Motor Powered Cable Reels
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 230 V and 500 V (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).

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

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 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

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.

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- Cable grips
- Cable support rollers and anchor shackles
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.

\[
I_n = I_{n1} + I_{n2} + I_G
\]

If only one power output is known:

\[
I_G = \frac{P \times 1000}{\sqrt{3} \times U \times (\cos \varphi \times \eta)} \times f_G
\]

- \(P\) = Power \([kW]\)
- \(U\) = Voltage \([V]\)
- \(\cos \varphi \times \eta = 0.8\) 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 \(30^\circ C\), the reduction factors on page 7 shall apply.
- \(f_1\) = Reduction factor for multi-layer winding
  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 \(10\, mm^2\)
2. Check of voltage drop

Rough calculation for determining the voltage drop $\Delta U$:

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

- $L$ = total cable length [m]
- $I_a$ = starting current [A]
- $Z$ = Impedance [\(\Omega/\text{km}\)]

For $\cos \varphi = 0.6$ from Table 1 (Page 7)

$\Delta U$ = recommended $\Delta U < 5\%$

1. 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:

$$I_k = I_{k1} + I_{k2} \quad [A]$$

$I_{k1}$: 1. Motor with highest start-up current
$I_{k2}$: 2. Motor with highest nominal current

Note:

$$I_a = X \cdot I_n \quad [A]$$

- Squirrel cage motors: $X = 6$
- Slip-ring motors: $X = 2$
- Frequency regulated drives: $X = 1.1$

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 mm$^2$. 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.

<table>
<thead>
<tr>
<th>Nominal cross section [mm²]</th>
<th>Ambient temperature 30 °C continuous amp. [A]</th>
<th>Factors for intermittent duty with ED</th>
<th>Z [Ω/km]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>1.5</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2.5</td>
<td>1.00</td>
<td>1.00</td>
<td>1.04</td>
</tr>
<tr>
<td>4</td>
<td>1.00</td>
<td>1.03</td>
<td>1.05</td>
</tr>
<tr>
<td>6</td>
<td>1.00</td>
<td>1.04</td>
<td>1.13</td>
</tr>
<tr>
<td>10</td>
<td>1.03</td>
<td>1.09</td>
<td>1.21</td>
</tr>
<tr>
<td>16</td>
<td>1.07</td>
<td>1.16</td>
<td>1.34</td>
</tr>
<tr>
<td>25</td>
<td>1.10</td>
<td>1.23</td>
<td>1.46</td>
</tr>
<tr>
<td>35</td>
<td>1.13</td>
<td>1.28</td>
<td>1.53</td>
</tr>
<tr>
<td>50</td>
<td>1.16</td>
<td>1.34</td>
<td>1.62</td>
</tr>
<tr>
<td>70</td>
<td>1.18</td>
<td>1.38</td>
<td>1.69</td>
</tr>
<tr>
<td>95</td>
<td>1.20</td>
<td>1.42</td>
<td>1.74</td>
</tr>
<tr>
<td>120</td>
<td>1.21</td>
<td>1.44</td>
<td>1.78</td>
</tr>
<tr>
<td>150</td>
<td>1.22</td>
<td>1.46</td>
<td>1.81</td>
</tr>
<tr>
<td>185</td>
<td>1.23</td>
<td>1.48</td>
<td>1.82</td>
</tr>
<tr>
<td>240</td>
<td>1.23</td>
<td>1.49</td>
<td>1.85</td>
</tr>
</tbody>
</table>

Table 2: Multiplier for ambient temperature

<table>
<thead>
<tr>
<th>Ambient temperature [°C]</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction factor f_r</td>
<td>1.05</td>
<td>1.00</td>
<td>0.95</td>
<td>0.89</td>
<td>0.84</td>
<td>0.77</td>
<td>0.71</td>
<td>0.63</td>
<td>0.55</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Table 3: Multiplier for multilayer coiling.

<table>
<thead>
<tr>
<th>Number of complete layers LZ on the reel</th>
<th>1 (1)</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction factor f_r</td>
<td>0.80</td>
<td>0.61</td>
<td>0.49</td>
<td>0.42</td>
</tr>
</tbody>
</table>

1) Also applies to spiral coils
### Table 4: Multiplier for multilayer coiling up to 10 mm²

<table>
<thead>
<tr>
<th>Number of conductor</th>
<th>5</th>
<th>7</th>
<th>10</th>
<th>14</th>
<th>19</th>
<th>24</th>
<th>40</th>
<th>61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction factor $f_2$</td>
<td>0.75</td>
<td>0.65</td>
<td>0.55</td>
<td>0.50</td>
<td>0.45</td>
<td>0.40</td>
<td>0.35</td>
<td>0.30</td>
</tr>
</tbody>
</table>

