verope®
rely on

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KISWIRE

verope General Catalogue

2009 / 11

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KISWIRE

„Habit is a rope.
Every day we
strand a wire
and eventually
we cannot tear it
anymore.“

(Thomas Mann)

General Catalogue Special Wire Ropes

Edition 11/2009

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preface

verope AG is a Joint Venture company between Pierre Verreet, head and founder of verope, and Kiswire Ltd. from South Korea.
The concept of verope is to provide affordable high quality special wire ropes for crane applications to the world market.

After 5 successful years, verope has reached a new step. We are proud to present newly developed products, which have been approved by leading crane manufacturers. verope is now able to provide even better quality & service, which is confirmed by our certification through LRQA.

We at verope AG are pleased and proud to have satisfied our customers needs worldwide and will continue in our uncompromising mission of high service standards, combined with quality products that you can rely on.

Your requirement is our focus.

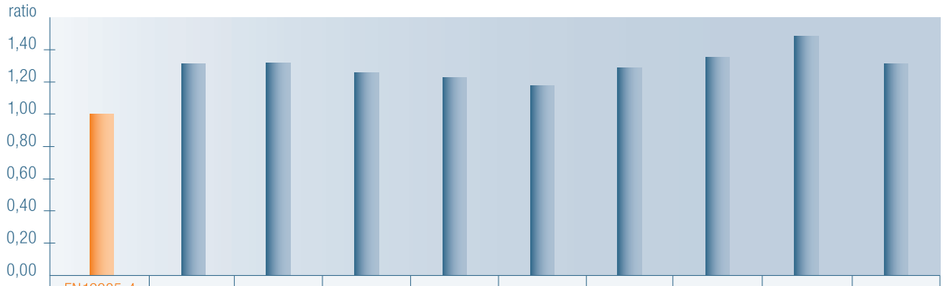
Pierre Verreet

content

why special wire ropes?

Breaking Load

verope Special Wire Ropes are designed to achieve high breaking loads and better strength to weight ratios. High ductility wires drawn to controlled tolerances are stranded and closed into a rope constructed with optimised gap spacing between the individual rope elements. verope products achieve an increased fill factor by using compacted strands as well as rotary swaging in their method of rope construction. Parallel lay elements in the rope composition increase the metallic cross sectional area.
Crane designers use the technical advantages provided by the rope manufacturers to reduce the drum and sheave dimensions in line with maintaining the recommended D/d ratios. The material cost and weight saving effect on the static design of the crane elements is substantial.



EN12385-4 6x36 WS-IWCR	verotop P	verotop	verotop E	vero 4	verostar 8	veropro 8	veropower 6	veropower 8	verosteel 8
1,00	1,31	1,31	1,23	1,21	1,18	1,28	1,34	1,43	1,30

Safety

Special wire ropes are supremely engineered products, carefully designed and tested to achieve an increased level of safety. The high number of parallel lay wires in strands as well as parallel lay compacted strands in the rope composition with steel-plastic combination concept allow a safe use of the rope.

Ropes with higher breaking loads offer a very useful service life under a lower specific level of stress. Well balanced wire rope construction prevent the rope core of being overloaded.
The discard criteria according to the international standards must always be applied.

Rotation

Rotation resistant ropes are manufactured with a steel core closed in the opposite direction to the outer strands.
When under load, the strands of the independent wire rope core (IWRC) have a tendency to twist in one direction, while the outer strands tend to rotate in the opposite direction.

Rotation resistant ropes are used as hoist ropes for unguided loads. The lifting application can be a single fall or multiple fall reeving system.

Non rotation resistant ropes are used as hoist ropes for guided loads with both ends of the rope fixed.

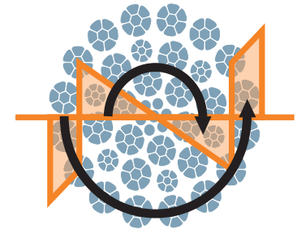
Bending Fatigue

The design concept of verope Special Wire Ropes offers many advantages to perform in a variety of demanding applications.
The working conditions for wire ropes on modern cranes are very demanding with frequent changes in loadings, operating at high rope speed with constant change in reeving configurations. The angle of deflection between the rope, sheave and drum all considerably influence the service life of the rope.

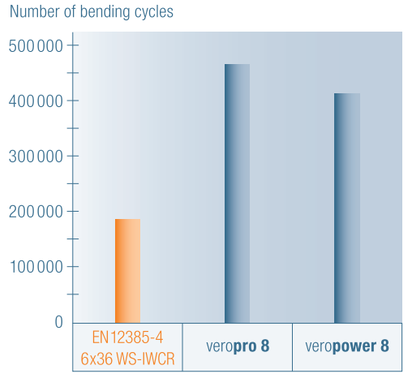
Increasing the number of strands and the number of wires enlarges the contact surface area between rope and sheave groove/rope and drum which in turn reduce the treat pressure. Compacted and rotary swaged ropes increase the surface area and reduce the pressure even further.
Flexible rope constructions improve the spooling behaviour.
The steel-plastic combination rope construction stabilises the rope construction during installation and prolongs the actual service by reducing the risk of internal wire break.
Due to the high service life, verope Special Wire Ropes can be used cost efficiently compared with standard rope constructions. Continuous quality improvements guarantee a calculable rope life.

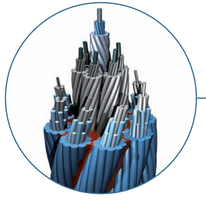
Main advantages of Special Wire Ropes are:

- Good rotational stability over a wide load spectrum for torque balanced rotation resistant ropes.
- Improved rope behaviour in multiple layer spooling on the drum for well balanced rotation resistant ropes made from compacted outer strands in lang's lay execution and a solid steel core.



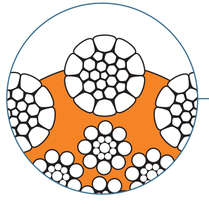
Non rotation resistant ropes, under constant load:



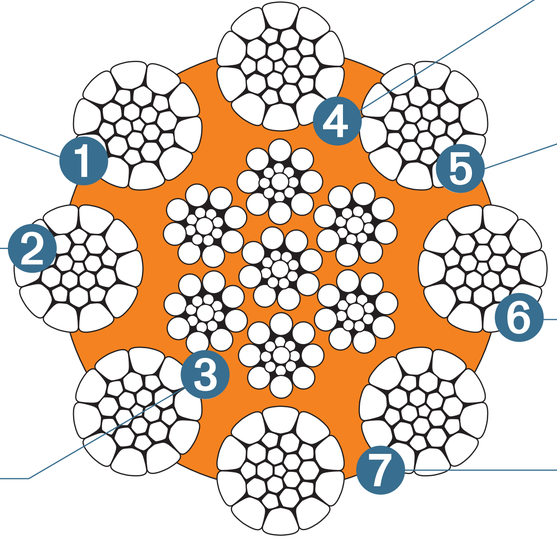


Construction by
Computer Aided Design
➜ Page 8

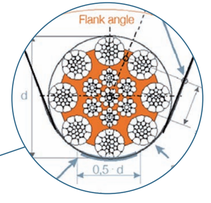
Lang's lay and
Regular lay
➜ Page 8



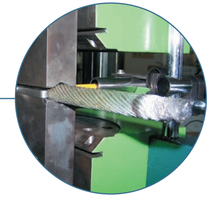
Plastic Layer
➜ Page 9



Compacting and
Rotary Swaging
➜ Page 9



Drum and **Sheaves**
➜ Page 10



Lateral pressure stability
➜ Page 11

Lubrication
➜ Page 11

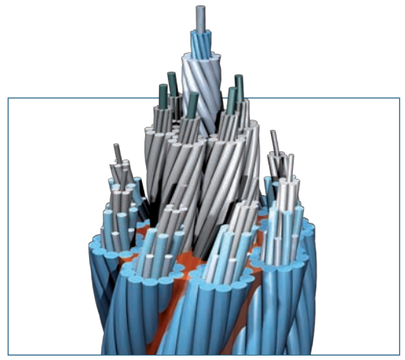
rope illustration in the middle: vero**pro 8**

special rope features

❶ Construction by **Computer Aided Design**

The main advantages are:

- State of the art wire rope design
- Continuously improved custom software
- Prototype development
- Production constraints
- Compacting and Rotary Swaging
- Filling grades
- Gap optimisation
- Torque minimisation
- 2D cross section views
- Realistic 3D views



vero**top E** constructed by Computer Aided Design

❷ **Lang's lay** and **Regular lay**

Individual steel wires are spun into strands, a number of strands into a rope. All elements are laid in a helical form. Two lay types are to be considered.
The «Regular» or «Ordinary» lay, where the strands are closed in the opposite direction to the lay of the wires in the strands (see picture).
In a «Lang's» lay rope, the wires in the strands and the strands themselves are laid in the same direction (see picture).
The correct choice of the lay type is important in relation to the behaviour/resistance of a rope to external influences during operation.
The regular lay type is used in a wide range of applications and can be regarded as the standard, most frequently used lay type.

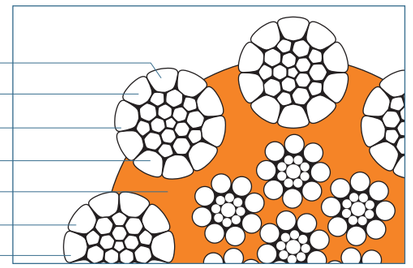
Lang's lay type is especially recommended for multilayer spooling applications, due to its better resistance to the damage occurring at the contact points between each winding on the drum.

Lang's lay Regular lay

❸ Plastic Layer

The ongoing issue for the wire rope industry and end user is how to minimise the internal damage caused by constant friction and abrasion between the outer strands and the inner steel core of a wire rope. The danger is that this internal damage is impossible to detect from an external examination. A huge improvement in this regard was made by the steel/plastic combination rope designs, where the independent wire rope core is covered with a plastic layer before the outer strands are closed onto the core. This cushion avoids internal steel to steel cross over contacts and limits as such the damage caused by this phenomenon. A large part of the verope product range uses this steel/plastic combination design and the resin as well as the method used has proved its value over the years.

