verope®
rely on

St. Antons-Gasse 4a
CH-6300 Zug / Switzerland
Tel: +41 41 72 80 880
Fax: +41 41 72 80 888

**www.verope.com**
**info@verope.com**

KISWIRE

# verope General Catalogue

2009 / 11

verope®
rely on

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

Technical figures are up to date at time of printing.
We reserve the right to change technical details
due to technical development.

!

verope®
rely on

# 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?** - page 6|7
Product features of Special Wire Ropes

**special rope features** - page 8|9|10|11
CAD, Lang's lay / Regular lay, plastic layer, compaction, drum & rope sheaves, lateral pressure stability, lubrication

**which rope for which application?**
page 12|13|14

**product overview** - page 15

**Rotation resistant Special Wire Ropes**
vero**top P** - page 16|17
vero**top** - page 18|19
vero**top E** - page 20|21
vero **4** - page 22|23

**Non rotation resistant Special Wire Ropes**
vero**star 8** - page 24|25
vero**pro 8** - page 26|27
vero**power 6** - page 28|29
vero**power 8** - page 30|31
vero**steel 8** - page 32|33

**wire quality** - page 34|35

**test results** - page 36|37
Bending Fatigue, Non Rotation Property, Flexibility, Efficiency, Form Stability

**company** - page 38|39

# 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 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.

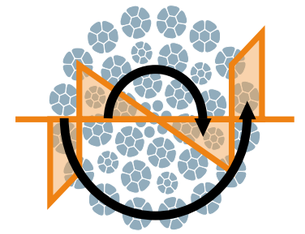
## Bending Fatigue

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

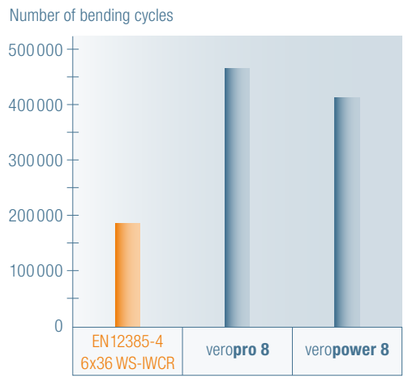
**Main advantages of Special Wire Ropes are:**

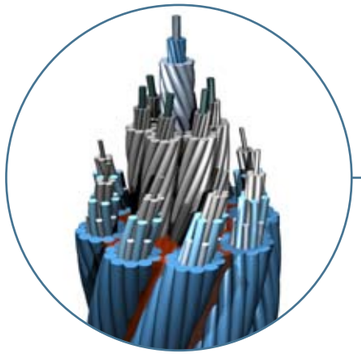
- Good rotational stability over a wide load spectrum for torque balanced rotation resistant ropes.
- Improved rope behaviour in multiple layer spooling on the drum for well balanced rotation resistant ropes made from compacted outer strands in lang's lay execution and a solid steel core.



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.

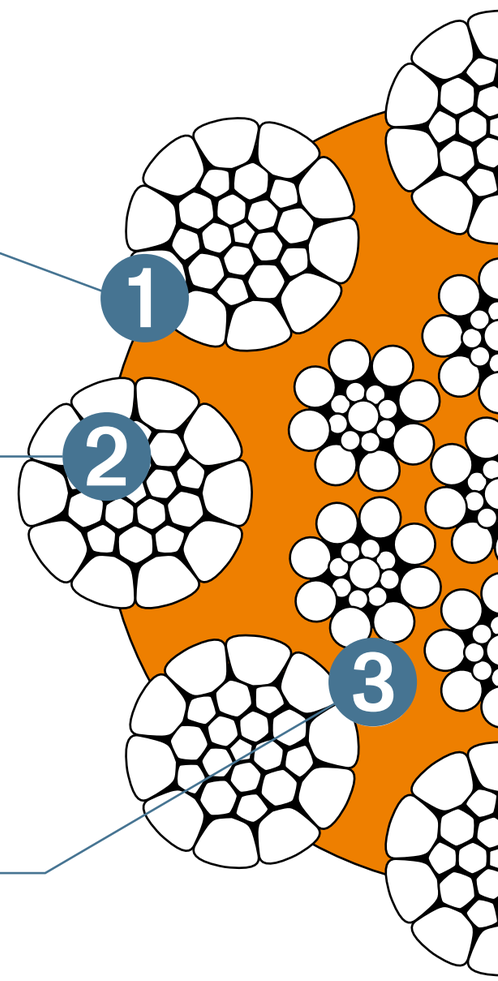
Non rotation resistant ropes, under constant load:

