

SYNTHETIC LIFTING SLINGS





HEAVY LIFT.

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LANKHORST ROPES... THE VITAL CONNECTION

Lankhorst Ropes is a world leading supplier of synthetic fiber and steel wire ropes for the maritime and offshore industries. As a Royal Lankhorst Euronete Group company, Lankhorst Ropes is also part of the world's largest steel wire manufacturer, WireCo WorldGroup.

Founded in 1803, Lankhorst Ropes has over 200 years' experience in the manufacture and supply of high performance ropes for mooring and towing applications.

Our core business is the development and production of high performance, synthetic and steel wire ropes for mooring and anchor systems, as well as towing and crane hoisting and luffing applications. We are committed to setting the standard for maritime ropes through our leading rope brands - TIPTO® 'Strong & Durable' family, EURO 'Strong & Stretch' family and LANKO® 'Strong & Light' family, which provide an optimal combination of breaking strength, life-time safety and ease of handling. All our ropes are produced in accordance with OCIMF recommendations and ISO standards.

As a supplier of steel wire ropes, Lankhorst Ropes has direct access to WireCo's large steel wire manufacturing resource and leading wire rope brands. Our design team has many years' experience in applications using both synthetic and steel ropes. Lankhorst offers a one-stop shop for synthetic and steel wire ropes to shipping and offshore companies globally; and we are the key player for new build ships' initial rope supply.

RELIABILITY AND SAFETY

Lankhorst Ropes conducts an Industry leading research program on the safe and reliable use of synthetic ropes in Offshore Engineered lifts. This program is witnessed by DNVGL to ensure safe and reliable products.

INNOVATION AND HIGH PERFORMANCE

Lankhorst Ropes is continuously working to improve the performance of our slings. Besides that we are working on smart solutions for Heavy Lifting. Some of these solutions will be ready to go to market in 2018. Lankhorst Ropes has a reputation for excellence in product innovation. Lankhorst Ropes has developed several multi-award winning rope innovations, including the TIPTO® WINCHLINE anti-snap back feature which received the 'Innovation in Ship Operations' award from SEATRADE in 2013, which have led the industry in rope handing and safety. Lankhorst Ropes is leader in providing extraordinary solutions in terms of breaking strength, service life and ease of rope handling.



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SUPPLY, SERVICE AND DELIVERY

Lankhorst Ropes is present at strategic locations worldwide. Thanks to our widespread network and global presence, you are ensured continuity of supply, fast service and short delivery times. Our strategic locations includes

- South East Asia (partnership)
- Middle East (branch)
- Europe (branch & partnership)
- USA (partnership)
- South America (branch)





PARTNER AND PROBLEM SOLVER

Our R&D department, engineers and application engineers are driven to solve your issues in Engineered Lifts. Together with our yarn suppliers, certification authorities and local distribution we are able to assist you. Lankhorst Ropes develops, manufactures and supplies a broad range of ropes directly from stock. Besides fast supply of standard items and rope configurations, Lankhorst Ropes has a dedicated confectioning centre to meet the needs of different market segment demands for specialized and tailor made solutions. In close consultation with our clients, we can bring nearly any desired product to market.

SUSTAINABLE AND ENVIRONMENTALLY FRIENDLY

Lankhorst Ropes is committed to sustainability in its products and operations, conserving energy and natural resources wherever possible. We introduced the maritime rope industry's first recycling scheme for retired ropes, for use in moulded public furniture, poles and planks, for example. It is an integral part of our sustainability policy and helps many of our partners enhance their environmental policies.



LANKHORST ROPES FOR SYNTHETIC LIFTING SLINGS

In recent years, high performance synthetic fiber rope slings have emerged as a viable alternative to steel wire rope (SWR) slings due to their intrinsic characteristics: equivalent load bearing capacity for the same rope diameter, lower weight and easier handling. These features enable faster lifting operations due to the user-friendly ergonomics of fiber rope slings, which in turn translate into significant operational savings.

Used successfully in many offshore projects, widespread usage of high performance synthetic fiber rope slings has been hindered by their novelty, in comparison with steel wire ropes slings, and a lack of familiarity regarding performance, characteristics and discard criteria.

To build confidence and encourage widespread use of fiber rope slings, Lankhorst Ropes has conducted an industry leading R&D program into the performance of high performance fiber rope slings under realistic scenarios, to provide offshore installation companies with the ability to determine and predict fiber rope sling behaviour for safe use in lifting projects.

