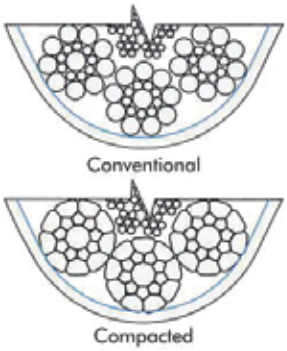
Our inventory and expertise span the broad spectrum of the crane market. Beyond large offshore heavy lift cranes, we also supply general cranes and we have a solution for every type of crane.

Redaelli
Wire Ropes

Compacted VS Standard Wire Rope:

The use of compacted wire rope will significantly increase the rope life.





Redaelli High Performance Crane Rope

	Special Crane Ropes						Multistrand Hi-Tech Crane Ropes						Non Rotating Hi-Tech Crane Ropes					
	Pack1			Pack1P			Pack9			Pack9P			Flexpack			Flexlpast		
																		
(mm)	Mass	MBF		Mass	MBF		Mass	MBF		Mass	MBF		Mass	MBF		Mass	MBF	
	kg/m	1960 kN	2160 kN	kg/m	1960 kN	2160 kN	kg/m	1960 kN	2160 kN	kg/m	1960 kN	2160 kN	kg/m	1960 kN	2160 kN	kg/m	1960 kN	2160 kN
6																		
7																		
8							0.30	57.6	62.7									
9							0.38	72.9	79.4									
10	0.45	85	91	0.46	85	91	0.47	90	98	0.47	90	98	0.48	92	98	0.49	92	98
11	0.55	103	110	0.56	103	110	0.57	109	119	0.57	109	119	0.58	111	119	0.59	111	119
12	0.65	122	131	0.66	122	131	0.68	130	141	0.68	130	141	0.69	132	141	0.70	132	141
13	0.76	144	154	0.78	144	154	0.80	152	166	0.80	152	166	0.81	155	166	0.82	155	166
14	0.89	167	178	0.90	167	178	0.93	176	192	0.92	176	192	0.94	180	192	0.95	180	192
15	1.02	191	205	1.03	191	205	1.06	203	221	1.06	203	221	1.08	207	221	1.09	207	221
16	1.14	218	233	1.18	218	233	1.25	230	251	1.22	230	251	1.27	136	251	1.26	236	251
17	1.28	246	263	1.33	246	263	1.41	260	283	1.38	260	283	1.43	266	283	1.43	266	283
18	1.44	275	295	1.49	275	295	1.58	292	318	1.54	292	318	1.61	298	318	1.60	298	318
19	1.60	307	329	1.66	307	329	1.76	325	354	1.72	325	354	1.79	332	354	1.78	332	354
20	1.78	340	364	1.84	340	364	1.95	360	392	1.90	360	392	1.98	368	392	1.98	368	392
22	2.15	411	440	2.22	411	440	2.36	436	474	2.30	436	474	2.40	445	474	2.39	445	474
24	2.56	490	524	2.64	490	524	2.81	518	564	2.74	518	564	2.86	530	564	2.85	530	564
26	3.03	561	602	3.10	575	615	3.29	608	662	3.22	608	662	3.35	608	649	3.34	608	649
28	3.51	651	698	3.60	651	713	3.82	690	753	3.73	690	753	3.86	706	753	3.87	706	753
30	4.03	747	801	4.13	747	801	4.38	792	864	4.28	792	864	4.46	810	864	4.45	810	864
32	4.59	850	911	4.70	850	911	4.99	901	983	4.87	901	983	5.08	922	983	5.06	922	983
34	5.18	959	1030	5.31	959	1030	5.63	1020	1110	5.50	1020	1110	5.73	1040	1110	5.71	1040	1110
36	5.81	1080	1150	6.04	1080	1150	6.31	1140	1240	6.17	1140	1240	6.43	1170	1240	6.40	1170	1240
38	6.47	1200	1290	6.73	1200	1290	7.03	1270	1390	6.87	1270	1390	7.16	1300	1390	7.13	1300	1390
40	7.17	1330	1420	7.46	1330	1420	7.79	1410	1540	7.62	1410	1540	7.94	1440	1540	7.90	1440	1540
42	7.94	1430	1530	8.22	1430	1530	8.59	1520	1660	8.40	1520	1660	8.82	1550	1660	8.71	1550	1660
44	8.71	1570	1680	9.02	1570	1680	9.43	1660	1820	9.22	1660	1820	9.68	1700	1820	9.56	1700	1820
46	9.52	1710	1840	9.86	1710	1840	10.3	1820	1990	10.1	1820	1990	10.6	1860	1990	10.5	1860	1990
48	10.4	1870	2000	10.7	1870	2000	11.2	1980	2170	11.0	1980	2170	11.5	2030	2170	11.4	2030	2170
50	11.3	2030	2180	11.7	2030	2180	11.6	2150	2350	12.2	2150	2350	12.5	2200	2350	12.4	2200	2350
52	12.2	2190	2350	12.6	2190	2350	12.6	2330	2540	13.1	2330	2540	13.5	2330	2490	13.4	2330	2490
54	13.1	2360	2540	13.6	2360	2540	13.6	2510	2740	14.2	2510	2740	14.6	2510	2680	14.4	2510	2680
56	14.1	2540	2730	14.6	2540	2730	14.6	2700	2950	15.2	2700	2950	15.7	2700	2890	15.5	2700	2890
58	15.1	2720	2930	15.7	2720	2930	15.6	2890	3160	16.3	2890	3160	16.8	2890	3090	16.6	2890	3090
60	16.2	2920	3130	16.8	2920	3130	16.7	3100	3380	17.5	3100	3380	18.0	3100	3310	17.8	3100	3310

Redaelli
Wire Ropes

HEAVY LIFT SLINGS AND GROMMETS

Engineering the World's Biggest and Best Heavy Lift Slings and Grommets

A Proven Track Record In The Heavy Lift Industry...

Some of our more prestigious and recent projects include the following:

- ESSO – Australia (2010)
- Mumbai High North – India (2010)
- Iwaki – Japan (2010)
- Saudi Aramco LTA – Saudi Arabia (2010)
- Morogot – Thailand (2009)
- Mumbai High South – India (2008)
- Reliance – India (2008)
- Manifa –Saudi Arabia (2007)
- Aramco – Saudi Arabia (2007)
- Kerisi – Indonesia (2007)
- Qatar Gas – Qatar (2007)
- Sarawak SSB – Malaysia (2007)
- BP Tan Lay – Vietnam (2007)
- Kupe Gas – New Zealand (2007)
- Huisman crane testing – Singapore (2006)
- Jasmine B – Thailand (2006)
- Qatar Gas – Qatar (2006)
- Bongkot – Thailand (2005)
- Ruby Second Phase – Vietnam (2005)
- Nine Wells Second Phase – India (2005)
- Ruby First Phase – Vietnam (2005)
- Sakhalin – Russia (2005)
- Dolphin – Saudi Arabia (2005)
- Otway Gas – Australia (2005)
- Apache John Brooks – Australia (2004)

KTL Offshore's Heavy Lift Slings:
Quality, Reliability and Accuracy

An Unswerving Commitment to Quality...

Manufactured at our facility in Singapore, our slings and grommets are made with the following characteristics:

- **Engineered Length Control (ELC)**

  All slings and grommets are engineered to attain the required effective length at the specified working load.

- **Consistency and Quality Of Workmanship**

  Each sling and grommet is produced in accordance to a dedicated Quality Control Plan that controls specification, tolerance and fabrication parameters.

- **Tested With Third Party Certification**

  Every sling and grommet is proof load tested after manufacture to ensure the sling or grommet meets specification. A consolidated certificate and Load-Extension graph is provided with every sling and grommet.

KTL Offshore - manufacturer of quality heavy lift slings and grommets backed by years of experience.

Heavy Lift Sling Product Range (Steel Wire Rope)

KimSwage Flemish Eye Slings

KimSwage slings are large diameter wire rope slings using a single wire rope with a Flemish eye splice. This new product range eliminates the need to use a braided or cable laid sling for the lower range of heavy lift slings.

The KimSwage range has outstanding flexibility and ease of handling that is similar to a single wire rope. **The range is available in 4-1/2" (114mm), 5.0" (127mm) and 6.0" (152mm) diameters.** The 6.0" diameter sling is made from an 8-strand wire rope for increased flexibility.

The KimSwage range is made to the same strict tolerances as our KimFlex and cable laid slings.

KimFlex Braided Slings

KimFlex braided slings are multi part slings braided in a 9-strand configuration and terminated using a Flemish eye splice and steel ferrules. This produces heavy lift slings that are extremely easy to handle.

The typical construction of a KimFlex sling is 9x(6x36+IWRC).

The eyes are laid in parallel to produce a very narrow structure, making these slings ideal for situations where there are limited spaces for the connection at the eye.

Available in diameters up to 24", KimFlex braided slings offer the following advantages:

- Flexibility
- Ease of inspection
- 'Narrow Gap' eye dimension
- Reduced weight
- Reduced rotation properties

KimLock Cable Laid Slings – Resin Socketed

The KIMLOCK cable laid sling has a resin socketed termination with an efficiency of 100%. This results in a sling with a very high breaking force.

KTL Offshore designs and fabricates our KIMLOCK cable laid slings to the PM20 (1987) Guidance Note. The typical construction of a KIMLOCK cable laid sling is 7x(6x36+IWRC).

KIMLOCK cable laid slings are available up to 16" in diameter.

Cable Laid Slings – Hand Spliced

Hand spliced cable laid slings have been used in the offshore industry for several decades and are still a favorite with many heavy lift contractors due to their proven ruggedness and reliability.

KTL Offshore designs and fabricates our cable laid slings to the IMCA M179 (2004) specification, which replaces the old PM 20 series.

The typical construction of a cable laid sling is 7x(6x36+IWRC).

Cable laid slings are available up to 16” in diameter.

Heavy Lift Grommet Product Range (Steel Wire Rope)

Cable Laid Grommets

Made to IMCA M179 (2004), cable laid grommets offer an extremely rugged lifting connection that is able to withstand the most adverse bending and lifting conditions.

Laid up with six outer ropes over a core rope, the core rope is butted and not spliced and hence it is disregarded in the strength calculation and the construction of a cable laid grommet is depicted as 12x(6x36+IWRC). This is in compliance to IMCA M179 as well as the now withdrawn PM 20 specification.

KTL Offshore cable laid grommets are provided with 3-ply wire rope seizing at each end, steel identification collar and visibly marked tuck and core butt positions.

Cable laid grommets are available up to 13.5” in diameter.

KTL Offshore cable laid grommets are produced “Twist Free” to ensure ease of use.

KimFlex Braided Grommets

KimFlex braided grommets are multi part grommets braided in a 9-strand configuration in two parts.

These grommets offer excellent handling characteristics.

The typical construction of a KIMFLEX grommet is 18x(6x36+IWRC).

KTL Offshore has developed our unique ***Crush Buster***, a device which is manufactured and incorporated at each end of the grommet to reduces crushing and distortion of the grommet at the bearing contact points during lifting. Independent testing under ABS witness has proven the effectiveness of this device in reducing damage to the grommet.

KimFlex grommet are available up to 16.2" in diameters.

KTL Offshore KIMFLEX grommets are produced "Twist Free" to ensure ease of use.

Ultra Short Grommets

The Ultra Short grommet has been designed in response to the requirement of many engineers for a heavy lift connection where the head room is extremely limited.

The Ultra Short grommet provides the big connection where the space and available lifting height is severely constrained.

KTL Offshore ULTRA SHORT grommets are produced "Twist Free" to ensure ease of use.

Application Information—Heavy Lift Slings

KTL Offshore Offers The Widest Choice For Your Heavy Lift Requirements

1. Which Heavy Lift Sling To Use?

The answer to this question depends upon several factors, mainly concerned with the type of lift being planned.

Where the required working load permits, the single-part KimSwage Flemish eye slings should always be used as they have the highest strength-to-mass ratio and are the easiest slings to handle.

When the working load exceeds the maximum available in the KimSwage range, the choice is between the flexible KimFlex range and the robust cable laid range. While each sling type posses certain advantages over the other, either type can be used safely for almost any lift. The table below provides a guideline for the optimum sling selection.

Application Table For Heavy Lift Slings

*Sling Type & Body Configuration	Max. Size and CSBL or MBL	Strength-to-Mass Ratio	Flexibility	Abrasion Resistance	Crush Resistance/ Suitability for Use in Basket Hitch	Shock Load Resistance	Torsion/ Twist Resistance	Use with a Swivel
KIMSWAGE 6x36 & 8x36	6” diameter (152mm) 1,425 MT	353	Medium	High	High	High	Low	No
KIMFLEX 9x(6x36)	24” diameter (608mm) 11,390 MT	347	High	Medium	Medium	Medium	Medium	Yes[#]
CABLE LAID (Hand Spliced) 7x(6x36)	16” diameter (406mm) 4,488 MT	173	Low	High	High	Low	Low	No
KIMLOCK CABLE LAID (Resin Socketed) 7x(6x37)	16” dia (406mm) 7,063 MT	367	Medium	High	High	Medium	Low	No

***Refers to the ANSI/API 9A/ISO 10425 Classification for wire rope constructions.**
Strength-to-mass ratio is the CSBL divided by the total mass of a 20-metre long sling at the maximum available diameter.
CSBL is the term used to denote sling strength for slings made from multiple component wire rope while MBL is used for slings made from a single component wire rope.
[#]Sling should be de-rated by 20% when used with a swivel.

2. Design Factor, Safety Factor And Rated Capacity (WLL or SWL)

In keeping with good practice and sound engineering design KTL Offshore follows the recommended practice as stipulated in the major international specifications such as IMCA M179 and ASME B30.9. *The Wire Rope Sling Users Manual* issued by the Wire Rope Technical Board is also a widely respected reference document.

The **design factor** or **safety factor** is used to calculate the sling or grommet’s rated capacity and allows for conditions such as wear, abrasion, damage and variations in load.

The **rated capacity** of a sling or grommet is based upon the minimum breaking load of the component wire rope, splicing efficiency, spinning loss, number of parts of wire rope used, type of hitch, diameter around which the body of the sling or grommet is bent (D/d) and the diameter of the pin used in the eye of the sling.

In the industry many terms are used to describe the rated capacity such as Working Load Limit (WLL) and Safe Working Load (SWL). In line with IMCA M179 and PM 20, KTL Offshore uses the term WLL to designate the maximum allowable load the sling or grommet is allowed to raise, lower or suspend.

2.1 WLL For KimSwage Slings

For a straight pull with no horizontal angle, the rated capacity for KimSwage slings is provided by the following formula:

$$\text{WLL} = \frac{\text{MBL}}{\text{Safety Factor}}$$

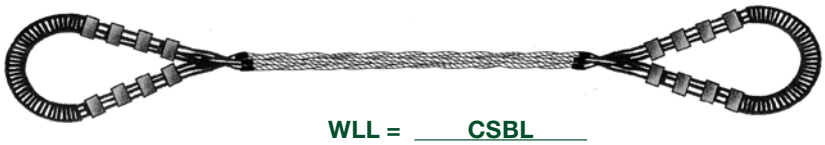
Where:

MBL = Minimum Breaking Load of KimSwage sling using a splicing efficiency of 0.9

Minimum D/d at the eye = 1.0

2.2 WLL For KimFlex Slings

For a straight pull with no horizontal angle, the rated capacity for KimFlex slings is provided by the following formula:



$$\text{WLL} = \frac{\text{CSBL}}{\text{Safety Factor}}$$

Where:

CSBL = Calculated Sling Breaking Load of KimFlex sling

Minimum D/d at the eye = 0.75

2.3 WLL For Cable Laid Slings (Hand Spliced)

For a straight pull with no horizontal angle, the rated capacity for cable laid slings is provided by the following formula:

$$\text{WLL} = \frac{\text{CSBL}}{\text{Safety Factor}}$$

Where:

CSBL = Calculated Sling Breaking Load according to IMCA M179 and PM 20

CSBL = CRBL x 0.75 for hand spliced slings

CRBL = Calculated Rope Breaking Load

IMCA M179 and PM20 recommend a minimum safety factor of 2.25

Minimum D/d at the eye = 1.0

2.4 WLL For KimLock Cable Laid Slings (Resin Socketed)

For a straight pull with no horizontal angle, the Rated Capacity for KIMLOCK cable laid slings is provide by the following formula:

$$\text{WLL} = \frac{\text{CSBL}}{\text{Safety Factor}}$$

Where:

CSBL = Calculated Sling Breaking Load according to PM 20

CSBL = CRBL x 1.00 for resin socketed slings

CRBL = Calculated Rope Breaking Load

IMCA M179 and PM20 recommend a minimum safety factor of 2.25

Minimum D/d at the eye = 1.0

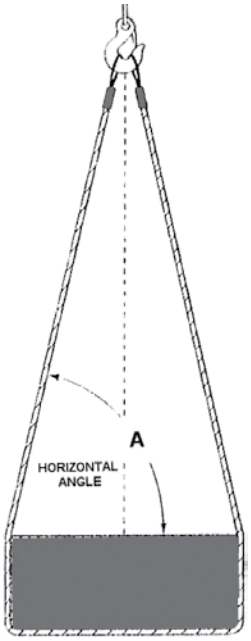
3. The Effect Of Bending And Sling Angle On Sling Strength

When a wire rope is bent or deflected around an object such as the bow or pin of a shackle or trunnion, a loss in strength occurs. This loss is measured by the **bending efficiency** (E_B) and is calculated from the following formula provided in IMCA M179 as well as PM 20:

$$E_B = 1 - \frac{0.5}{\sqrt{D/d}}$$

Where:
D = Minimum bend diameter
d = Sling body diameter

Similarly, when the sling is used where the horizontal angle (called the sling angle) is less than 90°, the load in the sling will increase. This increase must be factored into the WLL calculation.



3.1 Bending Effect On KimSwage Slings

KimSwage slings use a single wire rope with a Flemish eye splice using a steel ferrule as the termination. According to the manufacturers of the steel ferrules used by KTL Offshore—Crosby and Wirop—the **termination efficiency**, $E_T = 0.90$.

When using a **basket hitch** at a D/d ratio of 25 or more, $E_B = E_T = 0.90$. Therefore no de-rating of the WLL is required as KTL Offshore has already computed the termination efficiency into the original sling MBL. However, when the D/d ratio is below 25, the bending efficiency will cause the sling strength to reduce below that predicted by the original rating. In this case, the WLL should be de-rated according to the following equation:

$$WLL = \frac{MBL}{\text{Safety Factor}} \times \text{Number of legs} \times \sin A \times E_B$$

Where:
MBL = Minimum Breaking Load of KimSwage sling
Sin A = Minimum horizontal sling angle in degrees
E_B = Bend efficiency according to IMCA M179 and PM20

When ***considering the eyes*** of the KimSwage sling at the lifting point, each eye will comprise two legs. This means that the eye has twice the strength of the body.

When D/d = 1.0 (where $E_B = 0.5$), there is no need to de-rate the sling. However, at D/d values below 1.0, the sling must be de-rated but it is good practice not to use a bending ratio less than this at the eyes to avoid crushing damage on the sling.

It is important to note that under no circumstances should the sling be used or allowed to come into contact with a D/d of 0.5 or less.

3.2 Bending Effect On KimFlex Slings

KimFlex slings use a 9-part body construction with Flemish eye splices and multiple steel ferrules to form the termination. Although $E_T = 0.90$ for the Flemish eye, our product development testing program has demonstrated that when formed into a KimFlex sling arrangement, $E_T = 1.0$. Therefore, the effects of bending are immediate and the sling must be de-rated when using a basket hitch regardless of the D/d used.

When using a basket hitch all KimFlex slings should be de-rated according to the following calculation:

$$\text{WLL} = \frac{\text{CSBL}}{\text{Safety Factor}} \times \text{Number of legs} \times \text{Sin A} \times E_B$$

Where:
CSBL = Calculated Sling Breaking Load of KimFlex sling
Sin A = Minimum horizontal sling angle in degrees
E_B = Bend efficiency according to IMCA M179 and PM20

When considering the eyes of the KimFlex sling at the lifting point, each eye is comprised of 12-parts of wire rope laid in parallel. Because of this arrangement, at D/d = 0.75 or greater, there is no need to de-rate the sling. However, at D/d values below 0.75, the sling must be de-rated but it is good practice not to use a bending ratio less than this at the eyes to avoid crushing damage on the sling.

It is important to note that under no circumstances should the sling be used or allowed to come into contact with a D/d of 0.5 or less.

3.3 Bending Effect On Cable Laid Slings – Hand Spliced

Hand spliced cable laid slings use a 7-part body construction with hand splicing to form the termination. According to IMCA M179 and PM 20, for hand spliced cable laid slings $E_T = 0.75$.

IMCA M179 and PM 20 stipulate the following guidelines when considering the effects of bending on cable laid slings:

For hand spliced slings only, when using a basket hitch at a D/d ratio of 4 $E_B = E_T = 0.75$ therefore no de-rating of the WLL is required as the termination efficiency of 0.75 has already been factored into the original sling CSBL. E_B and E_T are not additive therefore whichever one causes the greater loss in strength is used to calculate the sling strength. As the D/d ratio drops to below 4 the bending efficiency E_B is less than the termination efficiency E_T and the WLL should be de-rated according to the following equation:

$$\text{WLL} = \frac{\text{CRBL}}{\text{Safety Factor}} \times \text{Number of legs} \times \text{Sin A} \times E_B$$

Where:

CRBL = Calculated Rope Breaking Load according to IMCA M179 and PM 20

Sin A = Minimum horizontal sling angle in degrees

E_B = Bend efficiency according to IMCA M179 and PM20

For hand spliced slings where D/d is equal to or greater than 4, replace E_B with $E_T = 0.75$

For resin socketed slings, E_B is used regardless of D/d

IMCA M179 and PM20 recommend a minimum safety factor of 2.25

For resin socketed cable laid slings, since $E_T = 1.0$ the effects of bending are immediate and the sling must be de-rated using the equation above regardless of the D/d used.

When **considering the eyes** of the cable laid sling at the lifting point, each eye will comprise two legs. This means that the eye has twice the strength of the body.

When D/d = 1.0 (where $E_B = 0.5$), there is no need to de-rate the sling. However, at D/d values below 1.0, the sling must be de-rated but it is good practice not to use a D/d less than 1.0 at the eyes to avoid crushing damage on the sling.

Both IMCA M179 and PM 20 stipulate that under no circumstances should the cable laid sling be used or allowed to come into contact with a D/d of 0.5 or less.

3.4 Bending Effect On KimLock Cable Laid Slings – Resin Socketed

KIMLOCK cable laid slings use a 7-part body construction with either hand splicing or a resin socket to form the termination. According to PM 20 for resin socketed slings $E_T = 1.0$.

IMCA M179 and PM 20 stipulate the following guidelines for considering the effects of bending on cable laid slings:

For resin socketed cable laid slings, since $E_T = 1.0$ the effects of bending are immediate and the sling must be de-rated using the below equation regardless of the D/d used.

$$\text{WLL} = \frac{\text{CSBL}}{\text{Safety Factor}} \times \text{Number of legs} \times \text{Sin A} \times E_B$$

Where:

CSBL = Calculated Rope Breaking Load according to IMCA M179 and PM 20

Sin A = Minimum horizontal sling angle in degrees

E_B = Bend efficiency according to IMCA M179 and PM20

For KIMLOCK resin socketed slings E_B is used regardless of D/d

IMCA M179 and PM20 recommend a minimum safety factor of 2.25

When considering the eyes of the KIMLOCK cable laid sling at the lifting point, each eye is comprised of two legs therefore providing twice the strength as the body of the sling. Thus at a D/d = 1.0 where $E_B = 0.5$, there is no need to de-rate the sling. At values below 1.0, the sling must be de-rated but it is good practice not to use a D/d less than 1.0 at the eyes to avoid crushing damage on the sling.

IMCA M179 and PM 20 both stipulate that under no circumstances should the cable laid sling be used with a D/d of 0.5 or less.

4. Sling Rotation And The Use Of Swivels

When any type of steel wire rope sling is loaded, torque will develop in the sling body. This build up of torque may cause the sling and the load being lifted to rotate under certain circumstances.

KimFlex slings have the best resistance to rotation because they are manufactured in a braided manner. The braided construction affords some inherent resistance to rotation, although these slings are not to be considered as non-rotating.

Independent testing by KTL Offshore has demonstrated that it is possible to use KimFlex slings with a swivel to relieve some of the torque build up in the sling construction. However, the WLL of the sling should be reduced to take into account the effects of twisting of the sling body on the strength of the sling.

The following twist data may be used as a guide for KimFlex slings:

Twist Data For KimFlex Slings*

Recommendation/Guideline	Data
Load at which Swivel may First Rotate	3% to 5% of CSBL
Reduction in WLL Required when using a Swivel	20%

***The above data applies only to KimFlex slings manufactured by KTL Offshore and tested using a Crosby swivel. Braided slings and swivels made by other manufacturers have different manufacturing parameters and design characteristics which may result in different twist behaviour.**

Cable laid and KimSwage slings are made in either a left hand or right hand direction of lay and have no inherent resistance to rotation. As the sling is loaded, the wire rope will turn in the opposite direction of lay and may eventually cause twist.

CABLE LAID (hand spliced and KIMLOCK) and KIMSWAGE slings should not be used with a swivel as this may cause the sling to unlay leading to catastrophic failure.

5. Slings And The Use Of A Crush Buster

KTL Offshore has developed the unique **Crush Buster** device. The Crush Buster has the ability to absorb a certain amount of crushing energy that is generated at the contact point between the sling and connection when a load is lifted.

Crush Busters (left) are recommended for all KimFlex slings used for basket hitch lifts. In addition, KTL Offshore supplies all KimFlex grommets as standard with a Crush Buster at each end. Independent testing and verification by ABS Consulting has proven the effectiveness of the Crush Buster device in reducing the effects of crushing on the sling/grommet body. Crush Busters are not available for cable laid slings or grommets. The 3-ply wire rope seizing is recommended for these products.

Application Information—Heavy Lift Grommets

1. Which Heavy Lift Grommet Is Suitable?

As for slings, the answer to this question depends on several factors like the type of lifting project or simply user preference.

We recommend the flexible KimFlex range and the robust cable laid range. While each grommet type has certain advantages over the other, both can be used safely for almost any lift. The Ultra Short grommet is designed specifically for situations where the lifting height is restricted. The table below provides a guide for the optimum grommet selection.

Application Table For Heavy Lift Grommets

Grommet Type & Body Configuration*	Max. Size and CGBL	Strength-to -Mass Ratio	Flexibility	Abrasion Resistance	Crush Resistance	Shock Load Resistance	Torsion/ Twist Resistance	Body Profile
KIMFLEX 18x(6x36)	16.2" (412mm) 10,368 MT	499	High	Medium	Medium	Medium	Medium	Braided
ULTRA SHORT 36x(6x36)	26.1" (664mm) 10,460 MT	N/A	Low	Medium	Medium	Medium	High	Braided
CABLE LAID 12x(6x36)	13.5" (342mm) 8,066 MT	494	Medium	High	High	Medium	Low	Smooth

***6x36 refers to the ANSI/API 9A/ISO 10425 Classification for wire rope constructions.**
Strength-to-mass ratio is the CGBL divided by the total mass of a 20 metre long grommet.

2. The Effect Of Bending And Horizontal Angle On Grommet Strength

Since the strength of a grommet is calculated according to the body in double part, the effects of bending must considered regardless of the D/d (unlike for slings where the eye has more strength than the body and hence is able to connect at a very low D/d ratio without a reduction in WLL).

IMCA M179 and PM 20 describe the effects of bending on the grommet strength. After thorough evaluation through our own product development program, KTL Offshore recommends that these guidelines are followed for both KimFlex and cable laid grommets.

For grommets, if the horizontal angle (sling angle) is less than 90°, the load in the grommet will be increased and must be factored into the WLL calculation.

2.1 Bending Effect On KimFlex And Cable Laid Grommets

According to IMCA M179 and PM20, the effect of bending must be factored into the WLL calculation for all *CABLE LAID* grommets. In addition KTL Offshore applies this rule to *KIMFLEX* grommets as well.

The following equation is used to determine the WLL for both types of grommets:

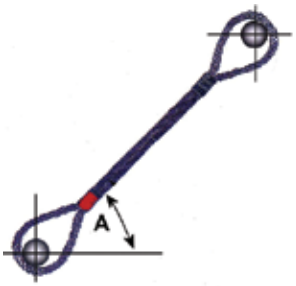
$$\text{WLL} = \frac{\text{CGBL} \times E_B}{\text{Safety Factor}}$$

Where:
CGBL = Calculated Grommet Breaking Load
E_B = Bend efficiency according to IMCA M179 and PM20
IMCA M179 and PM20 recommend a minimum safety factor of 2.25 for cable laid grommets

When the horizontal angle is less than 90°, the following formula should be used to determine the WLL:

$$\text{WLL} = \frac{\text{CGBL}}{\text{Safety Factor}} \times \text{Sin A} \times E_B$$

Where:
CGBL = Calculated Grommet Breaking Load
E_B = Bend efficiency according to IMCA M179 and PM20
Sin A = Minimum horizontal sling angle in degrees
IMCA M179 and PM20 recommend a minimum safety factor of 2.25 for cable laid grommets



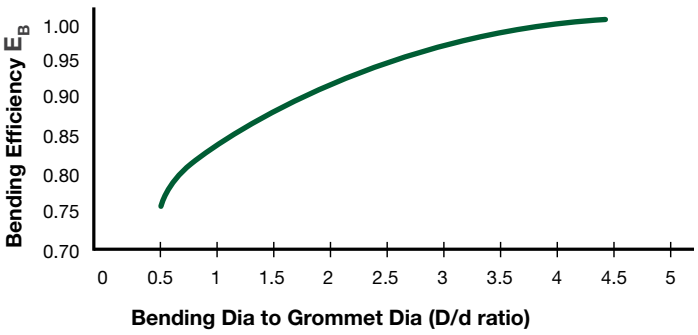
2.2 Bending Effect On Ultra Short Grommets

Ultra short grommets are designed and rated based on a minimum D/d ratio of 5:1.