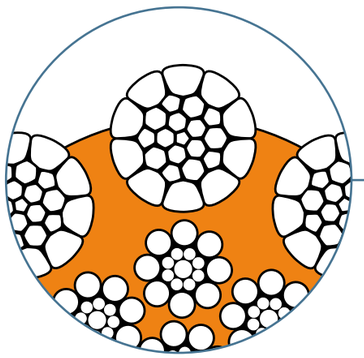




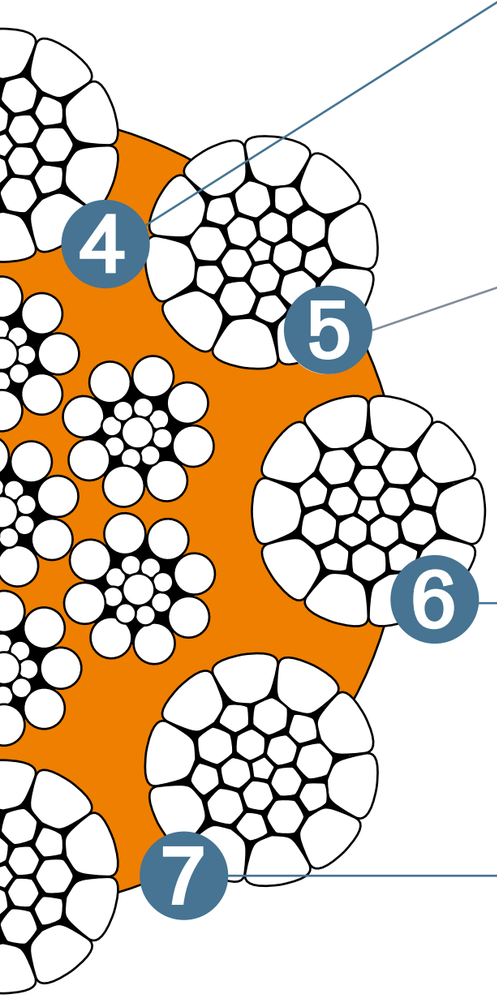
Construction by
**Computer Aided Design**
➜ Page 8

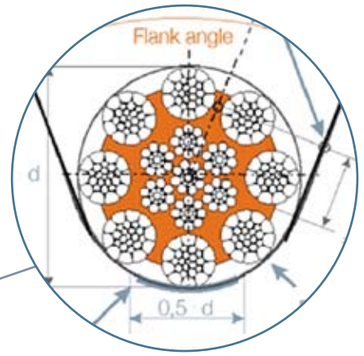
**Lang's lay** and
**Regular lay**
➜ Page 8



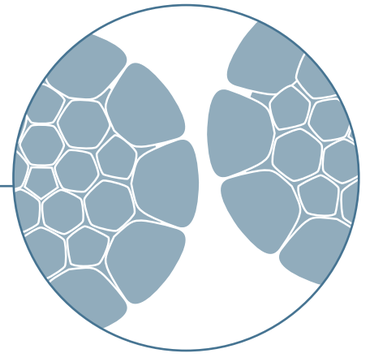



**Plastic Layer**
➜ Page 9




**Drum** and **Sheaves**
➜ Page 10



**Compacting** and
**Rotary Swaging**
➜ Page 9

**Lubrication**
➜ Page 11

**Lateral pressure**
**stability**
➜ Page 11

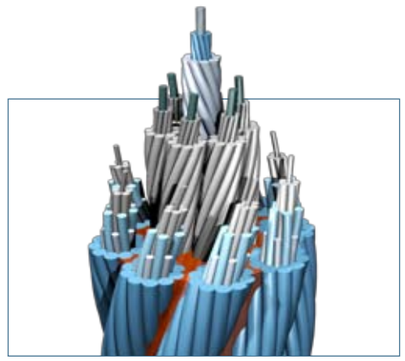
rope illustration in the middle: vero**pro 8**

# 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 optimization
- Torque minimization
- 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.

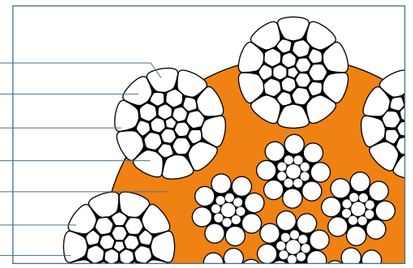
Lang's lay Regular lay



## 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.

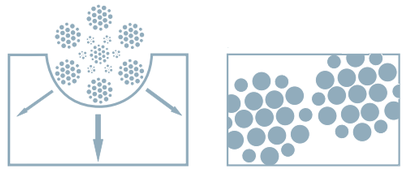
**The main advantages are:**
- Prevents internal wire breaks
- Seals in rope lubricant
- Keeps out infiltration of water, dust, etc…
- Reduces the internal stress
- Improves the form stability of the rope
- Absorbs dynamical energy
- Reduces the noise level



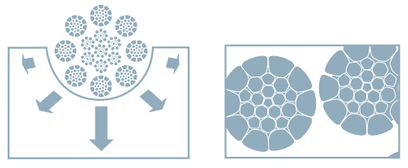
## ❹ **Compacting** and **Rotary Swaging**