The program included synthetic fiber rope slings' performance and behavior, in diverse service contexts and particular lifting scenarios, where the combined effect of interfaces, boundary conditions, and failure modes are considered.

Program output has included specific slings design information such as: bending efficiency reductions, accurate stiffness data (dynamic/static), temperature behaviour of rope slings during operations, and other characteristics that can be used as input for engineering lifting design calculations. High performance fiber rope lifting slings from the heavy lift division of Lankhorst Ropes increase the lifting options for offshore contractors. They maximize crane lifting capabilities, provide a gentler lift and extend the reach of lifting / deployment systems in deepwater. Contact us to find out how Lankhorst Ropes can transform your offshore lifting.

The Lankhorst Ropes LANKO[®]FORCE range of ropes produce slings with a minimum breaking load (MBL) of around 2.000 t in single leg configuration and 3,200t in a grommet configuration.

ADVANTAGES OF SYNTHETIC FIBER ROPE SLINGS

- 1. As strong (or stronger) as wire
- 2. Lighter less weight in lifting gear
- 3. Easy handling more efficient
- 4. Reduced risk of injuries
- 5. Torque-free
- 6. No corrosion









12 STRAND BRAIDED ROPE, MADE OF DYNEEMA® YARNS

LANKO[®]FORCE is a 12 strand braided rope and an excellent alternative for heavy and lumbersome wire ropes in situations requiring manual handling of the rope. It is stronger than conventional steel wire rope, yet the corresponding weight is 7 times lower. The improved handling characteristics are especially suitable for lifting, towing and mooring applications.

Another important benefit of LANKO[®]FORCE is that the rope is floating. Moreover, when replacing fiber rope, the reduction in rope diameter can lead to substantial savings in the weight and size of the mooring winches, for example, when incorporated in the design of a new build vessel the cost saving is substantial.

LANKO[®]FORCE is available in a 12x1 construction in the diameters up to 84mm and a 12x3 patented construction, where each strand is a 3 strand rope, in the diameters from 88mm and higher.

Lifting slings made from LANKO®FORCE ropes are project specific to match customer requirements. Different diameter ropes (higher fiber content) are selected to match the load bearing capacity needed. For sling applications, a premium Dyneema® fiber grade is used. This fiber combines maximum strength with minimum weight and is extremely durable and resistant to moisture, UV radiation and chemicals. The selected fiber grade is designed to perform in high demanding applications, such as heavy lifting, and offers the highest strength-to-weight ratio among all high performance fibers. During production the rope is coated using a proprietary coating technology, which extends rope life and provides increased abrasion resistance.



WATER ABSORPTION

0,98 (floating) excellent excellent good approx. 147 °C 12x1 strand braided (up to 84mm) and 12x3 strand braided (from 88m and up) vellow

0%



12X1 METRIC

nominal	weight	minimum breaking force			
diameter		IS0	ISO	SPLICED	GROMMET
mm	kg/m	kN	ton	ton	ton*
20	0,215	374	38,15	34,33	57,22
22	0,28	450	45,90	41,31	68,85
24	0,335	533	54,37	48,93	81,55
26	0,385	612	62,42	56,18	93,64
28	0,435	701	71,50	64,35	107,25
30	0,515	789	80,48	72,43	120,72
32	0,59	887	90,47	81,43	135,71
34	0,64	991	101,08	90,97	151,62
36	0,72	1.076	109,75	98,78	164,63
38	0,8	1.191	121,48	109,33	182,22
40	0,89	1.314	134,03	120,63	201,04
44	1,07	1.559	159,02	143,12	238,53
48	1,28	1.853	189,01	170,11	283,51
52	1,49	2.160	220,32	198,29	330,48
56	1,74	2.490	253,98	228,58	380,97
60	2	2.820	287,64	258,88	431,46
64	2,27	3.210	327,42	294,68	491,13
68	2,58	3.610	368,22	331,40	552,33
72	2,88	4.010	409,02	368,12	613,53
76	3,2	4.400	448,80	403,92	673,20
80	3,55	4.510	460,02	414,02	690,03
Diameter, w are determin	eight and MBI ned according	(as well as ISO 2307:2	other mechan	ical and physica	al properties)

