



 **VAHLE**

Motor Powered Cable Reels

SYSTEMS IN MOTION



General

| Contents | Page |
|---|------|
| General | 3 |
| Calculations | 5 |
| Determining the cable cross section | 7 |
| Type designation | 9 |
| Cable guides | 11 |
| Cable guides and guide rollers | 13 |
| Feed point funnel | 14 |
| Terminal box | 15 |

Application

Cable reels with motor drives are used as a power supply for mobile consumers for automated winding of flexible power or control cables for the following areas:

- All forms of portal and swivel cranes
- Container bridges
- Stacking cranes
- Gantry cranes
- Construction cranes
- Loading facilities
- Magnet and grip cranes
- E-trains
- Transfer tables
- Forklifts
- Warehouses in sewage treatment plants
- Coating machines

Our cable reels comply with VDE and UVV standards.

Special uses

- Reels for installation on maritime ships or use in the tropics
- Reels used under aggressive operating conditions (e.g. acid baths, galvanizing plants)
- Reels for the distribution of measured current, signal current and high frequency transmissions
- Reels for the transfer of optical signals (optical fibre)
- Reels for feeding liquid or gaseous media (hose reels)
- Reels for height variable tools or control boards on lifting equipment

Slip ring bodies

VAHLE slip ring bodies are available in the following versions:

- Low voltage: Voltages ranging between 230V and 500V
Amperages of 10 A to 1000 A)
- Medium voltage: Voltages ranging between 10 kV and 20 kV
Amperage 240 A

Higher voltages available upon request The housing for the slip ring bodies are encapsulated to meet protection type IP 55 (higher protection types available upon request).

| Contents | Page |
|---------------------------------|------|
| Cable grips | 16 |
| Cable support rollers | 17 |
| Anchor shackles | 17 |
| Installation sequence | 18 |
| Reference systems | 19 |
| Reel installation example | 22 |
| Questionnaire | 23 |

All slip-ring bodies may be equipped with stand heaters (standard for medium voltages) upon request. The installation of a heater is recommended for temperatures below - 25°C or where large temperature fluctuations are expected within a short period of time.

Special slip-ring bodies for profibus data transfer with 1.5 Mbit/s are also available.

Fibre optic cables are used for the transmission of all optic signals. The transmission between the rotating part (reel body) and the fixed part will then be performed using the fibre optic transmitter. This is adjusted to the length of the cable as well as the number of fibre optic cables.

A plug connector is used. The transmitter shall either be attached to the slip-ring body or is located in a housing, both in a heated room.

Drives

We offer the following drives

- Three-phase motor with magnetic coupling
- Three-phase motor with frequency converter
 - with constant torque
 - with adjustable torque
- Three-phase motor with integrated frequency converter
 - with constant torque
 - with adjustable torque
- Torque motor with/without external ventilator

All drives run in winding direction. The payout involves the pulling of the cable from the reel counter to the drive torque. The drive is suitable for all device speeds up to stopping. A brake stops the uncontrolled unwinding of the cable when the device is switched off. The drive can be electrically heated upon request.

General

Reel bodies

- Mono spiral winding bodies with spokes are available in welded and bolted versions. The bolted design can be set to the winding width and thus adjusted to different cable cross sections. The winding cross section is adjusted to the minimum bend radius for the cable.
- Cylindrical (random) winding reel bodies are made of galvanized steel.

Also available:

- Double spiral winding reel bodies for the parallel winding of two cables with the same cross section.
- 3-2-3 layered winding
- Cylindrical winding with spooling equipment

Payout

The cable payout as presented in the dimensional drawings. Payout direction changes can be made upon request at no added cost and a later time with no great effort.

Limit switch

In order to switch off the drive or hoist motors when unwinding the last or next-to-last cable winding, all reels come with an optional limit switch. The switching cams are set for a maximum of 5 A and 250 volts. The limit switch is located either in the slip-ring body housing or externally in its own housing (with a Nirosta chain as a drive). Alternatively other limit switches, proximity switches or feeds can be installed.

Surface protection

The reel body comes standard in a galvanized version. The slip-ring body housing and the drive unit have a primer and cover coating in RAL 7040. Other versions (e.g. hot-dip galvanized or stainless steel reel bodies) are available.

Operating Manual

Instructions for assembly and commissioning are included in every delivery.

Assembly

When attaching the motor-powered cable reel to the consumer, make sure that the assembly frames or the foot-mounted gears have a level surface. In order to guarantee the smooth winding up and down the reel needs to be aligned on two sides, i.e. the reel axis needs to be horizontal and perpendicular to the running direction.

The heat exhaust from the motor drive needs to flow upwards and may not be hindered by protective hoods or other devices.

The cables need to be free from twisting - while accounting for the safety winding(s) for the strain relief - on the reel body. Expert staff shall install the electrical connections to the slip rings and the feed points in compliance with regulations.

After successful connection of the drive motor, the reel is ready for operation. The drive motor needs to be connected so that the reel rotates in the wind up direction. The payout direction is marked with an arrow.

Accident protection measures.

In accordance with EC directive 2006/42/EC, we wish to indicate that rotating parts such as reels need to be secured to prevent potential accidents.

Warranty

We provide guarantees in compliance with the General Terms and Conditions for Products and Services of the Electrical Industry.

Accessories (from page 11)

- Guide rollers with and without tension control
- Sheave guides with and without top guide rollers
- Deflection and guide rollers
- Feed point
- Medium voltage terminal box (special versions available, e.g. with fibre optic cable)
- Cable grips
- Cable support rollers and anchor shackles

Calculations

Calculating the necessary cable cross section

1. Determination of ampacity and cable cross section
2. Control of voltage drop
3. Selection of cables

1. Determination of ampacity and cable cross section

The nominal current (I_N) of the individual motors are summarized with a reduction factor (f_{ED}, f_T, f_1, f_2) to an equivalent continuous current (I_D). The following calculation shall also be performed repeatedly if necessary.

$$I_D = \frac{I_N}{f_{ED} \times f_T \times f_1 \times f_2} \quad [A]$$

I_N : Recommendations for determining the nominal current

Estimated example for crane installations:

Sum up of the nominal currents for two motors with the strongest output.

$$I_N = I_{N1} + I_{N2} + I_G \quad [A]$$

If only one power output is known:

$$I_D = \frac{P \times 1000}{\sqrt{3} \times U \times (\cos \varphi \times \eta)} \times f_G \quad [A]$$

P = Power [kW]

U = Voltage [V]

$\cos \varphi \cdot \eta = 0.8$ estimated

$f_G = 1.0$ when individual power rating is known

$f_G = 0.9$ only total power is known

f_{ED} = Reduction factors for intermittent service are listed on page 7

f_T = Reduction factor for increased ambient temperature
For ambient temperatures above 30 °C, the reduction factors on page 7 shall apply.

f_1 = Reduction factor for multi-layer winding for ampacities based on the type of reel as per page 7.
They are valid for permanently wound up cables. For cables that are only temporarily fully wound, reduced factors can be applied.

f_2 = Reduction factor for multilayer coiling
The factors on page 8 should be taken into account for multilayer cables.
They apply for diameters of up to 10 mm²

2. Check of voltage drop

Rough calculation for determining the voltage drop ΔU :

$$\Delta U = \sqrt{3} \times L \times I_A \left(\frac{Z}{1000} \right) \quad [V]$$

- L = total cable length [m]
I_A = starting current [A]
Z = Impedance [Ω /km]
for $\cos \varphi = 0.6$ from Table 1 (Page 7)
 ΔU = recommended $\Delta U < 5\%$

I_A: Calculation of start-up current

The order of the motors sizes does not depend according to their power output but the level of start-up current, i.e.: Squirrel cage motor with less power output but high start-up current is placed ahead of a slip-ring motor with higher performance.