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



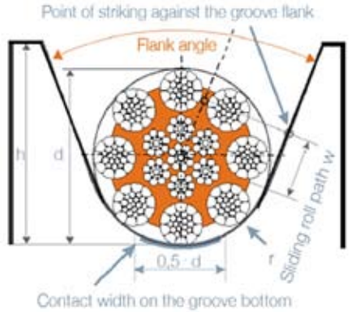
vero**pro 8**

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

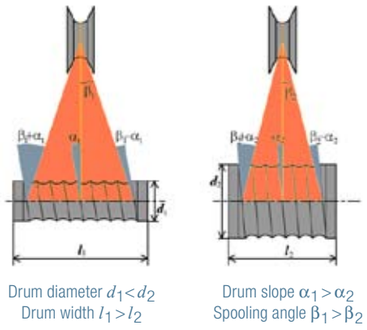
Increasing rope length requires good solutions for controlled spooling onto the hoisting drum.
The following rope features improve the spooling:

- 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

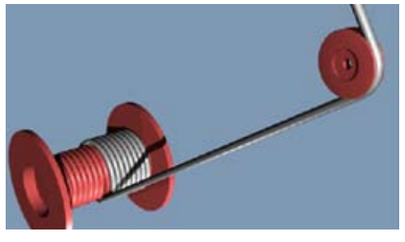
### Drum and Sheave spooling angle

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 $\beta_1 > \beta_2$

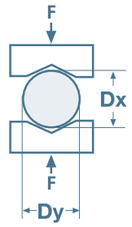


picture on the left:
verope 3D animation to monitor multiple-layer drum spooling.

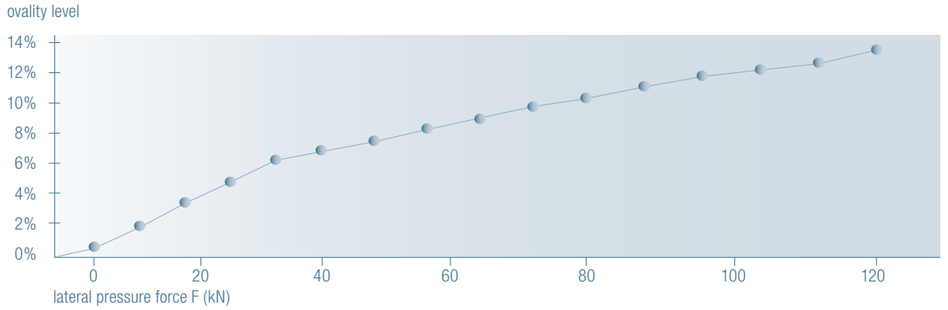


# ❻ Lateral pressure stability

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)<br>vero**power 6** (p. 28\|29)<br>vero**power 8** (p. 30\|31) |
| Tower Crane | vero**top** (p. 18\|19)<br>vero**top E** (p. 20\|21) | vero**pro 8** (p. 14\|15)<br>vero**star 8** (p. 18\|19) | |

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

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

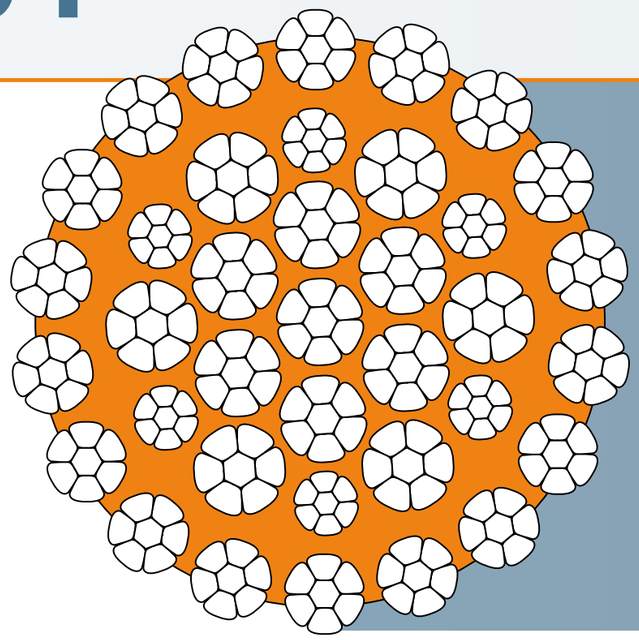
vero**power 8** | Regular lay - page 30|31
is an 8-strand non rotation resistant rope. It is a flexible steel-plastic combination rope with double parallel layed strands. All strands are compacted and rotary swaged.

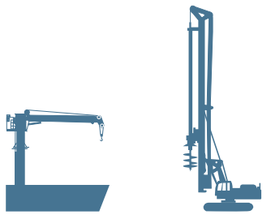
vero**steel 8** | Lang's lay/Regular lay - page 32|33
is a full steel 8-strand rope with compacted outer strands. It is a very flexible rope construction with high abrasion resistance and good service life.