12X1 IMPERIAL

nominal	weight	minimum breaking force			
diameter	lb/ft	ISO KN	ISO Ib	SPLICED	GROMMET
men	10/11	NIN	10	10	10
13/16"	0.14	374	84.102	75.692	126.153
7/8"	0,19	450	101.192	91.073	151.788
1"	0,23	533	119.856	107.870	179.784
1-1/16"	0,26	612	137.621	123.859	206.432
1-1/8"	0,29	701	157.635	141.872	236.453
1-1/4"	0,35	789	177.423	159.681	266.135
1-5/16"	0,40	887	199.461	179.515	299.192
1-3/8"	0,43	991	222.847	200.562	334.271
1-1/2"	0,48	1.076	241.961	217.765	362.942
1-9/16"	0,54	1.191	267.822	241.040	401.733
1-5/8"	0,60	1.314	295.481	265.933	443.222
1-3/4"	0,72	1.559	350.574	315.517	525.861
1-7/8"	0,86	1.853	416.686	375.017	625.029
2-1/16"	1,01	2.160	492.468	443.221	738.702
2-1/4"	1,17	2.490	559.929	503.936	839.894
2-3/8"	1,34	2.820	634.137	570.723	951.206
2-5/8"	1,53	3.210	721.837	649.653	1.082.756
2-11/16"	1,73	3.610	811.785	730.607	1.217.678
2-13/16"	1,94	4.010	901.734	811.561	1.352.601
3-1/8"	2,19	4.400	989.875	890.888	1.484.813
3-3/16"	2,39	4.510	1.014.169	912.752	1.521.254
Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307:2010.					

12X3 METRIC

nominal	weight	minimum breaking force			
diameter		IS0	ISO	SPLICED	GROMMET
mm	kg/m	kN	ton	ton	ton*
00	1 20	E 220	E42 E0	100 05	010 75
88	4,30	5.320	542,50	488,25	813,75
96	5,10	6.478	660,60	594,54	990,90
104	6,00	7.677	782,80	704,52	1.174,20
112	6,95	8.875	905,00	814,50	1.357,50
120	7,98	10.289	1.049,20	944,28	1.573,80
128	9,10	11.466	1.169,20	1.052,28	1.753,80
136	10,30	12.765	1.301,70	1.171,53	1.952,55
144	11,50	14.260	1.454,10	1.308,69	2.181,15
152	12,78	15.332	1.563,40	1.407,06	2.345,10
160	14,16	16.730	1.705,90	1.535,31	2.558,85
168	15,61	18.177	1.853,60	1.668,24	2.780,40
176	17,12	19.674	2.006,20	1.805,58	3.009,30
184	18,71	21.220	2.163,90	1.947,51	3.245,85
Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307:2010.					





12X3 IMPERIAL

nominal	weight	minimum breaking force			
diameter		ISO	ISO	SPLICED	GROMMET
inch	lb/ft	kN	lb	lb	lb*
3-7/16"	2,89	5.320	1.196.006	1.076.405	1.794.009
4"	3,43	6.478	1.456.372	1.310.735	2.184.558
4-1/8"	4,03	7.677	1.725.777	1.553.199	2.588.666
4-7/16"	4,67	8.875	1.995.181	1.795.663	2.992.772
4-1/2"	5,36	10.289	2.313.087	2.081.778	3.469.631
5-1/16"	6,11	11.466	2.577.642	2.319.878	3.866.463
5-3/8"	6,92	12.765	2.869.754	2.582.779	4.304.631
5-2/3"	7,73	14.260	3.205.738	2.885.164	4.808.607
6"	8,59	15.332	3.446.703	3.102.033	5.170.055
6-3/10"	9,52	16.730	3.760.861	3.384.775	5.641.292
6-1/2"	10,49	18.177	4.086.484	3.677.836	6.129.726
6-15/16"	11,50	19.674	4.422.468	3.980.221	6.633.702
7-1/4"	12,57	21.220	4.770.798	4.293.718	7.156.197
Diameter, we are determin	eight and MI ed accordir	BF (as well a Ig ISO 2307:	s other mechan 2010.	ical and physica	I properties)

* GROMMET minimum breaking force (MBF) is based on D/d ratio 3

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SLING CONFIGURATION

LANKO[®]FORCE HL slings are available in two configurations, eye-and-eye (E&E) and endless loop (sometimes referred to as grommet).

These configurations offer different performance. Generally, the endless configuration will allow shorter Effective Working Length (EWL) than the eye-and-eye. On the other hand, the eye-and-eye slings make an overall more efficient use of the base rope. They also have better bend efficiency properties compared to endless loop configuration.