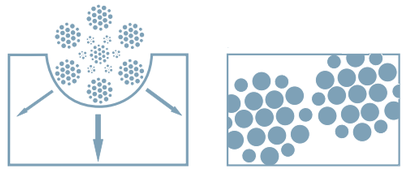
The main advantages are:
- Prevents internal wire breaks
- Seals in rope lubricant
- Keeps out infiltration of water, dust, etc…
- Reduces the internal stress
- Improves the form stability of the rope
- Absorbs dynamical energy
- Reduces the noise level



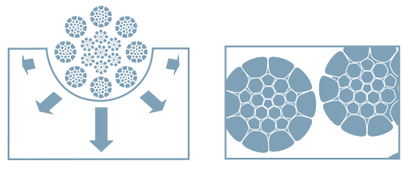
❹ **Compacting** and **Rotary Swaging**

Compacting of individual strands or of a complete wire rope has two main objectives: to increase the breaking load and to give the strand/rope a smoother surface. At verope, the compacting is made by passing the rope through a set of compacting rollers. This method has been proved to be the best in view of the plastic deformation of the steel. Rotary swaging of the finished rope gives the rope an extreme smooth surface of course. verope has some products in its program where this technique is applied.

The main advantages are:
- Smooth surface
- Linear contact between individual wires
- Better contact between rope surface and sheaves
- Higher metallic area and higher breaking strength
- Good structural stability for multilayer spooling systems
- Better resistance to abrasion
- Reduced rope crushing



Conventional strand



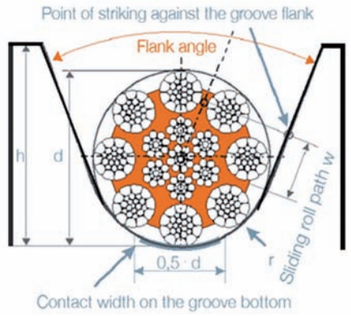
vero**pro 8**

vero**power 8**

❺ Drum and Sheaves

Sheave dimensions

The sheave groove dimensions with reference to the rope diameter should correspond to:
r = 0,53 x d and
h = 1,5 x d at the flange angle ≥ 45°
D/d ratio for sheaves. Minimum sheave dimension for verope products is 20 times the rope diameter. More favourable D/d ratio improves the service life of the rope due to reduced bending stress.



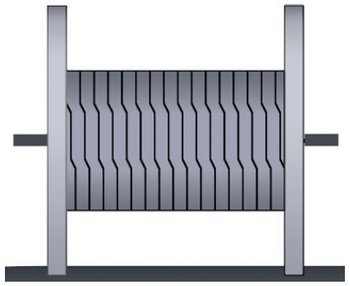
Single layer spooling

The lay direction of the verope products should always be chosen opposite the winding direction of the drum.

Multiple layer spooling

Increasing rope length requires good solutions for controlled spooling onto the hoisting drum.
The following rope features improve the spooling:

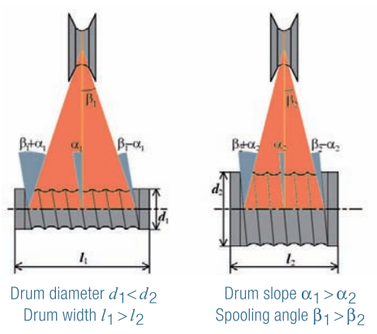
- First- and second layer spooled under tension (1% to 2% of M.B.L.)
- Lang's lay rope construction
- Compacted outer strands and/or rotary swaged rope construction
- Ropes with high form stability to withstand increased lateral pressure



Grooved drum suitable for multiple layer spooling with parallel / shifting zones

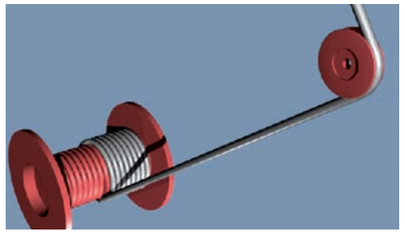
Drum and Sheave spooling angle

The spooling angle can be reduced by using different drum designs. The spooling angle for rotation resistant ropes should not exceed 2°. For non-rotation resistant ropes, the angle should not exceed 4°.



Drum diameter $d_1 < d_2$
Drum width $l_1 > l_2$

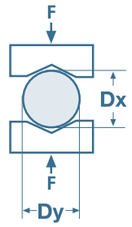
Drum slope $\alpha_1 > \alpha_2$
Spooling angle $\beta_1 > \beta_2$

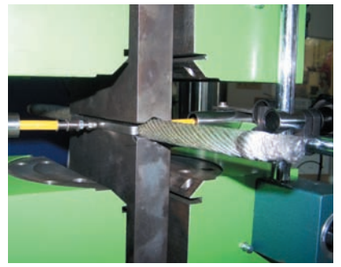


picture on the left:
verope 3D animation to monitor multiple-layer drum spooling.

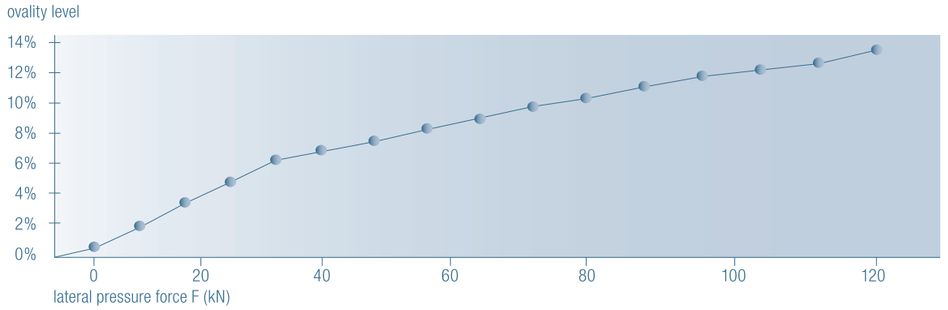
❻ Lateral pressure stability

Multilayer spooling is a demanding issue for wire rope. Optimum lateral pressure stability is of extreme importance to achieve proper spooling behaviour. The leading crane manufacturers impose strict criteria in this regard, resulting in a standard requirement. For example the lateral deformation for a 16 mm rotation resistant hoisting rope must be in between 1.8% (under 7.5 kN) and 16% (under 120 kN load).





$0g = [(Dy / Dx) - 1] \times 100\%$



❼ Lubrication

A precise lubrication procedure during production contributes to corrosion resistance and minimises the friction in ropes when running over sheaves. At verope, we constantly investigate new ways to improve our methods of lubrication, ensuring a suitable coating is applied to every wire and strand throughout the length of the rope.
In many applications a regular relubrication will contribute to increase the rope service life.
To guarantee the compatibility of the products, verope offers a lubricant spray under the brand «verolube». The composition of this lubricant is 100% compatible with the Ceplattyn lubricant used during the manufacture of our steel/plastic combination ropes. The «verolube» product is therefore recommended for this product range.

- Low viscous solvent based lubricant and preservative agent for all varieties of wire ropes
- Temperature range: - 35 / + 65 °C
- Water repellent properties
- Protects against corrosion
- Good penetration properties
- Protects against abrasion
- Weather proof
- Prolongs rope life
- Forms a non-drip adhesive lubrication film

verolube® spray

which rope for which application

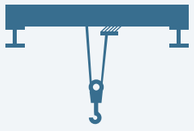


Crane	Hoist Rope	Trolley Rope	Luffing Rope
Telescopic Crane	vero**top** (p. 18|19)		
Crawler Crane	vero**top** (p. 18|19)		vero**pro 8** (p. 26|27) vero**power 6** (p. 28|29) vero**power 8** (p. 30|31)
Tower Crane	vero**top** (p. 18|19) vero**top E** (p. 20|21)	vero**pro 8** (p. 14|15) vero**star 8** (p. 18|19)	



Crane	Hoist Rope	Trolley Rope	Boom Hoist Rope	Counter Weight
Gantry Crane	vero**star 8** (p. 24|25) vero**star 8** (p. 26|27) vero**power 8** (p. 30|31)	vero**star 8** (p. 24|25) vero**star 8** (p. 26|27) vero**power 8** (p. 30|31)	vero**star 8** (p. 24|25) vero**star 8** (p. 26|27) vero**power 8** (p. 30|31)	
RTG	vero**star 8** (p. 24|25) vero**pro 8** (p. 26|27) vero**power 8** (p. 30|31)			
Straddle Carriers	vero**star 8** (p. 24|25) vero**pro 8** (p. 26|27) vero**power 8** (p. 30|31)			
Mobile Harbour Crane	vero**star 8** (p. 24|25) vero**pro 8** (p. 26|27) vero**power 8** (p. 30|31)			vero**star 8** (p. 24|25) vero**pro 8** (p. 26|27) vero**power 8** (p. 30|31)



Crane	Hoist Rope	Luffing Rope	Pusher Rope
 Deck Crane	vero**top** (p. 18|19) vero**top P** (p. 16|17) vero **4** (p. 22|23)	vero**star 8** (p. 24|25) vero**pro 8** (p. 26|27) vero**power 8** (p. 30|31)	
 Off-shore Crane	vero**top** (p. 18|19)	vero**star 8** (p. 24|25) vero**pro 8** (p. 26|27) vero**power 8** (p. 30|31)	
 Foundation equipment	vero**top** (p. 18|19) vero**top P** (p. 16|17)		vero**pro 8** (p. 26|27)
 Overhead Crane	vero**top** (p. 18|19)* vero**top E** (p. 20|21)* vero**pro 8** (p. 26|27) vero**star 8** (p. 24|25) vero**power 8** (p. 30|31) vero**steel 8** (p. 31|33)**		

* in case of rotation resistant rope is needed

** used in steel mills, where high temperatures are involved

product overview

Rotation resistant Special Wire Ropes

vero**top P** | Lang's lay - page 16|17
is a rotation resistant rope with a plastic layer between the IWRC and outer strands. The steel-plastic combination method of rope construction increases structural stability. All strands are compacted.

vero**top** | Lang's lay - page 18|19
is a rotation resistant rope with compacted inner and outer strands, most suitable for high lifting applications. It has an extremely high breaking load with strong resistance to drum crushing.

vero**top E** | Lang's lay - page 20|21
is a rotation resistant rope with compacted outer strands. This rope is very flexible, has a good structural stability and a high breaking load.

vero **4** | Regular lay - page 22|23
is a 4-strand rotation resistant rope with compacted strands. The long lay of the strands increases resistance against outer mechanical impacts. It is extremely flexible and has a high breaking load.