# 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 |

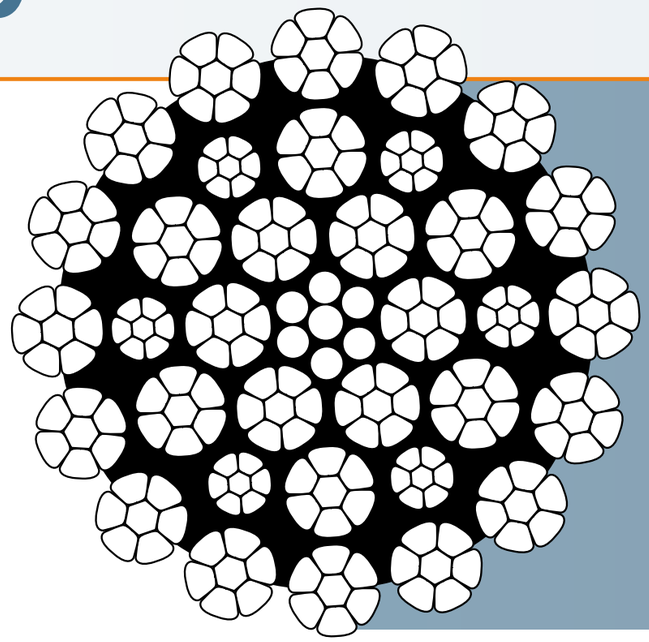
| Nominal Diameter | | Approx. Weight | Calculated Breaking Strength | | | | Minimum Breaking Strength | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1960 Grade | | 2160 Grade | | 1960 Grade | | 2160 Grade | |
| mm | inch | kg/m | kN | t(M) | kN | t(M) | kN | t(M) | kN | t(M) |
| 16 | 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 |

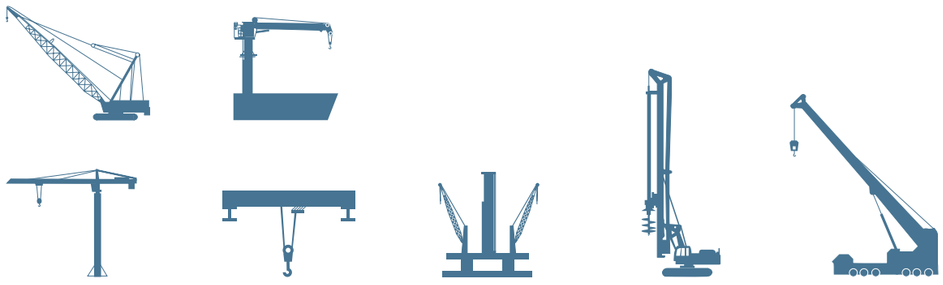
2009 / 11

# 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 |

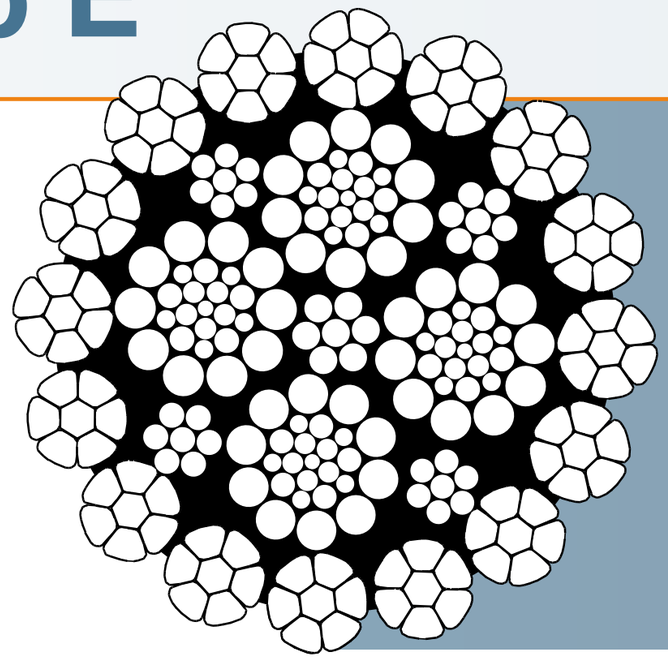
| Nominal Diameter | | Approx. Weight | Calculated Breaking Strength | | | | Minimum Breaking Strength | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1960 Grade | | 2160 Grade | | 1960 Grade | | 2160 Grade | |
| mm | inch | kg/m | kN | t(M) | kN | t(M) | kN | t(M) | kN | t(M) |
| 8 | | 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 |