Choosing the appropriate sling configuration will be project and lifting arrangement dependent. By providing rope characteristics and performance data, Lankhorst can assist customers in selecting the appropriate configuration for a specific project.

LOAD/ELONGATION BEHAVIOUR

The load elongation characteristics of a sling are a function of the current sling load and the highest load that it has experienced previously.

For new slings, it is important to understand that the manufactured rope will contain internal voids within the structure. When the sling is tensioned for the first time, its structure will undergo an internal adjustment resulting in a reduction of the rope diameter and increased length of the sling. Because of this, the sling will become more compact, due to the removal of internal voids. This structural elongation is usually called bedding-in. The bedding-in elongation is permanent, and the sling structure will not return to its original length.



LOAD/ELONGATION TOLERANCES

The correct Effective Working Length (EWL) is a critical factor in lifting operations, especially if a multi-sling arrangement is being used. Typically, LANKO®FORCE HL slings can be supplied with a length tolerance of $\pm 2\%$ of the EWL and $\pm 1xd$ on matched set. These tolerances are very depending on sling length and configuration of the sling.





BENDING AT BEARING POINT

When the rope termination is placed at the payload interface (pins, hook, shackles, etc.), care must be taken with regard to its dimensions and geometry.

The performance of LANKO[®]FORCE HL slings are affected by the bending radius that the rope is required to meet. Typically, the ratio between the hardware and the rope is used to specify the minimum bending radius.

Ask Lankhorst for advice regarding any specific project requirement.



SLING PROTECTION

The main source of damage to lifting slings is external abrasion or mechanical damage due to a foreign object. Fiber slings are more susceptible to damage than steel slings; therefore, it is advised to consider the application of a protective over-braided jacket to the sling. This protection can prevent damage to the load bearing fibers due to abrasion, cutting, particle ingress or UV degradation. LANKO®FORCE HL slings can be provided with a wide variety of different protective jackets to prevent damage to the sling base rope.

ROPE PROTECTION – JACKETS

LANKO[®]FORCE WITH POLYESTER JACKET



LANKO[®]FORCE with POLYESTER jacket is produced for applications where heat build-up and heavy abrasion is expected. The polyester jacket is a durable with excellent abrasion / heat resistance, but with non-floating properties. Applications: mooring, towing, salvage and lifting.



LANKO®FORCE WITH DYNEEMA® JACKET

LANKO[®]FORCE with braided DYNEEMA[®] jacket is produced for applications where heat build-up and heavy abrasion is expected. The DYNEEMA[®] jacket is durable jacket with excellent abrasion / heat resistance, as well as floating properties. Applications: mooring, towing, salvage and lifting.

SOFT EYE PROTECTION

POLYESTER TUBULAR CLOTH



DEFENDER[®] PROTECTION



POLYURETHANE (PU) COATED



WIRECO

HARD EYE PROTECTION

EYES WITH HEAVY DUTY GALVANIZED THIMBLES.





TESTING FACILITIES

Lankhorst Ropes has several dedicated rope test machine for loads up to 1.200 tonnes. It can also conduct tension-tension fatigue testing of ropes to any fatigue regime specified by clients and certified verification authorities. The test facility can be used for proof loading and length verification of slings up to 25m in accordance with various industry standards such as APL, ABS and DNV rules.





ROPE AND SLING TRACEABILITY

Record keeping is essential for the safe use of lifting slings. Lankhorst high performance ropes carry a unique Product Identification Code (PIC). This PIC code is printed on a tape inside the rope. It corresponds with the factory certificate number for each rope.

All slings are provided also with a sling label, which provides relevant information regarding the sling usage and limitations, such as Safe Working Load (SWL) Limit and Effective Working Length (EWL).

SLING CERTIFICATION

LANKO®FORCE HL slings have been developed as part of an extensive R&D program, where testing under realistic scenarios has been performed to develop comprehensive understanding of sling performance and behavior exposed to the combined effects of interfaces, boundary conditions and failure modes. As specific output, design information such as: bending efficiency reductions, accurate stiffness data (dynamic/static), temperature behavior of rope slings during operations, and other characteristics can be used as input for engineering lifting design.

Under close collaboration with certification body DNV-GL, the framework for Technology Qualification was used in association with the requirements of DNVGL-OS-E303 to demonstrate suitability and safety of use. With this process, LANKO®FORCE HL slings achieved a certification readiness status, according DNVGL-OS-E303, which can be further expanded towards system integration, if required.

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