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# THE VITAL CONNECTION

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# LANKHORST ROPES... THE VITAL CONNECTION

Lankhorst Ropes is a world leading supplier of synthetic fibre 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.

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. Most 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, like Casar. 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 is fully certified according to ISO 9001:2015. Quality is central to our business ethos, ensuring you benefit from the highest quality products and services. Our factories for both steel wire and fibre ropes are approved by many IACS members, such as Lloyds, DNV/GL, BV and ABS. In addition, Lankhorst Ropes incorporates features like higher visibility, traceability and lower weight in their ropes, making them easier and safer to use.

#### **INNOVATION AND HIGH PERFORMANCE**

Lankhorst Ropes has a reputation for excellence in product innovation. Lankhorst Ropes has developed several multi-award winning rope innovations, which have led the industry in rope handling and safety. Lankhorst Ropes is leader in providing extraordinary solutions in terms of breaking strength, service life and ease of rope handling.



#### SERVICE AND DELIVERY

Lankhorst Ropes maintains stock points at strategic locations and main ports worldwide. Thanks to our widespread network and global presence, you are ensured continuity of supply, fast service and short delivery times. Our global network of stock points, local sales offices and factories includes Bilbao, Brisbane, Dordrecht (NL), Dubai, Fujairah, Houston, Maia (PT), Philadelphia, Rio de Janeiro, Rotterdam, Singapore and Sneek (NL).





#### PARTNER AND PROBLEM SOLVER

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.

#### **ENVIRONMENTAL, SOCIAL AND GOVERNMENTAL POLICY**

While the growing recognition among governments and corporations of the potential effects of climate change certainly informs our thinking on sustainability, we're proud that it has taken hold as a grass-roots movement at our company. We, as an organization, must make a commitment to leave the world a better place than we found it. Sustainability thus became a foundational commitment for us which led us to take near-term steps to formalize existing sustainability efforts and begin to lay the foundation for a comprehensive sustainability program.

For example in synthetics, scrap rope and yarn is recycled in our facility in Maia, Portugal for use in new products. Not only does this make financial sense by reducing disposal and raw material costs, but it also creates circularity in the manufacturing process that reduces waste and enables a degree of self-sufficiency. At Lankhorst Engineered Products business goes even further to give used plastics new life through Lankhorst Recycling, a product line sourced primarily with recycled materials. Based in Sneek, The Netherlands, Engineered Products has been recognized throughout Europe for its leadership in repurposing discarded polyethylene and polypropylene goods for use in construction, agriculture, recreation, and landscaping.

In our Environmental, Social, and Governance (ESG) journey tremendous work is already taking place in the areas of recycling, responsible sourcing, community engagement, and in our support of sustainable industries. Please find out more about our activities in our ESG report on our website.



# LANKHORST ROPES FOR TOWAGE AND SALVAGE

OUTSTANDING SERVICE LIFE PERFORMANCE AND, AS A RESULT, LOW TOTAL COST OF OWNERSHIP.

With a renewed focus on safety in the towage and salvage industry Lankhorst is committed to providing the equipment required to ensure the safety of crews and tugs. Lankhorst Ropes offers a range of proven equipment which increase on-board safety while reducing cost per tow. They include the Lanko®nect, Lanko®loop, Strongline™ towing and mooring rope, Defender® high performance protective sleeve for hawser, towing line and pennant.

The Lanko®nect is a synthetic fibre rope connection for the main tow line that replaces a conventional cow hitch, shackle or similar hardware, providing tug operators with

a quicker and safer connection during towing. It enables a new approach to tow line assembly by allowing tug operators to set a calculated breaking force for the tow line configuration. Moreover, the small Lanko®nect knot provides smoother line movement, as well as easier handling, compared to a conventional and large bulky knot.

Lankhorst's high strength Strongline<sup>™</sup> rope offers high abrasion resistance and easy handling through its parallel core and braided protective cover design. As well as ensuring long service life the cover also provides protection to crew from snap back. Strongline's highly visible orange markings also help to indicate twisting which may shorten the service life of the rope.

Similarly, Lankhorst Rope's Defender<sup>®</sup> offers high abrasion resistance for hawser, towing line or pennant, preserving the condition of the ropes. Defender's hollow braid design allows it to be easily adjusted to the size of rope being used and can be made from different types of yarns, in order to offer extra strength, floatability and other characteristics.

Ease of handling, and rope safety are the trademark of Lankhorst Ropes. Manufactured in the EU using the latest in-house yarn extrusion and rope production techniques, rope construction is optimised to suit the application. All Lankhorst ropes are manufactured from premium materials, tested to OCIMF recommendations, and offer full rope traceability. Moreover, we work closely with our suppliers, ensuring the highest quality standards from raw materials, through to the manufacture, delivery and installation of the finished rope.

Consistent rope performance is vital during mooring and towing. Using Lankhorst ropes, vessel operators are assured that their ropes are made with the greatest materials consistency and provide the same elongation, and service life, enabling more efficient rope management and supply at any of Lankhorst Ropes' extensive global stock point network. In this way, mixed mooring is reduced to zero.

Lankhorst has a dedicated fibre rope R&D centre providing the technical know-how needed to produce award-winning rope innovations in rope handling and safety. The A3 splice that makes rope handling easier and safer during mooring and towing.