2009 / 11

# verotop E

## 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 |

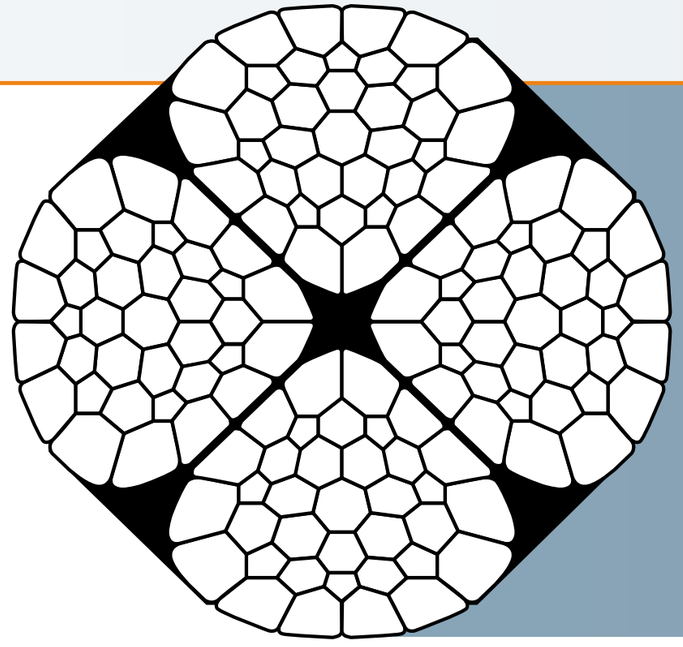
| Nominal Diameter | | Approx. Weight | Calculated Breaking Strength | | | | Minimum Breaking Strength | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1960 Grade | | 2160 Grade | | 1960 Grade | | 2160 Grade | |
| mm | inch | kg/m | kN | t(M) | kN | t(M) | kN | t(M) | kN | t(M) |
| 8 | | 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 |

2009 / 11

# vero 4

## Regular lay

should not be used with a swivel



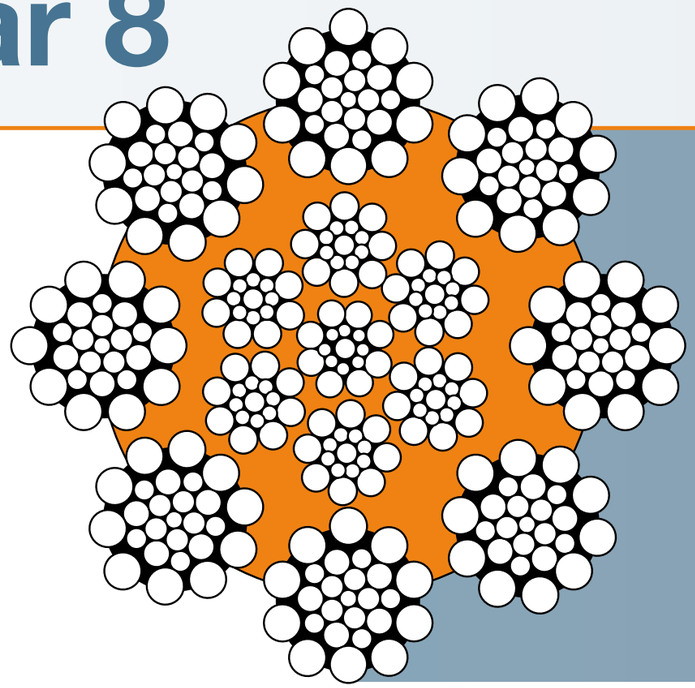
## Number of wires, Discard Criteria and Technical Data

| 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 |

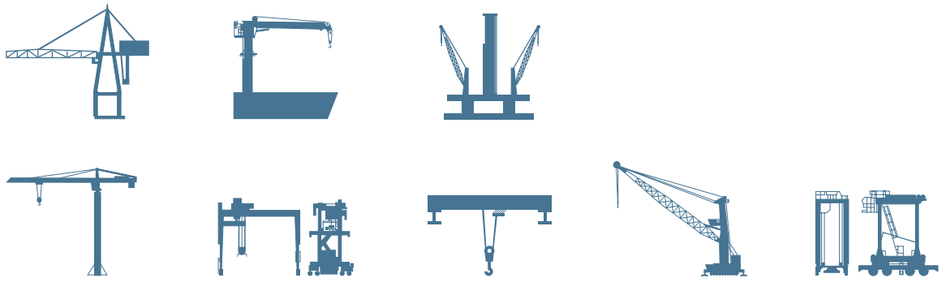
2009 / 11

# verostar 8



Regular lay
Lang's lay

should not be used with a swivel



## Number of wires, Discard Criteria and Technical Data

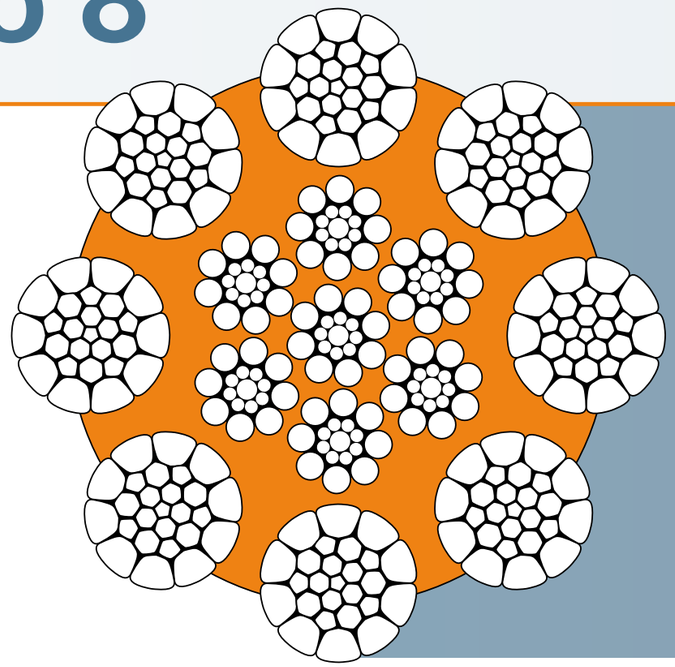
| Diameter in mm Ø | Total number of wires | Outer strands nr. of wires | Number of wire break at discard | | | | Average fill factor | Average spin factor | Average weight factor | Elasticity Modulus (kgf/mm²) | Elongation under 3% of M.B.L. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 |