Recommendation:

$$I_A = I_{A1} + I_{N2} \quad [A]$$

- I_{A1}: 1. Motor with highest start-up current
I_{N2}: 2. Motor with highest nominal current

Note:

$$I_A = X \cdot I_N \quad [A]$$

- Squirrel cage motors: X \approx 6
Slip-ring motors: X \approx 2
Frequency regulated drives: X \approx 1.1

3. Selection of cables

Reel-capable cables in accordance with DIN/VDE 0298 shall be used. In doing so the smallest permissible bend radii (page 8) need to be taken into account.

For reasons of mechanical strength, the diameter of control cables should not be less than 1,5 mm². We recommend to include spare conductors for multicore control cables.

Calculating the necessary cable diameter

**Table 1: Continuous ampacity of cables NSH ... and NTS ... for straight, open air installation.
Max. possible operating temperature of the conductor 90 °C.**

| Nominal cross section [mm ²] | Ambient temperature 30 °C continuous amp. [A] | Factors for intermittent duty with ED | | | | Z [Ω/km] |
|--|--|---------------------------------------|------|------|------|----------|
| | | 60% | 40% | 25% | 15% | |
| 1.5 | 23 | 1.00 | 1.00 | 1.00 | 1.00 | 8.770 |
| 2.5 | 30 | 1.00 | 1.00 | 1.04 | 1.07 | 5.310 |
| 4 | 41 | 1.00 | 1.03 | 1.05 | 1.19 | 3.360 |
| 6 | 53 | 1.00 | 1.04 | 1.13 | 1.27 | 2.250 |
| 10 | 74 | 1.03 | 1.09 | 1.21 | 1.44 | 1.370 |
| 16 | 99 | 1.07 | 1.16 | 1.34 | 1.62 | 0.888 |
| 25 | 131 | 1.10 | 1.23 | 1.46 | 1.79 | 0.547 |
| 35 | 162 | 1.13 | 1.28 | 1.53 | 1.90 | 0.443 |
| 50 | 202 | 1.16 | 1.34 | 1.62 | 2.03 | 0.344 |
| 70 | 250 | 1.18 | 1.38 | 1.69 | 2.13 | 0.258 |
| 95 | 301 | 1.20 | 1.42 | 1.74 | 2.21 | 0.205 |
| 120 | 352 | 1.21 | 1.44 | 1.78 | 2.26 | 0.174 |
| 150 | 404 | 1.22 | 1.46 | 1.81 | 2.30 | 0.154 |
| 185 | 461 | 1.23 | 1.48 | 1.82 | 2.32 | 0.136 |
| 240 | 540 | 1.23 | 1.49 | 1.85 | 2.36 | 0.119 |

Table 2: Multiplier for ambient temperature

| Ambient temperature [°C] | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
|--------------------------|------|------|------|------|------|------|------|------|------|------|
| Reduction factor f_r | 1.05 | 1.00 | 0.95 | 0.89 | 0.84 | 0.77 | 0.71 | 0.63 | 0.55 | 0.45 |

Table 3: Multiplier for multilayer coiling.

| Number of complete layers LZ on the reel | 1 ⁽¹⁾ | 2 | 3 | 4 |
|---|------------------|------|------|------|
| Reduction factor f_r | 0.80 | 0.61 | 0.49 | 0.42 |

1) Also applies to spiral coils

Table 4: Multiplier for multilayer coiling up to 10 mm²

| | | | | | | | | |
|-------------------------|------|------|------|------|------|------|------|------|
| Number of conductor | 5 | 7 | 10 | 14 | 19 | 24 | 40 | 61 |
| Correction factor f_2 | 0.75 | 0.65 | 0.55 | 0.50 | 0.45 | 0.40 | 0.35 | 0.30 |

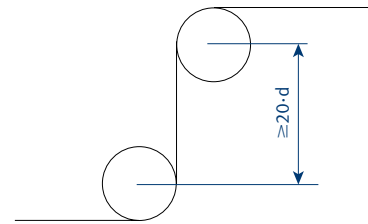
Table 5: Minimum bending radii

| Cable type | Nominal voltages of up to 0.6/1 kV | | | Nominal voltage of over 0.6/1 kV | Comment |
|--------------------------------------|---|---------------|---------|----------------------------------|---|
| | cross section of cables or thickness of the flat cables | | | | |
| Flexible cables | Over 8 to 12 | Over 12 to 20 | Over 20 | | If cable types can be used for several applications contact the manufacturer. |
| Fixed installation | 3 x d | 4 x d | 4 x d | 6 x d | |
| Free movement | 4 x d | 5 x d | 5 x d | 10 x d | |
| For entry | 4 x d | 5 x d | 5 x d | 10 x d | |
| For positive guidance ⁽¹⁾ | 5 x d | 5 x d | 6 x d | 12 x d | |
| Guide roller | 7.5 x d | 7.5 x d | 7.5 x d | 15 x d | |

The smallest permissible bending radius is 6 x d for PUR-HF cables 0.6/1 kV with positive guidance like reel operation.

The straight lengths between two bends with an s-shaped cable guide or cable guide to another level must be at least 20 times the cable diameter.

Subject to technical advancement



1) with reeling operation
 2) The suitability for this operating mode needs to be assured through special structural characteristics.

Type designation

Motor cable reels with magnetic coupling drive

| | | | | | | | | | |
|-----|-------|---|---|---|-----|---|-----|---|-----|
| LTM | 300 | S | 7 | M | 36 | - | R1 | / | 1,8 |
| LTM | 530 | N | 4 | M | 60 | - | 95 | / | 5 |
| LTM | 15/40 | H | 4 | K | 240 | - | 128 | / | 88 |

Cable reels with magnetic coupling drive

Random winding (inner diameter of the reel in millimetres)

Spiral winding (inner diameter / exterior diameter in decimetres)

S = Low voltage with vertical payout

S = Low voltage with horizontal payout

H = Medium voltage

Number of poles for slip ring body

M = Brass slip ring

K = Copper slip ring

Slip ring rating in amps (100% ED)

Gear sizes: bevel – helical gear unit 1 = R1

Flat spur gear = 95 + 96

bevel – helical gear unit = 48 - 168

Magnetic coupling sizes

Type designation

Motor cable reels with frequency converter drive

| | | | | | | | | | | | |
|----|-------|---|----|---|-----|---|-----|---|-----|---|------|
| LT | 420 | S | 24 | M | 36 | - | 68 | / | FMK | 4 | G |
| LT | 530 | N | 4 | M | 60 | - | 88 | / | FK | 4 | J |
| LT | 15/40 | H | 4 | K | 240 | - | 128 | / | FP | 6 | M -S |

Cable reels with frequency converter drive

Random winding (inner diameter of the reel in millimetres).