Lankhorst Ropes is your partner for new build, and replacement ropes. The breadth and depth of our range of fibre and steel wire ropes and associated hardware, backed by a global network of stock points, means we are able to provide complete fleet supply ensuring your operations remain efficient and cost-effective.

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# **'THROUGH LIFE, FOR LIFE' SERVICE MODEL**

The cost and operational demands on tug operators have never been greater. Maintaining a competitive edge is often the sum of marginal gains, small improvements, which when taken together can make a big difference. Lankhorst Ropes' Through Life, For Life service is designed to do just this.

Lankhorst Ropes: Through Life, For Life gives operators a costeffective portfolio of rope service life support and sustainability benefits unmatched in the industry.

From rope selection to management through predictive servicelife rope testing and training, Lankhorst provides complete 'through life' rope service – we want you to experience the benefit of working with our ropes in terms of longer rope servicelife, easier handling and safe operation.

And then we go further. Commitment to Green manufacture combined with a longer lasting rope service-life, and ultimately rope recycling, translates into levels of sustainability that make a significant contribution to your environmental policies. Looked at in this way, life enhancing, sustainability is built-in with Lankhorst Ropes: Through Life, For Life; and it makes good business sense too!

# STEP 1 ROPE SELECTION

Making the correct rope selection is vital. The cost-effectiveness and safety of shipping operations are dependent on selecting the correct rope. Lankhorst takes a holistic approach to prevent early failure of the rope:

• Review of type of tow job and harbour conditions We will jointly analyse all details including type of towing job, expected swell conditions, possible currents and risks of surging.

• Review of the configuration of technical tug layout We will jointly analyse all details of the rope route starting from the winch, and calculated winch capacity, to analysis of D/d ratios.

# THROUGH LIFE, FOR LIFE

Longer rope service-life, easier handling, safe operation, green manufacture and rope recycling.

SWL

WIRECO



# **STEP 4 RESIDUAL STRENGTH TESTING**

Lankhorst Ropes will provide a continuous residual strength testing program in order to assist in determining the best moment to change the rope end-toend in order to ensure the most economical life time and to optimise safety on board. We believe this should be based on mooring hours, i.e. the number of hours a line has been used in mooring the vessel. This can be quantified by vessel and reported back to the manufacturer. Other factors which should be taken into consideration during the review are the environmental conditions at the ports and terminals where the vessel will be moored.

#### **Test report**

Each sample will get its own test certificate as illustrated.

### **Rope selection criteria**

Based on the holistic analyses, Lankhorst will recommend a rope to meet the desired properties for:

- Elongation
- Rope flexibility/stiffness
- Twist impact
- Break load
- Chafing gear
- Safety risks
- Buoyancy
- Service life expectations
- Environmental conditions
- International standards.

# STEP 2 ROPE INSTALLATION AND CREW TRAINING

Lankhorst Ropes is committed to equipping crew with the knowledge and skills needed to ensure safe use of fibre ropes and maximum service life. Specifically, we provide:

- Training on rope handling
- Splicing instructions
- Installation on new (shipyard) or existing (ports) vessels
- Hardware inspection including all on-vessel equipment.

# STEP 3 INSPECTION / MAINTENANCE ADVICE / TRAINING

Regular inspection is important in ensuring maximum rope service life. In addition to the crew training on rope handling and inspection, Lankhorst Ropes will make periodic visits to the vessel to undertake:

- Hardware condition inspection
- Rope inspection
- Update crew training
- Provide inspection reports.







#### **Visual inspection**

The rope-sample is visually inspected. Photos are taken for the final residual strength test report before pulling the sample to destruction.

#### Developing safe retirement criteria

By a continuous process of analysis and testing, it is possible to determine the most economical and safest points for ending rope usage and ultimately rope retirement.



# STEP 5 RECYCLING OF ROPES

The two testing and recycling programmes can be combined. Ropes which are returned for testing and deemed unusable, can be used for recycling into other polymer products. The image above shows an offshore vessel with KLP® Deck Covers made by Lankhorst Engineered Products.

The recycling programme is an exclusive programme. It is not meant for ad hoc single rope returning for recycling as an alternative to disposal by our customers. The intention is that the whole fleet's ropes will be recycled in time.

Check the rope selection pages to find out which products participate in the recycling programme.





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100 m	FINE.	1995 - G	Will





### **ROPE TRACEABILITY**

Record keeping is essential for the safe use of mooring and towing ropes. Lankhorst high performance ropes carry a unique Product Identification Code (PIC). This PIC code is printed on a tape inside the rope and on the protective barrier in the eye. It corresponds with the factory certificate number for each rope, providing an effective way of managing rope use and maintenance.

#### 24/7 ONLINE ACCESS TO ROPE CERTIFICATES

Lankhorst Ropes offer 24/7 online access to fibre rope and steel wire rope certificates, regardless of the time zone. It provides as standard a manufacturer's certificate for each individual mooring line, connecting shackle and tail. Certificates may be mislaid during filing or transportation but can be required immediately to trace and identify ropes. By having direct access to rope certificates, Lankhorst customers are able to instantaneously check all of their ropes' details including construction, diameter, length, minimum breaking load and end termination. Please contact your accountmanager at Lankhorst Ropes for activation.