Non rotation resistant Special Wire Ropes

vero**star 8** | Lang's lay / Regular lay - page 24|25
is a 8-strand non rotation resistant rope with a plastic layer between the IWRC and outer strands. The outer strands are made of conventional round wires. It has a good structural stability.

vero**pro 8** | Lang's lay / Regular lay - page 26|27
is a 8-strand non rotation resistant rope with a plastic layer between the IWRC and compacted outer strands. It has a high breaking load and good structural stability.

vero**power 6** | Regular lay - page 28|29
is a 6-strand non rotation resistant rope. It is a flexible steel-plastic combination rope with double parallel layed strands, which are compacted and rotary swaged.

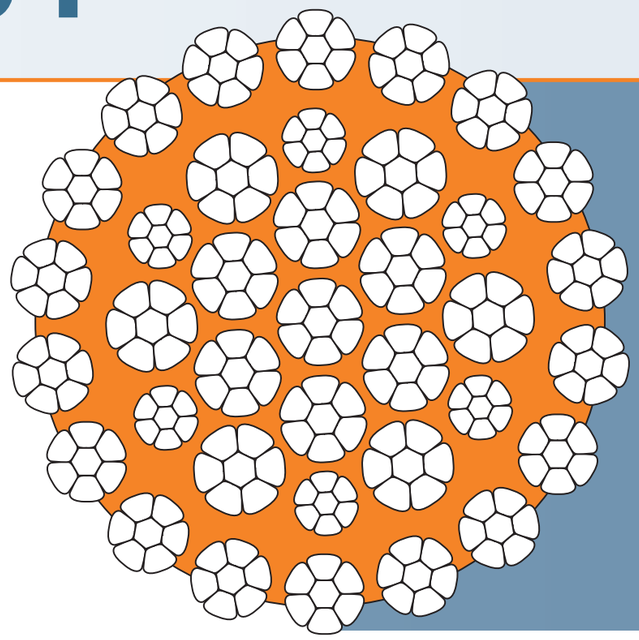
vero**power 8** | Regular lay - page 30|31
is an 8-strand non rotation resistant rope. It is a flexible steel-plastic combination rope with double parallel layed strands. All strands are compacted and rotary swaged.

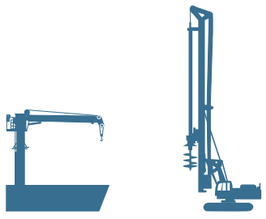
vero**steel 8** | Lang's lay / Regular lay - page 32|33
is a full steel 8-strand rope with compacted outer strands. It is a very flexible rope construction with high abrasion resistance and good service life.

verotop P

Lang's lay

should be used with a swivel





Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
16 ~ 48	259	126	/	/	6	11	0,73	0,81	0,91	12900	0,146

Nominal Diameter		Approx. Weight	Calculated Breaking Strength				Minimum Breaking Strength			
			1960 Grade		2160 Grade		1960 Grade		2160 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)
16	5/8	1,330	288,5	29,42	316,4	32,26	234,0	23,86	248,7	25,36
17		1,502	325,7	33,21	357,2	36,42	264,2	26,94	280,8	28,63
18		1,684	365,1	37,23	400,5	40,84	296,2	30,20	314,8	32,10
19	3/4	1,876	406,8	41,48	446,2	45,50	330,0	33,65	350,7	35,76
20		2,079	450,7	45,96	494,4	50,41	365,6	37,28	388,6	39,63
21		2,292	496,9	50,67	545,1	55,58	403,1	41,10	428,5	43,69
22		2,515	545,4	55,61	598,3	61,01	442,4	45,11	470,2	47,95
22,4	7/8	2,608	565,4	57,65	620,2	63,24	458,6	46,77	487,5	49,71
23		2,749	596,1	60,78	653,9	66,68	483,5	49,31	513,9	52,41
24		2,994	649,1	66,19	712,0	72,60	526,5	53,69	559,6	57,06
25		3,248	704,3	71,82	772,5	78,77	571,3	58,25	607,2	61,92
25,4	1	3,353	727,0	74,13	797,5	81,32	589,7	60,13	626,8	63,91
26		3,513	761,7	77,67	835,6	85,20	617,9	63,01	656,8	66,97
27		3,789	821,5	83,77	901,1	91,88	666,3	67,95	708,3	72,22
28		4,075	883,4	90,08	969,1	98,82	716,6	73,07	761,7	77,67
28,6	1-1/8	4,251	921,7	93,98	1011	103,1	747,7	76,24	794,7	81,03
29		4,371	947,7	96,64	1040	106,0	768,7	78,38	817,1	83,31
30		4,677	1014	103,4	1112	113,4	822,7	83,88	874,4	89,16
31		4,995	1083	110,4	1188	121,1	879,9	89,72	933,7	95,20
32	1-1/4	5,322	1154	117,7	1266	129,1	936,0	95,44	994,9	101,4
33		5,660	1227	125,1	1346	137,2	995,4	101,5	1058	107,9
34		6,008	1303	132,9	1429	145,7	1057	107,7	1123	114,5
35	1-3/8	6,367	1380	140,7	1514	154,4	1120	114,2	1190	121,4
36		6,736	1460	148,9	1602	163,4	1185	120,8	1259	128,4
38	1-1/2	7,505	1627	165,9	1780	181,5	1320	134,6	1403	143,1
40		8,316	1803	183,8	1972	201,1	1462	149,1	1554	158,5
41		8,737	1889	192,6	2072	211,3	1537	156,7	1633	166,5
42		9,168	1982	202,1	2174	221,7	1612	164,4	1714	174,8
43		9,610	2078	211,9	2279	232,4	1690	172,3	1796	183,2
44		10,06	2176	221,8	2386	243,3	1770	180,4	1881	191,8
45	1-3/4	10,52	2276	232,0	2496	254,5	1851	188,7	1967	200,6
46		11,00	2378	242,5	2608	266,0	1935	197,3	2056	209,6
48		11,97	2589	264,0	2840	289,6	2113	215,5	2238	228,2

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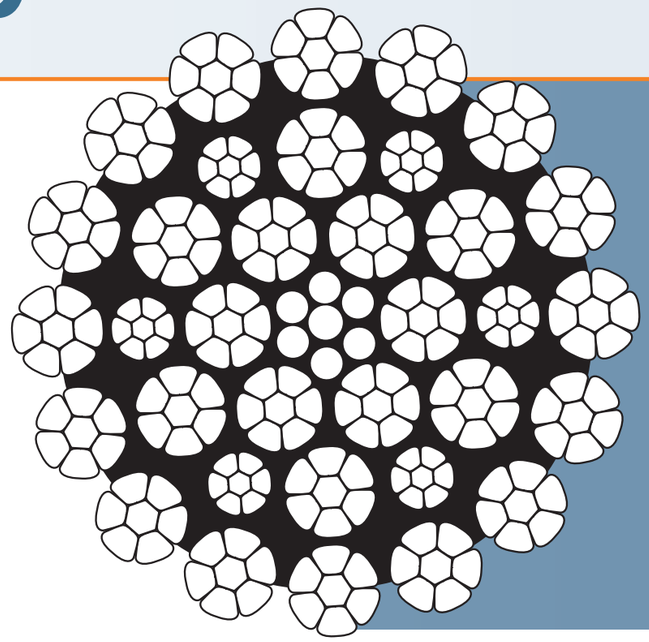
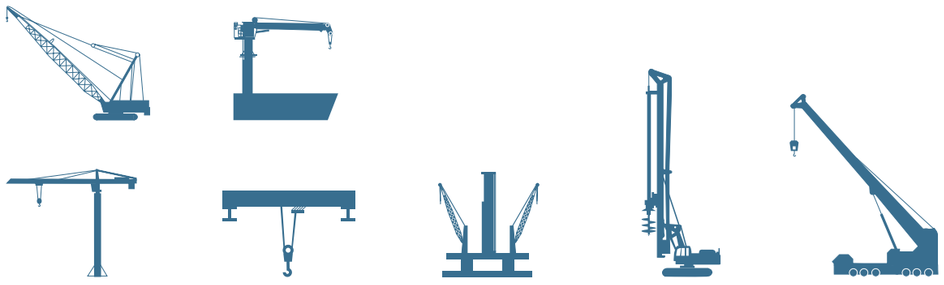
verotop

Lang's lay

should be used with a swivel





Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
8 ~ 52	245	112	/	/	5	10	0,74	0,81	0,88	11610	0,150