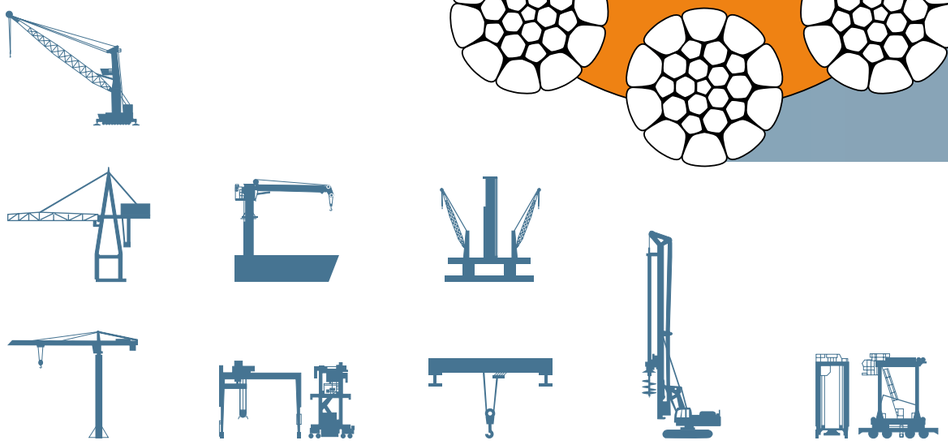
2009 / 11

# veropro 8



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 |

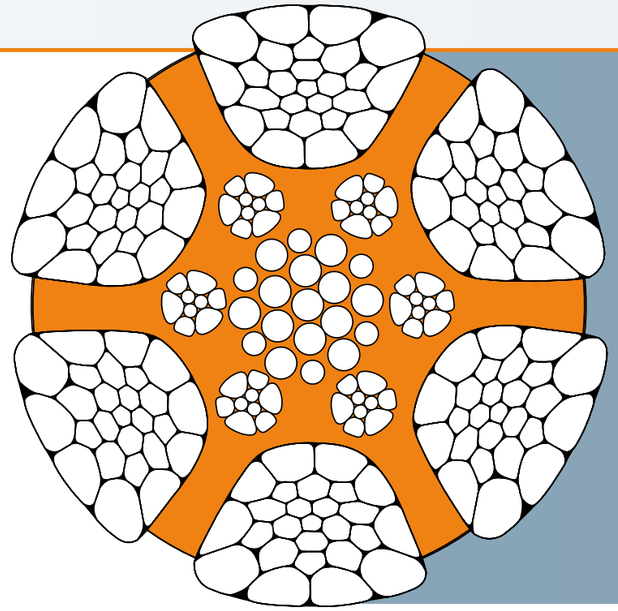
| Nominal Diameter | | Approx. Weight | Calculated Breaking Strength | | | | | | Minimum Breaking Strength | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1770 Grade | | 1960 Grade | | 2160 Grade | | 1770 Grade | | 1960 Grade | | 2160 Grade | |
| mm | inch | kg/m | kN | 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 | | |

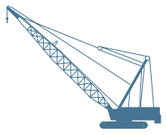
2009 / 11

# 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 |

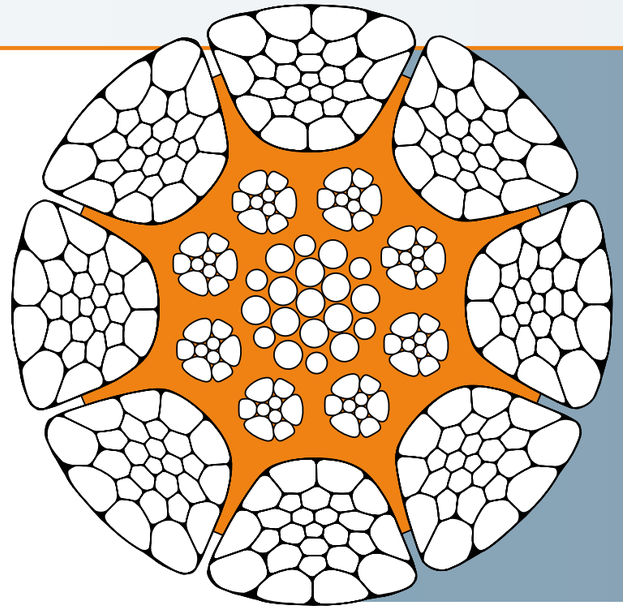
| Nominal Diameter | | Approx. Weight | Calculated Breaking Strength 1960 Grade | | Minimum Breaking Strength 1960 Grade | |
|---|---|---|---|---|---|---|
| mm | inch | kg/m | kN | t(M) | kN | t(M) |
| 20 | | 1,975 | 455,0 | 46,39 | 375,1 | 38,25 |
| 21 | | 2,178 | 501,6 | 51,15 | 413,6 | 42,17 |
| 22 | | 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 |