For smaller D/d ratios, use the following formula to estimate the WLL:

$$\text{WLL} = \frac{\text{CGBL} \times E_B}{\text{Safety Factor}} \qquad \text{Where } E_B = 1 - \frac{0.5}{\sqrt{8.D/d}}$$

Bending Efficiency for Ultra Short Grommets



Inspection, Examination And Discard Criteria - Heavy Lift Slings And Grommets

IMCA M179/PM20 and ASME B30.9 provide a guideline for the inspection, examination and discard of cable laid and braided slings and grommets. KTL Offshore recommends that the guidelines detailed in this section be used.

An **inspection** is defined as a visual check carried out by a competent person, either independent or representing the sling or grommet owner.

A **thorough examination** is defined as being more detailed than an inspection and is carried out by a competent person independent of the owner of the sling.

It is recommended that:

- an inspection is carried out prior to each use.
- a thorough examination is carried out at least once every six months if the sling or grommet is in use.
- a thorough examination is carried out before putting the sling or grommet into long term storage.
- a thorough examination is carried out if the sling or grommet has been in storage for more than six months and will be put to use.

Discard Criteria

Wire rope is a complex piece of machinery and therefore no precise rules can be provided as to when a sling or grommet should be replaced. There are many variables and all should be considered. ASME B30.9-2003 specifies that a wire rope should be replaced if any of the following conditions are present.

1. Broken Wires: the table below lists the number of broken wires that signals discard for the sling or grommet:

Sling/Grommet Type	Remove when the following Number of Broken Wires is Observed	
	Per Lay	Per Braid*
Cable Laid (hand spliced and KIMLOCK)	20	-
Braided—Less than 8-part braid	-	20
Braided—8-part braid or more (Applies to *KIMFLEX* range)	-	40
Single Part Sling (Applies to KIMSWAGE range)	10 randomly distributed or 5 in one strand	-

***One braid is one complete twist of the sling or grommet body.**

2. Metal loss: wearing or scraping of one-third the original diameter of the outside individual wires.
3. Distortion: kinking, crushing, birdcaging or other damage that distorts the rope structure. Check for wires or strands that are pushed out of their original position in the rope.
4. Heat damage: any metallic discolouration, fused wires or loss of internal lubricant caused by exposure to heat.
5. Damaged end attachments: cracked, bent or broken end fittings.
6. Corrosion: severe corrosion of the rope or end attachments which has caused pitting or binding of wires. Light surface rust does not substantially affect the sling or grommet strength.
7. Pulled eye splices: any evidence that the eye splices have slipped, tucked strands have moved or pressed sleeves have serious damage. For cable laid slings, the tail splices should be at least 3 times the sling diameter in length.
8. Unbalance: a very common cause of damage is the kink caused by pulling through a loop or even by using in basket hitch around an object too small for the sling or grommet body (low D/d). The presence of a kink will make the sling or grommet unbalanced and reduce the strength.

KimSwage Slings: Technical Data

Sling Diameter		MBL	WLL DF = 4:1	Unit Weight
(inches)	(mm)	(metric tons)	(metric tons)	(kg/m)
4-1/2	114	903	226	56
5.0	127	1,009	252	69
6.0	152	1,424	356	97

MBL = Minimum Breaking Load which takes into consideration a splicing coefficient of 0.90. The above MBL values should be used as a guide only as they may change depending upon material availability.

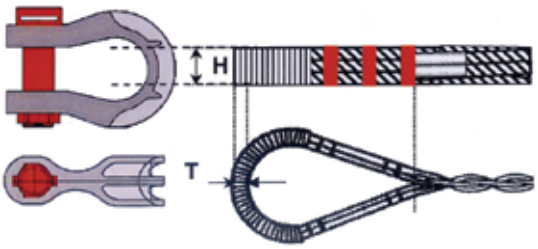
KimFlex Slings: Technical Data

Sling Diameter		CSBL EIPS Grade	WLL EIPS Grade	CSBL EEIPS Grade	WLL EEIPS Grade	Eye Dimension *(Incl. Seizing)*		Unit Weight
(inches)	(mm)	(metric tons)	(metric tons) DF = 4:1	(metric tons)	(metric tons) DF = 4:1	H (mm)	T (mm)	(kg/m)
4.0	102	338	84	372	93	92	67	25
4.4	112	425	106	467	117	100	72	31
5.0	128	522	131	574	143	112	80	39
5.7	144	627	157	692	173	124	88	47
6.0	152	742	185	814	203	130	92	56
6.6	168	864	216	950	238	142	100	65
6.9	176	1,001	250	1,094	274	148	104	76
7.6	192	1,138	284	1,253	313	160	112	87
8.2	208	1,296	324	1,418	355	172	120	99
9.0	228	1,440	360	1,778	445	187	130	125
9.4	240	1,613	403	1,973	493	196	136	140
10.1	256	1,973	493	2,167	542	208	144	156
11.2	284	2,398	599	2,592	648	229	158	187
11.7	296	2,599	650	2,822	706	238	164	205
12.1	308	2,801	700	3,060	765	247	170	222
13.1	332	3,218	805	3,550	887	265	182	261
14.2	360	3,737	934	4,054	1,013	286	196	304
16.2	412	4,788	1,197	5,184	1,296	325	222	396
18.0	456	N/A	N/A	7,222	1,805	358	244	501
20.0	508	N/A	N/A	8,611	2,153	397	270	619
23.9	608	N/A	N/A	11,390	2,848	472	320	870

CSBL = Calculated Sling Breaking Load which takes into consideration a splicing and spinning loss coefficient determined through empirical methods and verified by ABS Consulting.

KimFlex slings conform to the Wire Rope Technical Board *Wire Rope Sling Users Manual*, Third Edition, 2007.

Eye Dimensions: KimFlex Sling



CABLE LAID Slings – Hand Spliced: Technical Data

Sling Diameter		CRBL	CSBL	WLL	WLL	Unit Weight
(inches)	(mm)	(metric tons)	(metric tons)	(metric tons) DF = 2.25	(metric tons) DF = 4.0	(kg/m)
5.0	128	699	525	233	131	50
5.2	132	757	568	252	142	53
5.4	136	781	586	260	146	55
5.5	140	841	631	280	158	60
5.7	144	905	679	302	170	65
5.7	146	917	688	306	172	66
5.9	150	984	738	328	184	70
6.0	153	1,003	752	334	188	71
6.1	154	1,010	757	337	189	72
6.3	160	1,071	831	369	208	78
6.4	162	1,151	863	384	216	80
6.5	164	1,165	874	388	218	82
6.6	168	1,197	898	399	224	83
7.3	185	1,438	1,078	479	270	104
7.5	191	1,561	1,171	520	293	114
7.6	194	1,583	1,188	528	297	116
8.0	202	1,775	1,332	592	333	127
8.0	204	1,790	1,343	597	336	129
8.1	205	1,798	1,349	599	337	129
8.9	225	2,137	1,603	712	401	154
9.0	229	2,170	1,628	723	407	156
9.1	231	2,269	1,702	756	425	166
9.3	235	2,302	1,727	767	432	168
9.4	238	2,328	1,746	776	437	171
9.4	239	2,393	1,795	798	449	180
9.5	242	2,418	1,814	806	453	182
9.8	248	2,472	1,854	824	463	187
10.3	262	2,803	2,102	934	526	213
10.6	268	2,859	2,144	953	536	218
11.1	282	3,213	2,409	1071	602	247
11.4	289	3,281	2,461	1094	615	282
11.9	301	3,601	2,701	1200	675	282
12.0	306	3,652	2,739	1217	685	288
12.5	318	3,988	2,991	1329	748	320
13.0	331	4,128	3,096	1376	774	333
13.6	345	4,539	3,404	1513	851	366
16.0	406	5,984	4,488	1995	1122	510

CRBL = Calculated Rope Breaking Load which takes into consideration a spinning loss coefficient = 0.85.

CSBL = Calculated Sling Breaking Load which takes into consideration a splicing coefficient = 0.75 for hand splicing.

Minimum safety factor = 2.25 according to IMCA M179/PM20.

Where applicable, sling strength has been computed using a tensile grade of 1960/EIPS wire rope.

Sling strength is calculated according to ISO 2408:2004 and/or EN 12385-4: 2002, depending upon component wire rope size in accordance with IMCA M179-2005.

KIMLOCK CABLE LAID Slings – Resin Socketed: Technical Data

		SLING STRENGTH:	SLING			
Sling Diameter		CRBL	CSBL	WLL	WLL	Unit Weight
(inches)	(mm)	(metric tons)	(metric tons)	DF = 2.25	DF = 4.0	(kg/m)
100	3.9	493	493	219	123	32
102	4.0	503	503	224	126	32
104	4.1	512	512	228	128	33
106	4.2	562	562	250	141	36
108	4.3	571	571	254	143	37
110	4.3	582	582	259	146	37
114	4.5	638	638	283	159	42
116	4.6	648	648	288	162	43
120	4.7	706	706	314	177	45
122	4.8	718	718	319	180	46
126	5.0	773	773	344	193	49
128	5.0	783	783	348	196	50
132	5.2	847	847	377	212	53
135	5.3	867	867	385	217	54
136	5.4	873	873	388	218	55
139	5.5	929	929	413	232	58
140	5.5	935	935	416	234	59
144	5.7	1,007	1,007	447	252	64
148	5.8	1,034	1,034	460	259	66
149	5.9	1,043	1,043	464	261	67
152	6.0	1,090	1,090	484	272	72
153	6.0	1,099	1,099	488	275	72
154	6.1	1,099	1,099	488	275	73
159	6.2	1,213	1,213	539	303	77
160	6.3	1,213	1,213	539	303	78
162	6.4	1,236	1,236	549	309	79
162	6.4	1,250	1,250	556	313	83
164	6.5	1,273	1,273	566	318	85
185	7.3	1,564	1,564	695	391	99
191	7.5	1,704	1,704	758	426	114
194	7.6	1,731	1,731	769	433	116
200	7.9	1,860	1,860	827	465	124
204	8.0	1,896	1,896	842	474	129
205	8.1	1,896	1,896	842	474	129
225	8.9	2,254	2,254	1,002	564	154
229	9.0	2,285	2,285	1,015	571	156
231	9.1	2,412	2,412	1,072	603	166
235	9.3	2,443	2,443	1,086	611	168
238	9.4	2,473	2,473	1,099	618	171
239	9.4	2,611	2,611	1,161	653	180
242	9.5	2,641	2,641	1,174	660	182
239	9.4	2,611	2,611	1,161	653	180
242	9.5	2,641	2,641	1,174	660	182
248	9.8	2,706	2,706	1,202	676	187
262	10.3	3,052	3,052	1,357	763	213

		SLING STRENGTH:	SLING			
Sling Diameter		CRBL	CSBL	WLL	WLL	Unit Weight
(inches)	(mm)	(metric tons)	(metric tons)	DF = 2.25	DF = 4.0	(kg/m)
268	10.6	3,121	3,121	1,387	780	218
283	11.1	3,363	3,363	1,494	841	232
283	11.1	3,483	3,483	1,548	871	248
289	11.4	3,541	3,541	1,574	885	253
301	11.9	3,929	3,929	1,746	982	282
306	12.0	4,111	4,111	1,827	1,028	288
318	12.5	4,525	4,525	2,011	1,131	320
331	13.0	4,625	4,625	2,055	1,156	332
345	13.6	4,972	4,972	2,210	1,243	366
406	16.0	7,062	7,062	3,139	1,765	505

CRBL = Calculated Rope Breaking Load which takes into consideration a spinning loss coefficient = 0.85.

CSBL = Calculated Sling Breaking Load which takes into consideration a splicing coefficient = 1.00 for resin socketing.

Minimum safety factor = 2.25 according to IMCA M179/PM20. However, KTL Offshore recommends 4.0 for offshore engineered lifts.

Sling strength has been computed using a tensile grade of EEIPS wire rope.

KimFlex Grommets: Technical Data

Grommet diameter		CGBL EIPS	CGBL EEIPS	Unit Weight (In Double Part)
(inches)	(mm)	(metric tons)	(metric tons)	(kg/m)
4.0	102	675	743	50
4.4	112	850	933	63
5.0	128	1,044	1,148	77
5.7	144	1,254	1,384	94
6.0	152	1,483	1,627	111
6.6	168	1,728	1,901	131
6.9	176	2,002	2,189	152
7.6	192	2,275	2,506	174
8.2	208	2,592	2,837	198
9.0	228	2,880	3,557	250
9.4	240	3,226	3,946	279
10.1	256	3,946	4,334	311
11.2	284	4,795	5,184	374
11.7	296	5,198	5,645	410
12.1	308	5,602	6,120	445
13.1	332	6,437	7,099	522
14.2	360	7,474	8,107	608
16.2	412	9,576	10,368	792

KimFlex Grommets:

CGBL = Calculated Grommet Breaking Load

The WLL is calculated as follows:

$$\text{WLL} = \frac{\text{CGBL} \times E_B}{\text{Safety Factor}}$$

$$\text{Where } E_B = 1 - \frac{0.5}{\sqrt{D/d}}$$

And:
D = Minimum bend diameter
d = Grommet body diameter

Cable Laid Grommets: Technical Data

Grommet diameter		CGBL (metric tons)	Unit Weight (In Double Part)
(inches)	(mm)		(kg/m)
4.0	102	815	69
4.3	108	914	77
4.5	114	1,018	86
4.7	120	1,128	95
5.0	126	1,244	102
5.2	132	1,365	115
5.4	138	1,492	126
5.7	144	1,625	135
5.9	150	1,763	149
6.1	156	1,907	154
6.6	168	2,211	182
6.7	171	2,291	185
6.9	174	2,372	195
7.1	180	2,538	217
7.6	192	2,923	242
8.4	213	3,505	291
8.7	222	3,769	319
9.1	231	4,042	346
9.8	249	4,613	406
10.6	270	5,320	473
12.0	306	6,632	616
13.5	342	8,066	780

Cable Laid Grommets:

CGBL = Calculated Grommet Breaking Load

Minimum safety factor = 2.25 according to IMCA M179/PM20

Where applicable, grommet strength has been computed using a tensile grade of 1960/EIPS wire rope

Grommet strength is calculated according to ISO 2408:2004 and/or EN 12385-4: 2002, depending upon component wire rope size in accordance with IMCA M179-2005

The WLL is calculated as follows:

$$\text{WLL} = \frac{\text{CGBL} \times E_B}{\text{Safety Factor}}$$

$$\text{Where } E_B = 1 - \frac{0.5}{\sqrt{D/d}}$$

And:

D = Minimum bend diameter
d = Grommet body diameter

KimFlex Ultra Short Grommets: Technical Data

Grommet Diameter		CGBL EIPS	CGBL EEIPS	Unit Weight (In Double Part)	Minimum Effective Length
(inches)	(mm)	(metric tons)	(metric tons)	(kg/m)	(metres)
3.1	80	161		15	1.00
3.8	96	583		22	1.00
4.4	112	351		30	1.25
5.0	128	438		39	1.25
6.0	152	625		55	1.25
6.9	176	845		74	1.50
7.6	192	957		88	1.75
8.2	208	1,097		103	1.75
8.8	224	1,306		120	2.00
9.1	232	1,381		129	2.00
10.1	256	1,697		157	2.25
10.7	272	1,931		177	2.25
11.0	280	2,038		188	2.25
11.3	288	2,157		198	2.50
12.0	304	2,410		221	2.50
12.6	320	2,621		245	2.75
13.2	336	2,808	3,101	270	2.75
13.9	352	3,253	3,578	296	3.00
15.1	384	3,697	4,079	352	3.25
15.7	400	4,212	4,603	383	3.50
16.4	416	4,212	4,603	414	3.50
18.0	456	5,242	5,780	500	3.75
18.9	480	5.827	6,412	558	3.75
20.2	512	6,412	7,043	623	4.00
22.4	568	7,792	8,424	749	5.00
24.3	616	9,103	9,945	889	5.50
26.1	664	10,460	11,536	1044	6.00

KIMFLEX Ultra Short Grommets:

CGBL = Calculated Grommet Breaking Load

The WLL is calculated as follows:

$$\text{WLL} = \frac{\text{CGBL} \times E_B}{\text{Safety Factor}}$$

$$\text{Where } E_B = 1 - \frac{0.5}{\sqrt{8D/d}}$$

And:
D = Minimum bend diameter
d = Grommet body diameter

Heavy Lift Synthetic Grommets

KimPlasma Grommets - High Strength, Light Weight, Easy and Safe Inspection

Cortland PSR's Plasma grommets have been used in the deep waters in the Gulf of Mexico using DNV approved safety factors and lifting conditions.

At KTL Offshore, our KimPlasma grommets are produced using our rigorous Quality Control Plan (QCP) procedures that have seen us manufacture thousands of heavy lift wire rope slings over the last decade.

Our Engineered Length Control (ELC) technique enables us to manufacture KimPlasma grommets to exact tolerances under a specified load – bringing the customer the most advanced and technologically advanced heavy lift solution in the world.

Features and benefits of the KimPlasma Heavy Lift (HL) grommet range:

- Completely torque free
- Easy to inspect – no hidden components
- Damaged strands can be replaced in the field
- Re-splicing can be done in the field
- Highest strength-to-weight ratio of any sling or grommet
- Each grommet is individually engineered for a specific length, proof load tested and provided with 3rd party certification

KimPlasma Grommets – Technical Data

The KimPlasma Grommet is spliced by using a standard tucked hand splice. The splice is positively locking and will not slip under any circumstances. This splice does not require any tools and can be done in the field by suitably trained personnel. Protection at the eye is provided by a Nylon cover, which is easily removable and replaceable.

Product Code	Diameter	Diameter	Circ.	Circ.	Weight	Splice Length (Total)	Spliced MBL
	mm	inches	mm	inches	Kg/100m	mm	Metric Tons
KPG-HL-98	98	4.1	310	12.9	14.5	9,148	1,213
KPG-HL-102	102	4.3	322	13.4	15.4	9,500	1,280
KPG-HL-104	104	4.3	326	13.6	16.3	9,676	1,348
KPG-HL-108	108	4.5	338	14.1	17.1	10,028	1,415
KPG-HL-110	110	4.6	350	14.6	18.0	10,380	1,482
KPG-HL-112	112	4.7	358	14.9	19.1	10,556	1,550
KPG-HL-118	118	4.9	370	15.4	20.3	10,908	1,617
KPG-HL-120	120	5.0	382	15.9	21.5	11,259	1,684
KPG-HL-125	125	5.2	394	16.4	22.7	11,611	1,752
KPG-HL-130	130	5.4	406	16.9	23.9	11,963	1,819
KPG-HL-132	132	5.5	418	17.4	25.1	12,315	1,887
KPG-HL-140	140	5.8	442	18.4	27.9	13,019	2,021
KPG-HL-144	144	6.0	454	18.9	29.7	13,371	2,089
KPG-HL-146	146	6.1	466	19.4	31.6	13,723	2,156
KPG-HL-150	150	6.3	478	19.9	33.4	14,074	2,223
KPG-HL-156	156	6.5	494	20.6	35.3	14,602	2,291
KPG-HL-160	160	6.7	506	21.1	37.2	14,954	2,358
KPG-HL-166	166	6.9	523	21.8	39.5	15,482	2,426
KPG-HL-172	172	7.2	542	22.6	42.1	16,010	2,493
KPG-HL-178	178	7.4	559	23.3	44.9	16,537	2,560
KPG-HL-182	182	7.6	578	24.1	47.8	17,065	2,628
KPG-HL-190	190	7.9	595	24.8	50.8	17,593	2,695

Notes:

1. **The grommet MBL has already factored in a splicing efficiency.**
2. **MBL is attained as long as D/d at the bearing points is greater than or equal to 3.**
3. **For lower bending ratios, the MBL must be de-rated. Please consult KTL Offshore.**
4. **For engineered lifts the SWL may be calculated according to DNV Rules for Marine Operations, Part 2 Chapter 5, January 1996.**

HEAVY LIFT SHACKLES

As The Largest Crosby Distributor Outside The USA, KTL Offshore Offers A Vast Range Of Shackles Suitable For Heavy Lifting, Up To WLL 1550t

Around the world, applications such as heavy construction, oil exploration and production require shackles that are able to withstand demanding, extreme field conditions. Crosby's time-tested shackles, which have a reputation of being "Job Tough", are regularly deployed in these applications.

the Crosby group inc.

Crosby Value Added Feature:

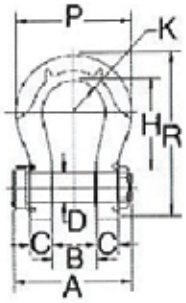
- Crosby's G-2160 has **DNV Type Approval** which includes the following certification:
  - * Manufacturing Survey Assessment (MSA) which includes a full audit of the Crosby manufacturing facility.
  - * Type Approval Certificate which is signed and stamped by DNV and includes a full design assessment of the product type.
  - * Product Certificate signed and stamped by DNV in which the appropriate tests are submitted for review and is shipped with the shackle.

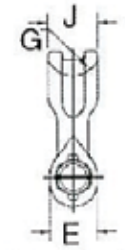
Why Is **Crosby's G-2160 Wide Body Shackle** The World's Premium Brand Heavy Lift Shackle?

There are compelling reasons why Crosby's G-2160 is regarded as the premium heavy lift shackle the world over:

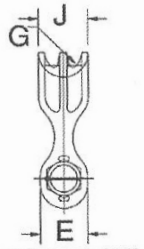
- Forged shackle are produced through closed-die forging rather than open-die forging, which requires extensive grinding. This ensures dimensional accuracy and improved surface quality.
- Cast shackle (200t and above as from January 2008) are made in an air set casting process to assure dimensional accuracy and improved surface quality.
- All ratings are in metric tons, embossed on the side of bow with raised lettering that is easy to read and places no stress on the shackle.
- Increase in shackle bow radius provides a minimum 58% gain in sling bearing surface and eliminates need for a thimble.
- The pin is non-rotating, with weld on handles for easier use (300t and larger).
- Crosby products meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
- All G-2160 shackles are individually proof tested and non-destructive tested.
- Shackles are Quenched and Tempered and meet DNV impact requirements of 42 joules at -20°C.
- Full data pack of certification is provided with all wide body shackles as follows:
  - * NDT certification
  - * Proof load test certificate
  - * Material certification—chemistry, Charpy, tensile
  - * Certificate of conformance
  - * DNV Product Type Approval

Crosby G-2160 Wide Body Shackles—Dimensions





30 through 300 metric tons



400 through 1550 metric tons

Mega Lift Range

Working Load Limit* (metric tons)	G-2160 Stock No.	Weight Each (lbs.)	Dimensions (inch)										
			A	B +/- .25	C	D +/- .02	E	G	H	J	K	P	R
†† 1250	1021272	5706	49.86	16.93	9.15	11.81	21.00	10.43	36.61	20.87	12.70	46.26	65.35
†† 1550	1021281	7025	54.87	18.31	10.58	12.60	23.82	15.92	42.32	22.82	13.28	49.41	73.43

Heavy Lift Range

Working Load Limit* (metric tons)	G-2160 Stock No.	Weight Each (lbs.)	Dimensions (inch)										
			A	B +/- .25	C	D +/- .02	E	G	H	J	K	P	R
† 200+	1021316	500	20.67	5.91	3.35	4.12	7.28	4.33	18.98	8.07	5.41	19.49	29.82
†† 200+	1021316	500	20.67	5.91	3.35	4.12	7.84	4.33	18.98	8.07	5.41	19.49	29.82
† 300+	1021325	811	24.20	7.38	4.00	5.25	9.25	5.47	23.69	10.38	6.31	23.38	37.26
†† 300+	1021325	811	24.20	7.38	4.00	5.25	10.00	5.47	23.69	10.38	6.31	23.38	37.26
†† 400	1021334	1041	30.06	8.66	5.16	6.30	11.81	6.30	22.71	12.60	7.28	27.17	38.78
†† 500	1021343	1378	32.99	9.84	5.59	7.09	12.52	6.69	24.88	13.38	8.86	31.10	42.71
†† 600	1021352	1833	35.39	10.83	6.04	7.87	13.78	7.28	27.64	14.56	9.74	34.06	47.24
†† 700	1021361	2446	38.91	11.81	6.59	8.46	14.80	7.87	29.04	15.74	10.63	37.01	50.17
†† 800	1021254	3016	43.50	12.80	7.19	9.06	15.75	8.27	29.62	16.54	10.92	38.39	52.09
†† 900	1021389	3436	43.60	13.78	7.78	9.84	16.93	8.66	30.02	17.32	11.51	40.35	54.04
†† 1000	1021370	4022	45.98	14.96	8.33	10.63	17.72	9.06	30.02	18.12	12.11	42.32	55.32

+Before November 2007, forged; after this date, cast.

Low Range

Working Load Limit * (metric tons)	G-2160 Stock No.	Weight Each (lbs.)	Dimensions (inch)										
			A	B +/- .25	C	D +/- .02	E	G	H	J	K	P	R
† 30	1021575	25	7.73	2.37	1.38	1.63	3.50	2.50	7.00	3.13	2.50	8.50	11.38
† 40	1021584	35	9.32	2.88	1.75	2.00	4.00	1.75	8.13	3.75	3.00	10.62	13.62
† 55	1021593	71	10.41	3.25	2.00	2.27	4.63	2.00	9.42	4.50	3.50	12.26	15.63
† 75	1021290	99	14.37	4.13	2.12	2.75	5.00	2.55	11.60	4.75	3.64	12.28	18.41
† 125	1021307	161	16.51	5.12	2.56	3.15	5.71	3.15	14.43	5.91	4.33	14.96	22.65

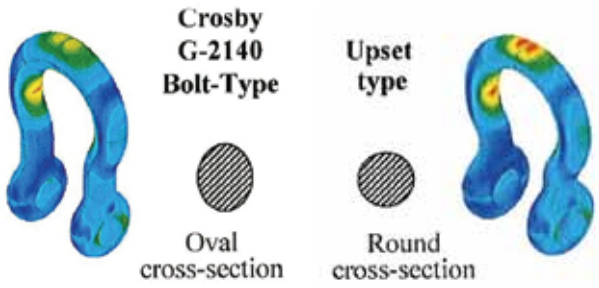
*** Ultimate Load is 5 times the Working Load Limit.**
† Forged Alloy Steel. Proof Load is 2 times the Working Load Limit.
†† Cast Alloy Steel. Proof Load is 1.33 times the Working Load Limit.

Crosby's Alloy Range **G-2140 Bolt Type Shackle**

What makes Crosby's G-2140 alloy shackles superior to the competition?

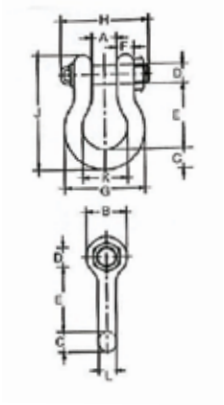
Crosby Value Added Features:

- Bow cross section is oval and not round, leading to lower bending stress and increased fatigue life.
- Crosby's G-2140 has **ABS Type Approval**, which includes the following certification:
  - * Manufacturing Survey Assessment (MSA) which includes a full audit of the Crosby manufacturing facility.
  - * Type Approval Certificate which is signed and stamped by ABS and includes a full design assessment of the product type.
  - * Product Certificate signed and stamped by ABS where the appropriate tests are submitted for review and shipped with the shackle.



Un-retouched drawings of actual Stress Analysis performed by Crosby Engineering showing the lower stress levels present in the Crosby G-2140 shackle compared to a competitor's product.

In addition to the benefits above, the G-2140 range also features:



- Alloy bows and bolts.
- Forged alloy steel 30 through 175 metric tons. Cast alloy steel 200 through 400 metric tons. Working Load Limit is permanently shown on every shackle.
- All sizes are individually proof tested to 2.0 times the Working Load Limit.
- Pins are galvanised and painted red.
- Shackles are Quenched and Tempered and can meet DNV impact requirements of 42 joules at -200C.
- Crosby products meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
- All G-2140 shackles are individually proof tested and for 200t and above, non-destructive tested as well.