Nominal Diameter		Approx. Weight	Calculated Breaking Strength				Minimum Breaking Strength			
			1960 Grade		2160 Grade		1960 Grade		2160 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)
8		0,327	72,71	7,41	79,76	8,13	58,51	5,97	62,75	6,40
9		0,413	92,02	9,38	100,9	10,29	74,05	7,55	79,42	8,10
10		0,510	113,6	11,58	124,6	12,71	91,42	9,32	98,05	10,00
11		0,617	137,5	14,02	150,8	15,38	110,6	11,28	118,6	12,10
12		0,735	163,6	16,68	179,5	18,30	131,7	13,42	141,2	14,40
12,7	1/2	0,823	183,2	18,68	201,0	20,50	147,5	15,04	158,1	16,13
13		0,862	192,0	19,58	210,6	21,48	154,5	15,75	165,7	16,90
14		1,000	222,7	22,71	244,3	24,91	179,2	18,27	192,2	19,60
15		1,148	255,6	26,06	280,4	28,59	205,7	20,98	220,6	22,49
16	5/8	1,306	290,8	29,66	319,0	32,53	234,0	23,87	251,0	25,59
17		1,475	328,3	33,48	360,1	36,72	264,2	26,94	283,4	28,89
18		1,653	368,1	37,53	403,8	41,17	296,2	30,20	317,7	32,39
19	3/4	1,842	410,1	41,82	449,9	45,87	330,0	33,65	354,0	36,09
20		2,041	454,4	46,34	498,5	50,83	365,7	37,29	392,2	39,99
21		2,250	501,0	51,09	549,6	56,04	403,2	41,11	432,4	44,09
22		2,470	549,9	56,07	603,2	61,50	442,5	45,12	474,6	48,39
22,4	7/8	2,561	570,0	58,12	625,3	63,76	458,7	46,78	492,0	50,16
23		2,700	601,0	61,28	659,2	67,22	483,6	49,32	518,7	52,89
24		2,939	654,4	66,72	717,8	73,19	526,6	53,70	564,8	57,59
25		3,189	710,0	72,40	778,9	79,42	571,4	58,26	612,8	62,49
25,4	1	3,292	732,9	74,74	804,0	81,98	589,8	60,14	632,6	64,50
26		3,450	768,0	78,31	842,4	85,90	618,0	63,02	662,8	67,58
27		3,720	828,2	84,45	908,5	92,64	666,5	67,96	714,8	72,88
28		4,001	890,7	90,82	977,0	99,62	716,8	73,09	768,7	78,38
28,6	1-1/8	4,174	929,3	94,75	1019	103,9	747,8	76,25	802,0	81,78
29		4,292	955,4	97,42	1048	106,9	768,9	78,40	824,6	84,08
30		4,593	1022	104,3	1122	114,4	822,8	83,90	882,4	89,98
31		4,904	1092	111,3	1198	122,1	878,6	89,59	942,2	96,08
32	1-1/4	5,226	1163	118,6	1276	130,1	936,2	95,46	1004	102,4
33		5,557	1237	126,2	1357	138,4	995,6	101,5	1068	108,9
34		5,899	1313	133,9	1441	146,9	1057	107,8	1133	115,6
35	1-3/8	6,251	1392	141,9	1527	155,7	1120	114,2	1201	122,5
36		6,614	1472	150,1	1615	164,7	1185	120,8	1271	129,6
38	1-1/2	7,369	1640	167,3	1799	183,5	1320	134,6	1416	144,4
40		8,165	1818	185,3	1994	203,3	1463	149,2	1569	160,0
41		8,578	1910	194,7	2095	213,6	1537	156,7	1648	168,1
42		9,002	2004	204,3	2198	224,2	1613	164,4	1730	176,4
43		9,435	2101	214,2	2304	235,0	1690	172,4	1813	184,9
44		9,879	2199	224,3	2413	246,0	1770	180,5	1898	193,6
45	1-3/4	10,33	2301	234,6	2524	257,3	1851	188,8	1985	202,5
46		10,80	2404	245,1	2637	268,9	1935	197,3	2075	211,6
48		11,76	2617	266,9	2871	292,8	2106	214,8	2259	230,3
50	2	12,76	2840	289,6	3115	317,7	2286	233,1	2451	249,9
52		13,80	3072	313,2	3370	343,6	2472	252,1	2651	270,3

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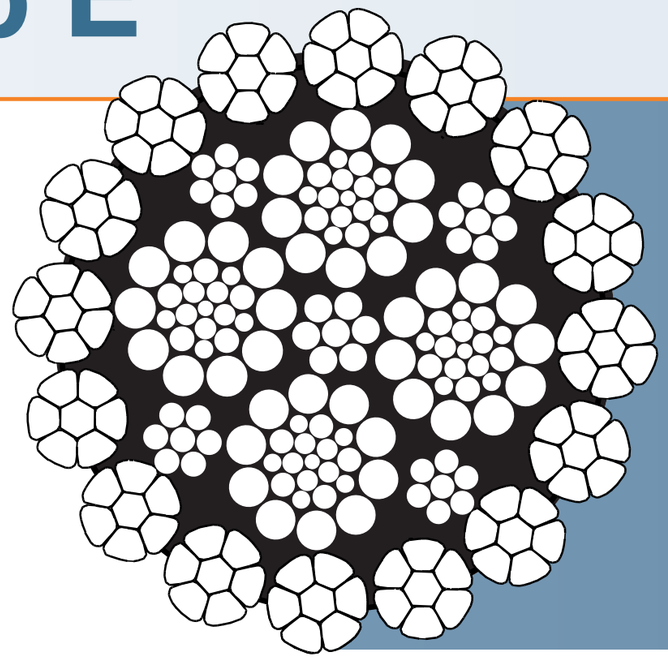
Lang's lay

should be used with a swivel



Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
8 ~ 40	251	112	⟋	⟋	5	10	0,70	0,80	0,89	11800	0,150

Nominal Diameter		Approx. Weight	Calculated Breaking Strength				Minimum Breaking Strength			
			1960 Grade		2160 Grade		1960 Grade		2160 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)
8		0,311	68,55	6,99	75,55	7,70	55,00	5,61	60,24	6,14
9		0,394	86,76	8,85	95,61	9,75	69,61	7,10	76,24	7,77
10		0,486	107,1	10,92	118,0	12,04	85,94	8,76	94,12	9,60
11		0,589	129,6	13,22	142,8	14,56	104,0	10,60	113,9	11,61
12		0,700	154,2	15,73	170,0	17,33	123,8	12,62	135,5	13,82
13		0,822	181,0	18,46	199,5	20,34	145,2	14,81	159,1	16,22
14		0,953	209,9	21,41	231,4	23,59	168,4	17,18	184,5	18,81
15		1,094	241,0	24,57	265,6	27,08	193,4	19,72	211,8	21,59
16	5/8	1,245	274,2	27,96	302,2	30,81	220,0	22,43	241,0	24,57
18		1,576	347,0	35,39	382,4	39,00	278,5	28,39	305,0	31,10
19	3/4	1,756	386,7	39,43	426,1	43,45	310,3	31,64	339,8	34,65
20		1,945	428,4	43,69	472,2	48,15	343,8	35,05	376,5	38,39
22		2,354	518,4	52,86	571,3	58,26	416,0	42,41	455,5	46,45
23		2,573	566,6	57,78	624,4	63,67	454,6	46,36	497,9	50,77
24		2,801	617,0	62,91	679,9	69,33	495,0	50,48	542,1	55,28
25		3,040	669,4	68,26	737,7	75,23	537,1	54,77	588,3	59,98
26		3,288	724,1	73,83	797,9	81,37	581,0	59,24	636,3	64,88
27		3,546	780,8	79,62	860,5	87,74	626,5	63,89	686,1	69,96
28		3,813	839,7	85,63	925,4	94,36	673,8	68,71	737,9	75,24
29		4,090	900,8	91,85	992,7	101,2	722,8	73,70	791,6	80,71
30		4,377	964,0	98,30	1062	108,3	773,5	78,87	847,1	86,38
32	1-1/4	4,980	1097	111,8	1209	123,3	880,1	89,74	963,8	98,28
34		5,567	1226	125,0	1351	137,8	983,8	100,3	1077	109,9
35	1-3/8	5,900	1299	132,5	1432	146,0	1043	106,3	1142	116,4
36		6,242	1375	140,2	1515	154,5	1103	112,5	1208	123,2
38	1-1/2	6,955	1532	156,2	1688	172,1	1229	125,3	1346	137,2
40		7,706	1697	173,0	1870	190,7	1362	138,8	1491	152,1

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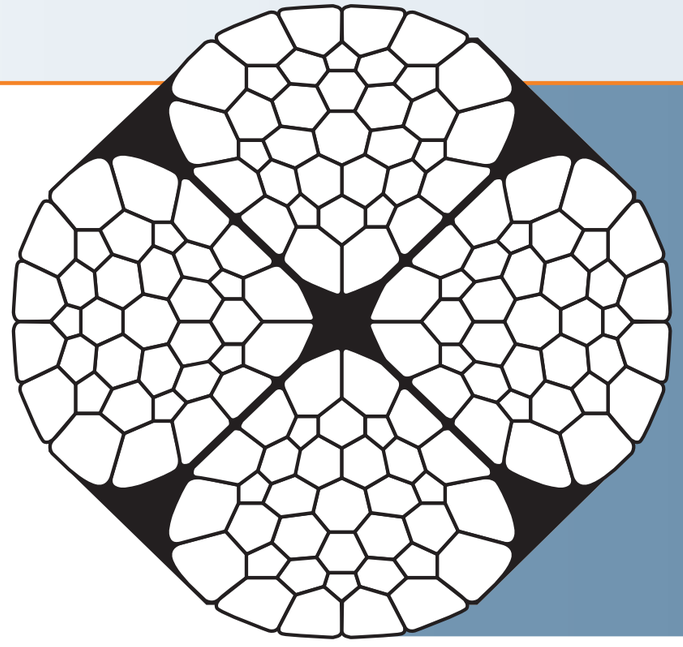
Regular lay

should not be used with a swivel



Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
8 ~ 36	144	144	13	26			0,63	0,87	0,85	13560	0,190

Nominal Diameter		Approx. Weight	Calculated Breaking Strength 1960 Grade		Minimum Breaking Strength 1960 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)
8		0,269	62,2	6,34	54,1	5,52
9		0,340	78,7	8,02	68,5	6,99
10		0,420	97,1	9,90	84,6	8,63
11		0,509	117,5	11,98	102,4	10,44
12		0,605	139,9	14,26	121,8	12,42
13		0,710	164,2	16,74	143,0	14,58
14		0,824	190,4	19,41	165,8	16,91
15		0,946	218,6	22,29	190,3	19,41
16	5/8	1,076	248,7	25,36	216,6	22,08
18		1,362	314,7	32,09	274,1	27,95
19	3/4	1,517	350,7	35,76	305,4	31,14
20		1,681	388,5	39,62	338,4	34,50
22		2,034	470,1	47,94	409,4	41,75
24		2,421	559,5	57,05	487,2	49,68
25		2,627	607,1	61,90	528,7	53,91
26		2,841	656,6	66,96	571,8	58,31
27		3,064	708,1	72,20	616,7	62,88
28		3,295	761,5	77,65	663,2	67,63
29		3,534	816,9	83,30	711,4	72,54
30		3,782	874,2	89,14	761,3	77,63
31		4,039	933,5	95,18	812,9	82,89
32	1-1/4	4,303	994,7	101,4	866,2	88,33
33		4,577	1058	107,9	921,2	93,93
34		4,858	1123	114,5	977,9	99,71
35	1-3/8	5,148	1190	121,3	1036	105,7
36		5,447	1259	128,4	1096	111,8