Furthermore, Lankhorst Ropes has a DNV GL type approval for the manufacture of synthetic ropes used for mooring and towing. Check the synthetic rope selection pages to find out for which product a DNV F497 'Certificate of Test and Examination of Fibre Ropes' may be ordered.



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# **ROPE SOLUTION OVERVIEW** CONFIGURATION FOR 80t BOLLARD PULL\*



		I	
Total weight	Elongation of used rope at break	Features	
453kg 453kg	LANKO®FORCE: 2,2% STRONGLINE: 7,5%	<ul> <li>Popular towing system for tug owners.</li> <li>Elongation of STRONGLINE provides shock absorption</li> <li>LANKO®FORCE is lightweight pennant for quick, safe and easy handling</li> <li>Connecting main line and pennant with LANKO®NECT system</li> <li>Optional 'single': DEFENDER® jacketed version to increase abrasion resistance</li> </ul>	
162kg 158kg	LANKO®FORCE: 2,2% EUROFLEX®: 12,5%	<ul> <li>Popular towing system where weight and speed of connecting is key</li> <li>Suitable for winch system designed solely for steel wire</li> <li>Extremely long service life</li> <li>EUROFLEX<sup>®</sup> pennant resolves shock absorption</li> <li>Connecting main line and pennant</li> </ul>	
275kg		<ul> <li>with LANKO®NECT system</li> <li>Optional 'single': DEFENDER® jacketed version to increase abrasion resistance</li> </ul>	
1.226kg	6x36WS+IWRC: 1,5% LANKO®FORCE: 2,2% EUROFLEX®: 12,5%	<ul> <li>Traditional towing system with a proven track record</li> <li>LANKO®FORCE pennant is an option for quick, safe and easy handling by the area.</li> </ul>	
1.222kg		<ul> <li>EUROFLEX<sup>®</sup> pennant resolves shock absorption</li> <li>Optional 'single': DEFENDER<sup>®</sup> jacketed version to increase abrasion</li> </ul>	
1.488kg	1	resistance	and the second
1.334kg			

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# **CONFIGURATION ADDITIONAL VARIATIONS**

# FIBRE ROPE CONNECTIONS

# LANKO<sup>®</sup>NECT



#### Lanko®nect benefits:

- quick and easy (dis)connection
- variable calculated breaking force
- cost savings
- connection to a wide range of synthetic ropes
- smoother line movement and easier handling because of the small knot

The Lanko<sup>®</sup>nect is a synthetic fibre rope connection for the main tow line that replaces a conventional cow hitch, shackle or similar hardware, providing tug operators with a quicker and safer connection during towing.

#### THEORETICAL BREAKING FORCE



description	theoretical breaking force				
	kN	t (metric)	lbs		
2-loops 22mm 3-loops 22mm 3-loops 24mm 2-loops 26mm 3-loops 26mm 2-loops 26mm 3-loops 28mm 2-loops 30mm 2-loops 30mm 3-loops 32mm 3-loops 32mm 3-loops 34mm 3-loops 34mm 3-loops 34mm 3-loops 36mm	1.026 1.539 1.215 1.822 1.395 2.093 1.598 2.397 1.799 2.698 2.022 3.034 2.259 3.389 2.453 3.680	104,6 156,9 123,9 185,7 142,2 213,4 162,9 244,3 183,4 275,0 206,1 309,3 230,3 345,5 250,1 375,1	230.575 345.863 273.050 409.462 313.501 470.364 359.122 538.683 404.293 606.327 454.408 681.837 507.670 761.617 551.268 827.014		
3-loops 36mm Tolerance on the	3.680 pretical bre	375,1 aking force is	827.014 +/- 10%,		

Tolerance on theoretical breaking force is +/- 10%, based on D/d ratio 3.5:1.

A typical tow line configuration comprises a main towing line with a forerunner, and perhaps a stretcher, as well as a cow hitch or connector hardware. Labourious and time consuming to make up, there is also a risk of a break in the costly main line and forerunner from overpulling. The Lanko<sup>®</sup> nect enables a new approach to tow line assembly by removing the need for a cow hitch knot or hardware. It also allows tug operators to set a calculated breaking force for the tow line configuration.

With the Lanko<sup>®</sup>nect there is a minimal chance of damage to other components such as the towing bit and winch on board the tug boat or ship bollard and, of course, the other lines in the towing configuration. By allowing a variable calculated breaking force to be set for the tow line – the Lanko<sup>®</sup>nect can be either the strongest connection or a calculated weak link in a towing configuration.





# LANKO®LOOP

The Lanko<sup>®</sup>loop is a custom made synthetic fiber rope eye that can be repeatedly opened and closed as needed. It uses a simple knot and eye connection to easily and quickly complete the connection between, for instance, the main tow line and pennant or the main mooring line and stretcher.

#### Simple and Strong Connection

Ease of handling and the ability to connect lines safely and quickly are vital in many towing situations, especially in adverse weather conditions. Lanko<sup>®</sup>loop is an all-in-one connection, no additional gear is needed. Simplifying the connection to a single openable eye ensures a safer operation without compromising on the strength of the complete line configuration.

The Lanko®loop can replace a conventional cow hitch, shackle or other hardware. Its simplicity allows many different mooring and towing configurations, as well as innovative approaches to mooring. The Lanko®loop eye splice is made from HMPE (High Modulus Polyethylene) twelve-strand rope and can be connected to a wide range of synthetic ropes. Please consult Lankhorst Ropes to check the possible use of Lanko®loop in your specific application.