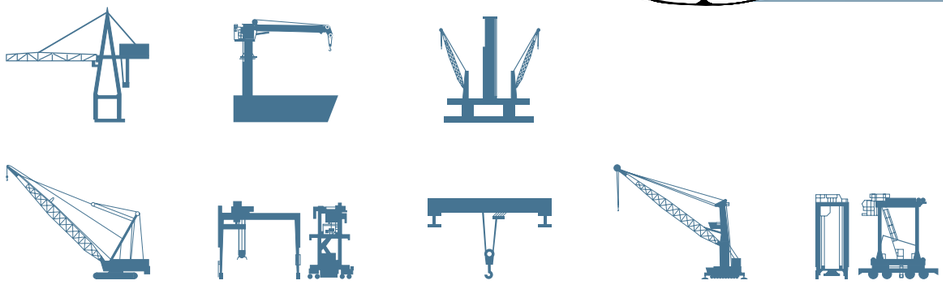
2009 / 11

# veropower 8

## Regular lay

should not be used with a swivel





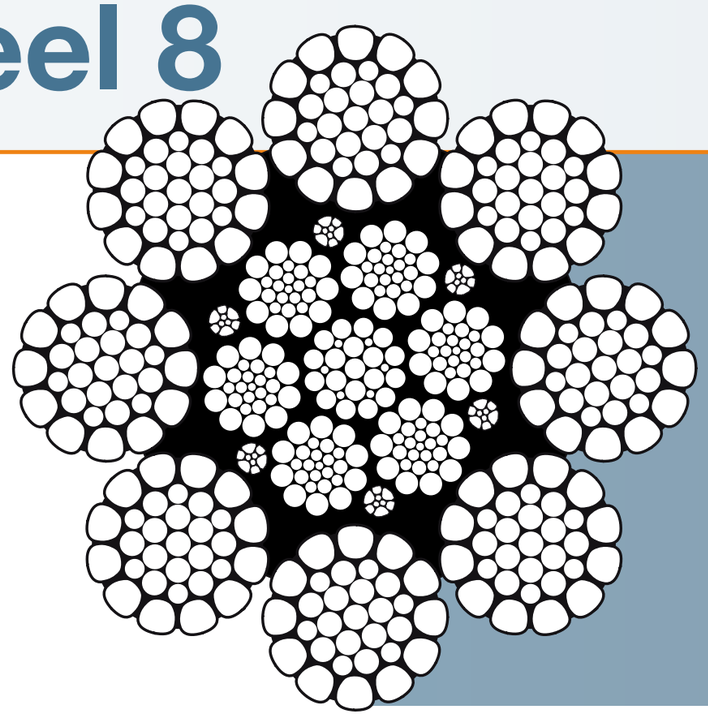
## Number of wires, Discard Criteria and Technical Data

| 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 |

2009 / 11

# verosteel 8



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 |

2009 / 11

# 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

wire rod → Inspection → pickling & surface treatment → Inspection → 1st drawing → Inspection → patenting & galvanizing → Inspection → 2nd drawing → Inspection

## 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

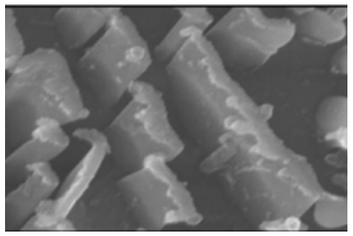
**Drawing**

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

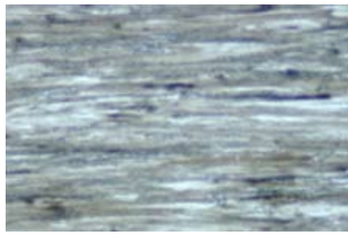
**Patenting & galvanizing**

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

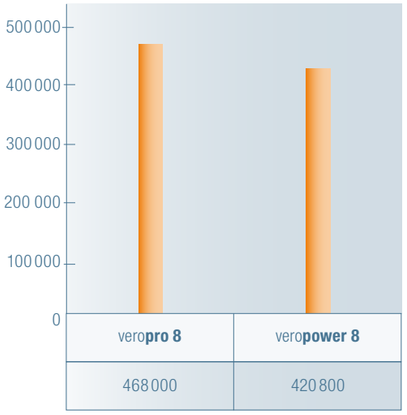
wire drawing

# test results

## Bending Fatigue

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

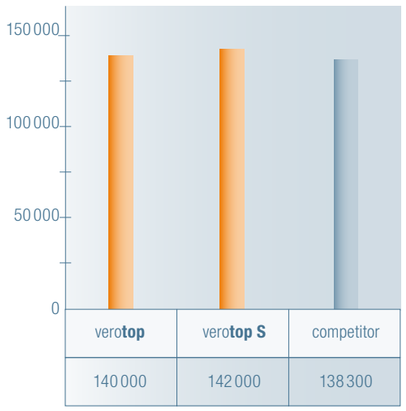
Number of bending cycles (16 mm rope tested)