Spiral winding (inner diameter / exterior diameter in decimetres)

S = Low voltage with vertical payout
 S = Low voltage with horizontal payout
 H = Medium voltage

Number of poles for slip ring body

M = Brass slip ring
 K = Copper slip ring

Slip ring rating in amps (100% ED)

Gear sizes:

FMK = Frequency converter with constant torque installed directly to the motor (always from Getriebebau Nord)
 FMP = Frequency converter with variable torque installed directly to the motor (always from Getriebebau Nord)
 FK = Frequency converter with constant torque
 FP = Frequency converter with variable torque

Number of poles of the motor

Motor size

S = Frequency converter from Siemens Sinamics
 No label = from Getriebebau Nord

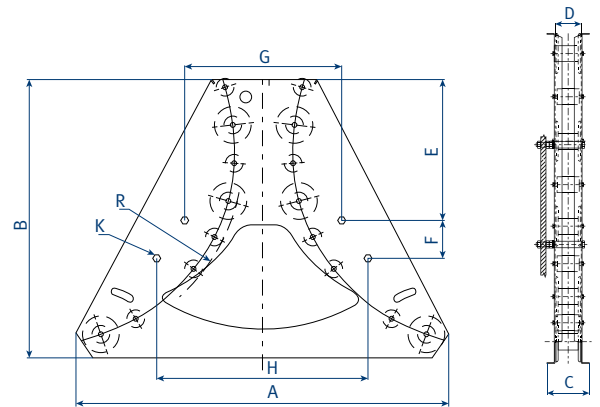
Cable guides

Guide roller assemblies

monospiral wrap

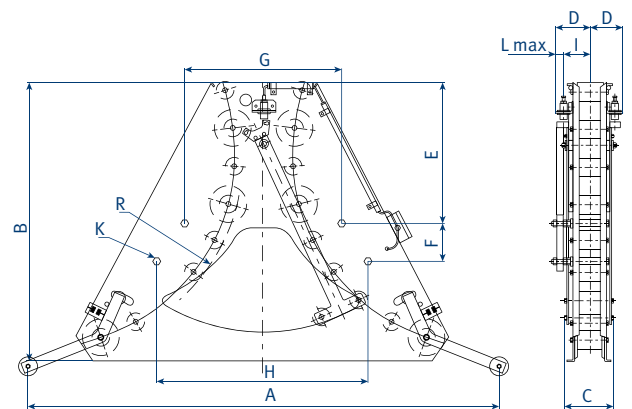
For voltages up to 1000 volt and payout in two directions

For voltages exceeding 1000 volt: $r \text{ min.} = 15 \times \text{cable cross section}$



Guide roller without pendulum

| Type | ≈kg | A | B | C | D | E | F | G | H | K | R | max. LTG ø | Order no. |
|------|-----|------|------|-----|-----|-----|-----|-----|------|------|------|------------|-----------|
| R 6 | 85 | 1140 | 860 | 145 | 95 | 360 | 125 | 430 | 598 | M 16 | 600 | 55 | 924 994 |
| R 9 | 150 | 1595 | 1200 | 180 | 130 | 606 | 164 | 670 | 900 | M 20 | 900 | 75 | 924 995 |
| R 12 | 250 | 2100 | 1660 | 210 | 130 | 560 | 500 | 740 | 1200 | M 20 | 1200 | 83 | 924 996 |



Guide roller with tension control

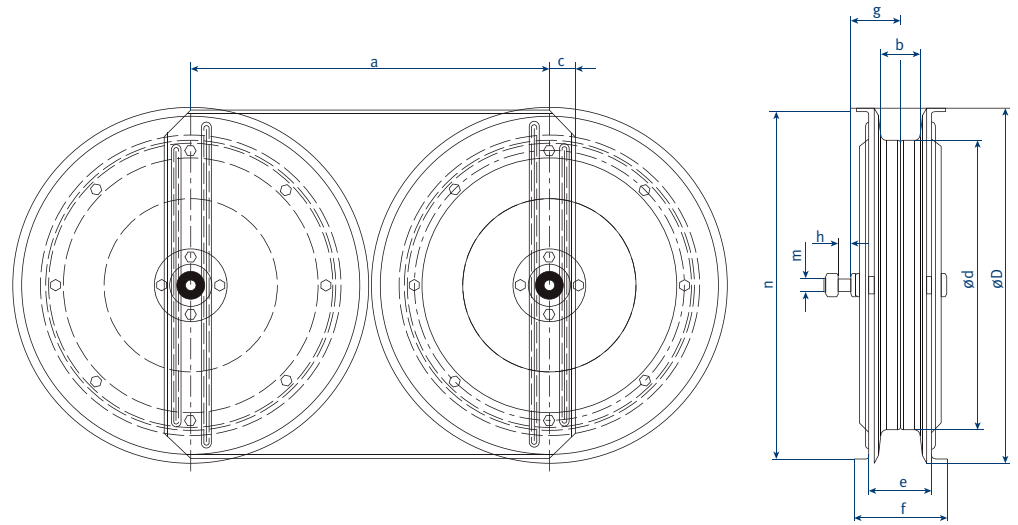
| Type | ≈kg | A | B | C | D | E | F | G | H | I | K | R | max. LTG ø | Order no. with position switch | Order no. without position switch |
|-------|-----|------|------|-----|-----|-----|-----|-----|------|------|------|------|------------|--------------------------------|-----------------------------------|
| RZ 6 | 95 | 1700 | 930 | 185 | 123 | 360 | 125 | 430 | 598 | 92.5 | M 16 | 600 | 55 | 926 576 | 924 742 |
| RZ 9 | 160 | 2175 | 1240 | 220 | 140 | 606 | 164 | 670 | 900 | 111 | M 20 | 900 | 75/601 | 925 073 | 925 002 |
| RZ 12 | 260 | 2600 | 1710 | 220 | 140 | 560 | 500 | 740 | 1200 | 111 | M 20 | 1200 | 83/801 | 926 573 | 925 003 |