Nominal Shackle Size (inches)	Working Load Limit* (metric tons)	Stock No. G-2140 Galv.	Weight Each (lbs.)	Dimensions (inches) A	B	(Bend Diameter) C	D	E	F	G	H	J	K	L	Tolerance A	E
For shackles under 200t in capacity, see Shackles under *General Engineering Slings, Shackles and Grommets*																
4-3/4 **	† 200	1021414	450.0	7.25	10.50	6.00	4.75	15.69	3.75	21.00	20.59	29.25	11.00	4.50	.25	.25
5 **	† 250	1021432	600.0	8.50	12.00	6.50	5.00	20.06	3.88	24.50	22.06	35.00	13.00	4.50	.25	.25
6 **	† 300	1021450	775.0	8.38	12.00	6.75	6.00	19.56	6.43	25.00	24.44	35.25	13.00	5.00	.25	.25
7 **	† 400	1021478	1102.0	8.25	14.00	7.25	7.00	22.56	6.50	26.00	28.06	40.25	13.00	6.00	.25	.25
7-1/2 **	† 500	N/A	1556.0	8.31	15.00	7.50	7.63	25.19	6.28	28.00	28.12	44.00	13.00	7.50	.25	.25

***Note: Maximum Proof Load is 2.0 times the Working Load Limit.**
Minimum Ultimate Load is 4 times the Working Load Limit on 200 through 400 metric tons.
**** Cast Alloy Steel.**
† Furnished with round head bolts with welded handle.

Application Information—Heavy Lift Shackles

Consider The Effects Of Bending

As discussed under the Heavy Lift Slings and Grommets section, the bending effect on slings and grommets can have a significant effect on strength. Very often the connection point between the sling or grommet and the shackle represents the minimum-bending diameter to be considered in the D/d equation.

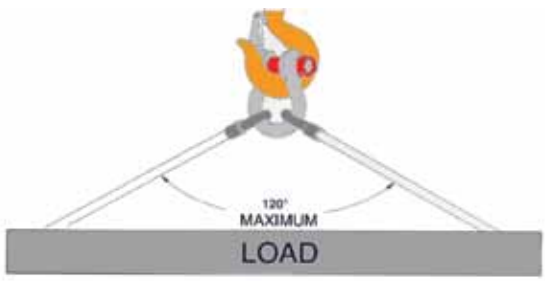
The bending diameter of the shackle is usually situated at the bow—unless the pin is used to connect the sling, in which case the pin diameter becomes the minimum bend diameter. It is recommended to connect the slings or grommet to the bow of the shackle and use the pin to connect to the structure being lifted. In this way, the full advantage of the larger bow diameter in raising the D/d ratio between sling and shackle can be gained.

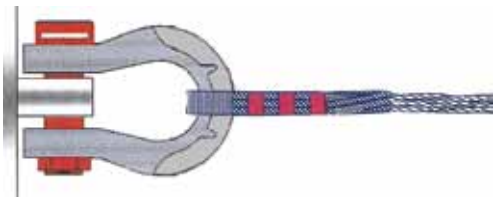
Wide body shackles have much larger bow diameters and hence provide higher D/d ratios and greater bending efficiency.

Connecting Shackles Together

Connecting two Crosby shackles either bow-to-bow or bow-to-pin is entirely acceptable. Two Crosby shackles of the same size and type can be fitted together in a bow-to-bow arrangement.

Connecting two Crosby shackles pin-to-pin is acceptable as long as the load can be balanced.





Balance The Load

Crosby shackles symmetrically loaded with two leg slings having a maximum included angle of 120° can be utilised to full Working Load Limit. Never exceed a 120° included angle for any shackle application.

The load should always be balanced to prevent tilting. Use spacers around the bearing point on the shackle pin to stabilise the load if necessary.

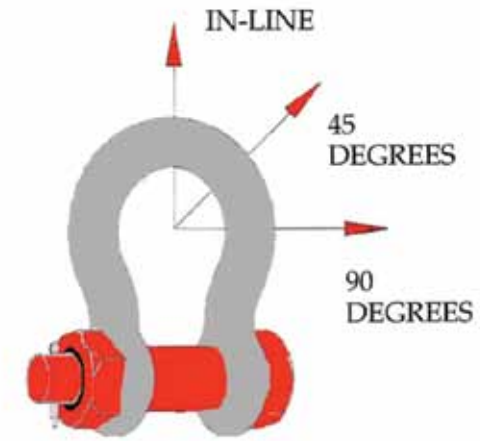
Point Loading

Crosby shackles may be point loaded at the bows. At the pins, point loading is also acceptable but Crosby recommends an 80% spread over the pin as “best practice”.

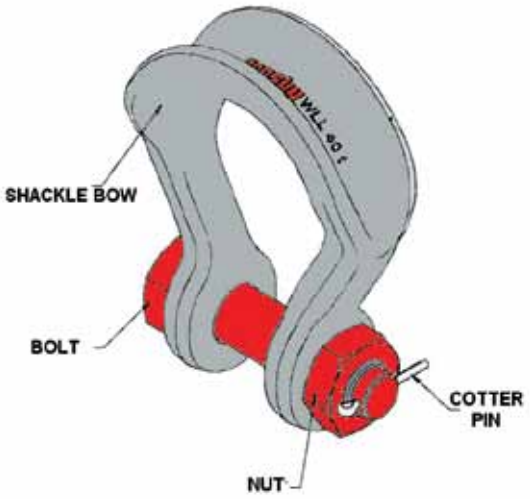
Side Loading

Side loading of Crosby shackles is allowed, although the WLL must be reduced according to the following table:

Side Loading Reduction Chart (from Crosby Catalogue) For Screw Pin and Bolt Type Shackles Only	
Angle of Side Load from Vertical In-line of shackle	Adjusted Working Load Limit
0^0 In-line	100% of rated Working Load Limit
45^0 from In-line	70% of rated Working Load Limit
90^0 from In-line	50% of rated Working Load Limit



For other brands of shackles, side loading may not always be recommended - please check their latest product brochures for more information.



Complete Equipment

The shackle comes complete as a tested assembly consisting of the shackle bow, bolt (pin), nut and cotter pin.

The cotter pin acts as a safety pin to prevent the nut from disengaging should the load cause the pin to rotate. The cotter pin should always be present during use of the shackle.

Although Crosby Wide Body shackles have serialised identification numbers on the bows and pins, it is not necessary for the number on the bow and pin to match each other on any individual shackle.

MOORING SYSTEMS AND DECK EQUIPMENT

The Complete Mooring System From The Anchors To The Winches

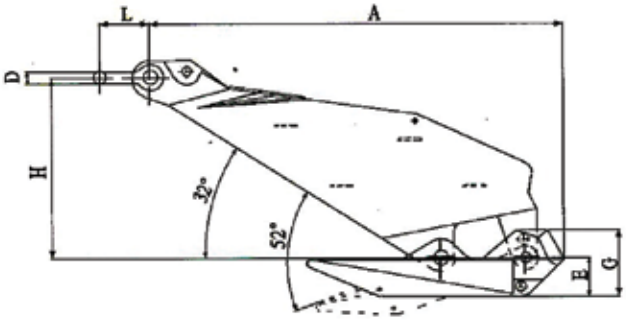
Anchors

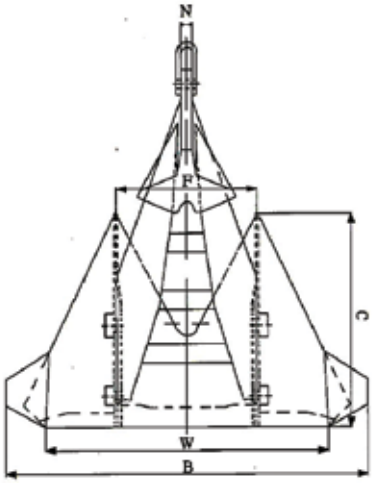
KTL Offshore has established a winning combination of quality and economics: High Holding Power (HHP) anchors made in China with project management and 3rd party inspection from Singapore.

This perfect combination has seen us deliver anchors of up to 25t to the world's premium contractors for their offshore projects.

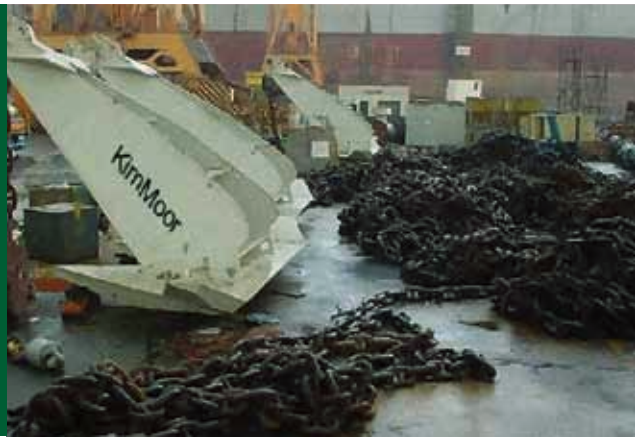
(Above) Anchors are made in China with 3rd party inspection and witness of testing from Singapore.

CMIC ST Anchor (High Holding Power)

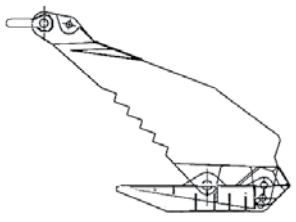




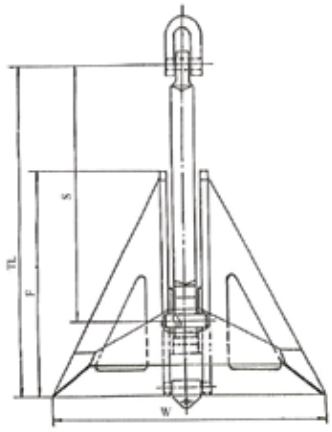
Nominal Weight (kg)	Dimensions (mm)										
	A	B	C	D	E	F	G	H	L	N	W
500	2045	2155	1252	50	186	850	324	905	260	74	1685
1500	2952	3108	1805	68	268	1225	645	1305	345	100	2430
2000	3250	3420	1986	82	235	1345	510	1440	401	115	2675
3000	3720	3916	2275	90	338	1540	585	1645	430	125	3060
4000	4095	4310	2505	100	372	1695	645	1810	465	135	3368
5000	4410	4645	2698	110	400	1825	695	1950	535	150	3628
6000	4685	4935	2865	110	425	1940	738	2072	555	157	3855
7000	4932	5195	3016	117	448	2042	774	2180	600	163	4058
8000	5158	5430	3156	130	468	2135	812	2280	665	177	4245
9000	5365	5648	3282	135	486	2220	845	2372	688	182	4415
10000	5556	5850	3400	140	504	2300	875	2456	710	188	4572
11000	5735	6038	3510	145	520	2375	905	2535	735	193	4720
12000	5904	6216	3612	150	536	2445	930	2610	755	198	4858
13500	5140	6465	3756	155	558	2542	968	2715	778	205	5052
15000	6275	6695	3890	160	578	2635	1002	2810	810	214	5235
18000	6668	7115	4135	170	615	2800	1065	2985	855	224	5562
20000	6905	7370	4282	180	635	2900	1105	3092	890	234	5760
22000	7128	7608	4420	190	655	2995	1140	3192	945	246	5945
25000	7438	7940	4612	195	685	3125	1190	3330	958	252	6205

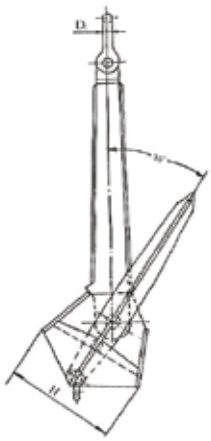


Efficiency range: 33 to 55
Slender anchor with excellent penetration.
Approximate holding capacity = efficiency x weight
STS anchor (below) is supplied with a jagged edge for very hard anchoring conditions
Anchors are shipped with the flukes and shanks disassembled for easier transportation.



CMIC (Flipper) Delta Anchor (High Holding Power)





Nominal Weight (kg)	Dimensions (mm)						
	TL	W	F	H	S	D1	Proof Load (kN)
300	1380	1200	960	465	1080	45	98
500	1725	1500	1200	570	1350	48	143
750	1950	1700	1360	650	1530	50	198
1000	2150	1870	1500	710	1680	62	250
1500	2460	2140	1710	815	1920	70	350
2000	2715	2360	1890	900	2125	75	435
2500	2925	2540	2035	970	2290	80	510
3000	3105	2700	2160	1030	2430	90	576
3500	3240	2845	2280	1087	2565	90	635
4000	3375	2953	2315	1140	2650	100	686
5000	3658	3200	2560	1225	2900	110	776
6000	3935	3405	2720	1310	3125	110	875
7000	4120	3580	2860	1360	3220	117	968
7500	4215	3666	2935	1390	3295	124	1005
8000	4315	3750	3000	1425	3380	130	1048
9000	4490	3874	3120	1480	3512	135	1108
10000	4725	4100	3280	1560	3690	140	1172
11000	4868	4140	3310	1600	3750	145	1238
12000	4960	4275	3420	1640	3860	150	1300
13500	5120	4450	3560	1700	4000	155	1408
15000	5345	4600	3685	1735	4160	160	1520
18000	5678	4890	3919	1840	4418	170	1710
20000	5880	5065	4050	1900	4570	175	1840

Efficiency range: 14 to 26
Anchor has relatively short shank with stabilizers.
Approximate holding capacity = efficiency x weight
Anchors are shipped with the flukes and shanks disassembled for easier transportation.

Anchor Chain And Accessories

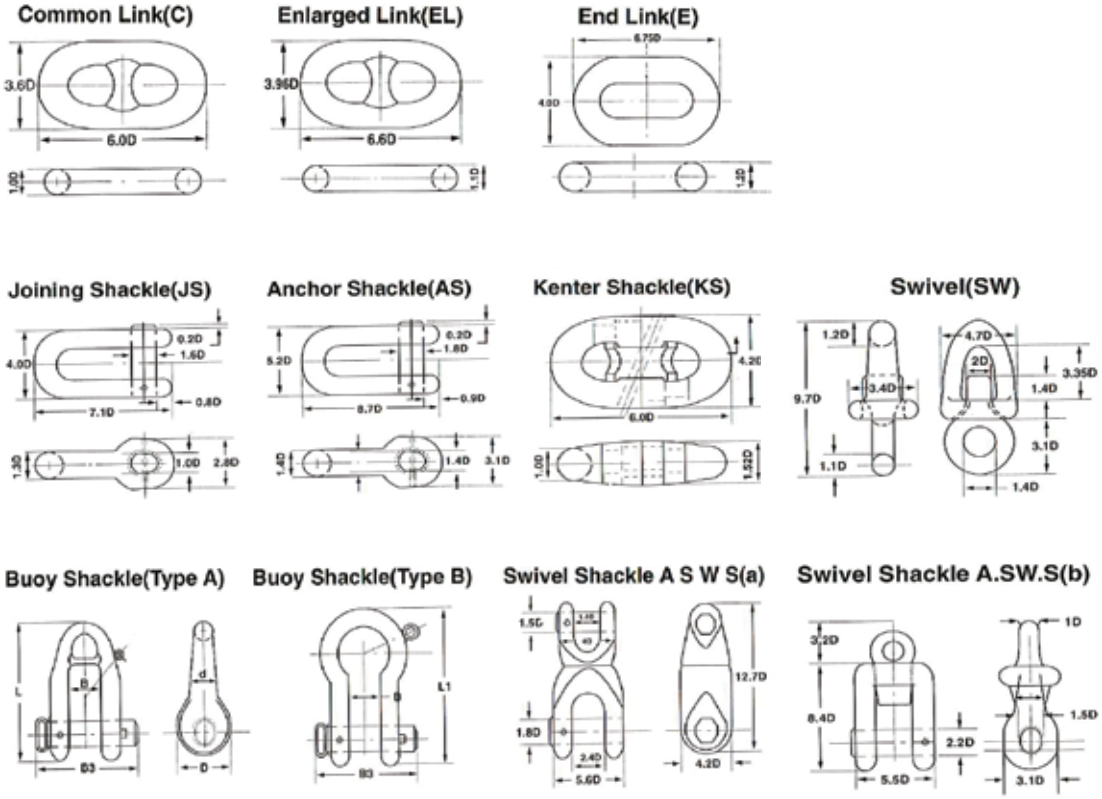
We stock a wide range of anchor chains and accessories suitable for offshore use. This includes:

- Swivels (various types)
- Kenter links
- C-links
- Pear links
- Hinge links

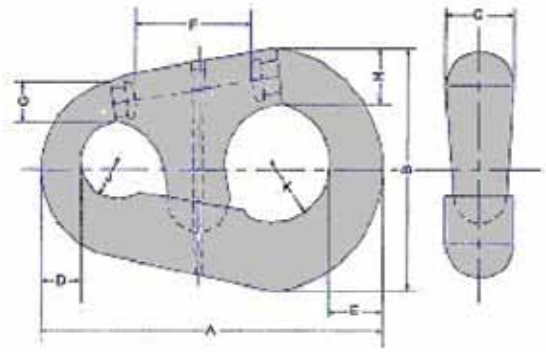
Anchor Chain—Table Of Minimum Breaking Load And Proof Load

Chain Diameter (mm)	Grade 2		Grade 3		Grade ORQ		Approx. weight (27.5m) (kg)
	Proof load (kN)	Breaking load (kN)	Proof load (kN)	Breaking load (kN)	Proof load (kN)	Breaking load (kN)	
22	200	280	280	401			
24	237	332	332	476			
26	278	389	389	556			
28	321	449	449	642			
30	368	514	514	735			
32	417	583	583	833			
34	468	655	655	937			
36	523	732	732	1050			
38	581	812	812	1160	870	1250	905
40	640	896	896	1280			1003
42	703	981	981	1400	1060	1510	1106
44	769	1080	1080	1540	1160	1650	1213
46	837	1170	1170	1680			1326
48	908	1270	1270	1810	1370	1950	1444
50	981	1370	1370	1960	1480	2110	1567
52	1060	1480	1480	2110	1590	2270	1695
54	1140	1590	1590	2270	1710	2440	1828
56	1220	1710	1710	2430	1830	2620	1966
58	1290	1810	1810	2600	1960	2790	2109
60	1380	1940	1940	2770	2090	2980	2257
62	1470	2060	2060	2940	2220	3170	2410
64	1560	2190	2190	3130	2350	3360	2568
66	1660	2310	2310	3300	2490	3560	2731
68	1750	2450	2450	3500	2640	3760	2899
70	1840	2580	2580	3690	2780	3970	3072
73	1990	2790	2790	3990	3010	4290	3341
76	2150	3010	3010	4300	3240	4620	3621
78	2260	3160	3160	4500	3400	4850	3814
81	2410	3380	3380	4820	3640	5190	4113
84	2580	3610	3610	5160	3890	5550	4424
87	2750	3850	3850	5500	4140	5920	4745
90	2920	4090	4090	5840	4410	6290	5078
92	3040	4260	4260	6080	4580	6540	5326
95	3230	4510	4510	6440	4860	6930	5679
97	3340	4680	4680	6690	5040	7190	5920
100	3530	4940	4940	7060	5320	7600	6292
102	3660	5120	5120	7320	5510	7870	6546
105	3850	5390	5390	7700	5800	8280	9637
107	3980	5570	5570	7960	6000	8560	7204
111	4250	5940	5940	8480	6400	9130	7752
114	4440	6230	6230	8890	6700	9560	8177
117	4650	6510	6510	9300	7010	10010	8613
120	4850	6810	6810	9720	7320	10450	9060
122	5000	7000	7000	9990	7530	10750	9360
124	5140	7200	7200	10280	7740	11060	9675
127	5350	7490	7490	10710	8070	11520	10148

Anchor Chain Accessories—Dimensions



Pear Connecting Links



The pear connecting link is used to join two pieces of mooring lines with different dimensions and also to connect the anchor chain to the anchor.

Type No.	Chain Size (mm)	Dimensions (mm)										Weight (kg)
		A	B	C	D	E	F	G	H	J	K	
5	42-51	378	260	76	51	64	100	51x60	74	32	52	27
6	52-60	454	313	92	60	76	121	62x73	88	37	64	49
7	62-79	562	376	117	79	95	149	85x79	111	48	76	94
8	81-92	654	419	133	92	124	149	111x102	130x133	54	79	149
9	94-95	692	435	146	98	130	159	124x137	141	57	83	236
10	97-102	889	571	190	121	165	190	130	181	73	108	386
11	103-108	940	610	203	127	175	203	156	200	76	111	418

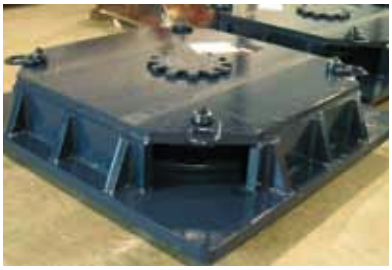
Fairleaders, Horizontal And Vertical Sheaves

Fairleaders can be supplied in the standard **double sheave swivel head** design, or as a **single sheave swivel head** type.

The single sheave type has the advantage of increasing the D/d ratio between the sheave and wire rope, thereby resulting in significantly improved wire rope life while the double sheave arrangement provides a back up in case one of the sheaves should become unusable.

(Left) McKissick single sheave fairleaders and (below) horizontal sheaves for 3" diameter anchor lines supplied by KTL Offshore (in 2007) to one of the largest derrick barges in the world – DB 101.

Precision engineered and custom made!



KTL Offshore has supplied vertical and horizontal sheaves for many offshore vessels where quality is of paramount importance.

For offshore pipelay operations, *tapered roller bearings* are strongly recommended for use in both the sheaves and barrel. For underwater use, special seals and self-lubrication bushings can be installed.

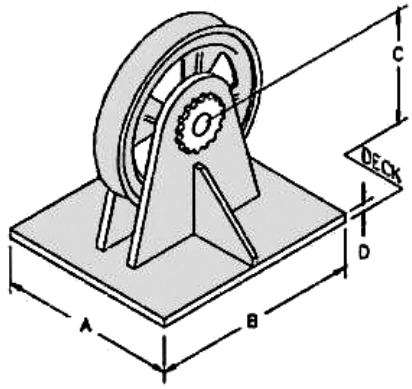
McKissick (part of the Crosby Group) engineering is respected and trusted throughout the world – brought to you by KTL Offshore.

Other Deck Equipment

We supply other deck equipment such as:

• Smit brackets • Chocks • Capstans

McKissick Vertical (Type 461) And Horizontal (Type 463) Lead Sheaves



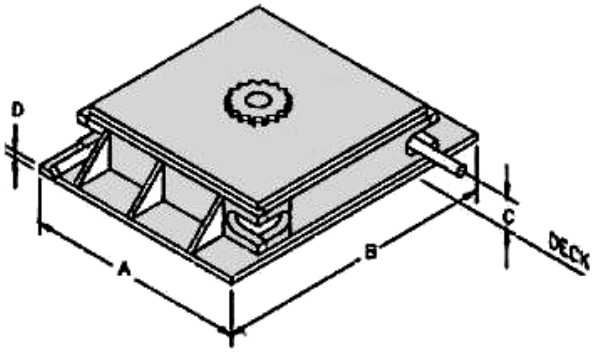


Figure No.	Lead Sheave Stock No.	Sheave Diameter (mm)	Standard Wire Rope Size (mm)	Weight Each (kg)	Dimensions (mm)			
					A	B	C	D
461-18	239753	457	22	227	305	508	279	38.1
461-24	131574	610	32	227	381	660	356	38.1
461-26	238120	660	38	299	406	711	381	38.1
461-36	148389	914	42	386	508	914	495	50.8
461-40	136285	1016	50	910	584	1067	572	50.8
461-42	130753	1067	64	1814	711	1321	648	63.5
463-26	4440359	660	26	448	838	838	95.5	38.1
463-30	1404177	762	32	556	940	940	89.0	38.1
463-36	146522	914	38	862	1092	1092	89.0	38.1
463-42	1406525	1067	44	1350	1270	1270	111	51.0
463-48	131583	1219	50	1630	1397	1397	118	51.0
463-60	123164	1524	64	2900	1727	1727	146	51.0

Furnish The Following Important Information When Ordering:

- A,B, and C dimensions.
- Line pull in pounds and degree of wrap.
- Line speed.
- Diameter of wire rope
- Roller bearings, bronze bushings, or sealed double row tapered bearings.

Guide And Control Your Deck Lines With McKissick's® Deck Mounted Wire Rope Sheaves. Built To Your Specific Requirements.

- Extra heavy construction, built to withstand breaking strength of indicated rope (EIPS, EEIPS or higher).
- Flame-hardened sheaves, machined grooves for proper rope size.
- For special requirements, contact KTL Offshore.

McKissick Double Sheave Deck Mounted Anchor Fairleader (457)

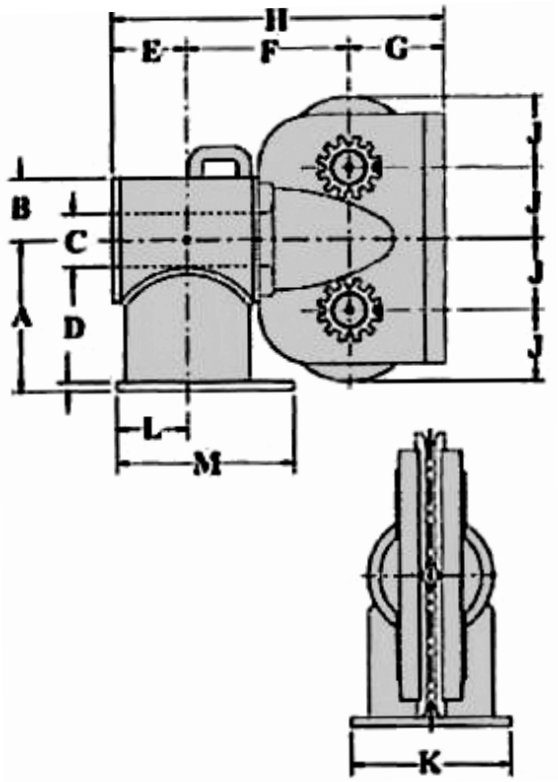


Figure No.	457 Stock No.	Sheave Diameter (mm)	Wire Rope Size (mm)	Weight Each (kg)	Dimensions (mm)											
					A	B	C	D	E	F	G	H	J	K	L	M
B-10-D	8073880	254	26	136	273	114	89.0	19.1	127	257	171	556	129	241	114	279
B-12-D	8073924	305	32	272	324	127	127	19.1	162	314	203	679	154	279	133	330
B-16-D	8079379	406	38	590	432	178	152	25.4	214	451	273	938	205	457	203	508
B-20-D	8074022	508	44	1134	533	229	216	25.4	286	557	324	1167	256	533	254	622
B-24-D	8074111	610	52	1633	641	279	254	31.8	324	673	375	1372	306	584	279	686
B-30-D	8097347	762	64	5443	838	330	254	51.0	359	861	521	1740	383	762	381	762

Deck Mounted Anchor Fairleader

- Barrel and sheaves equipped with sealed double row tapered bearings.
- Extra heavy construction, built to withstand breaking strength of indicated rope at 90 degree sheave wrap and 45 degree head swing.
- All bearings Alemite-lubricated.
- Custom Anchor Fairleader sets available.

TOWING BRIDLES

KTL Offshore Provides The Complete Towing Bridle - Tested And Certified

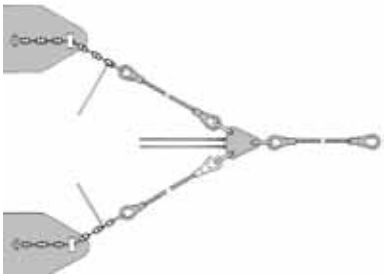
KTL Offshore Is Able To Supply:

- Wire rope towing pennants
- Triplate
- Chafe chain and towing chain
- Open, closed and mooring spelter sockets
- Nylon and chain springs
- Connecting shackles (bow type recommended)
- Tugger and retrieval wires
- Proof load testing of individual components
- Smit brackets

The strength of the towing components should be compatible with one another to ensure a successful towing operation.

The following factors have been compiled by representative ocean-towing contractors and marine surveyors and may be used as a guide to ensure compatibility:

Component	Minimum Strength
Chafe chain	1.3x MBL of tow wire
Bridle legs	1.3x MBL of tow wire
Towing pendant	1.0x MBL of tow wire
Weak link	0.9x MBL of tow wire
Chain spring	1.3x MBL of tow wire
Nylon rope spring	2.3x MBL of tow wire
Shackles	WLL = 1.0x MBL of tow wire



Towing bridles may be all chain (for heavy towing such as semi submersible rigs) or a combination wire rope – chafe chain system (example above). The safety factor is usually around 3:1 and at the apex (by the triplate) the included angle should not exceed 60°.

Table Of Minimum Breaking Load: Pennant/Towing Line With Spelter Socket

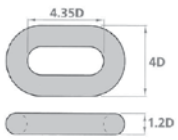
Nominal Diameter		Approximate Weight		Minimum Breaking Load (metric tons)	
				API 9A Specification	
(mm)	(inch)	(kg/m)	(lb/ft)	EIPS	EEIPS
48	1-7/8	9.67	6.50	158	174
52	2	11.0	7.39	180	197
54	2-1/8	12.4	8.35	200	221
58	2-1/4	13.9	9.36	224	247
60	2-3/8	15.5	10.4	249	274
64	2-1/2	17.3	11.6	274	301
67	2-5/8	19.0	12.8	299	330
71	2-3/4	20.8	14.0	333	360
74	2-7/8	22.8	15.3	361	392
76	3	24.7	16.6	389	425

Chafe Chain

Chafe chain is usually supplied to connect the wire rope pennants with the Smit brackets to prevent premature wear of the towing bridle.