| veropro 8 | veropower 8 |
|---|---|
| 468 000 | 420 800 |

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

Number of bending cycles (16 mm rope tested)



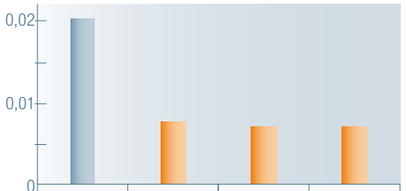

| verotop | verotop S | competitor |
|---|---|---|
| 140 000 | 142 000 | 138 300 |

## Non rotation property

Torque factor

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

torque factor

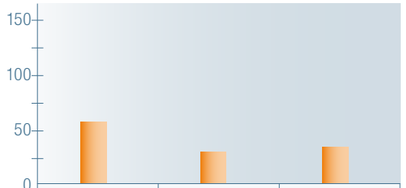



| conventional 35x7 | verotop | verotop E | verotop S |
|---|---|---|---|
| 0,02 | 0,008 | 0,007 | 0,007 |

Rotation angle

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

Angle in degree/100d




| verotop | verotop E | verotop S |
|---|---|---|
| 62 | 43 | 45 |

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 |

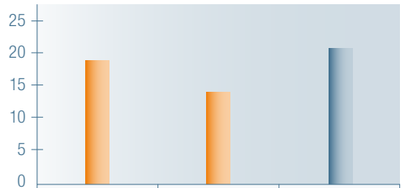


## Flexibility

is inverse proportion to bending force

Bending force (16 mm)

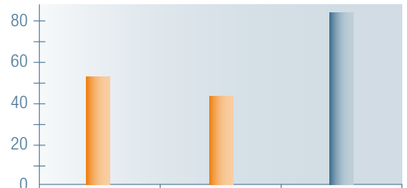
Bending force in kgf




| verotop | verotop E | competitor |
|---|---|---|
| 18,7 | 14,2 | 21,6 |

Bending force (23 mm)

Bending force in kgf



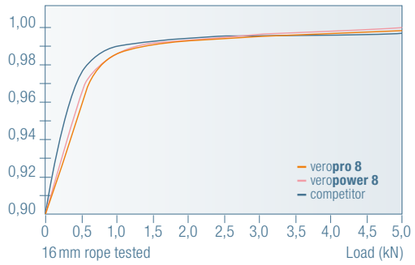

| verotop | verotop S | competitor |
|---|---|---|
| 52,4 | 46,6 | 82 |

## Efficiency

Efficiency under lower load ~2% of M.B.L.,

D/d = 20 (non rotation resistant ropes)

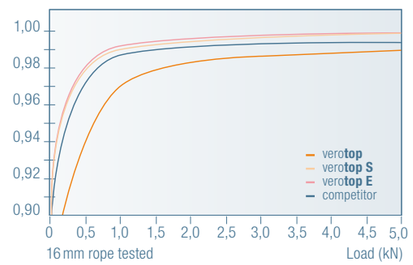
Efficiency




Efficiency under lower load ~2% of M.B.L.,

D/d = 20 (rotation resistant ropes)

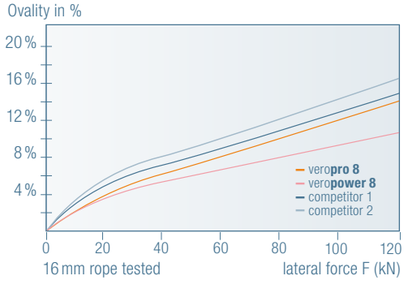
Efficiency




## Form Stability

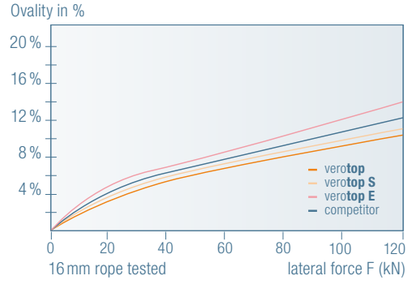
Lateral force stability (non rotation resistant ropes)

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 manufaturing 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.

Factory in Busan, Korea

Production 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: 30.000m² (+20.000m² optional)
Builded surface in 1st. stage: 4.000m²
Equipment : stocking facilities, coiling and cutting equipment, presses, testing machines, …

Service Center in Zweibrücken, Germany

**verope AG is ISO 9001 : 2008 certified**