1) For voltages exceeding 1000 V

Sheave guide

Sheave guide SU

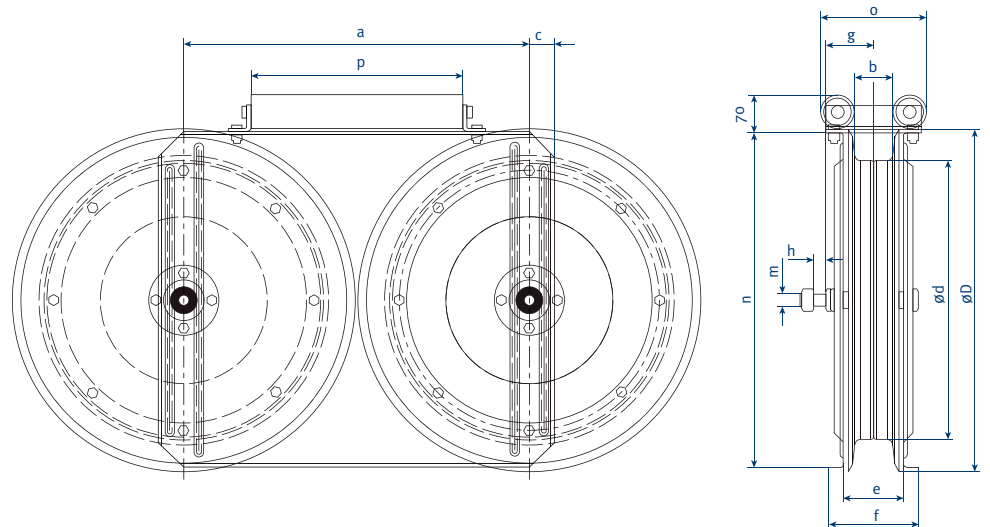
The SU sheave guide is used for spiral winding reels. It serves to deflect the cable of the cable reel located above and to bypass the feed point.



| Type | Weight kg. | a | b | c | Ø d | Ø D | e | f | g | h | m | n | o | p | max. LTG Ø | Order no. |
|------|------------|-----|----|------|-----|-----|-----|-----|----|----|------|-----|-----|-----|------------|-----------|
| SU 1 | 48 | 455 | 70 | 32.5 | 350 | 450 | 114 | 170 | 85 | 50 | M 24 | 445 | 180 | 315 | 22 | 901 635 |
| SU 2 | 76 | 655 | 70 | 47.5 | 503 | 650 | 114 | 170 | 85 | 50 | M 24 | 640 | 180 | 400 | 32 | 901 636 |
| SU 3 | 90 | 785 | 70 | 80 | 663 | 780 | 114 | 170 | 85 | 50 | M 24 | 770 | 180 | 500 | 39 | 901 637 |
| SU 4 | 120 | 905 | 75 | 80 | 783 | 900 | 114 | 170 | 85 | 50 | M 24 | 890 | 180 | 600 | 50 | 901 638 |

Sheave guide SU-R

The SU-R sheave guide with additional top guide roller is used in cross rollers for cylindrical winding reels. It serves to deflect the cable of the cable reel located above and to bypass the feedpoint funnel. The installation height of the drum to the guide needs to provide for a maximum diagonal pull of 3° to allow a smooth winding of the cables.

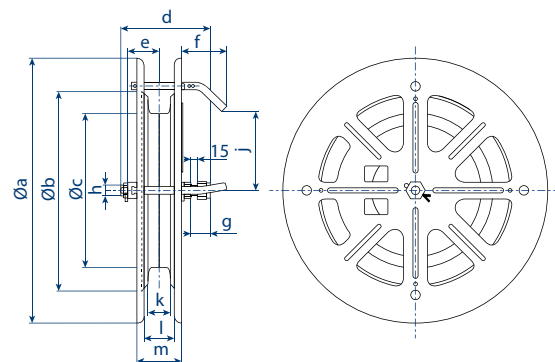


| Type | Weight kg. | a | b | c | Ø d | Ø D | e | f | g | h | m | n | o | p | max. LTG Ø | Order no. |
|--------|------------|-----|----|------|-----|-----|-----|-----|----|----|------|-----|-----|-----|------------|-----------|
| SU-R 1 | 53 | 455 | 70 | 32.5 | 350 | 450 | 114 | 170 | 85 | 50 | M 24 | 445 | 180 | 315 | 22 | 901 630 |
| SU-R 2 | 84 | 655 | 70 | 47.5 | 503 | 650 | 114 | 170 | 85 | 50 | M 24 | 640 | 180 | 400 | 32 | 901 631 |
| SU-R 3 | 105 | 785 | 70 | 80 | 663 | 780 | 114 | 170 | 85 | 50 | M 24 | 770 | 180 | 500 | 39 | 901 632 |
| SU-R 4 | 140 | 905 | 75 | 80 | 783 | 900 | 114 | 170 | 85 | 50 | M 24 | 890 | 180 | 600 | 50 | 901 633 |

Deflection and guiding rollers

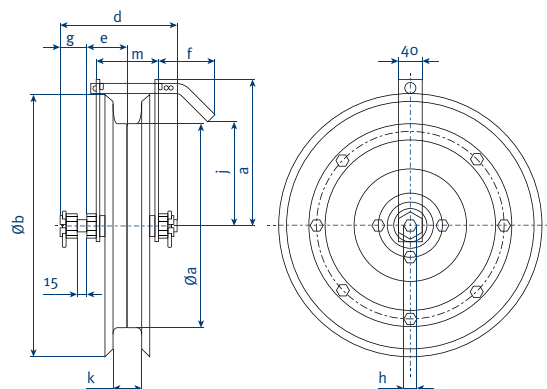
Deflection and guide rollers are used if the cable payout cannot be made directly from the reel.

the roller cross section needs to be at least 15 times the cable cross section



URN series

| Type | Weight kg. | $\varnothing a$ | $\varnothing b$ | $\varnothing c$ | d | e | f | g | h | j | k | l | m | Order no. |
|----------|------------|-----------------|-----------------|-----------------|-----|----|----|----|------|-----|----|----|-----|-----------|
| VURN 350 | 23 | 600 | 450 | 350 | 195 | 60 | 99 | 42 | M 20 | 180 | 50 | 58 | 98 | 970 421 |
| VURN 500 | 42 | 800 | 650 | 530 | 240 | 84 | 85 | 57 | M30 | 280 | 50 | 82 | 112 | 970 422 |
| VURN 660 | 52 | 900 | 780 | 660 | 240 | 86 | 75 | 55 | M30 | 344 | 70 | 90 | 120 | 970 423 |