Chafe Chain Details	
Standard Lengths	7m, 8m or 10m
Chain Diameter	64mm or 76mm
Grade	U2 or U3
Components	Common links with end links at both ends

End Link



Common Link

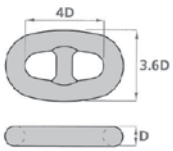
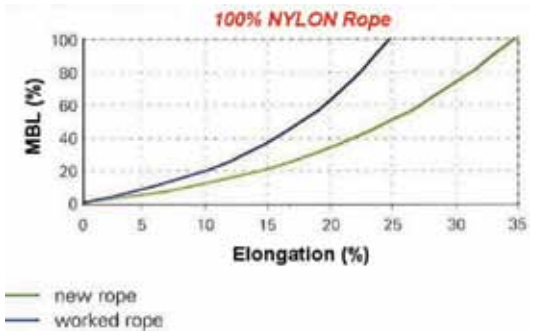


Table Of Minimum Breaking Load: Anchor & Chafe Chain

Chain Diameter	Approximate Weight per metre	Minimum Breaking Load (metric tons)	
(mm)	(kg/m)	Grade 2 U2	Grade 3 U3
48	53	129	185
52	62	151	215
54	66	162	231
58	77	185	265
60	82	198	282
64	93	223	319
68	105	250	357
70	112	263	376
73	121	284	407
76	132	307	438

Towing Stretchers



Nylon towing stretchers are manufactured with the following features:

- Made using 100% nylon rope with high elasticity
- Laid in single or double part
- Single part stretcher has spliced eyes each end
- Double part stretcher is in grommet (endless) form with a spliced joint
- Double part has strapping at each end to form eyes
- Terminated using 6-tuck splicing
- Both ends fitted with an integrated thimble and link
- Proof load tested to customer's requirement

Table of Minimum Breaking Load: Single & Double Part Nylon Towing Stretchers

Nylon Body (Single part) Size		Approximate Weight (kg/m)		*Minimum Breaking Load (metric tons)	
Diameter (mm)	Circle (inches)	Single Stretcher	Double Stretcher	Single Stretcher	Double Stretcher
80	10	3.85	7.70	110	220
96	12	5.45	10.90	152	304
112	14	7.50	15.00	189	378
120	15	8.00	16.00	230	461
130	16	8.89	17.78	270	540

***Splicing efficiency already taken into consideration**

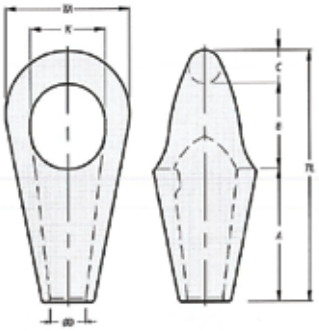
Spelter Sockets

Spelter sockets have a 100% efficiency when resin socketed therefore the full strength of the wire rope is achieved. KTL Offshore uses sockets from **Crosby (USA)** and **Ropeblock (Holland)**. For pennants, either closed spelter sockets are used or the more compact and lighter G-517 M-*Line/ Short Bow* socket (Pee Wee or Gold Nose type).

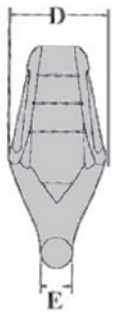
The *M-Line/Short Bow* sockets have the additional advantage of a streamlined shape – they slide easier over the tailboard or roller (no hang-ups) and they wind easier on the drum as compared to the closed spelter socket.

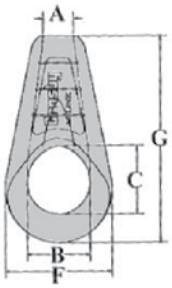
Ropeblock "Short Bow" Sockets ("Pee Wee/Gold Nose" Type)

Model No.	MBL (metric tons)	For Wire Rope Dia.		Dimensions (mm)							Weight (kg)
		(mm)	(inches)	A	B	C	D	K	TA	TL	
SBS 519	200	43-48	1¾-1⅞	188	120	48	51	112	178	356	15
SBS 522	250	49-54	2-2⅛	204	132	54	57	120	200	390	22
SBS 524	320	55-60	2¼-2⅜	230	148	62	63	135	220	440	27
SBS 526	400	61-68	2½-2⅝	235	165	68	73	150	250	468	40
SBS 527	500	69-75	2¾-2⅞	287	178	75	79	164	274	540	54
SBS 528	600	76-80	3-3⅛	314	195	76	86	175	295	585	75



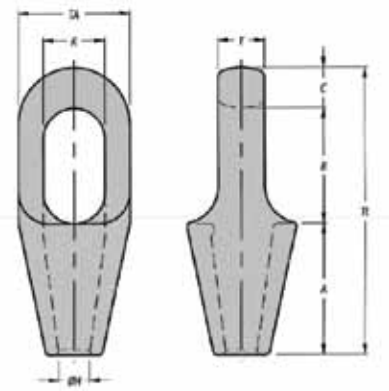
Crosby G-517 "M-Line" Mooring Sockets ("Pee Wee" Type)





G-517 Stock No.	MBL (metric tons)	For Wire Rope Dia		Dimensions (mm)							Weight (kg)
		(mm)	(inches)	A	B	C	D	E	F	G	
N/a	N/a	43-48	1¾ - 1⅞	For Crosby M-Line sockets below 2" wire rope diameter, data will be provided upon application							
1005002	227	50-54	2 - 2⅛	63.5	121	133	178	53.1	210	407	26
1005020	276	57-60	2¼ - 2⅜	70.5	133	146	196	58.7	233	455	35
1005048	362	64-67	2½ - 2⅝	77.5	149	170	217	68.3	257	505	48
1005066	453	70-73	2¾ - 2⅞	84.5	165	181	237	76.2	282	549	63
1005084	544	76-79	3 - 3⅛	89.0	184	197	262	82.6	313	597	88

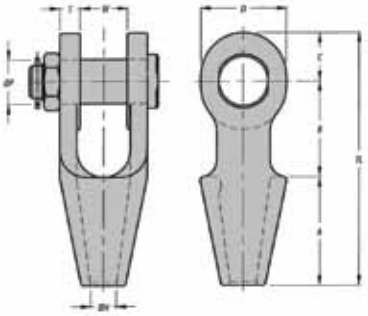
Crosby / Ropeblock (G-417 Type) Closed Spelter Socket



For Wire Rope Dia		MBL	Dimensions (mm)								Weight (kg)	
(mm)	(inches)	(metric tons)	A	B	C	H	K	T	TA	TL	*RB	**CB
43-48	$1^{3/4}$ - $1^{7/8}$	225 (*RB) 268 (**CB)	190	198	55	51	93	76	171	443	26	26
49-54	2 - $2^{1/8}$	280 (*RB) 291 (**CB)	216	224	62	57	100	82	193	502	37.5	36
55-60	$2^{1/4}$ - $2^{3/8}$	360 (*RB) 351(**CB)	228	247	73	63	112	92	216	548	50	48
61-68	$2^{1/2}$ - $2^{5/8}$	425 (*RB) 389 (**CB)	248	270	79	73	140	102	241	597	65	64
69-75	$2^{3/4}$ - $2^{7/8}$	460 (*RB) 511(**CB)	279	286	79	79	159	124	273	644	94	100
76-80	3 - $3^{1/8}$	560 (*RB) 563 (**CB)	305	298	83	86	171	133	292	686	110	125
82-86	3-1/4–3-3/8	625 (*RB) 722 (**CB)	330	311	102	92	184	146	311	743	146	142
88-92	3-1/2–3-5/8	720 (*RB) 779 (**CB)	356	330	102	99	197	159	330	787	168	181
94-102	3-3/4 – 4	875 (*RB) 851 (**CB)	381	356	108	108	216	178	362	845	210	246

***RB = Data provided by Ropeblock**
****CB = Data provided by Crosby**

Crosby / Ropeblock (G-416 Type) Open Spelter Socket



For Wire Rope Dia		MBL	Dimensions (mm)									Weight (kg)	
(mm)	(inches)	(metric tons)	A	B	C	D	H	P	T	TL	W	*RB	**CB
43-48	$1^{3/4}$ - $1^{7/8}$	225 (*RB) 268 (**CB)	190	178	100	176	51	89	39	468	89	41	37
49-54	2 - $2^{1/8}$	280 (*RB) 291 (**CB)	216	228	108	194	57	95	46	552	101	58	59
55-60	$2^{1/4}$ - $2^{3/8}$	360 (*RB) 351(**CB)	228	250	120	210	63	108	53	598	113	85	76
61-68	$2^{1/2}$ - $2^{5/8}$	425 (*RB) 389 (**CB)	248	273	133	236	73	121	60	654	127	118	114
69-75	$2^{3/4}$ - $2^{7/8}$	460 (*RB) 511(**CB)	279	279	138	240	79	127	73	696	133	155	143
76-80	3 - $3^{1/8}$	560 (*RB) 563 (**CB)	305	286	146	252	86	133	76	737	146	173	172
82-86	3-1/4–3-3/8	625 (*RB) 722 (**CB)	330	298	160	290	92	140	79	788	159	230	197
88-92	3-1/2–3-5/8	720 (*RB) 779 (**CB)	356	318	178	320	99	152	83	852	171	265	255
94-102	3-3/4 – 4	875 (*RB) 851 (**CB)	381	343	190	350	108	178	89	914	191	370	350

***RB = Data provided by Ropeblock**
****CB = Data provided by Crosby**

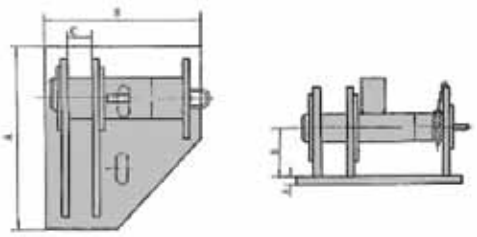
Guide To Amount Of Wirelock & Resin Required For Socketing

Wire Rope Size (inch)	WIRELOCK Required (cc)
1/4	9
5/16	17
3/8	17
7/16	35
1/2	35
9/16	52
5/8	52
3/4	86
7/8	125
1	160
1-1/8	210
1-1/4	350
1-3/8	350
1-1/2	420
1-5/8	495

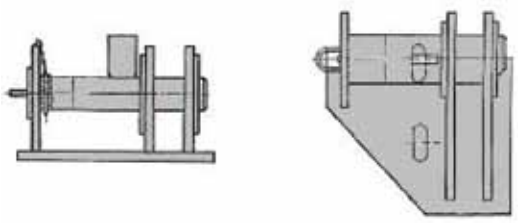
Wire Rope Size (inch)	WIRELOCK Required (cc)
1-3/4	700
1-7/8	700
2	1265
2-1/8	1265
2-1/4	1410
2-3/8	1410
2-1/2	1830
2-5/8	1830
2-3/4	2250
3	3160
3-1/4	3790
3-1/2	4920
3-3/4	5980
4	7730

Other Towing Equipment

Smit Bracket



Left Hand Smit bracket – for starboard side



Right Hand Smit bracket – for port side

Smit brackets are available in both left hand and right hand version.

Chain Diameter (mm)	Dimensions (mm)					
	A	B	C	D	H	Weight (kg)
54-56	500	450	72	160	25	100
62-64	625	600	100	180	35	198
76-78	800	720	110	228	35	311

Triangle Plates NEN 3561/DIN 82015

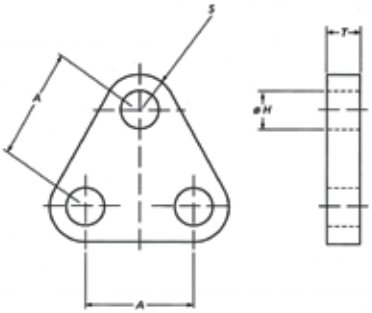
Stock No.	WLL (t)	MBL (t)	Dimension (mm)				Weight (kg)
			A	H	T	S	
51.008.02.00	2	10	75	23	25	25	2
51.008.03.00	3	15	90	30	30	30	3
51.008.05.00	5	25	115	39	35	40	5.05
51.008.08.00	8	40	140	48	45	50	10
51.008.10.00	10	50	145	52	50	55	15

Other sizes possible.
Painted blue or primer.

Minimum Ultimate Strength = 5xWLL

Triangle Plates, High tensile steel

Stock No.	WLL (t)	MBL (t)	Dimension (mm)				Weight (kg)
			A	H	T	S	
51.100.09.50	9.5	47.5	100	35	40	35	5
51.100.12.00	12	60	110	40	40	40	6.5
51.100.13.50	13.5	68	120	42	45	42.5	8.5
51.100.17.00	17	85	130	45	45	50	9.5
51.100.25.00	25	125	140	55	50	65	13.5
51.100.35.00	35	175	150	60	60	70	19
51.100.55.00	55	275	180	75	80	85	37.5
51.100.85.00	85	425	220	90	90	110	62
51.101.20.00	120	600	240	105	110	130	95
51.101.50.00	150	750	260	115	130	135	133
51.101.75.00	175	875	290	115	140	145	163
51.102.00.00	200	1000	380	140	150	160	282
51.102.50.00	250	1250	450	150	170	175	413

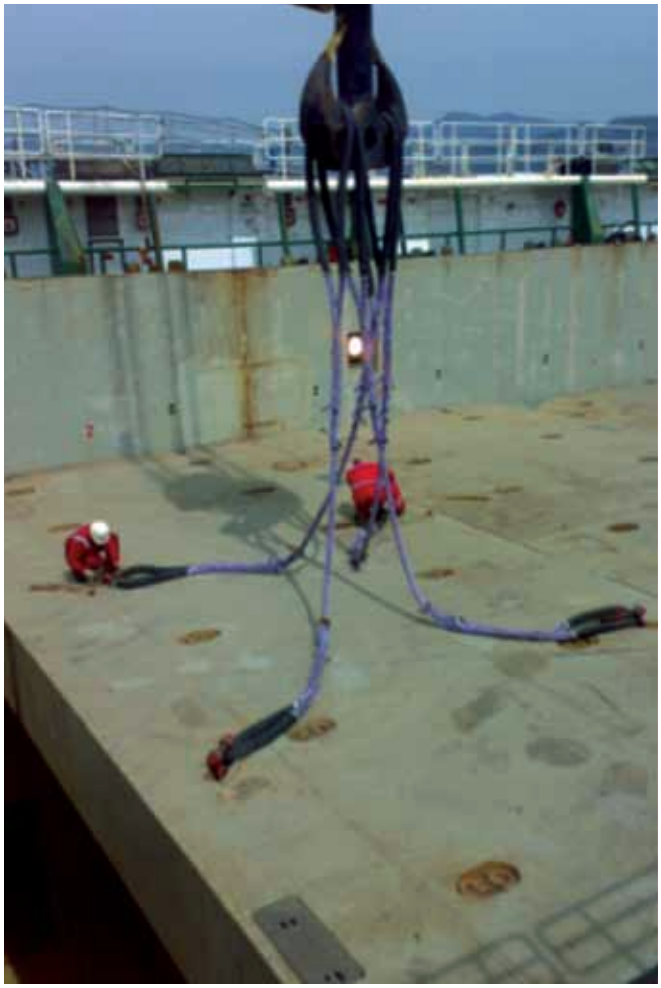


Other sizes possible. Painted blue or primer. Material and test certificate included.

Minimum Ultimate Strength = 5xWLL

SYNTHETIC SLINGS AND GROMMETS (HMPE)

High Strength, Light Weight, Easy and Safe Inspection



In today's fast moving world, the cost of rigging set-up time is expensive. Traditionally dominated by steel wire rope, slings comprise the backbone of the lifting accessories in use in almost all lifting operations around the world.

With the introduction of high performance synthetic rope – made from HMPE (High Modulus PolyEthylene) fibers – the rigging environment is changing.

As one of the world's premium heavy lift riggging manufacturers, KTL Offshore has combined forces with the world's foremsot HMPE rope manufacturer – Cortland Puget Sound Rope.

KimPlasma And Puget Sound Rope (PSR) Synthetic Rope Solutions – The Benefits In Lifting

The use of KTL Offshore's **KimPlasma** synthetic rope slings and grommets holds many advantages and during lifting when compared to using steel wire rope:

- Reduced weight - **removes self-weight penalty** of steel wire rope
- **Crane capacity not limited** by weight of rigging.
- **Installation and rigging set-up times** drastically reduced
- **Retains 100% strength** in sea water
- **Easily inspected**, externally and internally
- **Easily repaired** and spliced in the field
- **High fatigue** and abrasion resistance

CORTLAND
PUGET SOUND ROPE

KimPlasma Eye-and-Eye Slings and Grommets as a Replacement for Synthetic Round Slings

KimPlasma slings can be used to synthetic round slings in almost any application. The advantages of the KimPlasma range as compared to round slings – either polyester or HMPE round slings – are as follows:

FULL INSPECTABILITY

Every strand of every inch of the KimPlasma sling is visible and therefore inspectable – there are no hidden components.

HIGHEST ABRASION RESISTANCE

Plasma rope strands have been heat treated (recrystallized) and have a polyurethane coating that gives a tough, abrasion resistant surface finish – the toughest available.

EASY RE-SPLICING

The KimPlasma hand splicing can be done in the field – re-splicing of damaged sections will ensure longevity of the sling.

HIGH STRENGTH-TO WEIGHT

KimPlasma slings and grommets have the highest strength-to-mass ratio of any sling on the market.

LOW ELONGATION

KimPlasma slings and grommets have elongation properties at WLL of around 1-2%, equivalent to steel wire rope.

Nylon or Polyester cover tears easily – a cause for immediate discard or thorough inspection.

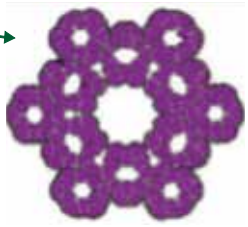
Nylon or Polyester cover prevents visual inspection of the core of the sling – a dangerous condition during repeat lifting.

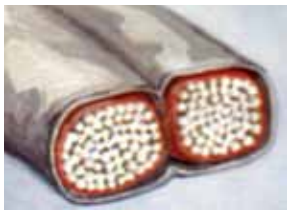
Round slings cannot be repaired in the field and once damaged, cannot be re-used. There is no re-splicing- a costly investment.

Polyester slings have high elongation (10-15%).

SOLID CROSS SECTION

KimPlasma slings and grommets have a simple 12 strand cross section comprised of relatively large diameter strands – no small strands that break easily. The construction is also easy to open up by hand, facilitating inspection.





Round slings are made up of multiple, small strands – this is inherently subject to rapid fatigue and mechanical damage.

KimPlasma slings are safer and more economical to use than round slings!

KimPlasma Eye-and-Eye Slings

The KimPlasma Eye-and-Eye sling is spliced by using a standard tucked hand splice. The splice is positively locking and will not slip under any circumstances. This splice does not require any tools and can be done in the field by suitably trained personnel. Protection at the eye is provided by a Nylon cover, which is easily removable and replaceable.

Product Code	Diameter	Diameter	Circ.	Unit Weight	Splice Length	Spliced MBL	SWL
	mm	inches	mm	Kg/100m	mm	Metric Tons	Metric Tons
					(Each end)		5:1
KP-1	8	5/16	22.5	4	473	5	1
KP-1.6	9	3/8	27	6	567	8	1.6
KP-2	11	7/16	30	6	630	10	2
KP-3	12	1/2	36	10	756	14	3
KP-6	18	3/4	54	20	1260	31	6
KP-10	24	1	72	35	1512	50	10
KP-15	30	1-1/4	90	54	1764	75	15
KP-20	36	1-1/2	108	77	2268	100	20
KP-26	40	1-5/8	120	98	2520	132	26
KP-28	44	1-3/4	132	117	2772	142	28
KP-32	48	2	144	136	3024	161	32
KP-39	52	2-1/8	156	162	3276	194	39
KP-44	56	2-1/4	168	182	3528	218	44
KP-48	60	2-1/2	180	220	3780	240	48
KP-54	64	2-5/8	192	249	4032	270	54
KP-60	68	2-3/4	204	278	4284	299	60
KP-71	72	3	216	319	4536	354	71
KP-85	80	3-1/4	240	388	5040	426	85
KP-113	88	3-5/8	264	482	5544	567	113
KP-138	96	4	288	586	6048	689	138

Notes:

1. **The sling MBL and SWL has already factored in a splicing efficiency of 0.90.**
2. **SWL is attained as long as D/d at the eye is greater than or equal to 1.**
3. **When used in basket hitch, D/d should not be less than 3. For a lower bending ratio, the SWL must be de-rated. Please consult KTL Offshore.**

KimPlasma Grommets (Endless Slings)

The KimPlasma Grommet is spliced by using a standard tucked hand splice. The splice is positively locking and will not slip under any circumstances. This splice does not require any tools and can be done in the field by suitably trained personnel. Protection at the eye is provided by a Nylon cover, which is easily removable and replaceable.

KimPlasma grommets have an exceptionally high strength-to-mass ratio.

Product Code	Diameter	Diameter	Circ.	Weight	Splice Length (Total)	Spliced MBL	SWL
	mm	inches	mm	Kg/100m	mm	Metric Tons	Metric Tons
							5:1
KPG-2	8	5/16	22.5	4	630	9	2
KPG-2.6	9	3/8	27	5	756	13	2.6
KPG-3	11	7/16	30	6	840	16	3
KPG-5	12	1/2	36	9	1008	23	5
KPG-10	18	3/4	54	20	1512	51	10
KPG-16	24	1	72	35	2016	82	16
KPG-25	30	1-1/4	90	54	2520	123	25
KPG-33	36	1-1/2	108	77	3024	165	33
KPG-44	40	1-5/8	120	98	3360	218	44
KPG-47	44	1-3/4	132	117	3696	235	47
KPG-53	48	2	144	136	4032	266	53
KPG-64	52	2-1/8	156	162	4368	320	64
KPG-72	56	2-1/4	168	182	4704	360	72
KPG-79	60	2-1/2	180	220	5040	397	79
KPG-89	64	2-5/8	192	248	5376	446	89
KPG-99	68	2-3/4	204	278	5712	494	99
KPG-117	72	3	216	318	6048	584	117
KPG-141	80	3-1/4	240	388	6720	703	141
KPG-187	88	3-5/8	264	482	7392	934	187
KPG-227	96	4	288	586	8064	1136	227

Notes:

1. The grommet MBL and SWL has already factored in a splicing efficiency.

2. SWL is attained as long as D/d at the bearing points is greater than or equal to 3.

3. For a lower bending ratio, the SWL must be de-rated. Please consult KTL Offshore.

GENERAL ENGINEERING SLINGS, GROMMETS AND SHACKLES

Used For Everyday Lifting, General Engineering Slings, Grommets And Shackles Are Usually Supplied With A Standard Rated Lifting Capacity

Turnback Eye Slings (Aluminium Swaged)

With sizes up to 4" (102mm) in diameter, our turnback eyes slings, which feature swaged aluminium ferrules, are an economical choice for general lifting.

Our aluminium ferrules conform to EN13411-3, while our slings are manufactured according to the ASME B30.3. In addition, we are able to produce slings according to the standard you require.

When considering the sling's load bearing capacity or minimum breaking load (MBL), the termination efficiency (T_E) is of vital importance. Several rigging manufacturers conveniently omit this in the technical specification when quoting their products. Not only is this reckless, it is also dangerous as the actual sling MBL will be overstated.

At KTL Offshore, we set our T_E at 0.90, which is in compliance with EN13411-3 for aluminium swaged slings.

Flemish Eye Slings (Steel Swaged)

KTL Offshore's range of Flemish eye slings come in a wide range of sizes: **from as small as 1/2" (12mm) to 6" (152mm) in diameter.**

Our slings conform to ASME B30.3 ensuring we have one of the highest industry manufacturing standards.

At KTL Offshore we use only the best steel ferrules for general engineering slings - Crosby's National Steel "Cold Tuff" Swaging Sleeve S-505. According to Crosby's rigorous quality standards - proven through decades of testing and certifying - the S-505 has the following T_E factors according to wire rope size:

Wire Rope Diameter		Termination Efficiency (For wire rope with *IWRC*)
(mm)	(inches)	
6 – 26	1/4 – 1	96%
28 – 52	1-1/8 – 2	92%
54 and Larger	2-1/8 and Larger	90%

In addition, the S-505 has the following advantages over other sleeves available in the industry:

- Designed for low temperature toughness
- Resists cracking when swaged (equals or exceeds stainless steel sleeves)
- Manufactured with special processed low carbon steel
- "Cold Tuff®" for better swageability

KTL Offshore Value Added Features:

- Termination efficiency is already factored into rated sling MBL or WLL as it appears on the test certification.
- The use of Crosby "Cold Tuff" steel sleeves—the world's most trusted brand for Flemish eyes slings.
- Our slings conform to the latest international standards.
- "After swage" dimensions are measured and recorded by the QC department to ensure that full swaging has taken place.

Accessories

Slings without thimble inserts are called "soft eye" slings. To protect the wire rope at the eye, it is recommended to use a steel thimble. Such slings are known as "hard eye" slings. There are several types of hard eye sling configurations possible.

a. Standard thimble—for regular use.
b. Heavy duty thimbles—for demanding applications.
c. Heavy duty with gusset—for high load or shock load applications.
d. Solid thimble—for connection on to some form of appliance, for example the pin of a crane boom. It gives excellent protection against crushing damage to the sling eye.

Quality Control

KTL Offshore has a fully functional Quality Control department. It performs regular batch testing on all manufactured products, and ensures our manufacturing methods conform to the latest international standards.

Our slings go through an extensive testing programme. This includes visual inspection and proof load testing. Load testing is done on a batch testing basis, which is in accordance to the latest international practice and standards.

Advantages Of Flemish Eye VS Turnback Slings

Flemish eye slings are established as the required standard for offshore lifting due to the following inherent advantages over turnback eye slings using steel or aluminium ferrules:

- The interlocking strands in the Flemish eye provide backup lifting capacity if ferrule should fail for any reason.
- The fatigue life of swaged S-505 steel ferrule, together with the interlocking strands, is much greater than the turnback eye slings. This means they have longer usable life and there is less chance for sudden failure.

Wire Rope Slings: Rated Capacity

Single Leg Wire Rope Slings Using FLEMISH Eyes (Up To 103mm)

Nominal Diameter		Sling MBL FLEMISH eyes with Crosby S-505 Steel Ferrule		WLL at 90 Deg (Single Leg, Vertical Application)		WLL in Basket Hitch 90 Deg		WLL in Basket Hitch 60 Deg	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
25.4	1.0	45	50	9.0	9.9	18.0	19.8	15.6	17.2
28	1-1/8	54	60	10.9	11.9	21.7	23.8	18.8	20.7
32	1-1/4	67	73	13.3	14.7	26.7	29.3	23.1	25.4
36	1-3/8	80	88	16.0	17.7	32.1	35.4	27.8	30.6
38	1-1/2	95	104	19.0	20.8	37.9	41.6	32.8	36.0
42	1-5/8	110	121	22.1	24.3	44.2	48.6	38.2	42.1
44	1-3/4	128	140	25.6	28.0	51.2	55.9	44.3	48.4
48	1-7/8	145	160	29.1	32.0	58.1	64.0	50.4	55.5
52	2.0	166	181	33.1	36.2	66.2	72.5	57.4	62.8
57	2-1/4	202	222	36.0	44.5	72.0	88.9	62.4	77.0
60	2-3/8	224	247	40.3	49.3	80.6	98.6	69.8	85.4
64	2-1/2	247	271	49.3	54.2	98.6	108.4	85.4	93.8
71	2-3/4	300	324	59.9	64.8	119.9	129.6	103.8	112.2
74	2-7/8	325	353	65.0	70.6	130.0	141.1	112.5	122.2
77	3.0	350	383	70.0	76.5	140.0	153.0	121.3	132.5
83	3-1/4	402	444	80.5	88.7	160.9	177.5	139.4	153.7
90	3-1/2	467	507	93.4	101.3	186.8	202.7	161.8	175.5
103	4.0	599	648	119.7	129.6	239.4	259.2	207.3	224.5

MBL= Minimum Breaking Load and WLL= Working Load Limit and already takes into consideration the termination efficiency according to Crosby's published data for S-505 steel ferrules for Flemish eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.
BASKET WLL based on a D/d of 25:1 or greater. For a D/d below this value, the bending efficiency must be considered and the sling de-rated.