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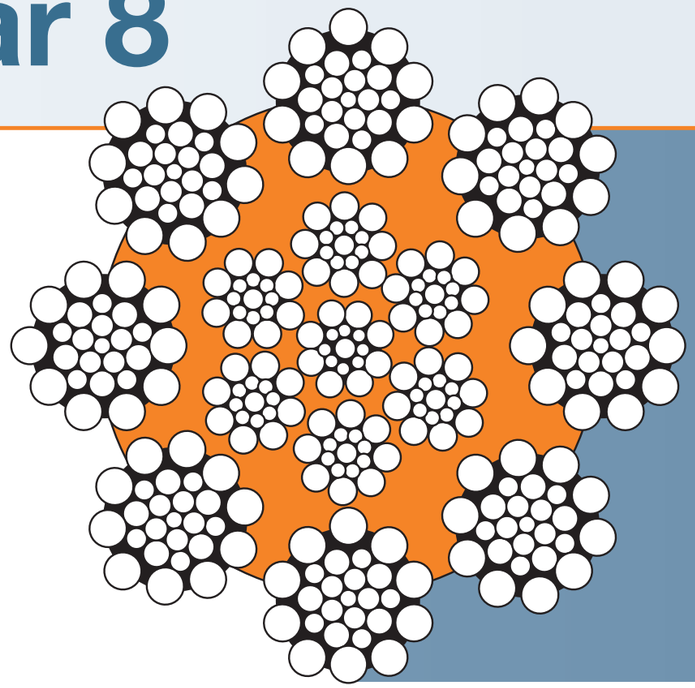
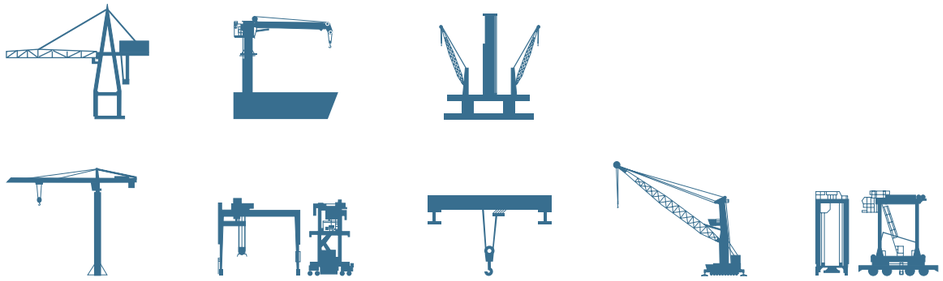


Regular lay
Lang's lay

should not be used with a swivel



Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
8 ~ 42	327	208	18	35	9	18	0,61	0,89	0,92	12250	0,290
43 ~ 48	367	248	21	42	10	21	0,61	0,89	0,92	12250	0,290
49 ~ 60	407	288	24	48	12	24	0,61	0,89	0,92	12250	0,290

Nominal Diameter		Approx. Weight	Calculated Breaking Strength				Minimum Breaking Strength			
			1770 Grade		1960 Grade		1770 Grade		1960 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)
8		0,279	53,82	5,49	61,48	6,27	47,69	4,86	52,81	5,38
9		0,353	68,11	6,95	77,81	7,93	60,36	6,15	66,84	6,82
10		0,435	84,09	8,57	96,06	9,80	74,51	7,60	82,51	8,41
11		0,527	101,7	10,38	116,2	11,85	90,16	9,19	99,84	10,18
12		0,627	121,1	12,35	138,3	14,10	107,3	10,94	118,8	12,12
12,7	1/2	0,702	135,6	13,83	154,9	15,79	120,2	12,25	133,1	13,57
13		0,735	142,1	14,49	162,3	16,55	125,9	12,84	139,4	14,22
14		0,853	164,8	16,81	188,3	19,20	146,0	14,89	161,7	16,49
15		0,979	189,2	19,29	216,1	22,04	167,7	17,10	185,6	18,93
16	5/8	1,114	215,3	21,95	245,9	25,07	190,8	19,45	211,2	21,54
17		1,258	243,0	24,78	277,6	28,31	215,3	21,96	238,5	24,31
18		1,410	272,5	27,78	311,2	31,73	241,4	24,62	267,3	27,26
19	3/4	1,571	303,6	30,95	346,8	35,36	269,0	27,43	297,9	30,37
20		1,741	336,4	34,30	384,2	39,18	298,0	30,39	330,1	33,66
21		1,919	370,8	37,81	423,6	43,19	328,6	33,51	363,9	37,10
22		2,106	407,0	41,50	464,9	47,40	360,6	36,77	399,4	40,72
22,4	7/8	2,184	421,9	43,02	482,0	49,15	373,9	38,12	414,0	42,22
23		2,302	444,8	45,36	508,1	51,81	394,2	40,19	436,5	44,51
24		2,507	484,4	49,39	553,3	56,42	429,2	43,76	475,3	48,46
25		2,720	525,6	53,59	600,4	61,22	465,7	47,49	515,7	52,58
25,4	1	2,808	542,5	55,32	619,7	63,19	480,7	49,02	532,3	54,28
26		2,942	568,5	57,96	649,3	66,21	504,7	51,46	558,8	56,98
27		3,172	613,0	62,51	700,3	71,41	543,2	55,39	601,5	61,33
28		3,412	659,3	67,22	753,1	76,79	584,2	59,57	646,9	65,96
28,6	1-1/8	3,560	687,8	70,14	785,7	80,12	609,5	62,15	674,9	68,82
29		3,660	707,2	72,11	807,8	82,37	626,7	63,90	693,9	70,76
30		3,917	756,8	77,17	864,5	88,15	670,6	68,38	742,6	75,72
31		4,182	808,1	82,40	923,1	94,13	716,1	73,02	793,0	80,86
32	1-1/4	4,456	861,1	87,80	983,6	100,30	763,0	77,80	844,9	86,15
33		4,739	915,7	93,38	1046	106,7	811,4	82,74	898,6	91,63
34		5,031	972,1	99,12	1110	113,2	861,4	87,83	953,9	97,27
35	1-3/8	5,331	1030	105,0	1177	120,0	912,8	93,07	1011	103,1
36		5,640	1090	111,1	1245	127,0	965,7	98,47	1069	109,0
38	1-1/2	6,284	1214	123,8	1387	141,4	1076	109,7	1191	121,5
40		6,963	1345	137,2	1537	156,7	1192	121,6	1320	134,6
41,3		7,423	1434	146,3	1638	167,0	1271	129,6	1407	143,5
42		7,677	1483	151,3	1694	172,7	1314	134,0	1456	148,5
44		8,425	1628	166,0	1860	189,7	1443	147,1	1597	162,9
45		8,813	1703	173,6	1945	192,3	1509	153,9	1671	170,4
46	1-3/4	9,209	1779	181,4	2033	207,3	1577	160,8	1746	178,0
47,5		9,819	1897	193,5	2167	221,0	1681	171,4	1862	189,8
48		10,03	1937	197,6	2213	225,7	1717	175,1	1901	193,8
50	2	10,88	2102	214,4	2401	244,8	1863	189,9	2063	210,3
52		11,77	2274	231,9	2597	264,8	2015	205,4	2231	227,5
54	2-1/8	12,69	2452	250,0	2801	285,6	2175	221,8	2409	245,6
56		13,65	2637	268,9	2920	297,8	2345	239,1	2597	264,8
58		14,64	2829	288,4	3132	319,4	2509	255,8	2778	283,3
60		15,67	3027	308,7	3352	341,8	2682	273,5	2970	302,9

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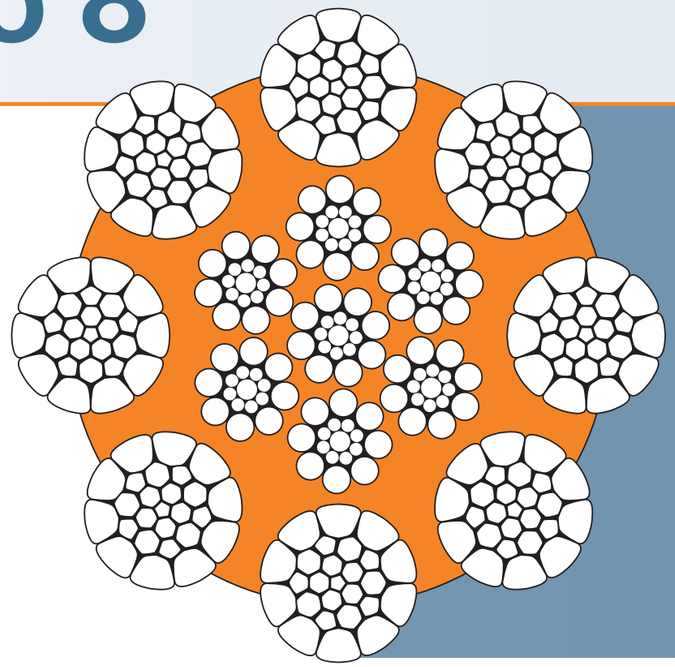
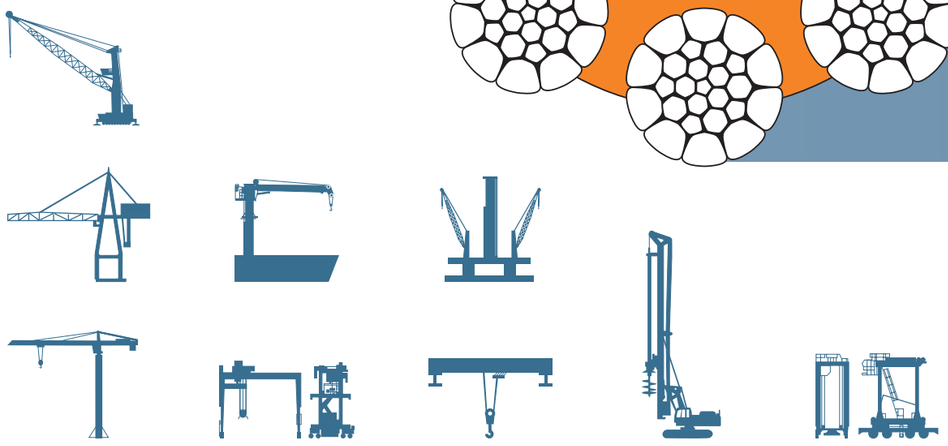


Regular lay
Lang's lay

should not be used with a swivel



Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
8 ~ 42	327	208	18	35	9	18	0,67	0,87	0,88	12900	0,276
43 ~ 48	367	248	21	42	10	21	0,67	0,87	0,88	12900	0,276
49 ~ 60	407	288	24	48	12	24	0,67	0,87	0,88	12900	0,276