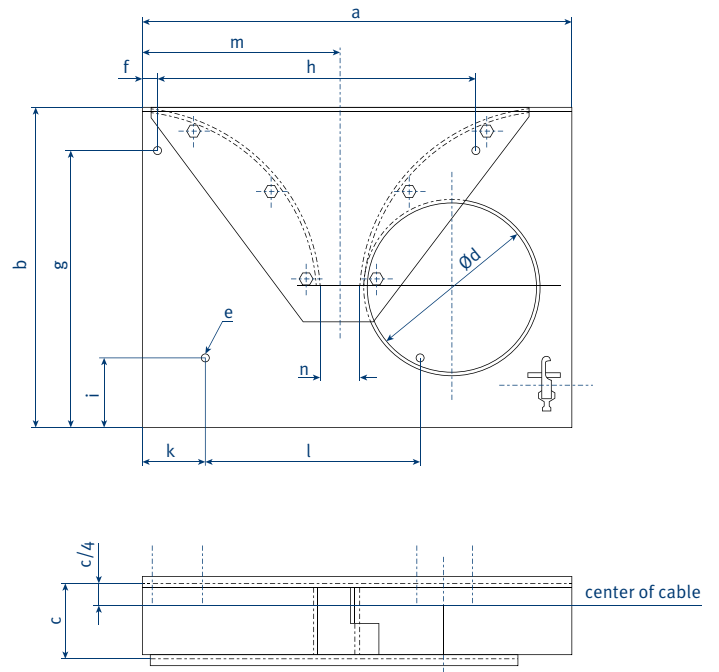


LRN series

| Type | Weight kg. | $\varnothing a$ | $\varnothing b$ | $\varnothing c$ | d | e | f | g | h | j | k | l | m | Order no. |
|---------|------------|-----------------|-----------------|-----------------|-----|----|----|----|------|-----|----|---|-----|-----------|
| LRN 350 | 16 | 253 | 450 | 350 | 183 | 70 | 97 | 45 | M 24 | 180 | 45 | - | 105 | 970 424 |
| LRN 500 | 24 | 360 | 650 | 530 | 240 | 82 | 88 | 59 | M 30 | 280 | 50 | - | 116 | 970 425 |

Feed point funnel

For voltages up to 1000 volt and cable payout in two directions for medium travel speed and frequent traveling of midpoint.



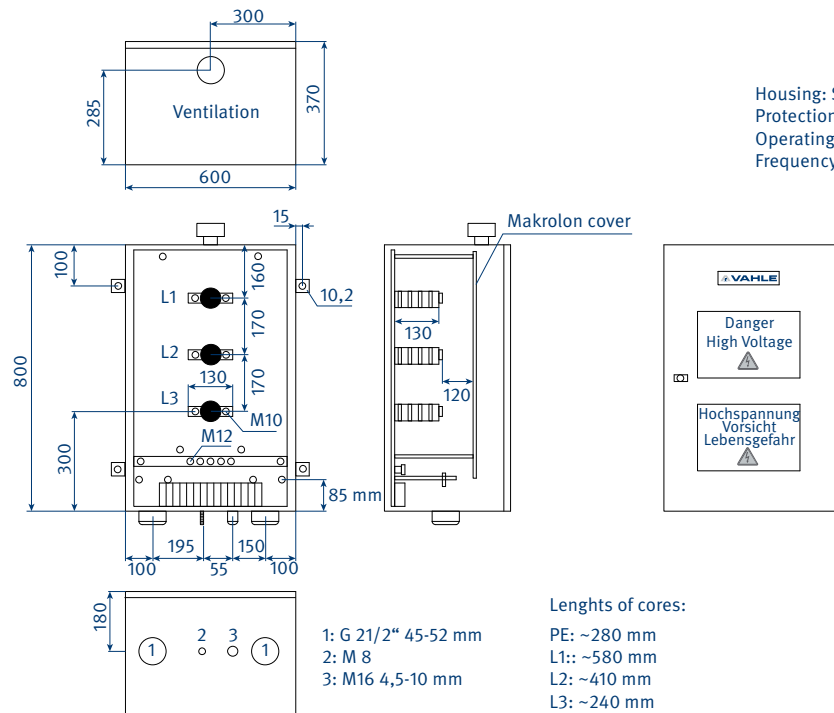
| Type | Weight kg. | a | b | c | d/r | e | f | g | h | l | k | l | m | n | max. LTG Ø | Order no. |
|-------|------------|------|------|-----|-----|----|-----|------|------|-----|------|-----|-----|-----|--------------------------|-----------|
| ETZ 3 | 15 | 650 | 530 | 106 | 275 | 14 | 40 | 405 | 400 | 220 | 120 | 300 | 270 | 60 | 34 | 921 380 |
| ETZ 4 | 28 | 900 | 700 | 146 | 400 | 18 | 40 | 550 | 740 | 220 | 210 | 400 | 410 | 80 | 50 | 921 390 |
| ETZ 5 | 52 | 1220 | 900 | 208 | 500 | 18 | 40 | 780 | 900 | 220 | 180 | 600 | 480 | 100 | 62 | 921 400 |
| ETZ 7 | 100 | 1760 | 1200 | 208 | 700 | 18 | 200 | 1080 | 1100 | 220 | 350 | 800 | 750 | 100 | 80 ~60 ⁽¹⁾ | 921 410 |
| ETZ 9 | 130 | 2070 | 1475 | 216 | 900 | 22 | 125 | 1325 | 1820 | 275 | 1250 | 695 | 960 | 120 | 90 ~70 ⁽¹⁾ | 921 720 |

1) For voltages exceeding 1000 V

Terminal box

Terminal box 10 kV

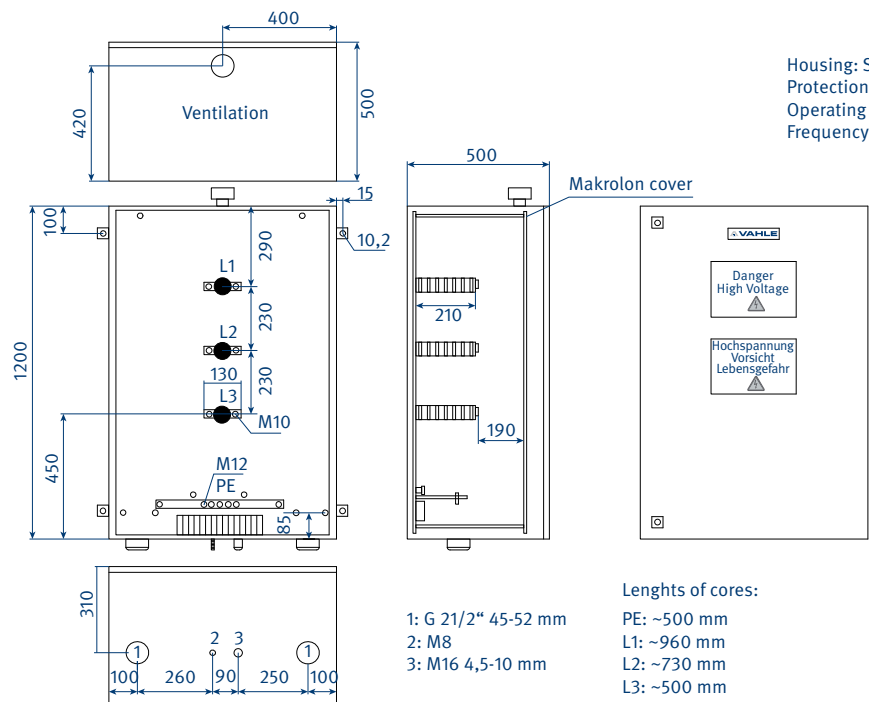
Protection type IP 54
Stainless steel housing



| Type | Weight kg. | Order no. |
|---|------------|-----------|
| KKU-10K-XXXX-UU-E-0000-P55-G683-0755320 | 50 | 970 579 |