Single Leg Wire Rope Slings Using ALUMINIUM-TURNBACK Eyes (Up To 103mm)

Nominal Diameter		Sling MBL TURNBACK eyes with Aluminium Ferrule		WLL at 90 Deg (Single Leg, Vertical Application)		WLL in Basket Hitch 90 Deg		WLL in Basket Hitch 60 Deg	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
25.4	1.0	42	51	8.4	10.2	16.9	20.4	14.6	17.7
28	1-1/8	53	58	10.6	11.7	21.2	23.3	18.4	20.2
32	1-1/4	65	72	13.1	14.3	26.1	28.7	22.6	24.8
36	1-3/8	78	86	15.7	17.3	31.4	34.6	27.2	30.0
38	1-1/2	93	102	18.5	20.3	37.1	40.7	32.1	35.2
42	1-5/8	108	119	21.6	23.8	43.2	47.5	37.4	41.2
44	1-3/4	125	137	25.0	27.4	50.0	54.7	43.3	47.4
48	1-7/8	142	157	28.4	31.3	56.9	62.6	49.3	54.2
52	2.0	162	177	32.4	35.5	64.8	70.9	56.1	61.4
57	2-1/4	202	222	36.0	44.5	72.0	88.9	62.4	77.0
60	2-3/8	224	247	40.3	49.3	80.6	98.6	69.8	85.4
64	2-1/2	247	271	49.3	54.2	98.6	108.4	85.4	93.8
71	2-3/4	300	324	59.9	64.8	119.9	129.6	103.8	112.2
74	2-7/8	325	353	65.0	70.6	130.0	141.1	112.5	122.2
77	3.0	350	383	70.0	76.5	140.0	153.0	121.3	132.5
83	3-1/4	402	444	80.5	88.7	160.9	177.5	139.4	153.7
90	3-1/2	467	507	93.4	101.3	186.8	202.7	161.8	175.5
103	4.0	599	648	119.7	129.6	239.4	259.2	207.3	224.5

MBL= Minimum Breaking Load and WLL= Working Load Limit and already takes into consideration the termination efficiency according to EN13411-3:2004 for Aluminium turnback eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.
BASKET WLL based on a D/d of 25:1 or greater. For a D/d below this value, the bending efficiency must be considered and the sling de-rated.

Two Legged Wire Rope Slings Using FLEMISH Eyes (Up To 52mm)

Nominal Diameter		2-Legged Wire Rope Sling: Flemish Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
13	1/2	4.6	5.1	4.0	4.4	3.3	3.6	2.3	2.5
16	5/8	7.2	7.9	6.2	6.9	5.1	5.6	3.6	4.0
19	3/4	10.3	11.3	8.9	9.8	7.2	8.0	5.1	5.6
22	7/8	13.9	15.2	12.0	13.2	9.8	10.8	6.9	7.6
25.4	1.0	18.0	19.8	15.6	17.2	12.7	14.0	9.0	9.9
28	1-1/8	21.7	23.8	18.8	20.7	15.4	16.9	10.9	11.9
32	1-1/4	26.7	29.3	23.1	25.4	18.9	20.7	13.3	14.7
36	1-3/8	32.1	35.4	27.8	30.6	22.7	25.0	16.0	17.7
38	1-1/2	37.9	41.6	32.8	36.0	26.8	29.4	19.0	20.8
42	1-5/8	44.2	48.6	38.2	42.1	31.2	34.3	22.1	24.3
44	1-3/4	51.2	55.9	44.3	48.4	36.2	39.5	25.6	28.0
48	1-7/8	58.1	64.0	50.4	55.5	41.1	45.3	29.1	32.0
52	2.0	66.2	72.5	57.4	62.8	46.8	51.3	33.1	36.2

WLL= Working Load Limit and already takes into consideration the termination efficiency according to Crosby's published data for S-505 steel ferrules for Flemish eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.

Two Legged Wire Rope Slings Using ALUMINIUM-TURNBACK Eyes (Up To 52mm)

Nominal Diameter		2-Legged Wire Rope Sling: Aluminium Turnback Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
13	1/2	4.4	4.8	3.8	4.1	3.1	3.4	2.2	2.4
16	5/8	6.7	7.4	5.8	6.4	4.8	5.2	3.4	3.7
19	3/4	9.6	10.6	8.3	9.2	6.8	7.5	4.8	5.3
22	7/8	13.0	14.3	11.3	12.4	9.2	10.1	6.5	7.1
25.4	1.0	16.9	18.6	14.6	16.1	11.9	13.1	8.4	9.3
28	1-1/8	21.2	23.3	18.4	20.2	15.0	16.5	10.6	11.7
32	1-1/4	26.1	28.7	22.6	24.8	18.5	20.3	13.1	14.3
36	1-3/8	31.4	34.6	27.2	30.0	22.2	24.5	15.7	17.3
38	1-1/2	37.1	40.7	32.1	35.2	26.2	28.8	18.5	20.3
42	1-5/8	43.2	47.5	37.4	41.2	30.5	33.6	21.6	23.8
44	1-3/4	50.0	54.7	44.3	47.4	35.4	38.7	25.0	27.4
48	1-7/8	56.9	62.6	49.3	54.2	40.2	44.3	28.4	31.3
52	2.0	64.8	70.9	56.1	61.4	45.8	50.1	32.4	35.5

WLL= Working Load Limit and already takes into consideration the termination efficiency according to EN13411-3:2004 for Aluminium turnback eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.

Two Legged Wire Rope Slings Using FLEMISH Eyes Or ALUMINIUM-TURNBACK Eyes (57mm And Above)

Nominal Diameter		2-Legged Wire Rope Sling: Flemish Eye Or Aluminium Turnback Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
57	2-1/4	72.0	88.9	62.4	77.0	50.9	62.9	36.0	44.5
60	2-3/8	80.6	98.6	69.8	85.4	57.0	69.7	40.3	49.3
64	2-1/2	98.6	108	85.4	93.8	69.7	76.6	49.3	54.2
71	2-3/4	120	130	104	112	85	92	60	65
74	2-7/8	130	141	113	122	92	100	65	71
77	3.0	140	153	121	132	99	108	70	77
83	3-1/4	161	177	139	154	114	125	80	89
90	3-1/2	187	203	162	176	132	143	93	101
103	4.0	239	259	207	224	169	183	120	130

WLL= Working Load Limit and already takes into consideration the termination efficiency according to Crosby's published data for S-505 steel ferrules for Flemish eyes and EN13411-3:2004 for Aluminium turnback eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.

Single and two legged wire rope slings can be supplied with a variety of configurations and fitting such as soft or hard eyes, solid or standard thimbles, master links, hooks, and shackles. Ensure the slings rated capacity (WLL) matches the lowest rated component in the assembly.

Three Legged Wire Rope Slings Using FLEMISH Eyes

Nominal Diameter		3-Legged Wire Rope Sling: Flemish Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
13	1/2	7.0	7.6	6.0	6.6	4.9	5.4	3.5	3.8
16	5/8	10.8	11.9	9.3	10.3	7.6	8.4	5.4	5.9
19	3/4	15.4	16.9	13.3	14.7	10.9	12.0	7.7	8.5
22	7/8	20.8	22.9	18.0	19.8	14.7	16.2	10.4	11.4
25.4	1.0	27.0	29.7	23.4	25.7	19.1	21.0	13.5	14.9
28	1-1/8	32.6	35.8	28.2	31.0	23.0	25.3	16.3	17.9
32	1-1/4	40.0	44.0	34.7	38.1	28.3	31.1	20.0	22.0
36	1-3/8	48.1	53.0	41.6	45.9	34.0	37.5	24.0	26.5
38	1-1/2	56.9	62.4	49.2	54.0	40.2	44.1	28.4	31.2
42	1-5/8	66.2	72.9	57.4	63.1	46.8	51.5	33.1	36.4
44	1-3/4	76.7	83.9	66.4	72.7	54.2	59.3	38.4	42.0
48	1-7/8	87.2	96.0	75.5	83.2	61.7	67.9	43.6	48.0
52	2.0	99.4	108.7	86.0	94.2	70.2	76.9	49.7	54.4

WLL= Working Load Limit and already takes into consideration the termination efficiency according to Crosby's published data for S-505 steel ferrules for Flemish eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.

Three Legged Wire Rope Slings Using ALUMINIUM-TURNBACK Eyes

Nominal Diameter		3-Legged Wire Rope Sling: Aluminium Turnback Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
13	1/2	6.5	7.1	5.7	6.2	4.6	5.0	3.3	3.6
16	5/8	10.1	11.1	8.7	9.6	7.1	7.9	5.0	5.6
19	3/4	14.4	15.9	12.5	13.7	10.2	11.2	7.2	7.9
22	7/8	19.5	21.4	16.9	18.6	13.8	15.2	9.7	10.7
25.4	1.0	25.3	27.9	21.9	24.1	17.9	19.7	12.7	13.9
28	1-1/8	31.9	35.0	27.6	30.3	22.5	24.7	15.9	17.5
32	1-1/4	39.2	43.0	33.9	37.3	27.7	30.4	19.6	21.5
36	1-3/8	47.4	51.9	40.7	44.9	33.3	36.7	23.5	25.9
38	1-1/2	55.6	61.0	48.2	52.8	39.3	43.1	27.8	30.5
42	1-5/8	64.8	71.3	56.1	61.7	45.8	50.4	32.4	35.6
44	1-3/4	75.1	82.1	65.0	71.1	53.1	58.0	37.5	41.0
48	1-7/8	85.3	94.0	73.9	81.4	60.3	66.4	42.7	47.0
52	2.0	97.2	106.4	84.2	92.1	68.7	75.2	48.6	53.2

WLL= Working Load Limit and already takes into consideration the termination efficiency according to EN13411-3:2004 for Aluminium turnback eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.

Three legged wire rope slings can be supplied with a variety of configurations and fittings such as soft or hard eyes, solid or standard thimbles, master links, hooks and shackles. Ensure the sling rated capacity (WLL) matches the lowest rated component in the assembly.

Four Legged Wire Rope Slings Using FLEMISH Eyes

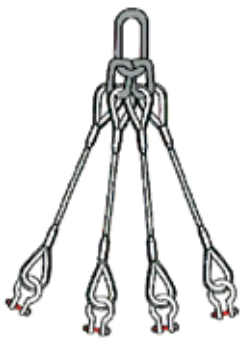
Nominal Diameter		4-Legged Wire Rope Sling: Flemish Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
13	1/2	9.3	10.1	8.0	8.8	6.6	7.2	4.6	5.1
16	5/8	14.4	15.8	12.4	13.7	10.2	11.2	7.2	7.9
19	3/4	20.5	22.6	17.8	19.6	14.5	16.0	10.3	11.3
22	7/8	27.7	30.5	24.0	26.4	19.6	21.6	13.9	15.2
25.4	1.0	36.0	39.6	31.2	34.3	25.5	28.0	18.0	19.8
28	1-1/8	43.4	47.7	37.6	41.3	30.7	33.7	21.7	23.8
32	1-1/4	53.4	58.7	46.2	50.8	37.7	41.5	26.7	29.3
36	1-3/8	64.1	70.7	55.5	61.3	45.3	50.0	32.1	35.4
38	1-1/2	75.8	83.2	65.6	72.0	53.6	58.8	37.9	41.6
42	1-5/8	88.3	97.2	76.5	84.1	62.4	68.7	44.2	48.6
44	1-3/4	102.3	111.9	88.6	96.9	72.3	79.1	51.2	55.9
48	1-7/8	116.3	128.1	100.7	110.9	82.2	90.5	58.1	64.0
52	2.0	132.5	145.0	115	126	93.7	102.5	66.2	72.5

WLL= Working Load Limit and already takes into consideration the termination efficiency according to Crosby's published data for S-505 steel ferrules for Flemish eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.

Four Legged Wire Rope Slings Using ALUMINIUM-TURNBACK Eyes

Nominal Diameter		4-Legged Wire Rope Sling: Aluminium Turnback Eye							
		WLL at 90 Deg DF=5		WLL at 60 Deg DF=5		WLL at 45 Deg DF=5		WLL at 30 Deg DF=5	
		EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS	EIPS	EEIPS
(mm)	(inches)	(metric tons)		(metric tons)		(metric tons)		(metric tons)	
13	1/2	8.7	9.5	7.5	8.2	6.2	6.7	4.4	4.8
16	5/8	13.5	14.8	11.7	12.8	9.5	10.5	6.7	7.4
19	3/4	19.2	21.2	16.6	18.3	13.6	15.0	9.6	10.6
22	7/8	26.0	28.6	22.5	24.8	18.4	20.2	13.0	14.3
25.4	1.0	33.8	37.2	29.2	32.2	23.9	26.3	16.9	18.6
28	1-1/8	42.5	46.7	36.8	40.4	30.0	33.0	21.2	23.3
32	1-1/4	52.2	57.4	45.2	49.7	36.9	40.6	26.1	28.7
36	1-3/8	62.7	69.2	54.3	59.9	44.3	48.9	31.4	34.6
38	1-1/2	74.2	81.4	64.2	70.5	52.4	57.5	37.1	40.7
42	1-5/8	86.4	95.0	74.8	82.3	61.1	67.2	43.2	47.5
44	1-3/4	100.1	109.4	86.7	94.8	70.8	77.4	50.0	54.7
48	1-7/8	113.8	125.3	98.5	108.5	80.4	88.6	56.9	62.6
52	2.0	129.6	141.8	112	123	91.6	100.3	64.8	70.9

WLL= Working Load Limit and already takes into consideration the termination efficiency according to EN13411-3:2004 for Aluminium turnback eyes.
DF = Design (Safety) Factor and for general engineering slings a factor of 5 is recommended.
WLL is based on a bend diameter at the eyes of the sling with a D/d of at least 1.0.



Four legged wire rope slings are made with a master link assembly and can be supplied with a variety of configurations and fittings such as soft or hard eyes, solid or standard thimbles, hooks and shackles. Ensure the sling capacity (WLL) matches the lowest rated component in the assembly.

Wire Rope Grommets: Rated Capacity

KimFlex Grommets

KimFlex grommets are braided grommets that offer excellent flexibility, strength and durability.

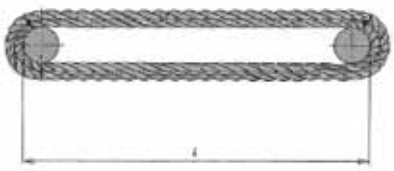
For offshore work, our KimFlex grommets are often used to replace synthetic slings. This is due to the difficulty in assessing the condition of the interior of the synthetic slings.

KIMFLEX Grommet Diameter		EIPS Grade			
		CGBL (MBL)	WLL in Vertical (DF = 5:1)	Vertical Basket Hitch (DF = 5:1)	WLL in 60° Basket Hitch (DF = 5:1)
					
(mm)	(inches)	(metric tons)	(metric tons)	(metric tons)	(metric tons)
32	1.26	65	10.1	20.1	17.4
40	1.57	99	15.4	30.8	26.7
48	1.89	174	27.0	54.1	46.8
56	2.20	219	34.0	67.9	58.8
64	2.52	269	41.8	83.6	72.4
76	2.99	385	59.7	119.3	103.4
88	3.46	520	80.7	161.4	139.7
96	3.78	589	91.4	182.8	158.3
104	4.09	675	104.8	209.6	181.5
For grommet diameter greater than 104mm, please look under Heavy Lift Slings and Grommet Section					

DF = Design (Safety) Factor. This may change according to the customer's requirement.
WLL in VERTICAL is based on a vertical pull (90 degrees) with both parts (legs) of the grommet considered and with a D/d of at least 5:1. For lower D/d ratios, the effects of bending on the grommet strength must be considered and may be estimated by applying the formula: $E_B = 1\text{-}0.5/(\sqrt{D/d})$.
KIMFLEX grommets in general conform to ASME B30.9:2003.

Cable Laid Grommets

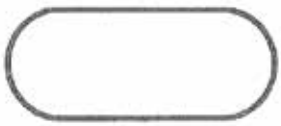
Cable laid grommets have a 6 over 1 construction in two parts where the outer component wire rope is laid up over the core component rope. The core is butted and tucked. This area is marked with red paint and the grommet should never be lifted at this point. The core is disregarded in the strength calculation as it is only butted. These grommets offer excellent strength, crushing resistance and durability.



Cable Laid Grommet Diameter		Dimensions (inch)			
		CGBL (MBL)	WLL in Vertical (DF = 5:1)	Vertical Basket Hitch (DF = 5:1)	60° Basket Hitch (DF = 5:1)
					
(mm)	(inches)	(metric tons)	(metric tons)	(metric tons)	(metric tons)
24	0.9	45	7.0	14.0	12.1
42	1.7	138	21.5	42.9	37.2
48	1.9	140	28.0	56.1	48.5
54	2.1	177	35.5	70.9	61.4
57	2.2	197	39.5	79.1	68.5
60	2.4	219	43.8	87.6	75.9
72	2.8	315	63.1	126.1	109.2
84	3.3	429	85.8	171.7	148.7
90	3.5	492	98.5	197.1	170.7
96	3.8	560	112.1	224.2	194.2
102	4.0	632	126.6	253.1	219.2
105	4.1	670	134.1	268.3	232.3
For grommet diameter greater than 105mm, please look under Heavy Lift Slings and Grommets section					

DF = Design (Safety) Factor. This may change according to the customer's requirement.
WLL in VERTICAL is based on a vertical pull (90 degrees) with both parts (legs) of the grommet considered and with a D/d of at least 5:1. For lower D/d ratios, the effects of bending on the grommet strength must be considered and may be estimated by applying the formula: $E_B = 1\text{-}0.5/(\sqrt{D/d})$.
Cable laid grommets conform to IMCA M179: 2005.

Strand Laid Hand Tucked Grommet Diameter		EIPS Grade		
		WLL in Vertical (DF = 5:1)	WLL in Vertical Basket Hitch (DF = 5:1)	WLL in 60° Basket Hitch (DF = 5:1)
				
(mm)	(inches)	(metric tons)	(metric tons)	(metric tons)
16	5/8	5.2	9.9	8.6
19	3/4	7.4	14.5	12.6
22	7/8	9.9	19.9	17.2
26	1	12.7	26.3	22.8
28	1-1/8	16.3	31.8	27.5
32	1-1/4	19.1	39.0	33.8
35	1-3/8	22.7	46.3	40.1
38	1-1/2	27.2	54.4	47.1
42	1-5/8	30.8	62.6	54.2
45	1-3/4	36.3	71.7	62.1
48	1-7/8	40.8	80.7	69.9
50	2	45.4	91.6	79.3
54	2-1/8	50.8	101.6	87.9
57	2-1/4	56.3	112.5	97.4
60	2-3/8	61.7	124.3	107.6
64	2-1/2	68.0	135.2	117.1
67	2-5/8	74.4	148.8	128.9
71	2-3/4	80.7	160.6	139.1
74	2-7/8	86.2	173.3	150.1
76	3	94.3	187.8	162.6



Strand Laid Hand Tucked Grommets

Strand laid hand tucked grommets are made from one continuous length of strand. To manufacture a very smooth, circular grommet, the sleeves are omitted when making the joint. The core of the grommet does not contribute towards the CGBL. Therefore, it must be disregarded in the strength calculation. These grommets offer excellent strength, crushing resistance and durability.

DF = Design (Safety) Factor. This may change according to the customer's requirement.
WLL in VERTICAL is based on a vertical pull (90 degrees) with both parts (legs) of the grommet considered with a D/d of at least 5:1. For lower D/d ratios, the effects of bending on the grommet strength must be considered and may be estimated by applying the formula: $E_B = 1\text{-}0.5/(\sqrt{D/d})$.
Strand laid hand tucked grommets conform to WRTB's Wire Rope Sling Users Manual: Third Edition.

Strand laid Mechanical Spliced (Al-Swaged) Grommet Diameter		EIPS Grade		
		WLL in Vertical DF = 5:1	WLL in Vertical Basket Hitch DF = 5:1	WLL in 60° Basket Hitch DF = 5:1
				
(mm)	(inches)	(metric tons)	(metric tons)	(metric tons)
16	5/8	5.8	11.8	10.2
19	3/4	8.4	16.3	14.1
22	7/8	10.9	22.7	19.7
26	1	14.5	29.0	25.1
28	1-1/8	18.1	37.2	32.2
32	1-1/4	22.7	45.4	39.3
35	1-3/8	27.2	54.4	47.1
38	1-1/2	32.7	64.4	55.8
42	1-5/8	37.2	74.4	64.4
45	1-3/4	43.5	86.2	74.7
48	1-7/8	49.0	98.9	85.6
50	2	56.2	112.5	97.4
54	2-1/8	62.6	125.2	108.4
57	2-1/4	59.9	139.7	121.0
60	2-3/8	77.1	155.1	134.3
64	2-1/2	85.3	170.6	147.7
67	2-5/8	93.4	187.8	162.6
71	2-3/4	102.5	204.1	176.8
74	2-7/8	110.7	222.3	192.5
76	3	120.7	240.4	208.2

Strand Laid Mechanical Splice (Al-Swaged) Grommets

Strand laid mechanical splice grommets are made from a single length of steel wire rope joined mechanically by swaging one or more aluminium ferrules to connect the two ends of the grommet. These grommets are not as smooth as the strand laid hand tucked type but do offer the advantage of a clear indication of the splice area. They offer ease of use and are regularly utilised in shipyards.

DF = Design (Safety) Factor. This may change according to the customer's requirement.
WLL in VERTICAL is based on a vertical pull (90 degrees) with both parts (legs) of the grommet considered with a D/d of at least 5:1. For lower D/d ratios, the effects of bending on the grommet strength must be considered and may be estimated by applying the formula: $E_B = 1\text{-}0.5/(\sqrt{D/d})$.
Strand laid mechanical spliced grommets conform to WRTB's Wire Rope Sling Users Manual: Third Edition.

Shackles For General Lifting

Crosby—The Market Leader

Being one of the world's largest Crosby dealers places KTL Offshore in a position to offer the widest range of shackles available in the market.

Crosby is our premium brand of shackles and our recommended choice for any application.

Why Buy Crosby?

Consider the following value added features provided by the Crosby brand:

1. **Made in the USA**

   Absolutely no genuine Crosby product is made in China. Majority of the products are made in the USA, while some smaller shackles are manufactured in Crosby's facilities in the European and Canadian markets.

2. **Charpy impact properties**

   Shackles have enhanced impact properties for greater toughness at all temperatures.

3. **Reduced brittleness**

   Bows and pins are quenched and tempered to reduce brittleness.

4. **QUIC-CHECK®**

   All shackles (except G-2160) incorporate two marking indicators forged into the shackle bow at 45° angles from vertical. These allow the approximate angle of a two-legged hitch to be checked quickly.

5. **Material analysis**

   Crosby can provide certified material (mill) analysis for each production lot, that is traceable by the product.

6. **Product Identification Code (PIC)**

   Crosby verifies the analysis of each heat of steel and every shackle is traceable back to the steel making process.

7. **Fatigue testing**

   1/3t to 55t shackles are fatigue tested to meet the Euronorm standard of 20,000 cycles at 1.5x WLL.

8. **Field inspection**

   Written instructions for visual, magnaflux, and dye penetrant inspection of shackles are available from Crosby and KTL Offshore. In addition, acceptance criteria and repair procedures for shackles are available.

Standard Round Pin Anchor Shackles: Crosby G-209 And G-210

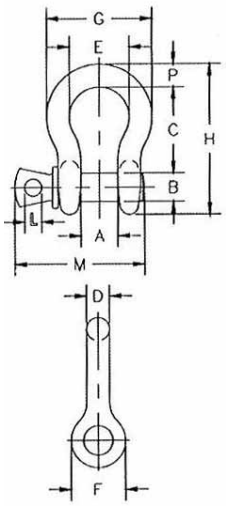
G/S-209

G/S-210

- Wide capacity range: 1/3 through 55 metric tons.
- Forged Quenched and Tempered, with alloy pin.
- Working Load Limit permanently shown on every shackle.
- Hot Dip galvanised or Self Coloured.
- Fatigue Rated.
- Shackles can be furnished proof tested with certificates to designated standards such as ABS, DNV, Lloyds or other certification. Charged for proof testing and certification are available when requested at the time of order.
- Shackles are Quenched and Tempered, and meet DNV impact requirements of 42 joules at -20°C.

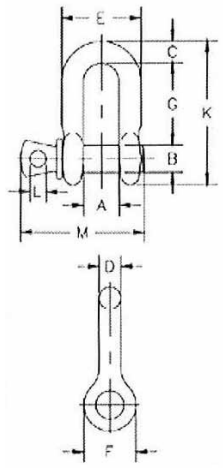
G-209

Nominal Size (inch)	Working Load Limit (t)*	Stock No.	Weight Each (lbs.)	Dimensions (inches)											Tolerance +/-	
		G-209		A	B	C	D	E	F	G	H	L	M	P	C	A
3/16	1/3	1018357	.06	.38	.25	.88	.19	.60	.56	.98	1.47	.16	1.12	.19	.06	.06
1/4	1/2	1018375	.10	.47	.31	1.13	.25	.78	.61	1.28	1.84	.19	1.38	.25	.06	.06
5/16	3/4	1018393	.19	.53	.38	1.22	.31	.84	.75	1.47	2.09	.22	1.66	.31	.06	.06
3/8	1	1018419	.31	.66	.44	1.44	.38	1.03	.91	1.78	2.49	.25	2.03	.38	.06	.06
7/16	1-1/2	1018437	.38	.75	.50	1.69	.44	1.16	1.06	2.03	2.91	.31	2.38	.44	.13	.06
1/2	2	1018455	.72	.81	.63	1.88	.50	1.31	1.19	2.31	3.28	.38	2.69	.50	.13	.06
5/8	3-1/4	1018473	1.37	1.06	.75	2.38	.63	1.69	1.50	2.94	4.19	.44	3.34	.69	.13	.06
3/4	4-3/4	1018491	2.35	1.25	.88	2.81	.75	2.00	1.81	3.50	4.97	.50	3.97	.81	.13	.06
7/8	6-1/2	1018516	3.62	1.44	1.00	3.31	.88	2.28	2.09	4.03	5.83	.50	4.50	.97	.25	.06
1	8-1/2	1018534	5.03	1.69	1.13	3.75	1.00	2.69	2.38	4.69	6.56	.56	5.07	1.06	.25	.06
1-1/8	9-1/2	1018552	7.41	1.81	1.25	4.25	1.16	2.91	2.69	5.16	7.47	.63	5.59	1.25	.25	.06
1-1/4	12	1018570	9.50	2.03	1.38	4.69	1.29	3.25	3.00	5.75	8.25	.69	6.16	1.38	.25	.06
1-3/8	13-1/2	1018598	13.53	2.25	1.50	5.25	1.42	3.63	3.31	6.38	9.16	.75	6.84	1.50	.25	.13
1-1/2	17	1018614	17.20	2.38	1.63	5.75	1.54	3.88	3.63	6.88	10.00	.81	7.35	1.62	.25	.13
1-3/4	25	1018632	27.78	2.88	2.00	7.00	1.84	5.00	4.19	8.86	12.34	1.00	9.08	2.25	.25	.13
2	35	1018650	45.00	3.25	2.25	7.75	2.08	5.75	4.81	9.97	13.68	1.22	10.34	2.40	.25	.13
2-1/2	55	1018687	85.75	4.13	2.75	10.50	2.71	7.25	5.69	12.87	17.84	1.38	13.00	3.13	.25	.25



G-210

Nominal Size (inch)	Working Load Limit (t)*	Stock No.	Weight Each (lbs.)	Dimensions (inches)										Tolerance +/-	
		G-210		A	B	C	D	E	F	G	K	L	M	G	A
1/4	1/2	1019150	.11	.47	.31	.25	.25	.97	.62	.97	1.59	.19	1.43	.06	.06
5/16	3/4	1019178	.17	.53	.38	.31	.31	1.15	.75	1.07	1.91	.22	1.71	.06	.06
3/8	1	1019196	.28	.66	.44	.38	.38	1.42	.92	1.28	2.31	.25	2.02	.13	.06
7/16	1-1/2	1019212	.43	.75	.50	.44	.44	1.63	1.06	1.48	2.67	.31	2.37	.13	.06
1/2	2	1019230	.59	.81	.63	.50	.50	1.81	1.18	1.66	3.03	38	2.69	.13	.06
5/8	3-1/4	1019258	1.25	1.06	.75	.63	.63	2.32	1.50	2.04	3.76	.44	3.34	.13	.06
3/4	4-3/4	1019276	2.63	1.25	.88	.81	.75	2.75	1.81	2.40	4.53	.50	3.97	.25	.06
7/8	6-1/2	1019294	3.16	1.44	1.00	.97	.88	3.20	2.10	2.86	5.33	.50	4.50	.25	.06
1	8-1/2	1019310	4.75	1.69	1.13	1.00	1.00	3.69	2.38	3.24	5.94	.56	5.13	.25	.06
1-1/8	9-1/2	1019338	6.75	1.81	1.25	1.25	1.13	4.07	2.69	3.61	6.78	.63	5.71	.25	.06
1-1/4	12	1019356	9.06	2.03	1.38	1.38	1.25	4.53	3.00	3.97	7.50	.69	6.25	.25	.13
1-3/8	13-1/2	1019374	11.63	2.25	1.50	1.50	1.38	5.01	3.31	4.43	8.28	.75	6.83	.25	.13
1-1/2	17	1019392	15.95	2.38	1.63	1.62	1.50	5.38	3.62	4.84	9.05	.81	7.33	.25	.13
1-3/4	25	1019418	26.75	2.88	2.00	2.12	1.75	6.38	4.19	5.78	10.97	1.00	9.06	.25	.13
2	35	1019436	42.31	3.25	2.25	2.36	2.10	7.25	5.00	6.77	12.74	1.13	10.35	.25	.13
2-1/2	55	1019454	71.75	4.12	2.75	2.63	2.63	9.38	5.68	8.07	14.85	1.38	13.00	.25	.25



*** NOTE: Maximum Proof Load is 2.0 times the Working Load Limit. Minimum Ultimate Strength is 6 times the Working Load Limit. For Working Load Limit reduction due to side loading applications, see page 63.**

Standard Bolt-Type Anchor Shackles: Crosby G-2130 And G-2150

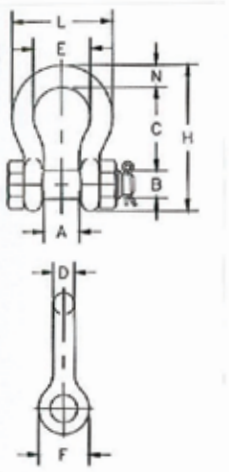

G/S-2130


G/S-2150

- Working Load Limit permanently shown on every shackle.
- Wide capacity range: 1/3 through 150 metric ton.
- Forged Quenched and Tempered, with alloy pins.
- Hot Dip galvanised or Self Coloured.
- Fatigue Rated.