Nominal Diameter		Approx. Weight	Calculated Breaking Strength						Minimum Breaking Strength					
			1770 Grade		1960 Grade		2160 Grade		1770 Grade		1960 Grade		2160 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)
8		0,293	59,55	6,07	65,81	6,71	72,19	7,36	51,75	5,28	56,98	5,81	59,99	6,12
9		0,371	75,37	7,69	83,29	8,49	91,73	9,35	66,00	6,73	73,00	7,44	75,93	7,74
10		0,459	93,05	9,49	102,8	10,48	112,8	11,50	80,86	8,25	89,04	9,08	93,74	9,56
11		0,555	112,6	11,48	124,4	12,68	136,5	13,92	97,8	9,98	107,7	10,99	113,4	11,57
12		0,660	134,0	13,66	148,1	15,10	162,4	16,56	116,4	11,87	128,2	13,07	135,0	13,76
12,7	1/2	0,740	150,1	15,30	165,9	16,92	181,9	18,55	130,4	13,30	143,6	14,64	151,2	15,42
13		0,775	157,3	16,04	173,8	17,72	190,6	19,44	136,7	13,93	151,3	15,43	158,4	16,15
14		0,899	182,4	18,60	201,5	20,55	221,1	22,55	158,5	16,16	174,8	17,82	183,7	18,73
15		1,032	209,4	21,35	231,4	23,60	253,8	25,88	183,1	18,67	202,7	20,67	210,9	21,51
16	5/8	1,174	238,2	24,29	263,2	26,84	288,8	29,45	207,2	21,13	229,4	23,39	240,0	24,47
17		1,325	268,9	27,42	297,2	30,30	326,0	33,24	233,7	23,83	257,3	26,24	270,9	27,62
18		1,486	301,5	30,74	333,2	33,98	365,5	37,27	262,0	26,71	288,5	29,42	303,7	30,97
19	3/4	1,655	335,9	34,25	371,2	37,85	407,2	41,52	292,1	29,78	323,5	32,99	338,4	34,50
20		1,834	372,2	37,95	411,3	41,94	451,2	46,01	323,4	32,98	356,2	36,32	374,9	38,23
21		2,022	410,4	41,84	453,5	46,24	497,4	50,72	356,6	36,36	392,7	40,04	413,4	42,15
22		2,219	450,4	45,92	497,7	50,75	545,9	55,66	391,7	39,94	433,7	44,22	453,7	46,26
22,4	7/8	2,301	466,9	47,61	516,0	52,62	566,0	57,71	405,7	41,37	446,8	45,56	470,3	47,96
23		2,426	492,2	50,19	544,0	55,47	596,7	60,84	427,8	43,62	471,0	48,03	495,9	50,56
24		2,641	536,0	54,65	592,3	60,40	649,7	66,25	465,8	47,49	514,3	52,44	539,9	55,05
25		2,866	581,6	59,30	642,7	65,53	705,0	71,89	505,4	51,53	558,2	56,92	585,9	59,74
25,4	1	2,958	600,3	61,21	663,4	67,65	727,7	74,20	521,7	53,20	574,4	58,57	604,7	61,66
26		3,100	629,0	64,14	695,1	70,88	762,5	77,75	548,9	55,97	607,8	61,98	633,7	64,61
27		3,343	678,3	69,17	749,6	76,44	822,3	83,85	589,5	60,11	649,1	66,19	683,3	69,68
28		3,595	729,5	74,39	806,2	82,21	884,3	90,17	634,0	64,64	698,1	71,18	734,9	74,94
28,6	1-1/8	3,751	761,1	77,61	841,1	85,77	922,6	94,08	652,3	66,51	718,2	73,24	766,7	78,18
29		3,856	782,6	79,80	864,8	88,18	948,6	96,73	678,8	69,22	738,5	75,30	788,3	80,38
30		4,127	837,5	85,39	925,5	94,37	1015	103,5	727,1	74,14	790,3	80,58	843,6	86,02
31		4,407	894,2	91,18	988,2	100,8	1084	110,5	776,8	79,21	843,8	86,05	900,8	91,85
32	1-1/4	4,695	952,8	97,16	1053	107,4	1155	117,8	828,0	84,43	911,0	92,89	959,9	97,87
33		4,994	1013	103,3	1120	114,2	1228	125,2	875,2	89,24	956,2	97,51	1021	104,1
34		5,301	1076	109,7	1189	121,2	1304	133,0	936,4	95,48	1025	104,5	1084	110,5
35	1-3/8	5,617	1140	116,2	1260	128,5	1382	140,9	976,9	99,61	1076	109,7	1148	117,1
36		5,943	1206	123,0	1333	135,9	1462	149,1	1033	105,4	1138	116,0	1215	123,9
38	1-1/2	6,621	1344	137,0	1485	151,4	1629	166,1	1163	118,6	1268	129,3	1354	138,0
40		7,337	1489	151,8	1645	167,7	1805	184,1	1286	131,1	1405	143,3	1500	152,9
41,3	1-5/8	7,812	1585	161,6	1754	178,9	1924	196,2	1359	138,5	1496	152,5	1597	162,8
42		8,089	1641	167,4	1814	185,0	1990	202,9	1422	145,0	1549	157,9	1654	168,6
44		8,877	1798	183,4	1991	203,0	2184	222,7	1554	158,5	1696	172,9	1815	185,1
45	1-3/4	9,285	1881	191,8	2082	212,3	2272	231,7	1608	164,0	1774	180,9	1895	193,2
46		9,703	1965	200,4	2176	221,9	2374	242,1	1713	174,7	1860	189,6	1980	201,9
47, 5	1-7/8	10,35	2096	213,7	2320	236,6	2531	258,1	1792	182,7	1977	201,6	2111	215,3
48		10,56	2140	218,2	2369	241,6	2585	263,6	1859	189,5	2019	205,9	2156	219,8
50	2	11,46	2287	233,3	2571	262,2	2763	281,7	1989	202,8	2198	224,1	2343	239,0
52		12,40	2474	252,3	2781	283,6	2988	304,7	2151	219,4	2369	241,6	2535	258,5
54	2-1/8	13,37	2668	272,1	2999	305,8	3223	328,6	2335	238,1	2586	263,7	2733	278,7
56		14,14	2869	292,6	3160	322,2			2495	254,4	2747	280,2		
58		15,17	3078	313,9	3389	345,6			2677	272,9	2956	301,4		
60		16,23	3294	335,9	3627	369,8			2864	292,1	3168	323,0		

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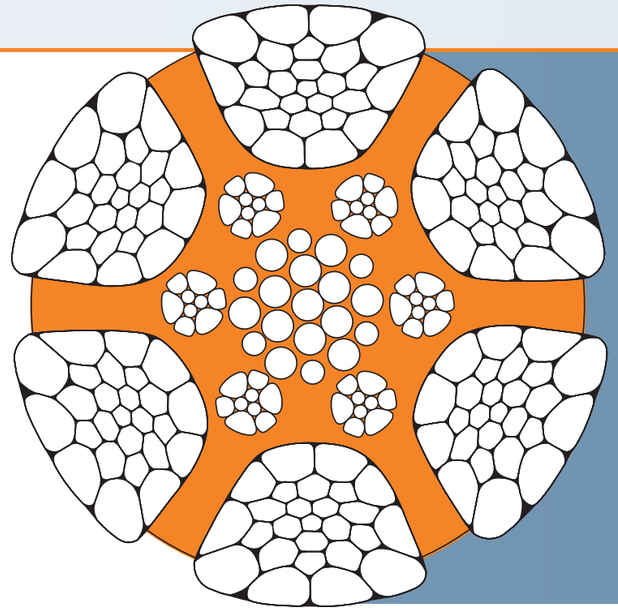
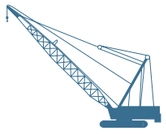
veropower 6

Regular lay

should not be used with a swivel





Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
20 ~ 33	229	156	13	26	/	/	0,74	0,83	0,85	14560	0,176
34 ~ 38	259	186	16	32	/	/	0,74	0,83	0,85	14560	0,176
39 ~ 50	289	216	18	35	/	/	0,74	0,83	0,85	14560	0,176

Nominal Diameter		Approx. Weight	Calculated Breaking Strength 1960 Grade		Minimum Breaking Strength 1960 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)
20		1,975	455,0	46,39	375,1	38,25
21		2,178	501,6	51,15	413,6	42,17
22		2,390	550,5	56,14	453,9	46,29
22,4	7/8	2,478	570,7	58,20	470,6	47,98
23		2,612	601,7	61,36	496,1	50,59
24		2,844	655,2	66,81	540,2	55,08
25		3,086	710,9	72,49	586,2	59,77
25,4	1	3,186	733,8	74,83	605,1	61,70
26		3,338	768,9	78,40	634,0	64,65
27		3,600	829,2	84,55	683,7	69,72
28		3,871	891,8	90,93	735,3	74,98
28,6	1-1/8	4,039	930,4	94,87	767,1	78,22
29		4,153	956,6	97,54	788,7	80,43
30		4,444	1024	104,4	844,1	86,07
31		4,745	1093	111,5	901,3	91,90
32	1-1/4	5,056	1165	118,8	960,4	97,93
33		5,378	1239	126,3	1021	104,1
34		5,709	1315	134,1	1084	110,6
35	1-3/8	6,050	1393	142,1	1149	117,2
36		6,400	1474	150,3	1215	123,9
38	1-1/2	7,131	1642	167,5	1354	138,1
40		7,902	1820	185,6	1501	153,0
41		8,414	1938	197,6	1598	162,9
42		8,712	2006	204,6	1654	168,7
44		9,561	2202	224,5	1816	185,1
45	1-3/4	10,00	2303	234,9	1899	193,7
46		10,45	2407	245,4	1985	202,4
48		11,38	2621	267,2	2161	220,3
50	2	12,35	2844	290,0	2345	239,1