Terminal box 20 kV

Protection type IP 54
Stainless steel housing



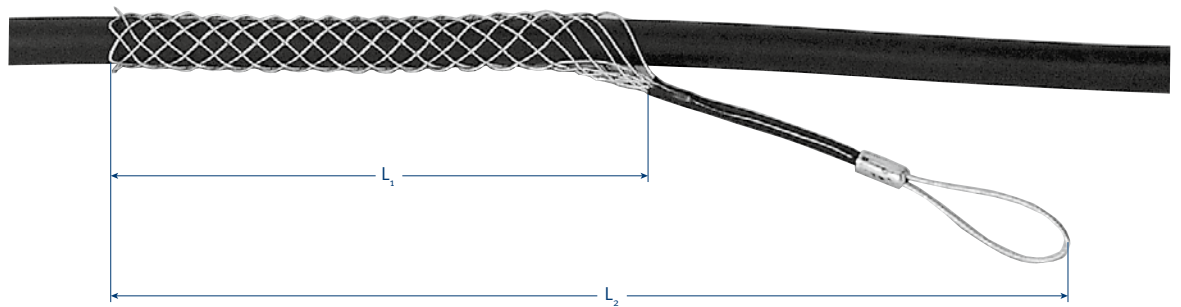
| Type | Weight kg. | Order no. |
|---|------------|-----------|
| KKU-20K-XXXX-UU-E-0000-P55-G8X3-0755330 | 75 | 970 580 |

Cable grips

with 2 grommets, open on the eye side, sleeve end without soldering point



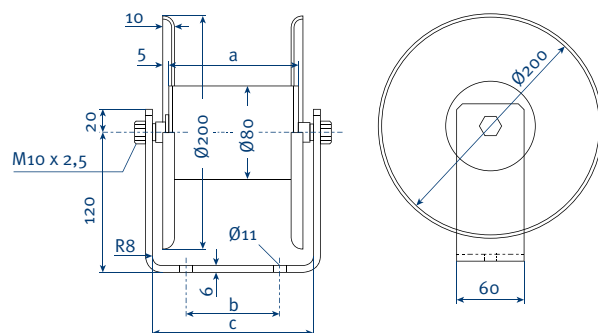
| Type | maximum permitted strain ⁽¹⁾ kg | for cable cross section | Order no. |
|-------|--|-------------------------|-----------|
| VLZ 1 | 930 | 15-20 | 901 620 |
| VLZ 2 | 1165 | 20-30 | 901 621 |
| VLZ 3 | 1400 | 30-40 | 901 622 |
| VLZ 4 | 1630 | 40-50 | 901 923 |



| Type | maximum permitted strain ⁽¹⁾ kg | for cable cross section | length of wire mesh measure L_2 | Mesh length dimension L_1 | Order no. |
|---------|--|-------------------------|-----------------------------------|-----------------------------|-----------|
| VLZK 6 | 60 | 4 to 7 | 100 | 275 | 900 391 |
| VLZK 9 | 110 | 7 to 9 | 120 | 290 | 900 392 |
| VLZK 12 | 130 | 9 to 12 | 135 | 340 | 900 393 |
| VLZK 15 | 210 | 12 to 15 | 180 | 390 | 900 394 |
| VLZK 20 | 260 | 15 to 20 | 220 | 450 | 900 395 |
| VLZK 25 | 260 | 20 to 25 | 275 | 510 | 900 396 |
| VLZK 30 | 400 | 25 to 30 | 350 | 610 | 900 397 |
| VLZK 40 | 580 | 30 to 40 | 370 | 660 | 900 398 |

1) Calculated for triple security

Cable support rollers



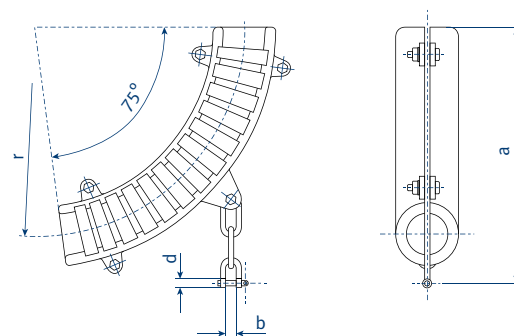
| Type | Weight kg. | Support | a | b | c | Order no. |
|-------------------|------------|---------|-----|-----|-----|-----------|
| TR 80/110 B 200 | 2.25 | Without | 110 | - | 130 | 924 450 |
| TR 80/300 B 200 | 3.25 | | 300 | - | 320 | 924 460 |
| TR 80/500 B 200 | 4.50 | | 500 | - | 520 | 924 470 |
| TR 80/110 B 200 H | 3.50 | with | 110 | 80 | 130 | 924 480 |
| TR 80/300 B 200 H | 5.15 | | 300 | 250 | 320 | 924 490 |
| TR 80/500 B 200 H | 6.90 | | 500 | 400 | 520 | 924 500 |

Turnover anchor clamp

For voltages of up to 1000 volt, for cable cable payout in 1 or 2 directions, for low speeds.