# **STRETCHERS**

EUROFLEX<sup>®</sup> stretchers are mainly used in combination with low stretching materials as steel wire rope (6x36WS+IWRC) and LANKO<sup>®</sup>FORCE. EUROFLEX<sup>®</sup> stretchers are very well resistant against heat built-up due to the 50% A-grade polyester (high melting point) that is used on the outside end of each yarn. EUROFLEX<sup>®</sup> stretchers need to absorb heavy shock loads that can occur during towing operations. EUROFLEX<sup>®</sup> stretcher are superior in terms of tension-tension fatigue, due to the extremely high TCLL value of 78,8%! This makes EUROFLEX<sup>®</sup> the best solution for your high-performance stretcher.



Single legged stretchers provide elongation in the towing system. Stretch that is required for some harbor conditions with high swell and strong currents.



B WIRECO

# **ROPE SELECTION**



# LANKO<sup>®</sup>FORCE

12 strand braided rope, made of Dyneema® yarns.



12 strand braided rope, made of DYNEEMA® yarns. LANKO®FORCE is an excellent alternative for heavy and lumbersome steel 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 towing and mooring applications. Another important benefit of LANKO®FORCE is that the rope is floating. Moreover, when replacing fibre 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. Available in 12 x 1 construction (up to 86mm) and 12 x 3 construction (from 88mm). In a 12 x 3 construction each strand is a 3 strand rope.

# **ELONGATION:**



excellent

excellent

very good approx. 147°C

up to 86mm

from 88mm

12 x 1 strand braided

12 x 3 strand braided

81,95% (with 100%

residual strength)

Č-	UV-RESISTANCE
×	ABRASION RESISTANCE
Ţ	CHEMICAL RESISTANCE
<b>]</b>	MELTING POINT
ß	CONSTRUCTION

TCLL	TCLL VALUE

-)

\*

COLOUR

yellow WATER ABSORPTION 0% ELONGATION

nominal diameter weight			spliced /LI IS02307 (OCIMF ME				ed /LDBP /IF MEG4		
	mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric
	construct	tion 12 x 1							
	6	1/4	2,3	1,5	7.868	35	3,6	32	3,2
	8 10	5/16	3,9	2,6	13.938	62	6,3 10	56	5,7
	10	3/8 1/2	5,9 9,3	4,0	30,799	98 137	14	123	9,0
	14	9/16	10,7	7,2	41.365	184	18,8	166	16,9
	16	5/8	14,0	9,4	54.853	244	24,9	220	22,4
	18	3/4	18,0	12,1	68.117	303	30,9	273	27,8
	20 22	7/8	21,5 28.0	14,4 18.8	101.164	450	38,1 45,9	405	34,3 41.3
	24	1	33,5	22,5	119.823	533	54,3	480	48,9
	26	1 1/16	38,5	25,9	137.583	612	62,4	551	56,1
	28	1 1/8	43,5	29,2	157.591	701	71,5	631	64,3
	30 32	$1 \frac{1}{5}$	51,5	39.6	199.405	887	80,4 90,4	710	81.4
	34	13/8	65,0	43,7	222.786	991	101	892	90,9
	36	1 1/2	71,0	47,7	241.894	1.076	109,7	968	98,7
	38	1 9/16	80,0	53,8	267.747	1.191	121,4	1.072	109,3
	40	1 11/16	98.0	65.9	319.229	1.420	144.8	1.278	130.3
	43	1 23/32	103,0	69,2	334.965	1.490	151,9	1.341	136,7
	44	13/4	109,0	73,2	350.477	1.559	158,9	1.403	143,0
	45	1 13/16	114,0	76,6	366.439	1.630	166,2	1.467	149,5
	40 48	2	126.0	78,6 84,7	391.392 416.571	1.853	188.9	1.668	170.0
	50	2 1/16	137,0	92,1	449.618	2.000	203,9	1.800	183,5
	52	2 1/8	149,0	100,1	485.587	2.160	220,2	1.944	198,2
	54	2 3/16	162,0	108,9	515.037	2.291	233,5	2.062	210,2
	50 60	2 1/4	202.0	135.7	633.961	2.490	200,0 287.5	2.241	220,4
	62	2 9/16	213,0	143,1	656.667	2.921	297,8	2.629	268,0
	64	2 5/8	230,0	154,6	721.637	3.210	327,2	2.889	294,5
	68 70	23/4	259,0	174,0	811.560	3.610	368	3.249	331,2
	72 74	2 15/16	290,0 304.0	194,9 204 3	901.484 944 422	4.010	408,8 428.2	3.609	367,9
	76	3 1/16	320,0	215,0	989.384	4.401	448,6	3.961	403,8
	80	3 3/16	358,0	240,6	1.013.888	4.510	459,7	4.059	413,8
	82	3 1/4	373,0	250,6	1.068.067	4.751	484,3	4.276	435,9
	84 86	3 3/8	391,0 410.0	262,7	1.113.029	4.951	504,7 525.2	4.456	454,2
	construct	tion 12 x 3	110,0	210,0	1.100.210	0.102	020,2		
	88	3 7/16	430,0	288,9	1.321.652	5.320	542,3	4.788	488,1
	92	3 5/8	469,0	315,2	1.456.312	5.879	599,3	5.291	539,4
	96 100	3 3/4	510,0 557.0	342,7 374 3	1.591.197	6.478 7.078	660,3 721 5	5.830	594,3 649.4
	104	4 1/8	600,0	403,2	1.860.518	7.677	782,6	6.909	704,3
	108	4 1/4	650,0	436,8	1.995.179	8.276	843,6	7.448	759,3
	112	4 7/16	695,0	467,0	2.147.150	8.875	904,7	7.988	814,2
	116	4 9/16 4 5/8	747,0	502,0 518.8	2.197.282	9.551	973,6	8.596	876,2
	120	4 3/4	798,0	536,2	2.322.726	10.289	1.048,8	9.260	943,9
	124	4 7/8	856,0	575,2	2.582.155	10.332	1.053,2	9.299	947,9
	128	5 1/16	910,0	611,5	2.741.545	11.486	1.170,8	10.337	1.053,8
	132	5 3/10	972,0	692 1	2.869.910	12.195	1.243,1	11 489	1 171 2
	140	5 1/2	1.092,0	733,8	3.098.541	13.456	1.371,7	12.110	1.234,5
	142	5 5/8	1.123,0	754,6	3.205.775	13.783	1.405	12.405	1.264,5
	144	5 11/16	1.150,0	772,8	3.247.814	14.260	1.453,6	12.834	1.308,3
	140 148	5 <u>1</u> 3/16	1.218.0	818.5	3.393.715	14.772	1.505.8	13.295	1.355.2
	150	5 15/16	1.251,0	840,6	3.446.770	15.096	1.538,8	13.586	1.385,0
	152	6	1.278,0	858,8	3.551.081	15.332	1.562,9	13.799	1.406,6
	154 156	6 1/16 6 1/9	1.317,0	885,0	3.625.044	15.796	1.610,2	14.216	1.449,2
	158	5 1/4	1,385.0	930.7	3.760.828	16.454	1.677.3	14.809	1.509.5
	160	5 5/16	1.416,0	951,5	3.848.054	16.729	1.705,3	15.056	1.534,8
	162	6 3/8	1.456,0	978,4	3.929.435	17.117	1.744,9	15.405	1.570,4
	164 166	6 7/16 6 1/2	1.492,0	1.002,6	4.010.816	17.479	1./81,8 1.819.7	15.731	1.603,6
	168	6 9/16	1.561.0	1.048.9	4.086.576	18.178	1.853	16.360	1.667.7