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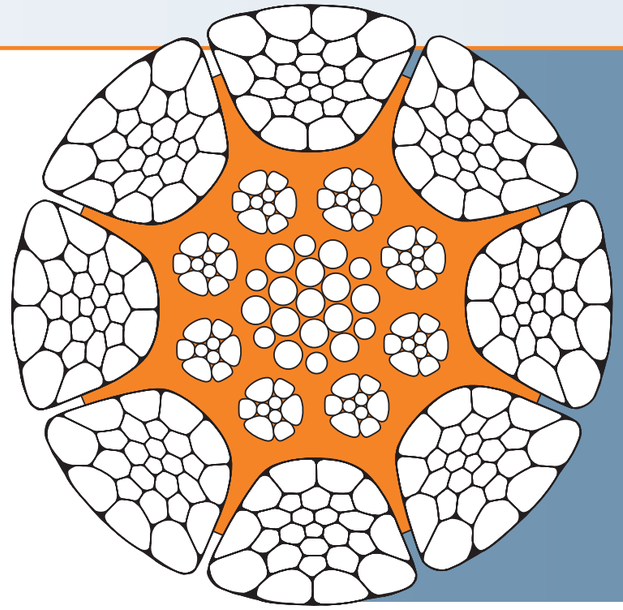
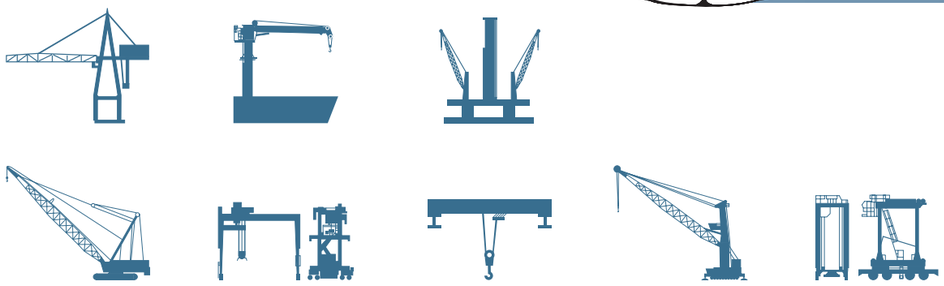
veropower 8

Regular lay

should not be used with a swivel





Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6 x d	30 x d	6 x d	30 x d					
12 ~ 40	299	208	18	35	/	/	0,75	0,87	0,85	13380	0,072
41 ~ 46	339	248	21	42	/	/	0,75	0,87	0,85	13380	0,072
47 ~ 54	379	288	24	48	/	/	0,75	0,87	0,85	13380	0,072

Nominal Diameter		Approx. Weight	Calculated Breaking Strength 1960 Grade		Minimum Breaking Strength 1960 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)
12		0,719	166,0	16,93	144,1	14,70
12,7	1/2	0,806	186,0	18,96	161,4	16,46
13		0,844	194,9	19,87	169,1	17,25
14		0,979	226,0	23,04	196,2	20,00
15		1,124	259,4	26,45	225,2	22,96
16	5/8	1,279	295,2	30,10	256,2	26,12
17		1,443	333,2	33,98	291,8	29,75
18		1,618	373,6	38,09	324,3	33,06
19	3/4	1,803	416,2	42,44	364,4	37,16
20		1,998	461,2	47,03	400,3	40,82
21		2,203	508,5	51,85	441,4	45,00
22		2,417	558,0	56,90	485,2	49,47
22,4	7/8	2,506	578,5	58,99	502,2	51,20
23		2,642	609,9	62,19	529,4	53,98
24		2,877	664,1	67,72	576,5	58,78
25		3,121	720,6	73,48	625,5	63,78
25,4		3,222	743,9	75,85	645,7	65,84
26		3,376	779,4	79,48	676,5	68,99
27		3,641	840,5	85,71	729,6	74,39
28		3,916	903,9	92,17	784,6	80,01
28,6	1-1/8	4,085	943,1	96,17	818,6	83,47
29		4,200	969,7	98,88	841,7	85,82
30		4,495	1038	105,8	902,2	92,00
31		4,800	1108	113,0	961,8	98,07
32	1-1/4	5,114	1181	120,4	1025	104,5
33		5,439	1256	128,0	1090	111,1
34		5,773	1333	135,9	1157	118,0
35	1-3/8	6,118	1412	144,0	1226	125,0
36		6,473	1494	152,4	1297	132,3
38	1-1/2	7,212	1665	169,8	1446	147,5
40		7,991	1845	188,1	1601	163,3
41,3	1-5/8	8,509	1964	200,3	1705	173,9
42		8,810	2034	207,4	1765	180,0
44		9,669	2232	227,6	1938	197,6
45	1-3/4	10,11	2335	238,1	2027	206,7
46		10,57	2440	248,8	2118	215,9
47,5	1-7/8	11,27	2601	265,3	2258	230,2
48		11,51	2657	270,9	2306	235,1
50	2	12,49	2882	293,9	2502	255,1
52		13,50	3118	317,9	2706	275,9
54	2-1/8	14,56	3362	342,8	2918	297,6

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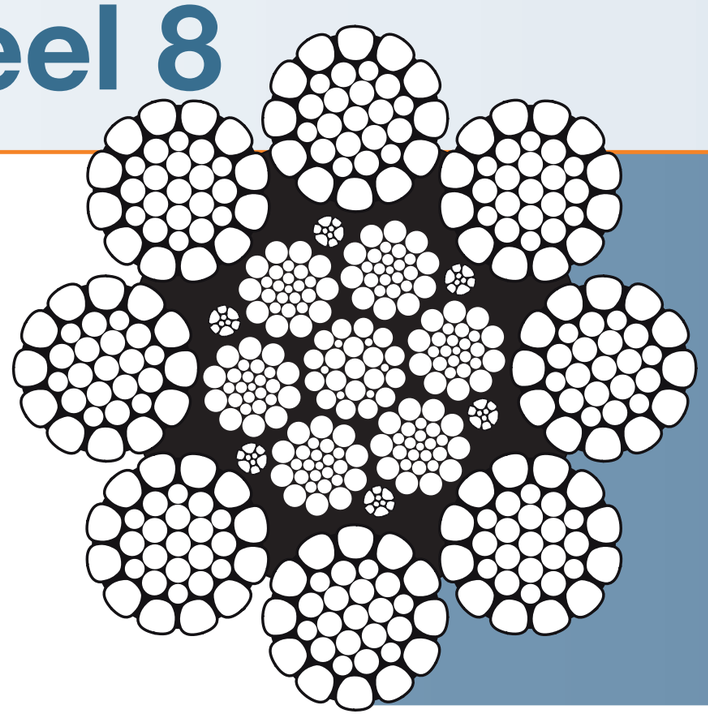

Regular lay
Lang's lay

should not be used with a swivel

Number of wires, Discard Criteria and Technical Data

Diameter in mm Ø	Total number of wires	Outer strands nr. of wires	Number of wire break at discard				Average fill factor	Average spin factor	Average weight factor	Elasticity Modulus (kgf/mm²)	Elongation under 3% of M.B.L.
			Regular lay		Lang's lay						
			6xd	30xd	6xd	30xd					
8 ~ 42	425	208	18	35	9	18	0,71	0,82	0,89	11500	0,330
43 ~ 48	465	248	21	42	10	21	0,71	0,82	0,89	11500	0,330
49 ~ 60	505	288	24	48	12	24	0,71	0,82	0,89	11500	0,330

Nominal Diameter		Approx. Weight	Calculated Breaking Strength				Minimum Breaking Strength			
			1960 Grade		2160 Grade		1960 Grade		2160 Grade	
mm	inch	kg/m	kN	t(M)	kN	t(M)	kN	t(M)	kN	t(M)
16	5/8	1,224	282,8	28,83	310,2	31,63	231,9	23,64	254,4	25,94
17		1,382	319,2	32,55	350,2	35,71	261,8	26,69	287,2	29,28
18		1,549	357,9	36,49	392,6	40,04	293,5	29,92	322,0	32,83
19	3/4	1,726	398,8	40,66	437,5	44,61	327,0	33,34	358,7	36,58
20		1,913	441,8	45,05	484,7	49,43	362,3	36,94	397,5	40,53
21		2,109	487,1	49,67	534,4	54,49	399,4	40,73	438,2	44,69
22		2,314	534,6	54,51	586,5	59,81	438,4	44,70	481,0	49,04
23		2,529	584,3	59,58	641,1	65,37	479,2	48,86	525,7	53,60
24		2,754	636,3	64,88	698,0	71,18	521,7	53,20	572,4	58,36
25		2,988	690,4	70,40	757,4	77,23	566,1	57,73	621,1	63,33
26		3,232	746,7	76,14	819,2	83,53	612,3	62,44	671,8	68,50
27		3,486	805,3	82,11	883,4	90,08	660,3	67,33	724,4	73,87
28		3,749	866,0	88,31	950,1	96,88	710,1	72,41	779,1	79,44
29		4,021	929,0	94,73	1019	103,9	761,8	77,67	835,7	85,22
30		4,303	994,1	101,4	1091	111,2	815,2	83,12	894,3	91,19
31		4,595	1062	108,2	1165	118,8	870,5	88,76	955,0	97,38
32	1-1/4	4,896	1131	115,3	1241	126,5	927,5	94,58	1018	103,8
33		5,207	1203	122,7	1320	134,6	986,4	100,6	1082	110,3
34		5,527	1277	130,2	1401	142,8	1047	106,8	1149	117,1
35	1-3/8	5,857	1353	138,0	1485	151,4	1110	113,1	1217	124,1
36		6,197	1432	146,0	1571	160,1	1174	119,7	1288	131,3
37		6,546	1512	154,2	1659	169,2	1240	126,4	1360	138,7
38	1-1/2	6,904	1595	162,6	1750	178,4	1308	133,4	1435	146,3
39		7,273	1680	171,3	1843	187,9	1378	140,5	1511	154,1
40		7,650	1767	180,2	1939	197,7	1449	147,8	1590	162,1
41		8,038	1857	189,3	2037	207,7	1523	155,3	1670	170,3
42		8,434	1949	198,7	2138	218,0	1598	162,9	1753	178,7
43		8,841	2042	208,3	2241	228,5	1675	170,8	1837	187,4
44		9,257	2139	218,1	2346	239,2	1754	178,8	1924	196,2
45	1-3/4	9,682	2237	228,1	2454	250,2	1834	187,0	2012	205,2
46		10,12	2337	238,3	2564	261,5	1917	195,4	2103	214,4
47		10,56	2440	248,8	2677	273,0	2001	204,0	2195	223,8
48		11,02	2545	259,5	2792	284,7	2087	212,8	2290	233,5
49		11,48	2652	270,4	2910	296,7	2175	221,8	2386	243,3
50	2	11,95	2762	281,6	3030	308,9	2264	230,9	2484	253,3

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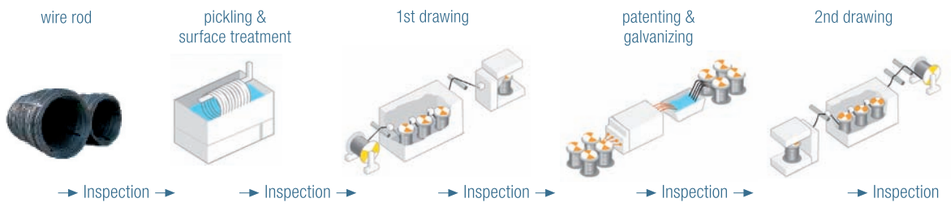
wire quality

an **important issue**

verope's aim is to produce wire ropes to high quality standards. To start from optimal raw material is indispensable in this regard. The large experience and skills available at our Joint Venture partner Kiswire, a world leading wire product manufacturer, grants us an advantage in this field. As an integrated manufacturer we start from wire rod raw material and control the complete process, from wire drawing to the closing of the ropes.