G-2130

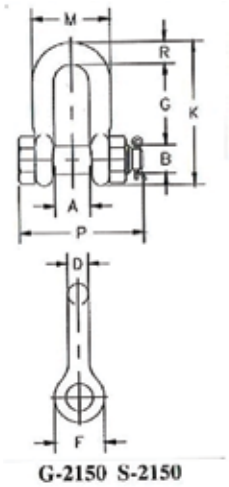
Nominal Size (inches)	Working Load Limit (t)*	Stock No.	Weight Each (lbs.)	Dimensions (inches)									Tolerance +/-	
		G-2130		A	B	C	D	E	F	H	L	N	C	A
3/16	1/3	1019464	.06	.38	.25	.88	.19	.60	.56	1.47	.98	.19	.06	.06
1/4	1/2	1019466	.11	.47	.31	1.13	.25	.78	.61	1.84	1.28	.25	.06	.06
5/16	3/4	1019468	.22	.53	.38	1.22	.31	.84	.75	2.09	1.47	.31	.06	.06
3/8	1	1019470	.33	.66	.44	1.44	.38	1.03	.91	2.49	1.78	.38	.13	.06
7/16	1-1/2	1019471	.49	.75	.50	1.69	.44	1.16	1.06	2.91	2.03	.44	.13	.06
1/2	2	1019472	.79	.81	.64	1.88	.50	1.31	1.19	3.28	2.31	.50	.13	.06
5/8	3-1/4	1019490	1.68	1.06	.77	2.38	.63	1.69	1.50	4.19	2.94	.69	.13	.06
3/4	4-3/4	1019515	2.72	1.25	.89	2.81	.75	2.00	1.81	4.97	3.50	.81	.25	.06
7/8	6-1/2	1019533	3.95	1.44	1.02	3.31	.88	2.28	2.09	5.83	4.03	.97	.25	.06
1	8-1/2	1019551	5.66	1.69	1.15	3.75	1.00	2.69	2.38	6.56	4.69	1.06	.25	.06
1-1/8	9-1/2	1019579	8.27	1.81	1.25	4.25	1.13	2.91	2.69	7.47	5.16	1.25	.25	.06
1-1/4	12	1019597	11.71	2.03	1.40	4.69	1.29	3.25	3.00	8.25	5.75	1.38	.25	.06
1-3/8	13-1/2	1019613	15.83	2.25	1.53	5.25	1.42	3.63	3.31	9.16	6.38	1.50	.25	.13
1-1/2	17	1019631	20.80	2.38	1.66	5.75	1.53	3.88	3.63	10.00	6.88	1.62	.25	.13
1-3/4	25	1019659	33.91	2.88	2.04	7.00	1.84	5.00	4.19	12.34	8.80	2.25	.25	.13
2	35	1019677	52.25	3.25	2.30	7.75	2.08	5.75	4.81	13.68	10.15	2.40	.25	.13
2-1/2	55	1019695	98.25	4.13	2.80	10.50	2.71	7.25	5.69	17.90	12.75	3.13	.25	.25
3	† 85	1019711	154.00	5.00	3.30	13.00	3.12	7.88	6.50	21.50	14.62	3.62	.25	.25
3-1/2	† 120	1019739	265.00	5.25	3.76	14.63	3.62	9.00	8.00	24.88	17.02	4.38	.25	.25
4	† 150	1019757	338.00	5.50	4.26	14.50	4.00	10.00	9.00	25.68	18.00	4.56	.25	.25



G-2130 S-2130

G-2150

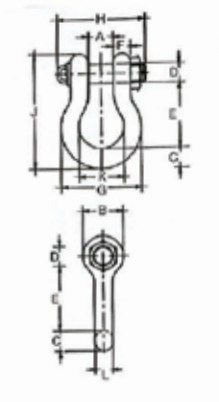
Nominal Size (inches)	Working Load Limit (t)*	Stock No.	Weight Each (lbs.)	Dimensions (inches)									Tolerance +/-	
		G-2150		A	B	D	F	G	K	M	P	R	G	A
1/4	1/2	1019768	.13	.47	.31	.25	.62	.91	1.59	.97	1.56	.25	.06	.06
5/16	3/4	1019770	.23	.53	.38	.31	.75	1.07	1.91	1.15	1.82	.31	.06	.06
3/8	1	1019772	.33	.66	.44	.38	.92	1.28	2.31	1.42	2.17	38	.13	.06
7/16	1-1/2	1019774	.49	.75	.50	.44	1.06	1.48	2.67	1.63	2.51	.44	.13	.06
1/2	2	1019775	.75	.81	.64	.50	1.18	1.66	3.03	1.81	2.80	.50	.13	.06
5/8	3-1/4	1019793	1.47	1.06	.77	.63	1.50	2.04	3.76	2.32	3.56	.63	.13	.06
3/4	4-3/4	1019819	2.52	1.25	.89	.75	1.81	2.40	4.53	2.75	4.15	.81	.25	.06
7/8	6-1/2	1019837	3.85	1.44	1.02	.88	2.10	2.86	5.33	3.20	4.82	.97	.25	.06
1	8-1/2	1019855	5.55	1.69	1.15	1.00	2.38	3.24	5.94	3.69	5.39	1.00	.25	.06
1-1/8	9-1/2	1019873	7.60	1.81	1.25	1.15	2.68	3.61	6.78	4.07	5.90	1.25	.25	.06
1-1/4	12	1019891	10.81	2.03	1.40	1.25	3.00	3.97	7.50	4.53	6.69	1.38	.25	.06
1-3/8	13-1/2	1019917	13.75	2.25	1.53	1.38	3.31	4.43	8.25	5.01	7.21	1.50	.25	.13
1-1/2	17	1019935	18.50	2.38	1.66	1.50	3.62	4.87	9.05	5.38	7.73	1.62	.25	.13
1-3/4	25	1019953	31.40	2.88	2.04	1.75	4.19	5.82	10.97	6.38	9.33	2.12	.25	.13
2	35	1019971	46.75	3.25	2.30	2.10	5.00	6.82	12.74	7.25	10.41	2.36	.25	.13
2-1/2	55	1019999	85.00	4.12	2.80	2.63	5.68	8.07	14.85	9.38	13.58	2.63	.25	.25
3	† 85	1020013	124.25	5.00	3.25	3.00	6.50	8.56	16.87	11.00	15.13	3.50	.25	.25



G-2150 S-2150

*** NOTE: Maximum Proof Load is 2.0 times the Working Load Limit.**
Minimum Ultimate Strength is 6 times the Working Load Limit.
For Working Load Limit reduction due to side loading applications, see page 63.
† Individually Proof Tested with certification.
‡ Furnished in anchor style only. Furnished with round head bolts with welded handles.

Alloy Bolt-Type Anchor Shackles: Crosby G-2140

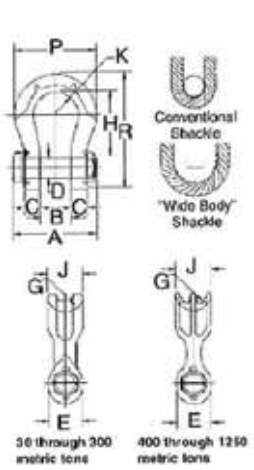


- Alloy bows and bolts.
- Forged alloy steel: 30 through 175 metric tons. Cast alloy steel: 200 through 400 metric tons.
- Working Load Limit is permanently shown on every shackle.
- All sizes are individually proof tested to 2.0 times the Working Load Limit.
- Pins are galvanised and painted red.
- Certification must be requested at time of order.
- Shackles are Quenched and Tempered and can meet DNV impact requirements of 42 joules at -20°C.

Nominal Shackle Size (inches)	Working Load Limit (t)*	Stock No. G-2140 Galv.	Weight Each (lbs.)	Dimensions (inches)											Tolerance +/-	
				A	B	C	D	E	F	G	H	J	K	L	A	E
1-1/2	30	1021110	20.8	2.38	3.63	1.62	1.66	5.75	1.39	6.88	7.73	10.00	3.88	1.53	.13	.25
1-3/4	40	1021138	33.9	2.88	4.19	2.25	2.04	7.00	1.75	8.80	9.33	12.34	5.00	1.84	.13	.25
2	55	1021156	52.0	3.25	4.81	2.40	2.30	7.75	2.00	10.15	10.41	13.68	5.75	2.08	.13	.25
2-1/2	85	1021174	96.0	4.12	5.81	3.12	2.71	10.50	2.62	12.75	13.58	17.70	7.25	2.71	.13	.25
3	120	1021192	178.0	5.00	6.50	3.62	3.30	13.00	3.00	14.62	15.13	21.50	7.88	3.12	.25	.25
3-1/2	† 150	1021218	265.0	5.25	8.00	4.38	3.76	14.63	3.75	17.02	19.00	24.88	9.00	3.62	.25	.25
4	† 175	1021236	338.0	5.50	9.00	4.56	4.00	14.50	4.00	18.00	19.75	25.68	10.00	4.00	.25	.25
For shackle sizes 200t and above, see Heavy Lift Shackle Section.																

*** Note: Maximum Proof Load is 2.0 times the Working Load Limit. Minimum Ultimate Load is 4 times the Working Load Limit on 200 through 400 metric tons. For sizes 30 through 175 metric tons, the Minimum Ultimate Load is 5.4 times the Working Load Limit.**
**** Cast alloy steel.**
† Furnished with round head bolts with welded handle.

"Wide Body" Bolt-Type Anchor Shackles: Crosby G-2160



- All sizes Quenched and Tempered for maximum strength.
- Forged alloy steel from 30 through 150 metric tons.
- All ratings are in metric tons, and embossed on side of bow.
- All bows are Dimetcoted. All pins are Dimetcoted before painted red.
- Greatly improves the durability of wire rope slings.
- Increase in shackle bow radius provides a minimum 58% gain in sling bearing surface and eliminates need for a thimble.
- Increases usable sling strength to a minimum of 15%.
- Pin is non-rotating, with weld on handles for easier use (300t and larger).
- All 2160 shackles are individually proof tested, Crosby certification available at time of order.

Working Load Limit * (t)	G-2160 Stock No.	Weight Each (lbs.)	Dimensions (inches)										
			A	B	C	D	E	G	H	J	K	P	R
† 30	1021575	25	7.73	2.37	1.38	1.63	3.50	2.50	7.00	3.13	2.50	8.50	11.38
† 40	1021584	35	9.32	2.88	1.75	2.00	4.00	1.75	8.13	3.75	3.00	10.62	13.62
† 55	1021593	71	10.41	3.25	2.00	2.27	4.63	2.00	9.42	4.50	3.50	12.26	15.63
† 75	1021290	99	14.37	4.13	2.12	2.75	5.00	2.55	11.60	4.75	3.64	12.28	18.41
† 125	1021307	161	16.51	5.12	2.56	3.15	5.71	3.15	14.43	5.91	4.33	14.96	22.65
For shackle sizes 200t and above, see Heavy Lift Shackle Section.													

Ultimate Load is 5 times the Working Load Limit.
†Forged alloy steel. Proof Load is 2 times the Working Load Limit.

Application Information—Shackles

Crosby Range Of General Lifting Shackles

Round pin shackles can be used in tie down, towing, suspension or lifting applications where the load is strictly applied in-line. No side loading is allowed.


G/S-213


G/S-215

Screw pin shackles can be used for applications involving side-loading circumstances. Reduced Working Load Limits are required for side-loading applications. While in service, do not allow the screw pin to be rotated by a live line, such as a choker application.


G/S-209


G/S-210

Bolt-type shackles are recommended for permanent or long term installations and where the load may slide on the shackle pin, causing the pin to rotate.


G/S-2130


G/S-2150


G/S-2140


G-2160

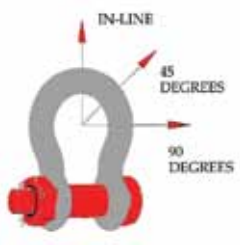
D-shaped shackles are used mainly for single leg slings whereas anchor shackles are used on multiple leg slings.

QUICK-CHECK Markings

All Crosby shackles, except for G-2160, incorporate markings forged into the product at 45° from vertical. These allow a quick check on the approximate angle of a two-legged hitch or the angle of a single leg hitch when the shackle pin is secured. And the pull of the load is off vertical or side loaded, thus requiring a reduction in the working load limit of the shackle.

Side Loading of Shackles

Side Loading Reduction Chart For Screw Pin and Bolt Type Shackles Only	
Angle of Side Load from Vertical In-line of shackle	Adjusted Working Load Limit
0° In-line	100% of rated Working Load Limit
45° from In-line *	70% of rated Working Load Limit
90° from In-line *	50% of rated Working Load Limit



Crosby shackles may be side loaded. However, the shackle WLL must be reduced according to the table above.

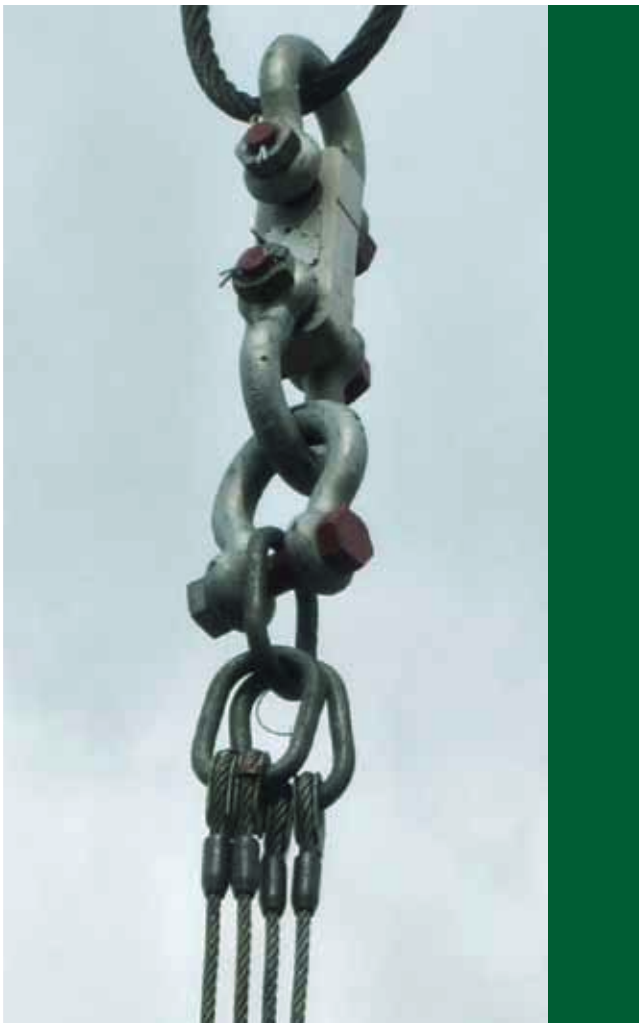
SLINGS AND FITTINGS FOR OFFSHORE CONTAINERS

KTL Offshore And Crosby Bring The Highest Quality Rigging Equipment For The Most Demanding Conditions - Certified To *DNV 2.7-1 Offshore Containers*

What Advantages Does Buying Offshore Container Slings From ***KTL Offshore*** Bring The Customer?

KTL Offshore Value Added Features:

- Each individual and complete sling assembly is tested and certified to DNV 2.7-1 Offshore Containers by DNV Singapore.
- Crosby "OC-Lifting products" consists of master links, master link assemblies and shackles used exclusively in our OC Sling range.
- Sling WLL calculations done according to DNV 2.7-1 Offshore Containers, with verification and approval from DNV.
- The rigorous and demanding test procedure is strictly adhered to using specially adapted test machines and is witnessed by DNV Singapore.



CROSBY'S "OC-LIFTING PRODUCT" RANGE

Crosby's OC-Lifting Products for offshore containers is manufactured to DNV Type Approval under DNV 2.7-1 and a DNV Manufacturing Survey Agreement (MSA). In addition, each lot (identified by the PIC system) of shackles and links will be provided with a product certificate stating that the shackle/aster link has been manufactured and tested according to the Type Approval in a facility approved by the Manufacturing Survey Agreement.

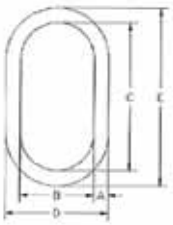
Crosby Master Link A-344Oc And Master Link Assembly A-347Oc

- Individually proof tested 62.5% of Ultimate Strength as per DNV 2.7-1.
- Certified to meet Charpy impact testing of 31 ft-lbs. min. ave. at - 4 F (42J at -20 °C).
- Marked with DNV type approval number.
- Crosby painted finish.

A347OC

Master Link Assembly A344oc

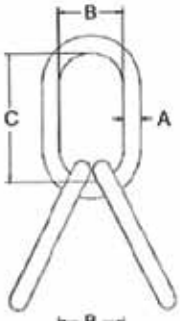
Size "A"		A344OC Stock No.	Working Load Limit (t) Based on 4:1 Design Facor*	Proof Load (kN)	Ultimate Load (kN)	Dimensions (mm)		
(mm)	(inches)					A	B	C
31	1-1/4	1262774	16.0	392.4	627.8	31	145	275
40	1-9/16	1262792	25.0	613.1	981.0	40	160	300
45	1-3/4	1262797	31.5	784.8	1256	45	140	250
51	2	1262813	40.	981.0	1570	51	215	390



* Minimum Ultimate Load is 5 times the Working Load Limit.

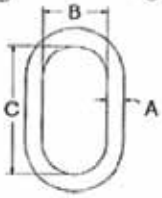
Master Link A-347OC

Size "A"		A347OC Stock No.	Working Load Limit (t) Based on 4:1 Design Facor*	Proof Load (kN)	Ultimate Load (kN)	Dimensions (mm)						
(mm)	(inches)					A	B	C	D	E	F	G
31/25	1-1/4	1262957	17.0	416.9	667.1	31	145	275	25	210	115	13.5
40/31	1-9/16	1262966	23.6	578.8	926.1	40	160	300	31	270	140	15.5
54/36	1-3/4	1262975	31.5	773.0	1236	45	180	340	36	285	155	15.5
51/45	2	1262984	45.0	1104	1766	51	190	350	45	340	180	22.0



CROSBY SHACKLES G-213OC

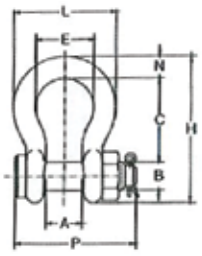
- Sample proof tested 40% of Ultimate Strength as per DNV 2.7-1.
- Certified to meet Charpy impact testing of 31 ft-lbs. min. ave. at - 4 F (42J at -20 °C).
- Hot dip galvanized finish.



Crosby Shackles G2130OC

Nominal Shackle Size (inches)	Working Load Limit (t)*	Proof Load (kN)	Ultimate Load (kN)	G2130OC Stock No.	Weight Each (kg)	Dimensions (inch)									Tolerance +/-	
						A	B	C	D	E	F	H	L	N	C	A
5/8	3-1/4	63.8	160	1262013	0.76	26.9	19.1	60.5	16.0	42.9	38.1	106	74.5	17.5	6.35	1.50
3/4	4-3/4	93.2	233	1262022	1.23	31.8	22.4	71.5	19.1	51.0	46.0	126	89.0	20.6	6.35	1.50
7/8	6-1/2	127.5	319	1262031	1.79	36.6	25.4	84.0	22.4	58.0	53.0	148	102	24.6	6.35	1.50
1	8-1/2	166.8	417	1262040	2.57	42.9	28.7	95.5	25.4	68.5	60.5	167	119	26.9	6.35	1.50
1-1/8	9-1/2	186.4	466	1262059	3.75	46.0	31.8	108	28.7	74.0	68.5	190	131	31.8	6.35	1.50
1-1/4	12	235.4	589	1262068	5.31	51.5	35.1	119	31.8	82.5	76.0	210	146	35.1	6.35	1.50
1-3/8	13-1/2	264.9	662	1262077	7.18	57.0	38.1	133	35.1	92.0	84.0	233	162	38.1	6.35	3.30
1-1/2	17	333.5	834	1262086	9.43	60.5	41.4	146	38.4	98.5	92.0	254	175	41.1	6.35	3.30
1-3/4	25	490.5	1226	1262095	15.40	73.0	51.0	178	44.5	127	106	313	225	57.0	6.35	3.30

Don't accept low quality slings and fittings with questionable certification for your offshore containers- insist on KTL Offshore's OC-Lifting Product range for peace of mind!



RIGGING FOR SUBSEA ENGINEERING

KTL Offshore Has A Comprehensive Range Of Products And Services That Is Specifically Designed For Subsea Engineering

Remote Operated Vehicle (ROV) Shackles And Hooks

Crosby's ROV friendly hooks and shackles are ideal for subsea engineering. The extensive range of designs prevents unauthorised alteration of standard subsea rigging equipment. This encourages the proper usage and lifespan of equipment.

G209R ROV Shackle
Available up to 120t

L320R Eye Hook
Available up to 60t

L562R Shank Hook
Available up to 175t

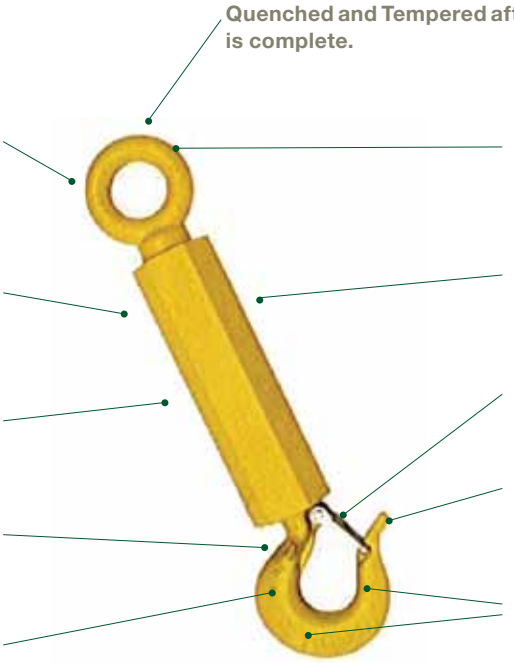
The ROV product range:

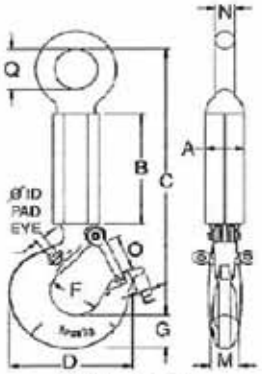
- Designed for efficient handling and attachment of subsea and other hard-to-reach loads.
- Developed in conjunction with major North Sea subsea operators.

the Crosby group inc.

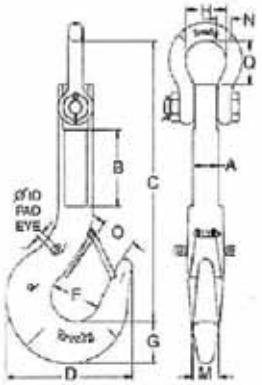
Crosby L562R Shank Hook

Features:





5.4t to 31.5t



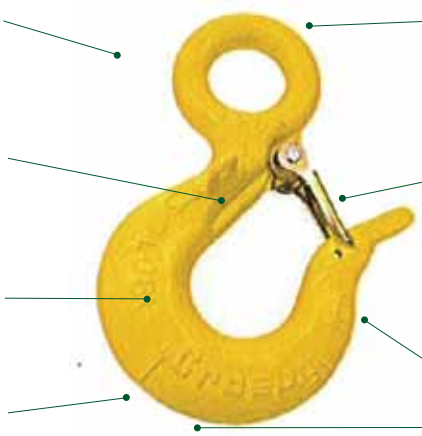
37t to 175t

L562A Stock No.	Working Load Limit (t)*	Hook ID Code	Weigh Each (kg)	Dimensions (mm)													Replacement Latch Stock No.
				A	B	C	D	E	F	G	H	M	N	Q	O	R	
1297722 †	5.4	IA	9.5	65	250	421	123	9.9	51	37	-	29	22	51	35	6.4	1096515
1297792 †	11.5	KA	15	65	250	518	192	30	76	57	-	41	32	76	53	9.7	1096609
1297806 †	16	LA	18	65	250	550	212	30	83	66	-	49	35	79	58	9.7	1096657
1297862 †	22	NA	31	85	250	608	263	45	108	76	-	60	40	91	77	19	1096704
1298042	31.5	OA	44	85	250	660	346	-	127	92	104	76	48	106	92	19	1090161
1298049 **	37	PA	44	80	235	828	357	-	137	116	127	76	47	134	95	19	1090189
1298057 **	45	SA	90	80	235	865	392	-	152	129	127	83	47	134	108	19	1090189
1298087 **	60	TA	131	90	215	941	470	-	178	152	146	99	53	150	130	19	1090205
1298103 **	100	WA	303	140	300	1185	584	-	173	218	184	140	69	190	124	19	1090241
1298117 **	150	XA	395	150	230	1233	619	-	171	232	229	152	92	309	137	19	1090241
1298130 **	175	YA	515	170	255	1326	678	-	191	248	254	178	102	300	-	19	-

*** Minimum Ultimate Load is 4 times the Working Load Limit.**
**** Utilises Crosby G-2140 shackle as eye.**
† Utilises Crosby S319N style hooks.

Crosby L320R Eye Hook

Features:



Quenched and Tempered after welding is complete.

Pad eyes on either side of hook allow use of stainless steel cable to open the latch remotely.

The hook identification code is stamped on the hook.

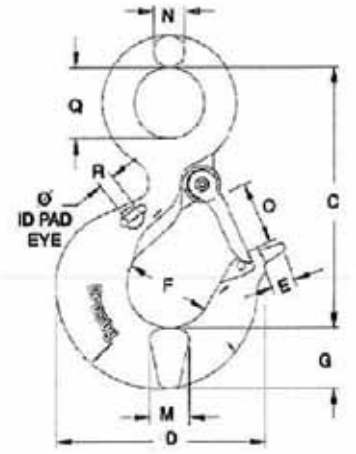
Painted fluorescent yellow (RAL 101) for enhanced underwater visibility.

QUIC-CHECK® indicators are forged on the top eye to show the maximum sling angle.

Heavy duty latch interlocks with the hook tip.

The unique tapered lead-in tip design allows easy engagement of eye bolts and pad eyes.

QUIC-CHECK® indicators (indicating maximum sling angle) and deformation indicators (for throat opening of hook) are forged on the hook.



L320R Stock No.	Working Load Limit (t)*	Hook ID Code	Weigh Each (kg)	Dimensions (mm)										Replacement Latch Stock No.
				C	D	E	F	G	M	N	O	Q	R	
1298427 †	3.2	HA	1.01	119	101	25	41	29	24	15	28	32	6	1096468
1298497 †	5.4	IA	2.04	147	122	25	51	37	33	18	35	40	6	1096515
1298567 †	8	JA	3.92	187	159	35	64	46	42	23	41	51	10	1096562
1298637 †	11.5	KA	7.02	230	189	35	76	57	41	28	53	62	10	1096609
1298707 †	16	LA	10.1	256	211	35	83	64	49	32	58	72	10	1096657
1298777 †	22	NA	18.4	318	262	45	108	76	60	40	77	89	19	1096704
1298847	31.5	OA	28.1	357	345	—	127	92	76	44	93	89	19	1090161
1298857	37	PA	48.5	462	357	—	137	116	92	51	95	114	19	1090189
1298867	45	SA	62.1	511	392	—	152	129	82	55	114	125	19	1090189
1298877	60	TA	102	602	470	—	178	152	99	64	130	145	19	1090205

*** Minimum Ultimate Load is 4 times the Working Load Limit.**
† Utilises Crosby S320N style hook.

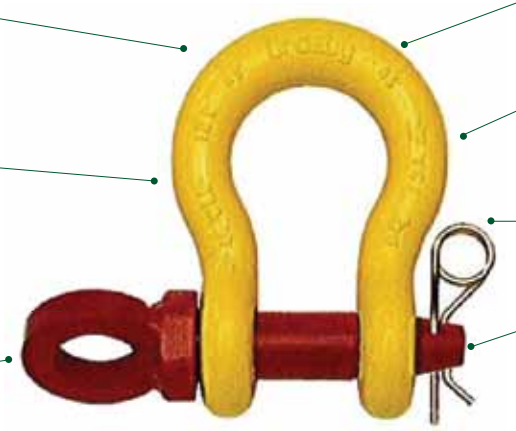
Crosby G209R Rov Shackle

Features:

Quenched and Tempered after welding is complete.