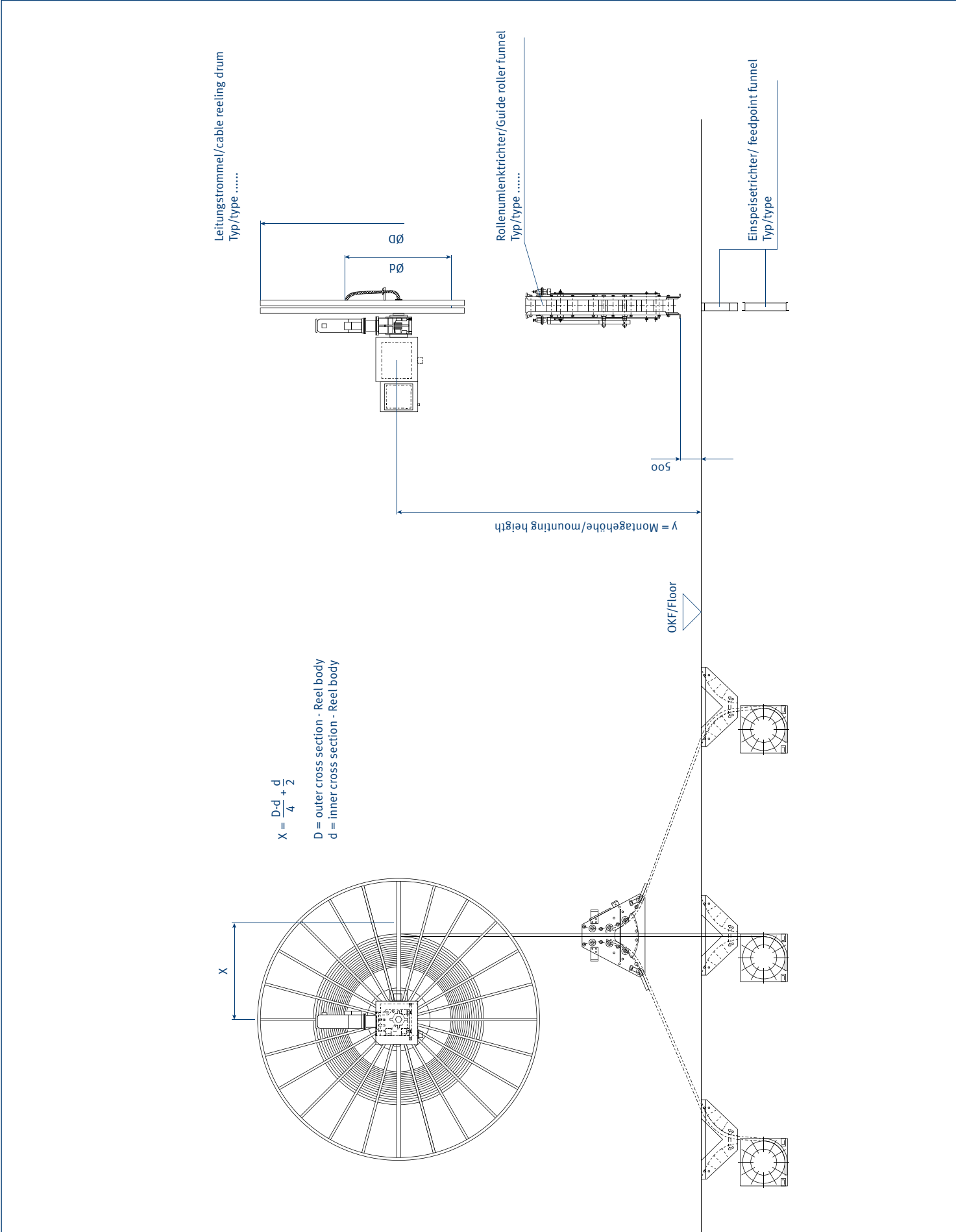
Application:

Mainly used in connection with plug & socket service or when a vertical seeding connection from underneath the cable tray is impossible.



| Type | Weight kg. | Cable Ø | R | a | d | b | Order no. |
|------|------------|--------------|-----|-----|----|----|-----------|
| LS 1 | 1.6 | - 21.5 | 100 | 205 | 10 | 14 | 921 420 |
| LS 2 | 2.5 | >21.5 - 28.0 | 130 | 225 | 10 | 14 | 921 430 |
| LS 3 | 3.5 | >28.0 - 36.5 | 170 | 265 | 12 | 17 | 921 440 |
| LS 4 | 5.5 | >36.5 - 48.0 | 220 | 300 | 12 | 17 | 921 450 |

Installation sequence Cable reel with guide roller and feedpoint funnel.



Reference systems

Container crane at Bremerhaven international harbour

Frequency regulated drive with strain regulation including control.
Slip-ring body 10 KV with 12 channel LWL-rotation transmission

Reel bodies: 7.4 m
Winding lengths: 500 m
Cable: NTSCGEWÖU
6 KV, 3 x 95 + 2 x 50/3 + 18 LWL
Operating speed: 55 m/min.
Installation height: 20 m

In use since 2002



Container crane at Duisburg Rhine Harbour

Frequency regulated drive with strain regulation including control.
Slip-ring body 10 KV with 6 channel LWL-rotation transmission

Reel bodies: 5.3 m
Winding lengths: 500 m
Cable: NTSCGEWÖU
10 KV, 3 x 3,5 + 2 x 25/2 + 6 LWL
Operating speed: 120 m/min.
Installation height: 6 m

In use since 2004



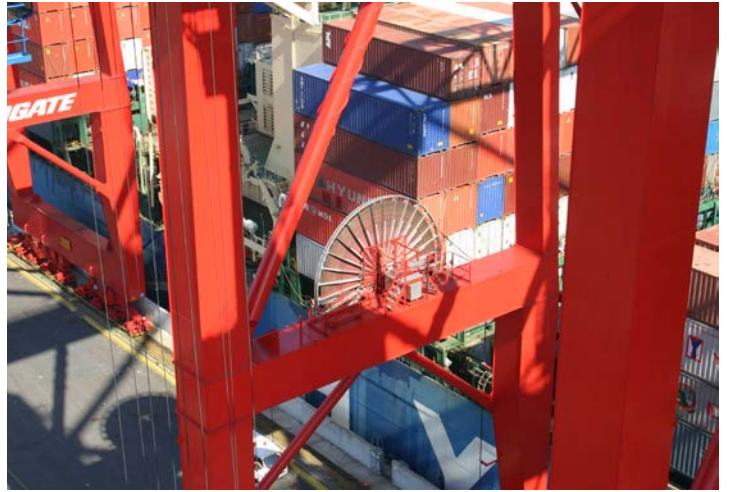
Reference systems

Container crane in Hamburg harbour

Frequency regulated drive with strain regulation including control.
Slip-ring body 10 KV with 18 channel LWL-rotation transmission

Reel bodies: 7.2 m
Winding lengths: 650 m
Cable: NTSCGEWÖU
10 KV, 3 x 50 + 2 x 25/2 + 18 LWL
Operating speed: 45 m/min.
Installation height: 22 m

In use since 2004



Container crane in Mediterranean harbour Ashod/Israel

Frequency regulated drive with strain regulation including control.
Slip-ring body 10 KV with 6 channel LWL-rotation transmission

Reel bodies: 6.4 m
Winding width: Adjustable
Winding lengths: 400 m
Cable: NTSCGEWÖU
6 KV, 3 x 70 + 2 x 25/+6 LWL
Operating speed: 45 m/min.
Installation height: 18.5 m

In use since 2004



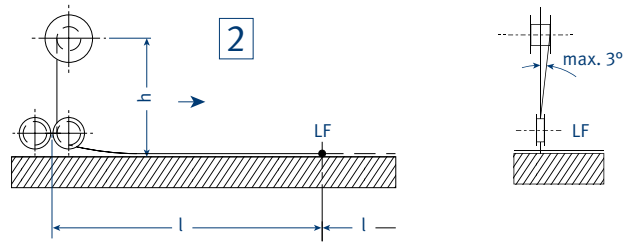
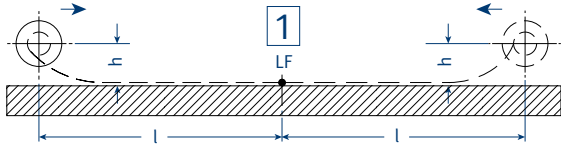
Notes

A large grid of small dots for taking notes, covering the majority of the page below the 'Notes' header.