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings. The figures in red refer to the Line Design Breaking Force (LDBF) in spliced dry condition and products are manufactured, tested and documented according to OCIMF guideline MEG4 Appendix B.

see graph for illustration purposes

minimum breaking force



# **A3 SPLICE**

In case of the unique A3 splice, the splice and the eye have been fully integrated. The A3 splice handling advantages include:

- No doubling of the rope in the splice area, therefore no doubling of the splice weight
- No stiffness due to the splicing, the rope maintains its natural flexibility

F

· Neater spooling on the storage drum of the winch if the line has an eye at both ends

# LANKO<sup>®</sup>FORCE WITH DEFENDER<sup>®</sup> JACKET 🐳



EA	TU	RE	S	

- light weight
- excellent abrasion resistance
- excellent
- UV-resistance
- floating
  - yellow A3 splice
- enhanced eye protection

					m	inimum brea	aking for	ce	
nominal diameter		weight			IS02307			spliced /LDBF (OCIMF MEG4)	
mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)	
34	13/8	116,5	78,3	261.902	1.165	118,8	1.049	106,9	
40	15/8	144,0	96,8	295.399	1.314	133,9	1.183	120,6	
44	13/4	168,0	112,9	350.477	1.559	158,9	1.403	143,0	
48	2	185,0	124,3	416.571	1.853	188,9	1.668	170,0	
52	2 2/16	208,0	139,8	485.587	2.160	220,2	1.944	198,2	
56	2 1/4	236,0	158,6	559.774	2.490	253,8	2.241	228,4	
60	2 1/2	275,0	184,8	633.961	2.820	287,5	2.538	258,7	
64	2 5/8	320,0	215,0	721.637	3.210	327,2	2.889	294,5	
68	2 11/16	341,0	229,1	811.560	3.610	368,0	3.249	331,2	
72	2 15/16	378,0	254,0	901.484	4.010	408,8	3.609	367,9	

Common diameters of Lanko®force with Defender® jacket pennants are available from stock in several standard lengths.

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength in the rope/wire itself, without splices or any other form of termination that can be formed with or without the use of accessories/fittings.

LANKO<sup>®</sup>FORCE with Defender<sup>®</sup> jacket is a 12 strand Dyneema<sup>®</sup> core rope covered with a braided jacket. It is an easy to handle, lightweight rope enabling quick mooring and towing connections. The Defender<sup>®</sup> jacket is woven in such a way that it provides maximum protection against heavy abrasion when using damaged and rusted fairleads and bollards. This is a significant benefit in preventing mooring / towing line damage, when the condition of these items is not known in advance. Moreover, by using the LANKO<sup>®</sup>FORCE with DEFENDER<sup>®</sup> jacket as a pennant, the overall total cost of rope ownership is reduced and safety increased.