The identification code is stamped on the shackle.

An eye welded to the head of the shackle bolt for easy grip by the robotic arm

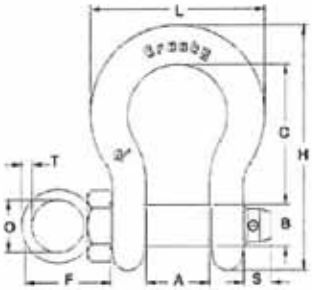


QUIC-CHECK® indicators are forged on the bow to show the maximum sling angle.

Galvanised and painted fluorescent yellow (RAL 101) for enhanced underwater visibility. (17t and below)

Large safety pin allows easy grip by the robotic arm.

Pin is tapered for easy entry into the shackle and hitch point, and allows easy removal by the robotic arm.



G209R Stock No.	Working Load Limit (t)*	Weight Each (kg)	Dimensions—Body (mm)					Dimensions—Pin (mm)			
			A	B	C	H	L	O	F	T	S
1020872	6-1/2	1.79	36.6	25.4	84	148	102	50	58	10	17
1020902	8-1/2	2.28	42.9	28.7	95.5	167	119	50	61	10	18
1020932	9-1/2	3.75	46	31.8	108	190	131	70	83	12	18
1020952	12	5.31	51.5	35.1	119	210	146	70	84	12	23
1020972	13-1/2	7.18	57	38.1	133	233	162	75	91	15	23
1020992	17	9.43	60.5	41.4	146	254	175	75	93	15	24
1021102	25 †	15.4	73	51	178	313	225	90	114	17.5	29
1021125	35 †	24	83	57	197	348	253	106	132	20	30
1021158	55 †	45	105	70	267	453	327	120	145	25	45

*** Minimum Ultimate Load is 5 times the Working Load Limit.**
† Furnished with galvanised finish.

ROV shackles up to 120t can be made to order

Application Information—ROV Hooks and Shackles

Pre-Rigging for Remote Operation of Latch

Pad eyes are provided on either side of the L320R eye hook and L562A shank hook as cable guides.

The cable is passed through a hole drilled in the latch to a remotely operated cable to open the latch easily.

Cables and drilled latches are not provided by Crosby but KTL Offshore will fit stainless steel cables and drilled latches upon request. Crosby allows the user to modify the latch as required to accomplish the task.

Using the QUIC-CHECK Indicators

The L320R eye hook utilises Crosby's S320N style hook while the L562A Shank hook makes use of the S319N style hook. Both hooks incorporate the following indicators:

Deformation indicators: Two strategically placed marks—one just below the shank and another on the hook—allow for a QUIC-CHECK® measurement to determine if the throat opening has changed. This prevents the abusing and overloading of the equipment.

A measuring device (such as a tape measure) should be used to determine the distance between the marks. The marks should align to either an inch or a half-inch increment. If the alignment is larger than an inch, the hook should be inspected for possible damage. If the throat opening has increased beyond the mentioned distance, the hook should be discarded.

If the tip of the hook is bent out of plane by more than 10 degrees from the body, the hook should be discarded.

Angle indicators: two marks on the bottom of the hook indicate the maximum included angle allowed between two sling legs in the hook.

Welding and Alterations

Since all Crosby ROV hooks and shackles are Quenched and Tempered after the welding process is complete, no in-service welding or alteration of the hook body, eye or hook is permitted. Doing so will severely reduce the strength of the component and may result in catastrophic failure.

Fluorescent Colour

The ROV hooks and shackles are painted with RAL101 (chosen by the North Sea subsea operators) to increase underwater visibility. Do note that this paint does not protect the equipment from corrosion. The ROV shackles are galvanised under the paint for corrosion protection (up to 17t WLL). For larger sizes, the shackles are provided in a galvanized finish.

Umbilical Spooling

KIMSPOOL 7 is able to accommodate the largest umbilical reels the offshore industry produces.

Using our experience gained in this segment of the market as well as consulting with our subsea engineering customers, KTL Offshore has designed a range of spooling equipment which is uniquely suitable for spooling of delicate umbilicals from the storage reel on to the winch. We also have specialist storage and transfer steel reels which ensures a smooth, tensioned application.

Our Kimspool machines have constant tension ability and we have performed many successful umbilical spooling jobs for our subsea engineering customers.

KTL Offshore Umbilical Spooling Features:

- Specialised transfer and installation steel reels designed for umbilical cords
- Constant tension spooling
- Accommodate reel weights up to 200 metric tons with 20t constant back tension
- A fleet of rugged spooling machines
- Experienced technical services personnel

SYNTHETIC ROPES FOR OFFSHORE CONSTRUCTION

High Performance Synthetic Rope (HMPE)

High Modulus PolyEthylene Ropes from Cortland Puget Sound Rope, USA

Plasma – The World's Strongest Synthetic Rope!

Plasma – the highest strength-to-mass-ratio of any rope available, this 12 strand or 12x12 strand constructions offers equivalent strength to a wire rope of the same size. Elongation is similar to wire rope. The patented 12x12 construction is easily repaired in the field by replacing any damaged strands and the Plasma rope is probably the easiest rope to splice on-site. A Polyurethane coating increases abrasion resistance while the rope is UV stabilized and creep properties are negligible at working loads. Made from Honeywell's Spectra fiber and heat treated using PSR's recrystallization process.

12 strand

12x12 strand

- Elongation 4-5% at breaking load for a new rope (2-3% for a worked rope).
- Critical temperature 65 Deg C (150 Deg F)
- Torque free construction.
- Coefficient of friction 0.09-0.12.
- Specific gravity 0.98 (floats). The formulation can be altered to change the specific gravity to make the rope sink if required (specify at time of order with the factory).
- Applications:
  - Winch lines.
  - Tugger winch lines.
  - Pick up and messenger lines.
  - Heavy lift slings where the highest strength-to-mass ratio and torque free properties are required.

Spectra - High Strength with Added Elongation!

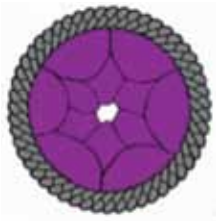
Spectra – a slightly lower strength than the Plasma rope, Spectra has the same outstanding abrasion, UV and creep resistant properties. The rope construction is the same 12 or 12x12 strand as the Plasma. Spectra will be selected if more elasticity is required, as the elongation properties are slightly higher than those of the Plasma rope.

- Elongation 6-8% at breaking load for a new rope (3-4% for a worked rope).
- Critical temperature 65 Deg C (150 Deg F).
- Torque free construction.
- Coefficient of friction 0.09-0.12.
- Specific gravity 0.98 (floats).
- Applications:
  - Winch lines.
  - Single/Split drum winch primary mooring lines.
  - Tugger winch lines.
  - Pick up and messenger lines.
  - Heavy lift slings where the higher elongation and elasticity is required.

Jacketed, High Strength HMPE Rope

High strength ropes using either Plasma or Spectra rope as the core, encased in a protective jacket increases the abrasion resistance of the rope while maintaining the high strengths offered by HMPE fibers.

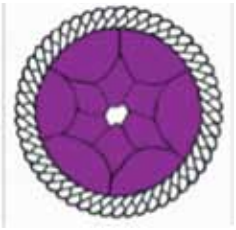
The outer jacket is tightly woven but has a looser fit over the core rope than a regular double braided rope and does not contribute to the strength. This creates the distinct advantage of not having to retire the rope if cuts and abrasion damage occurs to the jacket.



G/T Composite Double Braid – this is a **Plasma** rope encased in a tightly braided jacket of **Spectra** to offer the highest abrasion resistance and durability. They are suitable where a very high strength, firm, round and torque-free rope is required.

- Elongation 4-5% at breaking load for a new rope (2-3% for a worked rope).
- Critical temperature 65 Deg C (150 Deg F).
- Torque-free construction.
- Coefficient of friction 0.12 – 0.15.
- Specific gravity 0.98 (floats).

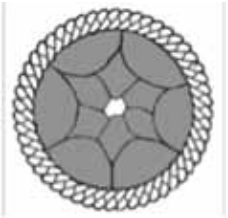
- Applications:
  - Heavy duty winch line where the most rugged duty is expected.
  - Single/Split drum winch primary mooring lines.



D/T Composite Double Braid – this is a **Plasma** rope encased in a tightly braided jacket of **polyester**. The polyester does not have the abrasion resistance of the Spectra jacket but does offer a softer feel to the rope.

- Elongation 4-5% at breaking load for a new rope (2-3% for a worked rope).
- Critical temperature 65 Deg C (150 Deg F).
- Torque-free construction.
- Coefficient of friction 0.12 – 0.15.
- Specific gravity 0.98 (floats).

- Applications:
  - Heavy duty winch lines.
  - Single/Split drum winch primary mooring lines.



D/S Composite Double Braid – this is a **Spectra** rope encased in a tightly braided jacket of **polyester** which gives the feel and handling of a polyester double braid rope. This rope will give a much higher strength than the polyester double braid due to the Spectra core while still providing the protection of an outer jacket.

- Elongation 4-5% at breaking load for a new rope (2-3% for a worked rope).
- Critical temperature 65 Deg C (150 Deg F).
- Torque-free construction.
- Coefficient of friction 0.12 – 0.15.
- Specific gravity 1.20 (sinks)

- Applications:
  - Heavy duty winch lines.
  - Single/Split drum winch primary mooring lines.

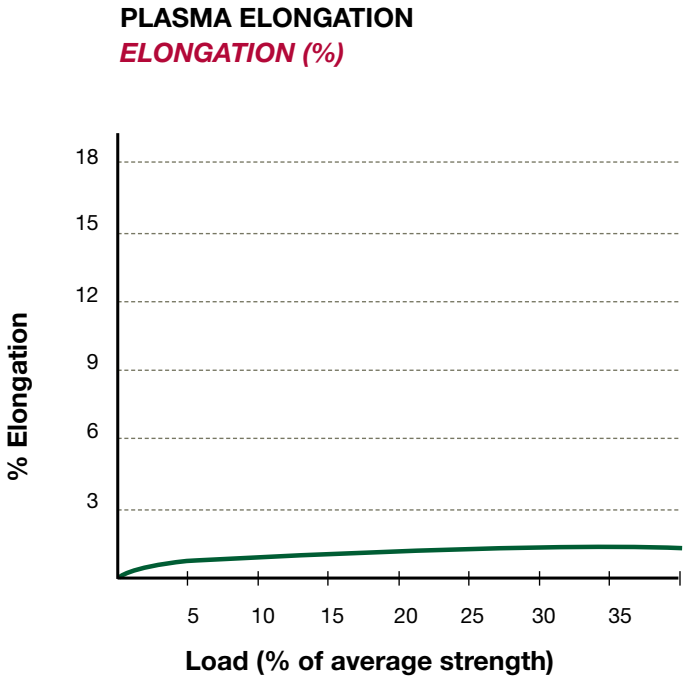
Summary of Comparative Properties

Applications – Offshore Winch

All of the PSR ropes mentioned here are suitable for general offshore winch duties including mooring, anchoring, towing, lifting and holding.

Key Property	Highest Strength-to Weight Ratio (Low Elongation)		Maximum Abrasion Resistance (Jacketed Rope)			Polyester, Higher Elongation		
Products	Plasma 12 Strand	Spectra 12 Strand	G/T Composite (Spectra Jacket/ Plasma Core)	D/T Composite (Polyester Jacket/ Plasma Core)	D/S Composite (Polyester Jacket/ Spectra Core)	Polyester Double Braid	Polyester 12-Plait	Braided Polyester Parallel Core
Strength	Highest	High	High	High	High	Moderate	Moderate	Moderate to high
Elongation at break (new rope)	4% - 5%	6% - 8%	4% - 5%	4 % - 5%	6% - 8%	15% - 20%	15% - 20%	13% - 18%
Bending Fatigue	High	High	High	High	High	Moderate	Moderate	Moderate
Specific Gravity (kg/dm^3)	0.98	0.98	0.98	1.20	1.20	1.38	1.38	1.38
Floats in Water	Yes	Yes	Yes	No	No	No	No	No
Critical Temperature	65^0C	65^0C	65^0C	65^0C	65^0C	177^0C	177^0C	177^0C
UV Resistance	Moderate	Moderate	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Abrasion Resistance	Superior	Superior	Superior	Superior	Superior	Excellent	Excellent	Excellent
Fiber Water Absorption	0%	0%	0% to 1%	0% to 1%	0% to 1%	0% to 1%	0% to 1%	0% to 1%
Remarks	Highest strength to weight ratio	High strength with slightly more elongation	Braided outer cover provides superior abrasion resistance. Round, firm rope construction			Higher abrasion resistance than 12 plait polyester	Easily inspectable, low cost	Best suited to mooring in a static application

Elongation Characteristics of Plasma Rope



The graph on the left shows the elongation characteristics of the Plasma rope in the new condition.

A worked rope will demonstrate less elongation (maximum 2-3% at breaking load).

Strength Retention after Chemical Immersion

The test results in the table below demonstrate tha Plasma will not be affected by most chemicals and sea water.

Strength Retention After Chemical Immersion

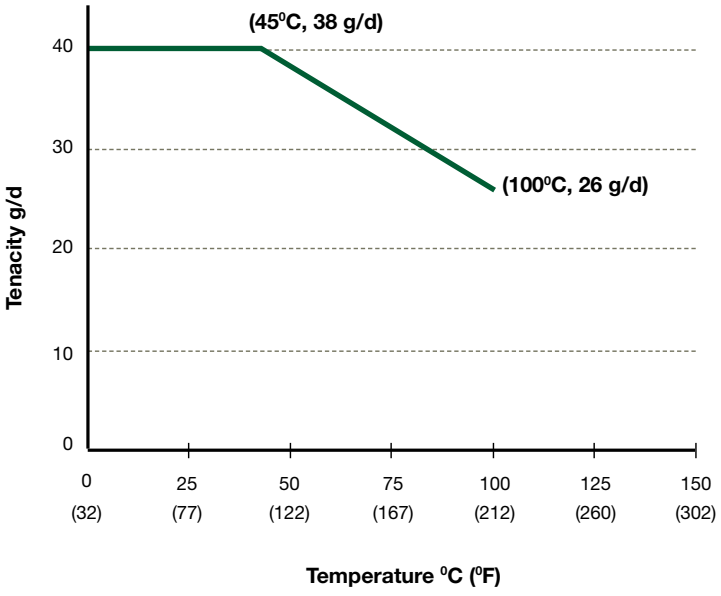
	SPECTRA® Fiber		Aramid	
	6 Mos.	2 Yrs.	6 Mos.	2 Yrs.
Seawater	100%	100%	100%	98%
Hydraulic Fluid	100%	100%	100%	87%
Kerosene	100%	100%	100%	97%
10% Detergent Solution	100%	100%	91%	*DET
Gasoline	100%	100%	93%	*DET
Toluene	100%	96%	72%	*DET
Glacial Acetic Acid	100%	100%	82%	*DET
1M Hydrochloric Acid	100%	100%	40%	*DET
5M Sodium Hydroxide	100%	100%	42%	*DET
Ammonium Hydroxide (29%)	100%	100%	70%	*DET
Perchloroethylene	100%	100%	75%	*DET
Clorox Bleach	100%	73%	0%	0%
Hypophosphite Solution (10%)	91%	**No Data	**No Data	**No Data
Nitric Acid (50% by Volume)	100%	**No Data	**No Data	**No Data
Sulfuric Acid (50% by Volume)	97%	**No Data	**No Data	**No Data
Phosphoric Acid (50% by Volume)	100%	**No Data	**No Data	**No Data
	95%			

**DET= Samples not tested due to physical deterioration*
***No Data= Sample not tested*

Effects of Temperature on Strength

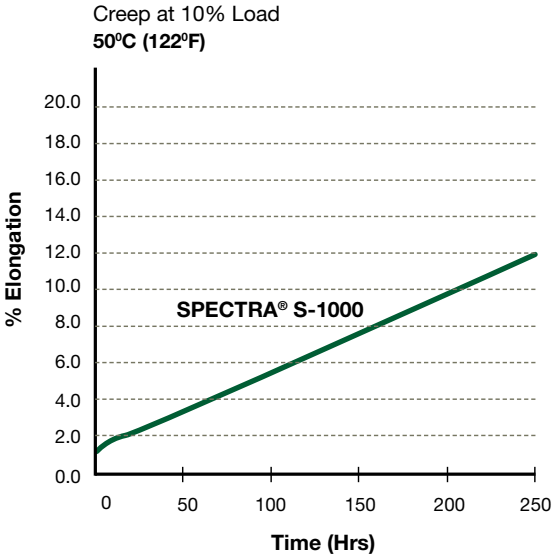
The graph on the right demonstrates the effects of increasing temperature on the Spectra fibers (not the rope). This graph does not show the effect on the rope, which would be expected to be less severe than indicated due to the insulating effect the outer strands will have on the inner strands. However, this graph may be used as an approximation as to the effects of temperature on the rope strength of Plasma.

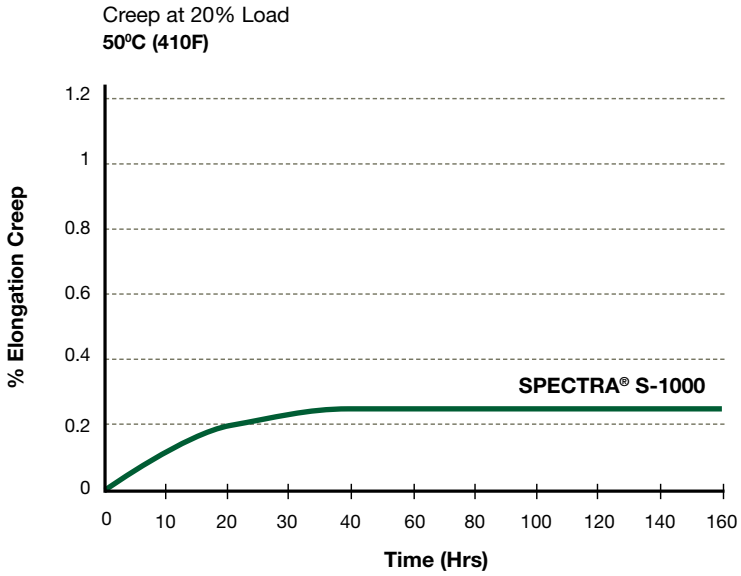
SPECTRA® 1000



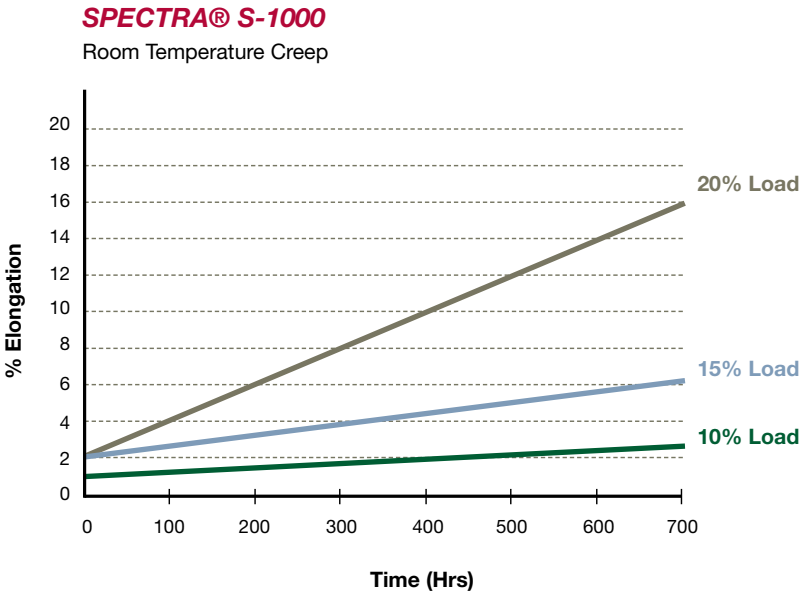
Creep Effects

The creep effect (whereby when the material is held under load it will elongate over a period of time) on the Spectra fibers is shown in the graphs below. At low temperatures the effect is very small while at elevated temperature, creep does become noticable.





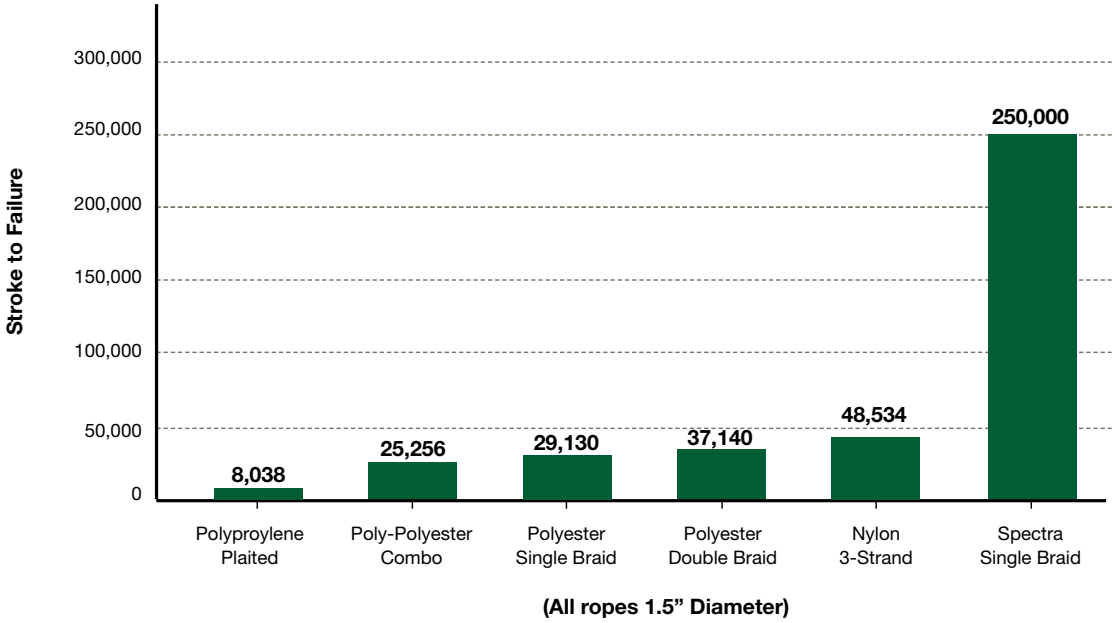
At room temperature the effects of creep as a function of applied load are indicated in the graph below.



Note: Test conducted on 1300d S-1000 fiber

Fatigue Life

The graph below shows the comparative fatigue life of a Spectra 12 strand, single braided rope against some other common synthetic ropes. The test results demonstrate clearly the superior fatigue life of the rope made of the Spectra fiber.



(All ropes 1.5" Diameter)

Rated Minimum Breaking Load

Plasma 12 Strand Rope Data – Up to 4" (102mm) Diameter

Rope Construction	Diameter	Diameter	Circ.	Weight	Spliced MBL	ISO BS EN 2307: 2010 MBL
	mm	inches	mm	kg/100m	(Metric Tons)	(Metric Tons)
12 Strand 	1.0	0.04	2.9	0.1	0.1	0.1
	1.25	0.05	3.6	0.1	0.2	0.2
	1.5	0.06	4.3	0.1	0.2	0.2
	1.75	0.07	5	0.2	0.3	0.4
	2.5	0.1	7.2	0.4	0.6	1
	3.0	1/8	9	0.8	1.3	2
	5	3/16	13.5	1.7	2.5	3
	6	1/4	18	2.4	3.6	4
	8	5/16	22.5	3.7	5.3	6
	9	3/8	27	5.5	7.9	9
	11	7/16	30	6.3	9.5	11
	12	1/2	36	9.5	14.2	16
	14	9/16	42	11.8	17.2	19
	16	5/8	48	15.8	23.3	26
	18	3/4	54	19.8	31.1	34
	20	13/16	60	23.7	33.6	37
	22	7/8	66	29.2	42	46
	24	1	72	34.8	49.9	55
	26	1-1/16	78	40.9	58.6	65
	28	1-1/8	84	47.5	66.7	74
	30	1-1/4	90	53.9	74.8	83
	32	1-5/16	96	62.1	88.9	98
	36	1-1/2	108	76.9	100.2	111

Rope Construction	Diameter	Diameter	Circ.	Weight	Spliced MBL	ISO BS EN 2307: 2010 MBL
	mm	inches	mm	kg/100m	(Metric Tons)	(Metric Tons)
12x12 Strand 	40	1-5/8	120	97.8	131.9	146
	44	1-3/4	132	116.7	142.4	158
	48	2	144	136	161.0	178
	52	2-1/8	156	162.2	194.1	215
	56	2-1/4	168	181.6	218.1	242
	60	2-1/2	180	220.2	240.3	267
	64	2-5/8	192	248.5	270.2	300
	68	2-3/4	204	278.3	299.3	332
	72	3	216	318.5	353.7	393
	76	3-1/8	228	349.7	385.4	428
	80	3-1/4	240	388.4	426.2	473
	88	3-5/8	264	482.2	566.8	629
	96	4	288	586.4	689.2	765

Large Diameter Plasma 12 Strand Rope - 104mm and Above

Rope Construction	Diameter	Diameter	Circ.	Weight	Spliced MBL	ISO BS EN 2307: 2010 MBL
	mm	inches	mm	kg/100m	(Metric Tons)	(Metric Tons)
12x12 Strand 	98.4	4.1	309.6	723	735	816
	103.2	4.3	321.6	768	776	862
	103.2	4.3	326.4	813	817	908
	108	4.5	338.4	856	858	953
	110.4	4.6	350.4	902	898	998
	112.8	4.7	357.6	957	939	1043
	117.6	4.9	369.6	1014	980	1089
	120	5	381.6	1073	1021	1134
	124.8	5.2	393.6	1136	1062	1180
	129.6	5.4	405.6	1197	1103	1226
	132	5.5	417.6	1256	1143	1270
	139.2	5.8	441.6	1397	1225	1361
	144	6	453.6	1485	1266	1470
	146.4	6.1	465.6	1579	1307	1452
	151.2	6.3	477.6	1671	1348	1498
	156	6.5	494.4	1765	1388	1542
	160.8	6.7	506.4	1860	1429	1588
	165.6	6.9	523.2	1973	1470	1633
	172.8	7.2	542.4	2104	1511	1678
	177.6	7.4	559.2	2244	1552	1724
	182.4	7.6	578.4	2392	1593	1770
	189.6	7.9	595.2	2539	1633	1814

Note:

- **All MBL values shown include provision of a 0.90 splicing efficiency. When spliced using a standard synthetic rope splicing method, no further de-rating of the rope MBL is required.**
- **For use in basket hitch, the full strength will be attained at a D/d = 3.0 or higher.**
- **MBL and SWL figures provided above are in accordance with the Cordage Institute CI-1500-02 (May 2006) from the USA which reports the strength as "spliced strength". According to BS EN ISO 2307:2010, theses figures can be increased by 10% as the splicing efficiency is not factored in to the rated strength using this European standard.**

Standard Synthetic Rope

Composite, Polypropylene And Nylon Rope

KTL Offshore Value Added:

Composite Ropes offer several advantages over Polypropylene ropes:

- Higher strength therefore a lighter and smaller diameter rope can be used
- Greater abrasion resistance
- Superior Ultra Violet (U.V.) resistance which leads to longer life
- Improved fatigue life and ability to withstand the harsh offshore environment

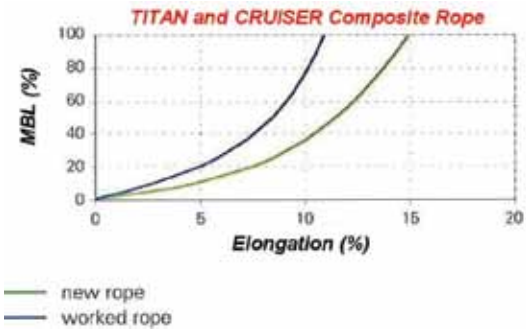
KTL Offshore Offers The Following 8-Strand Plaited **Composite Ropes** From Lanex (Made In Europe):

TITAN – one of the strongest ropes available on the market!

Titan is an advanced, plaited 8-strand rope with one of the highest tensile strengths available on the market. Due to the polyester filaments on the surface of the rope, it has excellent abrasion resistance. Titan ropes are suitable for the harshest offshore environments. Does not float on water.

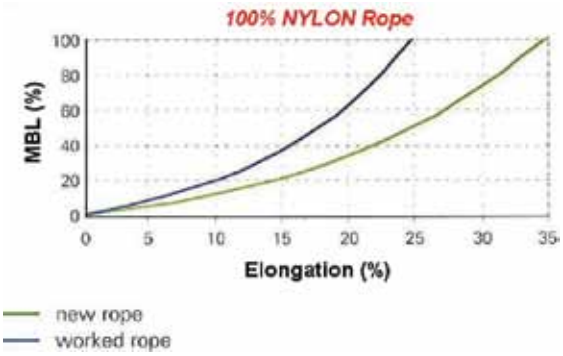
CRUISER – Excellent strength-to-mass ratio!

Cruiser has a very high strength as compared to polypropylene ropes and superior abrasion resistance properties. It is highly U.V. stabilized leading to long life in the offshore environment. Very good selection as a replacement for PP ropes to reduce weight, size and overall cost. Floats on water.