### Table 5: Minimum bending radii

<table>
<thead>
<tr>
<th>Cable type</th>
<th>Nominal voltages of up to 0.6/1 kV</th>
<th>Nominal voltage of over 0.6/1 kV</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible cables</td>
<td>cross section of cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>or thickness of the flat cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 8 to 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 12 to 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed installation</td>
<td>3 x d</td>
<td>4 x d</td>
<td>4 x d</td>
</tr>
<tr>
<td>Free movement</td>
<td>4 x d</td>
<td>5 x d</td>
<td>5 x d</td>
</tr>
<tr>
<td>For entry</td>
<td>4 x d</td>
<td>5 x d</td>
<td>5 x d</td>
</tr>
<tr>
<td>For positive guidance (1)</td>
<td>5 x d</td>
<td>5 x d</td>
<td>6 x d</td>
</tr>
<tr>
<td>Guide roller</td>
<td>7.5 x d</td>
<td>7.5 x d</td>
<td>7.5 x d</td>
</tr>
</tbody>
</table>

If cable types can be used for several applications contact the manufacturer.

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

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

<table>
<thead>
<tr>
<th>Motor cable reels with magnetic coupling drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTM 300</td>
</tr>
<tr>
<td>LTM 530</td>
</tr>
<tr>
<td>LTM 15/40 H</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Motor cable reels with frequency converter drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT 426</td>
</tr>
<tr>
<td>LT 530</td>
</tr>
<tr>
<td>LT 15/40</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Type</th>
<th>=kg</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>R</th>
<th>max. LTG Ø</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R 6</td>
<td>85</td>
<td>1140</td>
<td>860</td>
<td>145</td>
<td>95</td>
<td>360</td>
<td>125</td>
<td>430</td>
<td>598</td>
<td>M 16</td>
<td>600</td>
<td>55</td>
<td>924 994</td>
</tr>
<tr>
<td>R 9</td>
<td>150</td>
<td>1595</td>
<td>1200</td>
<td>180</td>
<td>130</td>
<td>606</td>
<td>164</td>
<td>670</td>
<td>900</td>
<td>M 20</td>
<td>900</td>
<td>75</td>
<td>924 995</td>
</tr>
<tr>
<td>R 12</td>
<td>250</td>
<td>2100</td>
<td>1660</td>
<td>210</td>
<td>130</td>
<td>560</td>
<td>500</td>
<td>740</td>
<td>1200</td>
<td>M 20</td>
<td>1200</td>
<td>83</td>
<td>924 996</td>
</tr>
</tbody>
</table>

Guide roller with tension control

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

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.

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

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.

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight kg.</th>
<th>Øa</th>
<th>Øb</th>
<th>Øc</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>j</th>
<th>k</th>
<th>l</th>
<th>m</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VURN 350</td>
<td>23</td>
<td>600</td>
<td>450</td>
<td>350</td>
<td>195</td>
<td>60</td>
<td>99</td>
<td>42</td>
<td>M 20</td>
<td>180</td>
<td>50</td>
<td>58</td>
<td>98</td>
<td>970 421</td>
</tr>
<tr>
<td>VURN 500</td>
<td>42</td>
<td>800</td>
<td>650</td>
<td>530</td>
<td>240</td>
<td>84</td>
<td>85</td>
<td>57</td>
<td>M30</td>
<td>280</td>
<td>50</td>
<td>82</td>
<td>112</td>
<td>970 422</td>
</tr>
<tr>
<td>VURN 660</td>
<td>52</td>
<td>900</td>
<td>780</td>
<td>660</td>
<td>240</td>
<td>86</td>
<td>75</td>
<td>55</td>
<td>M30</td>
<td>344</td>
<td>70</td>
<td>90</td>
<td>120</td>
<td>970 423</td>
</tr>
</tbody>
</table>

### LRN series

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight kg.</th>
<th>Øa</th>
<th>Øb</th>
<th>Øc</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>j</th>
<th>k</th>
<th>l</th>
<th>m</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRN 350</td>
<td>16</td>
<td>253</td>
<td>450</td>
<td>350</td>
<td>183</td>
<td>70</td>
<td>97</td>
<td>45</td>
<td>M 24</td>
<td>180</td>
<td>45</td>
<td>-</td>
<td>105</td>
<td>970 424</td>
</tr>
<tr>
<td>LRN 500</td>
<td>24</td>
<td>360</td>
<td>650</td>
<td>530</td>
<td>240</td>
<td>82</td>
<td>88</td>
<td>59</td>
<td>M 30</td>
<td>280</td>
<td>50</td>
<td>-</td>
<td>116</td>
<td>970 425</td>
</tr>
</tbody>
</table>
Feed point funnel