Reel installation examples

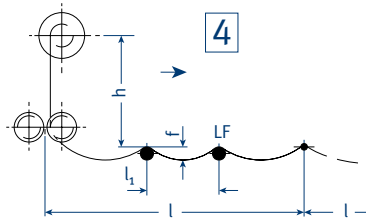
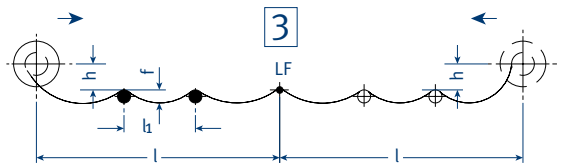
Reel on moving equipment

Cable tray on the ground or on a continuous tray.
Cable payout horizontally in one or two directions.



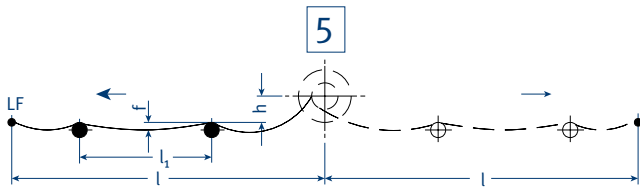
Reel on moving equipment

Cable storage on supports ($l_1 \leq 1$ m), or on rolls or round smooth supports ($l_1 = 1$ bis 3 m).
Cable payout horizontally in one or two directions on supports.



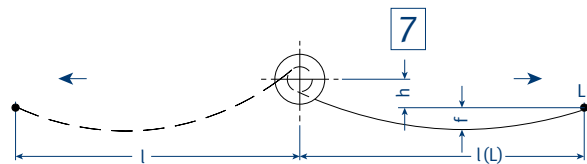
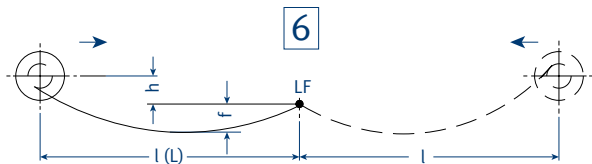
Reel stationary

(Cable fixation point on moving equipment), cable payout horizontally in one two directions on rolls or smooth supports ($l_1 \leq 3$ m).



Reel on moving equipment (6) or reel stationary (7) - (cable fix point at moving equipment)

Free cable payout horizontally in one or two directions. If the hanging cable length "L" is greater than "l", then "L" will be the determinative for sag "f" for the the payout in one direction.



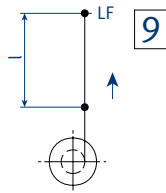
Legend to drawings (Examples 1-7)

l = maximum operational cable lengths [m]
(for cable payout in two directions = half travel lengths)
 L = maximum cable length [m] between reel and cable fix point

h = Installation height = Distance from cable tray or cable fix point to center reel [m]
LF = Cable fix point
 f = max cable loop depth [m], based on cable fix point "LF"
 l_1 = Rolls or support distance [m]

Lifting operation

Cable payout vertical or straight downwards (8)
Cable payout vertical or straight upwards (9)



Legend to Drawings (Examples 8 and 9)

l = operational length of cable [m]
 L = Maximum length between reel and end of cable [m].
Any additional weight (e.g. control switch) needs to be taken into account.
LF = Cable fix point

Questionnaire

1. For what type of moving equipment is the reel? _____
(Dimensional drawings of equipment and application are extremely valuable)
 - 1.1 Installation site indoor outdoor
 - 1.2 Temperature conditions - _____ °C + _____ °C
 - 1.3 Duty factor (time on) of full operating load _____ % DF
 - 1.4 Environmental conditions _____
2. Type of application (see page 6) example _____
 - 2.1 Reel type random wrap monospiral wrap
3. Mounting height from center of reel to cable pickup surface _____ m
4. Working travel of equipment in motion _____ m
5. Cable Payout one-way two-way
6. Operational length of active cable l = _____ m
(Midway feed-point cuts the length of cable needed in half)
 - 6.1 For vertical lift (see page 4, example 8) l = _____ m L = _____ m
 - 6.2 Operated from a remote point to raise and lower cable at a controlled speed yes no
 - 6.2.1 Loads in addition to cable weight (pendant controls or receptacles) _____ kg or _____ lbs
7. Chosen Cable (Number of copper conductors x wire size) _____ x _____ mm² or _____ #AWG
 - 7.1 Weight of cable _____ kg/m or _____ lbs/ft.
 - 7.2 Diameter of cable _____ mm or _____ in.
8. Full operating load or maximum horsepower of equipment _____ kW or _____ HP
 - 8.1 Nom. amperage (nominal current – IN) _____ A
 - 8.1.1 Start-up amperage (start-up current – IA) _____ A
 - 8.2 Voltage rating / frequency _____ V _____ Hz
9. What percentage of the total installed ampacity will work simultaneously _____ %
10. Number of phase collector rings required _____ pcs.
(Our cable reel slipping assemblies always include one non-insulated ground)
11. How many cycles of the equipment per hour? _____ cycles
12. Operating hours per day _____ hours.
13. Speed of travel or lift _____ m/min.
14. Shortest starting time _____ sec.
15. Acceleration _____ sec. _____ m/sec.²
16. Details for reel drive motor
 - 16.1 Voltage / frequency _____ V _____ Hz
 - 16.2 Duty cycle _____ % DF
 - 16.3 Is it possible to control reel drive motor from the host carrier yes no
17. Limit switch for travel or lift required yes no

Remarks: _____

Scope of delivery and services

Catalog no.

| | |
|---|-----|
| 1 Open conductor systems | |
| Open conductor systems | 1a |
| 2 Insulated conductor systems | |
| U10 | 2a |
| FABA 100 | 2b |
| U15, U25, U35 | 2c |
| U20, U30, U40 | 2d |
| 3 Compact conductor systems | |
| VKS 10 | 3a |
| VKS - VKL | 3b |
| VMT | 3c |
| 4 Enclosed conductor systems | |
| KBSL - KSL | 4a |
| KBH | 4b |
| MKH | 4c |
| LSV - LSVG | 4d |
| 5 Contactless power supply | |
| Contactless power supply (CPS®) | 5a |
| 6 Data transmission | |
| VAHLE Powercom® | 6a |
| Slotted Microwave Guide (SMG) | 6b |
| 7 Positioning systems | |
| VAHLE APOS® | 7a |
| VAHLE APOS® Optic | 7b |
| 8 Festoon systems and cables | |
| Festoon systems for □-tracks | 8a |
| Festoon systems for flatform cables on I-tracks | 8b |
| Festoon systems for round cables on I-tracks | 8c |
| Festoon systems for ◇-tracks | 8d |
| Cables | 8e |
| 9 Reels | |
| Spring-operated cable reels | 9a |
| Motor-powered cable reels | 9b |
| 10 Other | |
| Battery charging systems | 10a |
| Heavy enclosed conductor systems | 10b |
| Tender | 10c |
| Contact wire | 10d |
| 11 Automotive Handling | |
| Control systems | 11a |
| BOK | 11b |
| Assemblies / Commissioning | |
| Spare parts / Maintenance service | |



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OHSAS 18001 (Reg.No. 003140 QM OH)