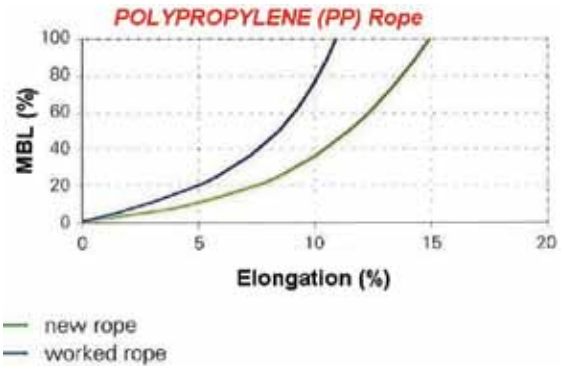
All LANEX ropes are supplied with soft eyes with canvas protection at both ends, 6-tuck splicing, colour tracers and Germanischer Lloyd's (GL) or Lloyd's Register (LR) certification.

KTL Offshore Stocks A Huge Range Of **Nylon** And **Polypropylene** Ropes From The Korean Manufactures Such As DSR, Dong Yang And Manho.



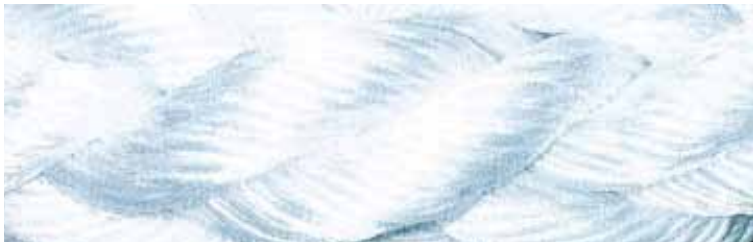
100% Nylon Ropes – Excellent Shock absorbing ability!

Nylon ropes have very high strength and have excellent shock absorbing properties due to their high elasticity. Nylon also has good abrasion resistance and is not damaged by oil and most chemicals. U.V. stability is good. Nylon ropes do not float in water.



Polypropylene (PP) Ropes – All purpose synthetic rope!

Polypropylene ropes are very light in weight and therefore float on water and are popular in the industry due to their low cost. They have excellent resistance to most chemicals but are affected by sunlight (poor U.V. resistance and it is best to store them out of direct sunlight).



KTL Offshore stocks **Superdan** (DSR), **Mega PP** (Dong Yang) and **Hi-Man** (Manho) polypropylene ropes.

All Nylon and PP ropes are supplied with soft eyes with canvas protection at both ends, 6-tuck splicing, colour tracers and Lloyd's Register (LR) certification.

DSR

ANCHOR ROPE DONG YANG ROPE MFG. CO., LTD. ANCHOR BRAND

MANHO

Application And Properties Table: 8-Strand Plaited Synthetic Rope

Type of Rope	POLYPROPYLENE	NYLON	LANEX CRUISER	LANEX TITAN
Composite Material	HDPP split film	100% Nylon	20% PES 80% Polys	50% PES 50% Polys
Specific Density:	0.91kg/dm^3	1.14kg/dm^3	0.99kg/dm^3	1.14kg/dm^3
Floats On Water:	Yes	No	Yes	No
Water Absorbtion:	None	2% to 5%	None	2% to 5%
Melting Point:	165^{0}C	215^{0}C	165/260^{0}C	165/260^{0}C
Maximum Working Temperature:	80^{0}C	100^{0}C	100^{0}C	100^{0}C
Elongation At MBL:	New Rope: 15% Worked Rope: 12%	New Rope: 35% Worked Rope: 25%	New Rope: 15% Worked Rope: 12%	New Rope: 15% Worked Rope: 12%
UV Stability:	Good	Very Good	Very Good	Excellent
Abrasion Resistance:	Good	Very Good	Very Good	Excellent
Chemical Resistance:	Very Good	Average	Very Good	Good
Durability:	Good	Excellent	Very Good	Excellent
Handling:	Good	Very Good	Very Good	Excellent
*TCLL Value (% of MBL):	52%	55%	78%	78%
Typical Application:	General all-purpose rope for marine and offshore use. Example: Mooring lines; messenger lines; pickup lines & towing.	Tails on wire rope; Towing & towing stretchers; any application where high elasticity is required.	Mooring and towing lines, messenger and pick-up lines. For Anchor Handling Vessel use in demanding conditions. Composite ropes offer a higher performance option than PP or Nylon ropes due to their superior abrasion, chemical resistance and fatigue properties. *Titan* ropes offer the best heavy duty performance followed by *Cruiser*	

PES: high tenacity polyester
Polys: 30% HDPE (Polyethylene) and 70% HDPP (polypropylene)
***TCLL Value: the load expressed as a % of the breaking strength at which the rope will fail at 1000 cycles in a tension-fatigue test.**

Minimum Breaking Load: 8-Strand Plaited Synthetic Rope

Rope Diameter	Circ.	POLYPROPYLENE (PP)		NYLON (100%)		LANEX CRUISER Composite Rope		LANEX TITAN Composite Rope	
		Weight	MBL	Weight	MBL	Weight	MBL	Weight	MBL
(mm)	(inches)	(kg/100m)	(metric tons)	(kg/100m)	(metric tons)	(kg/100m)	(metric tons)	(kg/100m)	(metric tons)
36 40 44 48 52	4-1/2 5 5-1/2 6 6-1/2	58.6 72.3 87.5 104.0 122.0	23 26 31 36 42	78.0 95.0 120.0 141.0 166.0	24 33 41 46 55	64.6 79.2 96.8 114.4 134.2	26 33 39 46 53	78.7 97.5 117.5 139.5 164.0	30 42 50 59 68
56 60 64	7 7-1/2 8	142.0 163.0 185.0	48 55 62	191.0 221.0 235.0	61 71 80	156.2 179.3 203.5	61 69 78	190.5 219.0 249.0	80 90 102
68 72 76	8-1/2 9 9-1/2	210.0 234.0 262.0	70 77 84	285.0 316.0 346.0	90 99 108	231.0 257.4 288.2	88 98 110	283.0 317.0 35.0	115 128 143
80 88 96	10 11 12	289.0 350.0 417.0	95 107 135	385.0 471.0 545.0	122 146 169	319.0 386.1 458.7	121 145 171	391.5 474.0 563.0	157 188 221
104 112 120 130	13 14 15 16	489.0 627.0 715.0	157 183 208	666.0 750.0 800.0 889.0	200 210 256 300	*Data provided upon application*			

BLOCKS FOR OFFSHORE CONSTRUCTION

KTL Offshore Provides High Quality Snatch Blocks From The USA And Europe For The Most Demanding Offshore Applications

Snatch Block Selection Guide

Use the following guide to select the right snatch blocks for offshore construction:

Main Requirement	
Durability and Cost Efficiency	McKissick's Light Champion, Champion, Super Champion and Double Sheave Light Champion Range **(Made in the USA)**
Reduced Weight and High Strength	McKissick's Alloy Range **(Made in the USA)**
High Working Load Limit	High WLL Heavy Duty Blocks (Up to 1,000 WLL) **(Made in Holland)**
Increased Work Efficiency for Specific Tasks	Specialised Blocks by KTL Offshore: Underwater blocks and custom designed blocks **(Made in the USA and Holland)**

KTL Offshore Value Added Features For Snatch Blocks:

- Full Range Inventory

  KTL Offshore maintains one of the largest and most comprehensive range of McKissick snatch blocks.
- Product Training

  Through Crosby, KTL Offshore provides specific product training on snatch blocks and their use, inspection and maintenance.
- Inspection, Testing and Certification

  Call our qualified inspectors to perform the required in-service inspection, testing and certification of all your snatch blocks.
- Refurbishment

  We provide assisting services like stripping down, reworking and reassembling the block before testing and certification.
- Custom Made

  We are able to customise your snatch blocks to meet every demand.

McKissick Snatch Blocks—Regular Use

The Most Popular Brand Of Snatch Blocks In The World: McKissick

Light Champion Range: 2T To 15T WII

Single sheave for 5/16” to 1” wireline.

Sheave Diameter (inches)	Bearing Code	Stock No.			Wire Rope Size (inches)	Working Load Limit (metric tons)*	Weight Each (lbs.)		
		418 (with Hook)	419 (with Shackle)	404 (with Tail -board)			418 (with Hook)	419 (with Shackle)	404 (with Tail -board)
* 3	BB	—	109091	—	5/16 -3/8	2	—	4	—
** 3	BB	108038	109037	102016	5/16 -3/8	2	5	4	3
** 4-1/2	BB	108065	109064	102025	3/8 - 1/2	4	12	12	7
6 6	BB RB	108127 108154	109126 109153	102098 102114	3/8 - 1/2	8 8	27 27	28 28	15 15
8 8	BB RB	108225 108252	109224 109251	102169 102187	5/8 - 3/4	8 8	33 33	34 34	21 21
10 10	BB RB	108323 108350	109322 109359	102230 102258	5/8 - 3/4	8 8	41 41	42 42	29 29
12 12	BB RB	169169 199911	202961 169347	178890 178934	5/8	8 8	48 48	49 49	36 36
12 12	BB RB	108421 108458	109420 109457	102301 102329	3/4	8 8	48 48	49 49	36 36
14 14	BB RB	194920 199948	169356 167857	— —	5/8	8 8	55 55	56 56	— —
14 14	BB RB	108528 108546	109527 109545	— —	3/4	8 8	55 55	56 56	— —
16 16	BB RB	199975 200008	203041 203087	— —	3/4	15 15	130 130	135 135	— —
16 16	BB RB	108608 108626	109607 109625	— —	7/8	15 15	130 130	135 135	— —
18 18	BB RB	200099 200151	203130 203176	— —	7/8	15 15	150 150	155 155	— —
18 18	BB RB	108644 108662	109643 109661	— —	1	15 15	150 150	155 155	— —

Type 418 (with hook)

Type 404 (with tailboard)

Type 419 (with shackle)

*** Ultimate Load is 4 times the Working Load Limit.**
**** Available in bronze bushed only. 3” and 4-1/2” types have self-lubricating bronze bushing.**
† Fitted with 1-1/4” I D swivel eye.
†† May be furnished in other wire rope sizes.

Champion Range: 12T To 15T WLL

Single sheave for 3⁄4” to 7/8” wireline.

Sheave Diameter (inches)	Bearing Code	Stock No.			Wire Rope Size (inches)	Working Load Limit (metric tons)*	Weight Each (lbs.)		
		420 (with Hook)	421 (with Shackle)	406 (with Tail -board)			420 (with Hook)	421 (with Shackle)	406 (with Tail -board)
6	BB	169374	169481	167973	3/4 - 7/8	12	40	48	24
6	RB	169392	204120	167982	3/4 - 7/8	12	40	48	24
8	BB	169418	169515	167991	3/4 - 7/8	15	51	57	30
8	RB	169445	204193	168008	3/4 - 7/8	15	51	57	30
10	BB	110221	110720	103186	3/4 - 7/8	15	63	69	42
10	RB	110258	110757	103202	3/4 - 7/8	15	63	69	42

Type 420 (with hook)

Type 421 (with shackle)

Type 406 (with tailboard)

***Ultimate Load is 4 times the Working Load Limit.**

†May be furnished in other Wire Rope sizes.

Super Champion Range: 20T To 30T WLL

Single sheave for 1” to 1-1/4” wireline.

Sheave Diameter (inches)	Bearing Code	Stock No.			Wire Rope Size (inches)	Working Load Limit (metric tons)*	Weight Each (lbs.)		
		430 (with Hook)	431 (with Shackle)	407 (with Tail -board)			430 (with Hook)	431 (with Shackle)	407 (with Tail -board)
8	BB	120023	121022	103523	1-1/8	20	75	87	42
8	RB	120041	121040	103541	1-1/8	20	75	87	42
10	BB	120096	121095	103603	1-1/8	20	89	101	55
10	RB	120112	121111	103621	1-1/8	20	89	101	55
12	BB	208536	169917	184375	1	20	103	115	70
12	RB	208554	209303	184393	1	20	103	115	70
12	BB	120176	121175	103685	1-1/8	20	103	115	70
12	RB	120194	121193	184419	1-1/8	20	103	115	70
14	BB	208572	209321	184437	1	20	123	135	90
14	RB	208590	170424	103765	1	20	123	135	90
14	BB	1201256	121255	103783	1-1/8	20	123	135	90
14	RB	120274	121273	184552	1-1/8	20	123	135	90
18	BB	208689	209410	184605	1	25	240	260	165
18	RB	208732	209465	119641	1	25	240	260	165
18	BB	119482	119561	119650	1-1/8	25	240	260	165
18	RB	119491	119570	184	1-1/8	25	240	260	165
20	BB	208750	209483	184623	1-1/8	30	375	400	215
20	RB	208787	169864	184650	1-1/8	30	375	400	215
20	BB	119507	119589	119669	1-1/4	30	375	400	215
20	RB	119516	119598	184678	1-1/4	30	375	400	215
24	BB	208812	209526	184687	1-1/8	30	450	475	290
24	RB	208858	209553	184721	1-1/8	30	450	475	290
24	BB	119525	119605	119687	1-1/4	30	450	475	290
24	RB	119534	119614	119696	1-1/4	30	450	475	290

Type 430 (with Hook)

Type 431 (with shackle)

Type 407 (with Tailboard)

***Ultimate Load is 4 times the Working Load Limit.**
†May be furnished in other Wire Rope sizes.

Double Sheave—Light Champion Range: 4T to 12T WLL

Double sheaves for 3/8” to 3/4” wireline.

Sheave Diameter (inches)	Bearing Code	Stock No.		Wire Rope Size (inches)	Working Load Limit (metric tons)*	Weight Each (lbs.)	
		408 (with Hook)	409 (with Shackle)			408 (with Hook)	409 (with Shackle)
† 4-1/2	BB	104023	105022	3/8 - 1/2	4	18	18
6	BB	104103	105102	5/8 - 3/4	12	45	50
6	RB	104121	105120	5/8 - 3/4	12	45	50
8	BB	104185	105184	5/8 - 3/4	12	53	58
8	RB	104201	105200	5/8 - 3/4	12	53	58
10	BB	104265	105264	5/8 - 3/4	12	70	75
10	RB	104283	105282	5/8 - 3/4	12	70	75
12	BB	194578	195185	5/8	12	90	95
12	RB	168044	195229	5/8	12	90	95
12	BB	104345	105344	3/4	12	90	95
12	RB	104363	105362	3/4	12	90	95
14	BB	194621	195247	5/8	12	100	105
14	RB	194649	195265	5/8	12	100	105
14	BB	104425	105424	3/4	12	100	105
14	RB	104443	105442	3/4	12	100	105

Type 408 (with Hook)

Type 409 (with Shackle)

***Ultimate Load is 4 times the Working Load Limit.**

†May be furnished in other Wire Rope sizes.

All Alloy Range: 12T WLL

Single sheave for 3/4” to 7/8” wireline.
All Alloy Range – High Strength, Low Weight
Weight is only 60% of regular block of same WLL!

Sheave Diameter (inches)	Bearing Code	Stock No.			Wire Rope Size (inches)	Working Load Limit (metric tons)*	Weight Each (lbs.)		
		416 Alloy with Hook	417 Alloy with Shackle	402 Alloy Tail Board			416 Alloy with Hook	417 Alloy with Shackle	402 Alloy Tail Board
6	BB	193427	168972	179238	3/4 - 7/8	12	26	27	15
6	RB	193472	193757	179283	3/4 - 7/8	12	26	27	15
8	BB	193490	168990	179316	3/4 - 7/8	12	33	34	21
8	RB	193542	163819	179363	3/4 - 7/8	12	33	34	21
10	BB	193614	193882	179434	3/4 - 7/8	12	41	42	29
10	RB	193677	193935	179498	3/4 - 7/8	12	41	42	29


Type 416- with Hook

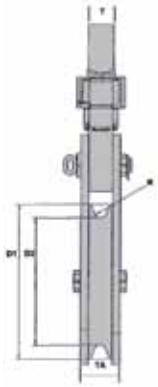

Type 417- with Shackle

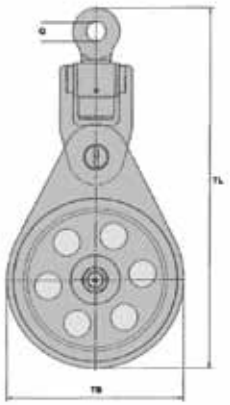

Type 402- with Tailboard

* **Ultimate Load is 4 times the Working Load Limit.**
† **May be furnished in other wire rope sizes.**

High WLL Heavy Duty (HD) Snatch Blocks

Manufactured In Holland, KTL Offshore’s Range Of Heavy Duty Snatch Blocks Extends Up To 1,000 Metric Tons WLL!





Ropeblock BV and their subsidiary Van Mechelen BV manufacture heavy duty snatch blocks to KTL Offshore’s specification – designed for the harsh offshore environment, built to last.

Snatch blocks can be custom made to suit your requirements and are supplied with material, proof load and third party test certification (upon request).

Used by the world’s foremost offshore contractors, our heavy duty snatch blocks have a proven track record for reliability and ruggedness.

HD Range Of Snatch Blocks

Part No	WLL (metric tons)	Wire Rope Diameter	Wire Rope Diameter (inches)	Dimensions (mm)								Weight
				D1	D2	T	Q	R	TA	TB	TL	(kg)
RKTL 851	85	52	2	855	725	120	87	27	175	870	1750	1000
RKTL 1201	120	52	2	855	725	135	102	27	195	870	1890	1300
RKTL 1501	150	64	2-1/2	920	770	150	115	35	220	935	2000	1600
RKTL 2001	200	76	3	1115	910	160	138	41	260	1130	2200	2400
RKTL 2501	250	82	3-1/4	1300	1080	185	149	44	280	1315	2500	3750
RKTL 3001	300	90	3-1/2	1500	1260	190	160	48	310	1515	2850	4800
RKTL 4001	400	102	4	1860	1550	210	185	55	310	1880	3860	7500
RKTL 5001	500	114	4-1/2	2115	1824	235	198	61	330	2135	4250	10500
RKTL 6001	600	127	5	2225	1905	260	215	68	350	2245	4500	12000

DF = 4:1
Wireline sizes and sheave sizes can be altered to suite your requirements.
Other combinations of wire line size and WLL available.

VAN MECHELEN LIFTING GEAR

Crane Blocks, Construction Blocks and Sheaves

McKissick Makes The Largest Blocks For The Offshore Industry

McKissick Value Added Features For Crane And Construction Blocks:

- Manufactured in the USA at McKissick's API Q1 certified factory.
- Crane blocks can be custom made to meet every demand.
- Repair parts are available for all block models.
- Roll forged sheaves are used as standard in all crane blocks.

For Offshore Cranes: The 380 Series

The McKissick 380 Utility Crane Block series is an industry standard and equips some of the largest derrick barges in the world.

It comes in one to eight sheave configurations, with more designs available upon request.

Features:

- Tapered Roller Bearings (other types can be used but TRB is recommended for offshore use).
- Dual action hooks: swings and rotates.
- Anti-rotation locking device (75t and larger).
- Plate steel cheek weights.

Available hook types:

SINGLE
(for loads up to 300t)

DUPLEX
(for loads up to 1000t)

QUAD
(for loads 200t and above)

780 Series Metric Crane Block

For Mobile Cranes: The M780 Series

For mobile cranes, the M780 series Metric Crane Block has been designed with a maximum WLL of 75 metric tons.

Features:

- Size of wire line range from 12 to 29mm.
- Sheaves can be grooved for metric or imperial dimensions (or both).
- Dual action hooks: swings and rotates.
- Available with 1, 2 or 3 sheaves.
- Supplied with sealed roller bearings.

McKISSICK

Underwater Blocks

Depend On KTL Offshore For Advice On Underwater Blocks With Special Features

Offshore construction frequently requires the use of hook blocks, construction blocks and snatch blocks below the waterline. The equipment used must be adapted for underwater longevity to ensure cost-effectiveness.

Special seals, lubrication channels, bushing material and surface coatings are just some of the features that are imperative.

KTL Offshore supplies underwater blocks in virtually any standard block configuration and WLL.

Roll Forged Sheaves

McKissick's Roll Forged Sheaves Set The Industry Standard

Roll forged sheaves offer the following advantages over fabricated or cast sheaves:

Closed die upset and roll forged—not split

Die upsetting and roll forging forms grooves and flange walls in multiple steps. This eliminates the need to split and weaken the groove. This exclusive forging process adds extra strength to the critical groove section.

Solid steel—not cast

Every McKissick sheave starts as a single piece of solid carbon steel plate. Solid steel gives better balance and distribution of forces in a McKissick roll forged sheave. It is flame-cut from closely checked stock to prevent inherent web/rim flaws found in cast sheaves. Conversely, casting can result in groove wall variations, causing uneven stress and premature failure.

Full range of standard sheave sizes

McKissick roll forged sheaves are available in a full range of sizes from 12- to 72-inch.

Flame hardened groove

The McKissick sheave groove is flame hardened to a minimum of 35 Rockwell C for a 140 degree contact area with the wire rope.

TECHNICAL SERVICES FOR THE OFFSHORE INDUSTRY

With One Of The Largest Tensile Testing Facilities In The Industry And Qualified Inspectors, KTL Offshore Provides The Total Solution Package For Your Rigging Needs

Inspection, Testing And Certification

KTL Offshore's capabilities go beyond conducting proof load testing on the largest and longest slings and grommets with DNV calibrated and computer controlled tensile testing machines.

Our Inspection, Testing and Certification (ITC) program for large diameter slings and grommets includes:

- Visual inspection report from a qualified inspector.
- Proof load (to customer specification) test report.
- ABS or other third party test report.
- Recommendation for discard or continued service based on latest international standards such as IMCA M179.

Our inspectors are also qualified in non-destructive testing such as magnetic particle inspection and magnetic rope testing.

Offshore Services—Going Beyond Borders

We are able to mobilise a team of qualified inspectors and riggers at a moment's notice to virtually any offshore location. Wherever your vessel is located, be it Hong Kong, Indonesia, Vietnam or Thailand for example, we will be there.

KTL Offshore Value Added Feature:

Our inspectors are qualified by international training organizations for rigging equipment as well as certified to work offshore.

Wire Rope Spooling And Installation

KTL Offshore Operates A Fleet Of Ultra Modern Wire Rope Spooling Machines

KimSpool 5 (shown above) is a massive spooler with 20-ton back-tension and the capability to handle a steel reel that weighs 200 metric tons. This spooler is ideal for large diameter crane and anchor wire rope in long lengths.

Our machines are hydraulic controlled and the back tension is attained without using sheaves or other potentially harmful tensioning devices.

We also have many other spooling machines of different dimensions and capabilities, allowing us great flexibility in scheduling our spooling jobs.

A Team Of Dedicated Professionals

In addition to high-tech modern equipment, our Technical Services Department is very experienced in the spooling of wire ropes and the installation and removal of crane and anchor wire rope.

Our major projects include the installation of 120t reels for Global Santa Fe's rigs and the installation of the main crane hoist ropes for the Sapura 3000.

Extended Hire Periods

Our Kimspool machines are available for extended periods of hire at preferable rates. We are capable of shipping the spoolers to your location anywhere in the world.

Complex Spooling Jobs

Cable armored umbilicals are a speciality of our technical services team. These delicate spooling jobs require a high level of expertise and the best equipment in order to get the job done correctly.

Wire Rope Lubrication

High Pressure Lubrication System With Specialised Lubricants

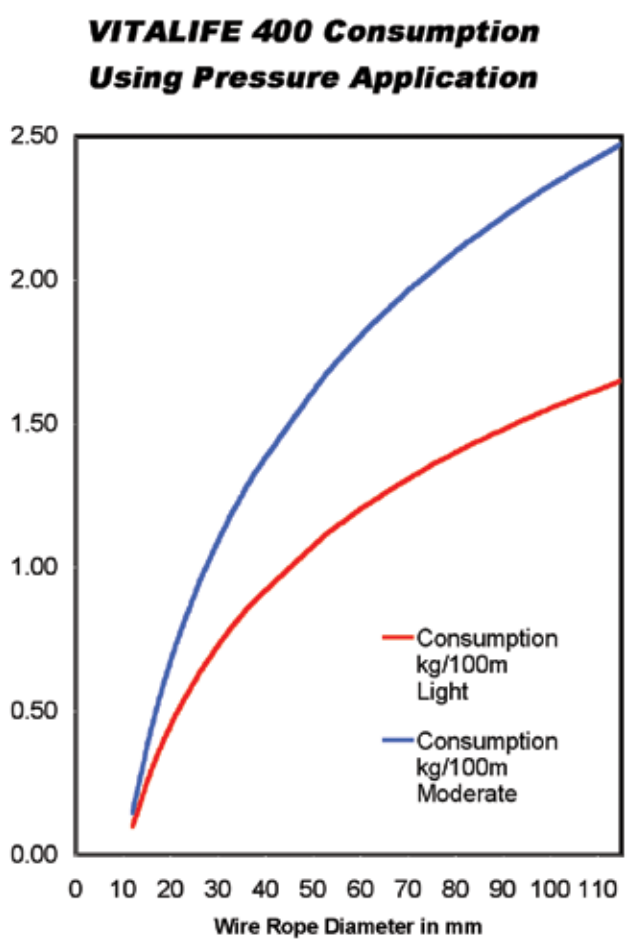
KTL Offshore uses the most advanced high pressure lubrication system available in the market together with the best lubricants.

Crosby's **Vitalife 400** is specifically designed for pressure applications and use in an offshore environment.

Vitalife 400 has low viscosity. It behaves more like oil rather than thick grease to ensure maximum penetration to the core of the wire rope.

The pressure lubrication system uses air pressure to force water present within the rope construction out before introducing lubrication into the rope.

We also have other lubricants available such as **Centigard 300**, another marine specific wire rope lubricant.



Our pressure lubrication system is designed to accommodate wire rope diameters of up to 5" (127mm).

VITALIFE® WIRE ROPE LUBRICANT

the Crosby group inc.

KIMTRACK Inventory Management System

Maintenance And Storage Service With Web-Based Access

KTL Offshore will store and maintain your spare wire rope (and any other rigging equipment) for you at our Singapore facility.

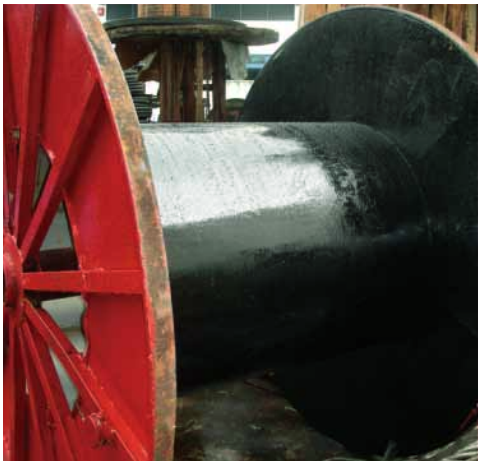
When your inventory information is recorded in our KimTrack web-based management system, a user-specific name and password will be provided to your organisation. It gives you 24-hour access to the KimTrack system via our website.

The KimTrack system enables our customers to:

- View all outstanding production orders with ETA dates.
- Access and download test certification for individual items in storage.
- View the relevant data for all items under the management system.

This tool provides the operator with vital, real-time information no matter where they are in the world.

(Right) Customer supplied slings and shackles may be stored in clearly identified containers while steel reels will be covered, lubricated and periodically rotated to prevent lubrication migration (above).



A used steel reel (above) is restored by cleaning, blasting and painting prior to re-installing the wire rope for storage.

(Right) Prior to storage under the KimTrack system, pressure lubrication cleans and lubricates the rope through to the core.

CONVERSION FACTORS

MASS

Long Tons (UK) : A long ton is a British measurement and equivilent to 2,240 pounds. Not to be confused with the US “short ton”

Short Tons (US) : United States measurement also known as a short ton that equals 2,000 pounds.

Metric Tons (or Tonnes) : A unit of weight equal to 1,000 kilograms, or 2,204.6 pounds.

FORCE

To convert from	To	Multiply by
dyne(dyn)	newton(N)	1.0 E-05
kilogram-force(kgf)	newton(N)	9.80665
kilopond (kilogram-force)(kp)	newton(N)	9.80665
kip(1 kip=1000lbf)	newton(N)	4.448222 E+03
kip (1 kip=1000lbf)	kilonewton(kN)	4.448222
ounce (avoirdupois)- force (ozf)	newton(N)	2.780139 E-01
poundal	newton(N)	1.382550 E-01
pound-force(lbf)	newton(N)	4.448222
pound-force per pound (lbf/lb)(thrust to mass ratio)	newton per kilogram(N/kg)	9.80665
ton-force (2000 lbf)	newton(N)	8.896443 E+03
ton-force (2000 lbf)	kilonewton(kN)	8.896443
pound-force per foot(lbf/ft)	newton per metre(N/m)	1.459390 E+01
pound-force per inch(lbf/in)	newton per metre(N/m)	1.751268 E+02

LENGTH

To convert from	To	Multiply by
metres (m)	ft	3.28084
kilometres (km)	miles	0.621371
metres (m)	fathoms	0.54545

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