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

**Table**

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

1) For voltages exceeding 1000 V
Terminal box

Terminal box 10 kV
Protection type IP 54
Stainless steel housing

Terminal box 20 kV
Protection type IP 54
Stainless steel housing

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight kg.</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>KKU-10K-XXXX-UU-E-0000-P55-G683-0755320</td>
<td>50</td>
<td>970 579</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight kg.</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>KKU-20K-XXXX-UU-E-0000-P55-G8X3-0755330</td>
<td>75</td>
<td>970 580</td>
</tr>
</tbody>
</table>
### Cable grips

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

<table>
<thead>
<tr>
<th>Type</th>
<th>maximum permitted strain(^{(1)}) kg</th>
<th>for cable cross section</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLZ 1</td>
<td>930</td>
<td>15-20</td>
<td>901 620</td>
</tr>
<tr>
<td>VLZ 2</td>
<td>1165</td>
<td>20-30</td>
<td>901 621</td>
</tr>
<tr>
<td>VLZ 3</td>
<td>1400</td>
<td>30-40</td>
<td>901 622</td>
</tr>
<tr>
<td>VLZ 4</td>
<td>1630</td>
<td>40-50</td>
<td>901 923</td>
</tr>
</tbody>
</table>

### Cable grips

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

\(^{(1)}\) Calculated for triple security
Cable support rollers

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight kg.</th>
<th>Cable Ø</th>
<th>Support</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR 80/110 B 200</td>
<td>2.25</td>
<td>- 21.5</td>
<td>Without</td>
<td>110</td>
<td>-</td>
<td>130</td>
<td>924 450</td>
</tr>
<tr>
<td>TR 80/300 B 200</td>
<td>3.25</td>
<td>&gt;21.5 - 28.0</td>
<td>100</td>
<td>205</td>
<td>10</td>
<td>14</td>
<td>924 460</td>
</tr>
<tr>
<td>TR 80/500 B 200</td>
<td>4.50</td>
<td>&gt;28.0 - 36.5</td>
<td>170</td>
<td>265</td>
<td>12</td>
<td>17</td>
<td>924 470</td>
</tr>
<tr>
<td>TR 80/110 B 200 H</td>
<td>3.50</td>
<td></td>
<td>with</td>
<td>110</td>
<td>80</td>
<td>130</td>
<td>924 480</td>
</tr>
<tr>
<td>TR 80/300 B 200 H</td>
<td>5.15</td>
<td></td>
<td></td>
<td>300</td>
<td>250</td>
<td>320</td>
<td>924 490</td>
</tr>
<tr>
<td>TR 80/500 B 200 H</td>
<td>6.90</td>
<td></td>
<td></td>
<td>500</td>
<td>400</td>
<td>520</td>
<td>924 500</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight kg.</th>
<th>Cable Ø</th>
<th>R</th>
<th>a</th>
<th>d</th>
<th>b</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS 1</td>
<td>1.6</td>
<td>- 21.5</td>
<td>100</td>
<td>205</td>
<td>10</td>
<td>14</td>
<td>921 420</td>
</tr>
<tr>
<td>LS 2</td>
<td>2.5</td>
<td>&gt;21.5 - 28.0</td>
<td>130</td>
<td>225</td>
<td>10</td>
<td>14</td>
<td>921 430</td>
</tr>
<tr>
<td>LS 3</td>
<td>3.5</td>
<td>&gt;28.0 - 36.5</td>
<td>170</td>
<td>265</td>
<td>12</td>
<td>17</td>
<td>921 440</td>
</tr>
<tr>
<td>LS 4</td>
<td>5.5</td>
<td>&gt;36.5 - 48.0</td>
<td>220</td>
<td>300</td>
<td>12</td>
<td>17</td>
<td>921 450</td>
</tr>
</tbody>
</table>
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
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.

![Diagram 1](image1)

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.

![Diagram 2](image2)

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).

![Diagram 3](image3)

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 "l1",
then "L" will be the determinative for sag "f" for the the payout in one direction.

![Diagram 4](image4)

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)

![Diagram 5](image5)

Legend to Drawings (Examples 8 and 9)
- $l$ = operational lenght 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 slipring 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.


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

## 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 Ω-tracks 8a
- Festoon systems for flat platform cables on Ω-tracks 8b
- Festoon systems for round cables on Ω-tracks 8c
- Festoon systems for Ω-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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DQS certified in accordance with DIN EN ISO 9001:2008
OHSAS 18001 (Reg.No. 003140 QM OH)