# LANKO<sup>®</sup> FORCE WITH HMPE JACKET

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



### FEATURES:

- light weight
- excellent abrasion resistance
- excellent UV-resistance
- floating white with blue marker yarn
- A3 splice
- enhanced eye protection

				minimum breaking force			rce		
nominal	diameter	wei	ght		IS02307			spliced /LDBF (OCIMF MEG4)	
mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)	
construct	construction 12 x 1								
40	15/8	91,1	61,2	264.600	1.177	120,0	1.059	108,0	
42	1 11/16	94,0	63,2	292.926	1.303	132,8	1.173	119,5	
44	13/4	116,0	77,9	347.105	1.544	157,4	1.390	141,7	
46	17/8	128,0	86,0	372.958	1.659	169,1	1.493	152,2	
48	2	138,0	92,7	400.609	1.782	181,7	1.604	163,5	
50	2 1/16	142,0	95,4	417.245	1.856	189,2	1.670	170,3	
52	2 1/8	157,0	105,5	481.316	2.141	218,2	1.927	196,4	
54	2 3/16	172,0	115,6	494.580	2.200	224,3	1.980	201,8	
56	2 1/4	187,0	125,7	513.239	2.283	232,7	2.055	209,4	
58	2 5/16	205,0	137,8	553.255	2.461	250,9	2.215	225,8	
60	2 1/2	210,0	141,1	592.371	2.635	268,6	2.372	241,7	
62	2 9/16	224,0	150,5	624.969	2.780	283,4	2.502	255,0	
64	2 5/8	246,0	165,3	670.605	2.983	304,1	4.457	454,3	

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings. The figures in red refer to the Line Design Breaking Force (LDBF) in spliced dry condition and products are manufactured, tested and documented according to OCIMF guideline MEG4 Appendix B.

# LANKO<sup>®</sup>FORCE WITH POLYESTER<sup>®</sup> JACKET

LANKO<sup>®</sup>FORCE with polyester jacket is produced for applications where heat buildup 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

					miı	nimum brea	iking fo	rce
nominal	diameter	wei	ght		IS02307		splic (OCII	ed /LDBF /IF MEG4)
mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)
40	15/8	97,0	65,2	264.600	1.177	120,0	1.059	108,0
42	1 11/16	104,0	69,9	292.926	1.303	132,8	1.173	119,5
44	13/4	122,0	82,0	347.105	1.544	157,4	1.390	141,7
48	2	139,0	93,4	400.609	1.782	181,7	1.604	163,5
52	2 1/8	164,0	110,2	481.316	2.141	218,2	1.927	196,4
56	2 1/4	195,0	131,0	513.239	2.283	232,7	2.055	209,4
60	2 1/2	221,0	148,5	592.371	2.635	268,6	2.372	241,7
64	2 5/8	248,0	166,6	670.605	2.983	304,1	2.685	273,7

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings. The figures in red refer to the Line Design Breaking Force (LDBF) in spliced dry condition and products are manufactured, tested and documented according to OCIMF guideline MEG4 Appendix B.



# FEATURES:

- light weight
- very good abrasion resistance
- excellent UV-resistance
- white with double blue marker yarns
- A3 splice
- enhanced eye protection





# STRONGLINE™



#### STRONGLINE<sup>™</sup> has a rope

construction comprising a parallel core with a braided protective cover. The parallel core produces a far higher strength rope than might be expected for a rope of this diameter and material. The protective cover ensures a long service life due to its excellent resistance against abrasion. Regular maintenance can significantly lengthen the rope service life. The main applications of STRONGLINE<sup>™</sup> are towing and mooring.

When STRONGLINE<sup>™</sup> is installed on a towing winch, twists in the rope during installation can reduce the service life of the rope once put to work. To prevent twisting, it is crucial to use a turning table for unwinding from a coil. To facilitate the installation and avoiding induced twisting, a longitudinal marking has been added to the STRONGLINE<sup>™</sup> during manufacture. Please make sure the longitudinal marking line is always on the same position while winding up the STRONGLINE<sup>™</sup> on your towing winch.

#### Made of 100% polyester

#### ELONGATION:

	used rope new rope	
	100	
	80	
(%)	60	
force (	50 40	
aking	30	
in.bre	10	
ž	0 10 20	30 40
		Elongation (%)
_		4.00
· **	SPECIFIC GRAVITY	1,38
Ŏ	UV-RESISTANCE	excellent
*	ABRASION RESISTANCE	excellent
⊿	CHEMICAL RESISTANCE	good
Ĵ,	MELTING POINT	approx. 265 °C
<b>8</b> 8	CONSTRUCTION	parallel cores with jacket
TCLL	TCLL VALUE	64,9%
(2)	COLOUR	white with orange marker orange
$\overline{\bigcirc}$	WATER ABSORPTION	< 1%