Wire Drawing process



Quality **monitoring** & **control** during the entire process

Wire rod

Procurement of high-quality and -purity wire rod from leading steel manufacturers

- meeting the international industrial standards
- using the designated, same-grade wire rod item by item for quality consistency

Pickling & surface treatment

Automated in-line process with optimised control system for wire quality

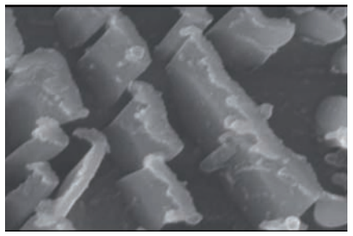
Drawing

- high-tensile and -ductility wire using up-to-date drawing machines
- homogeneous quality by optimum use of drawing dies (own Kiswire design & manufacture)

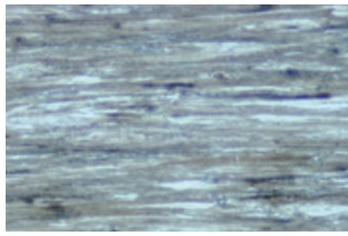
Patenting & galvanizing

Automated in-line process with optimised control of microstructure (high tensile and ductility)

FE-SEM



microstructure of high-carbon steel wire
(fine pearlite, FE-SEM X100,000)



microstructure of high-carbon steel wire
(after wire drawing , OM X500)

Testing & **Analyzing** equipment

microstructure analysis

- FE-SEM (Field Emission Scanning Electron Microscope)
- OM (Optical Microscope)

mechanical testing

- tensile strength tester
- torsion tester

chemical composition analyzing

- EPMA (Electron Probe Micro-Analyzer)
- EDS (Energy Dispersive Spectrometer) etc.

Wire Quality comparison (1960 grade)

verope products use high tensile and -ductility wires. Superior criteria are set.

- tensile strength (after drawing): value of 20% higher than international standard can be achieved.
- torsion (after drawing): value of 50% higher than the international standard can be achieved.

pickling & surface treatment

heat treatment & galvanizing

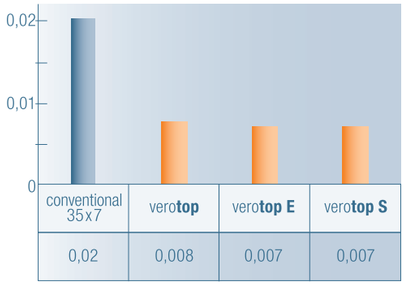
wire drawing

test results

Non rotation property

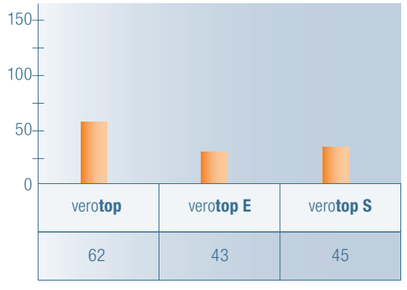
Torque factor
under 20% of M.B.L. (non rotation resistant ropes)

torque factor



Rotation angle
under 20% of M.B.L. (rotation resistant ropes)

Angle in degree/100d



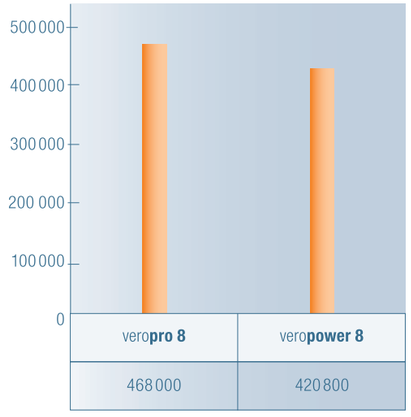
Torque factor of verope Special Wire Ropes

M.B.L.	verotop	verotop P	veropro 8	veropower 8
5%	0,006	0,004	0,051	0,067
10%	0,007	0,006	0,069	0,075
15%	0,007	0,008	0,073	0,082
20%	0,008	0,008	0,075	0,085

Bending Fatigue

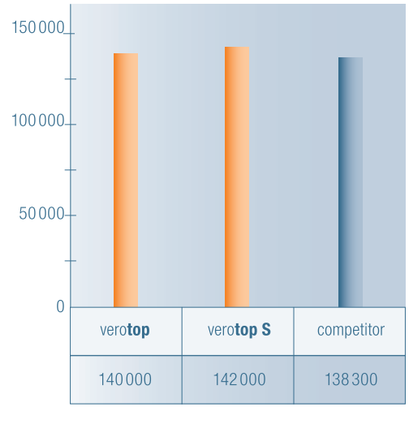
(non rotation resistant ropes, under 10% of M.B.L.)

Number of bending cycles (16 mm rope tested)



(rotation resistant ropes, under 10% of M.B.L.)

Number of bending cycles (16 mm rope tested)

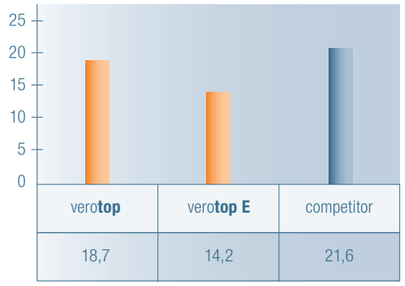


Flexibility

is inverse proportion to bending force

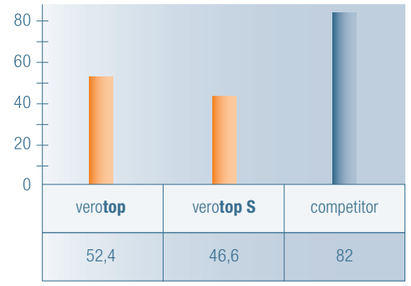
Bending force (16 mm)

Bending force in kgf



Bending force (23 mm)

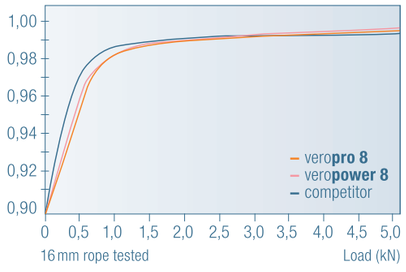
Bending force in kgf



Efficiency

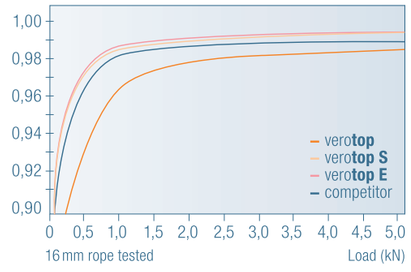
Efficiency under lower load ~2% of M.B.L.,
D/d = 20 (non rotation resistant ropes)

Efficiency



Efficiency under lower load ~2% of M.B.L.,
D/d = 20 (rotation resistant ropes)

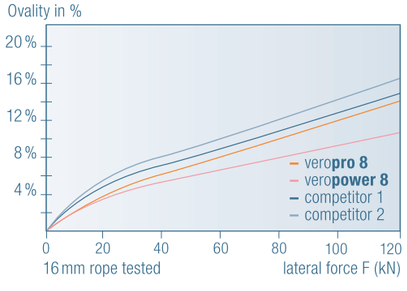
Efficiency



Form Stability

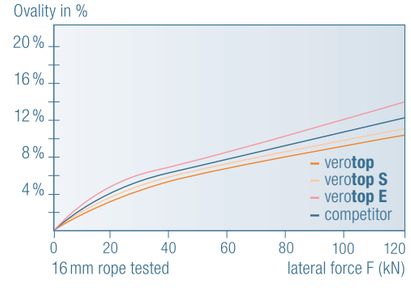
Lateral force stability (non rotation resistant ropes)

Ovality in %



Lateral force stability (rotation resistant ropes)

Ovality in %



company

Service and **Organization**

Based on long experience in the field of production and application verope's rope design takes place in our Head Office in Zug, Switzerland. From here the marketing and sales operation is organized, too. verope wants to be at the service of the end users in different market segments that have a need for high performance wire ropes.

We are happy to be able to appeal on a worldwide distributor network of professional wire rope/rigging shop companies to fulfill this target. At the other hand our sales department is constantly in contact with leading crane manufacturing companies, using the verope products for their new building.
To serve our European market, we have a large stock position in our warehouse in Aldenhoven (Germany).

Production

As part of the Joint Venture company, Kiswire takes care of the rope manufacturing. Since April 2007, the verope ropes are produced in a new factory.
A state-of-the-art, mainly specially designed, production equipment, together with the renowned technology and production skills available at this world leading wire and wire rope manufacturer stands as guarantee for the quality level and progressive further development of the verope products.

Production in Busan, Korea

Factory in Busan, Korea

Production in Busan, Korea

Prepared for the **future**

Service is a key issue in our market of course. Extending and improving our level here is as such a main target at verope. Our sales and technical support team is constantly strengthened and our distributor network extended.
In this regard our stock position will again be significantly increased in the near future, with the building of a brand new Service Center in Zweibrücken, Germany, set to be operational in 2010. To serve our OEM customers we will not only stock ropes there, but also be equipped to serve them with all kind of endfittings.

Location: Zweibrücken (Rheinland-Pfalz, Germany)
Ground surface: 30.000 m² (+ 20.000 m² optional)
Builded surface in 1st. stage: 4.000 m²
Equipment : stocking facilities, coiling and cutting equipment, presses, testing machines, …

Service Center in Zweibrücken, Germany

verope AG is ISO 9001 : 2008 certified