				minimum breaking force			rce		
nominal diameter		weight			IS02307			spliced	
mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)	
56	2 1/4	227,0	152,5	248.639	1.106	112,7	995	101,5	
60	2 1/2	256,0	172,0	282.360	1.256	128,0	1.130	115,2	
64	2 5/8	284,0	190,8	317.205	1.411	143,8	1.270	129,4	
68	2 3/4	307,0	206,3	354.748	1.578	160,9	1.420	144,8	
72	2 15/16	367,0	246,6	392.067	1.744	177,8	1.570	160,0	
76	3 1/16	390,0	262,1	432.083	1.922	195,9	1.730	176,3	
80	3 3/16	417,0	280,2	472.099	2.100	214,1	1.890	192,7	
88	3 7/16	493,0	331,3	562.022	2.500	254,8	2.250	229,4	
92	3 5/8	528,0	354,8	611.930	2.722	277,5	2.450	249,7	
96	3 3/4	560,0	376,3	656.892	2.922	297,9	2.630	268,1	
100	3 15/16	630,0	423,3	711.970	3.167	322,8	2.850	290,6	
104	4 1/8	662,0	444,8	771.769	3.433	349,9	3.090	315,0	
112	4 7/16	788,0	529,5	911.825	4.056	413,5	3.650	372,1	

#### Other diameters on request

Common diameters of Strongline mainline are available from stock in several standard lengths. Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings.

#### A3 splice

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see graph for illustration

purposes

standard

In case of the unique A3 splice, the splice and the eye have been fully integrated. The A3 splice handling advantages include:

- No doubling of the rope in the splice area, therefore no doubling of the splice weight
- No stiffness due to the splicing, the rope maintains its natural flexibility
- Neater spooling on the storage drum of the winch if the line has an eye at both ends

**ELONGATION** 

A3 SPLICE





# **EUROFLEX**®



Continuing industry demand for mooring and towing ropes with higher strength AND smaller diameters, has led to the development of EUROFLEX<sup>®</sup>. Its excellent handling properties, softness and flexibility, combined with high energy absorption capability and abrasion resistance, make the EUROFLEX<sup>®</sup> one of the best ropes available today for mooring and towing for both shipping and offshore operations.

					minimum breaking force				
nominal diameter		weight			IS02307			spliced /LDBF (OCIMF MEG4)	
	mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)
	64	2 5/8	263,0	176,7	238.522	1.061	108,2	955	97,3
	68	2 3/4	296,0	198,9	269.096	1.197	122,0	1.077	109,8
	72	2 15/16	332,0	223,1	299.895	1.334	136,0	1.201	122,4
	76	3 1/16	370,0	248,6	332.942	1.481	151,0	1.333	135,9
	80	3 3/16	411,0	276,2	365.989	1.628	166,0	1.465	149,4
	88	3 7/16	497,0	334,0	441.525	1.964	200,2	1.768	180,2
	96	3 3/4	590,0	396,5	521.781	2.321	236,6	2.089	212,9
	104	4 1/8	689,0	463,0	606.759	2.699	275,1	2.429	247,6
	112	4 7/16	803,0	539,6	701.179	3.119	317,9	2.807	286,1
	120	4 3/4	923,0	620,2	797.847	3.549	361,8	3.194	325,6
	128	5 1/16	1.050,0	705,6	904.181	4.022	410,0	3.620	369,0
	136	5 3/8	1.187,0	797,6	1.015.012	4.515	460,2	4.064	414,2
	144	5 11/16	1 334 0	896 4	1 133 037	5 040	513.8	4 5 3 6	462.4

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings. The figures in red refer to the Line Design Breaking Force (LDBF) in spliced dry condition and products are manufactured, tested and documented according to OCIMF guideline MEG4 Appendix B.

- SPECIFIC GRAVITY

   W

   W-RESISTANCE

   ABRASION RESISTANCE

   CHEMICAL RESISTANCE

   MELTING POINT

   MELTING POINT

   CONSTRUCTION

   Image: Colour

   WATER ABSORPTION

   ELONGATION
- 1,14 good very good good approx. 165 °C/ 265 °C 8 strand braided 78,8% white with yellow marker yarn <0,5% see graph for illustration purposes

# **ELONGATION:**



DNV



# **TIPTO®TWELVE**







					minimum breaking force				
nominal diameter		wei	ght		IS02307		splic (OCII	ed /LDBF NF MEG4)	
	mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)
32	2*	1 5/16	53,0	35,6	39.791	177	18,0	159	16,2
36	5*	1 1/2	66,0	44,4	49.908	222	22,6	200	20,4
40	)*	15/8	75,6	50,8	60.474	269	27,4	242	24,7
44	1*	13/4	92,4	62,1	72.164	321	32,7	289	29,4
48	3*	2	109,0	73,2	84.978	378	38,5	340	34,7
L .									

available in several standard lengths other diameters on request

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings. The figures in red refer to the Line Design Breaking Force (LDBF) in spliced dry condition and products are manufactured, tested and documented according to OCIMF guideline MEG4 Appendix B.

TIPTO®TWELVE, the 12 strand braided construction makes the rope rounder, more stable, more compact and more regular on the surface. This increases the abrasion resistance and the life-time. Due to it's flexibility this ropes is recommended to be used on the mooring bit's in a figure 8 configuration.

TIPTO®TWELVE ropes in the range from 32 mm up to 48 mm have been upgraded with an extra marker yarn. The rope size can now easily (and above all) without mistake be identified.

{{	SPECIFIC GRAVITY	0,93 (floating)
X	UV-RESISTANCE	very good
*	ABRASION RESISTANCE	very good
	CHEMICAL RESISTANCE	good
Ĵ₹'	MELTING POINT	approx. 140°C
8	CONSTRUCTION	8 strand braided
TCLL	TCLL VALUE	75,41%
$\bigotimes$	COLOUR	yellow with orange marker yarn
$\Diamond$	WATER ABSORPTION	0%
<⇒	ELONGATION	see graph for illustration purposes

# **EUROFLOAT®PREMIUM**



				minimum breaking force				
nominal diameter		weight		IS02307			spliced /LDBF (OCIMF MEG4)	
mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)
36	1 1/2	67,0	45,0	58.226	259	26,4	233	23,8
40	15/8	85,0	57,1	72.838	324	33,0	292	29,7
44	13/4	99,0	66,5	84.753	377	38,4	339	34,6
48	2	120,0	80,6	102.513	456	46,5	410	41,8
52	2 1/8	141,0	94,7	120.048	534	54,4	481	49,0
56	2 1/4	162,0	108,9	137.808	613	62,5	552	56,2

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2307. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings. The figures in red refer to the Line Design Breaking Force (LDBF) in spliced dry condition and products are manufactured, tested and documented according to OCIMF guideline MEG4 Appendix B.

Using our latest in-house extrusion technology. Lankhorst has developed EUROFLOAT® PREMIUM rope to meet the requirements of the modern fleet of today. This floating high performance rope is constructed from high strength polyolefin and polyester yarns. The rope's floating characteristic makes it a safe rope to work with, while its high TCLL value ensures excellent fatigue resistance. Due to it's flexibility this ropes is recommended to be used on the mooring bit's in a figure 8 configuration.



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0,98 (floating)performance r<br/>rope's floating<br/>ensures excell<br/>be used on the<br/>goodgoodbe used on the<br/>be used on the<br/>goodgood3approx. 165 °C/ 260 °C8 strand braided75,1%off white with double green marker yarns<br/>0,1%see graph for illustration purposes

### **ELONGATION:**







# **NON-ROTATION RESISTANT**

# 6X36WS + IWRC



Standard wire rope with higher breaking strength. Used for all kinds of purposes, i.e. luffing, mooring, towing, anchoring and coupling push barges. The independent wire rope core provides more strength and stability to the wire rope compared to a fibre core. Construction is according to ISO standard.



				minimum preaking force					
nominal diameter		wei	weight		IS02408			ferrule-secured	
mm	inch	kg/100m	lb/100ft	lbs	kN	t(metric)	kN	t(metric)	
30	1 1/4	368,0	247,3	141.180	628	64,0	565	57,6	
32	1 5/16	419,0	281,6	160.738	715	72,9	644	65,6	
34	13/8	472,0	317,2	181.421	807	82,3	726	74,0	
36	1 1/2	530,0	356,1	203.227	904	92,2	814	82,9	
38	1 9/16	590,0	396,5	226.607	1.010	102,8	907	92,5	
40	15/8	654,0	439,5	251.786	1.120	114,2	1.008	102,8	
42	1 11/16	721,0	484,5	276.515	1.230	125,4	1.107	112,8	
44	13/4	792,0	532,2	303.492	1.350	137,6	1.215	123,9	
46	17/8	866,0	581,9	332.717	1.480	150,9	1.332	135,8	
48	2	942,0	633,0	361.942	1.610	164,1	1.449	147,7	
50	2 1/16	1.020,0	685,4	391.167	1.740	177,4	1.566	159,6	
51	2 1/127	1.060,0	712,3	409.152	1.820	185,5	1.638	167,0	
52	2 1/8	1.110,0	745,9	424.889	1.890	192,7	1.701	173,4	
54	2 3/16	1.190,0	799,6	458.610	2.040	208,0	1.836	187,2	
56	2 1/4	1.280,0	860,1	492.331	2.190	223,2	1.971	200,9	
58	2 5/16	1.380,0	927,3	528.301	2.350	240	2.115	215,6	
60	2 1/2	1.470,0	987,8	564.270	2.510	255,9	2.259	230,3	
62	2 9/16	1.570,0	1.055,0	602.488	2.680	273,2	2.412	245,9	
64	2 5/8	1.680,0	1.128,9	642.953	2.860	291,5	2.574	262,4	

#### larger diameters on request

Diameter, weight and MBF (as well as other mechanical and physical properties) are determined according ISO 2408 and EN 12385-4. The MBF refers to the breaking strength of the rope without splices or any other form of termination that can be formed with or without the use of accessories / fittings.



If the rope is affected by rough surfaces or sharp edges, it can be easily damaged. Also in case of high abrasion resistance, high cut-resistance and high chemical resistance protection of the rope is needed. Lankhorst Ropes provide innovative high performance protection solutions to prevent loss of strength and maximize the life of the fibre rope. Please consult our sales departments for the optimal sleeve to use in your application.









**HMPE SLEEVE** 





**PES DEFENDER® SLEEVE** 

HMPE VELCRO SLEEVE





# **ENHANCED EYE PROTECTION**

The standard polyester hose eye protection suffers a lot from abrasion. For that reason Lankhorst has replaced the standard polyester protection with a polyester Defender® protection. This is a braided sleeve that can be easily adjusted to the circumferential size of the rope and offers a high abrasion resistance. The polyester Defender® protection is standard on our jacketed ropes.



www.lankhorstropes.com

# THE VITAL CONNECTION

MAERSK SURABAYA



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