MOTOR POWERED CABLE REELS

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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 of 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).

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 a standstill. A brake stops the uncontrolled unwinding of the cable when the device is switched off. The drive can be electrically heated upon request.

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 is as presented in the dimensional drawings. Payout direction changes can be made upon request without additional charges and at 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 5A and 250V. 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 emission 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 PREVENTION 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
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 (Iₙ) of the individual motors are summarized with a reduction factor (fₑ, fₜ, f₁, f₂) to an equivalent continuous current (Iₑ). The following calculation shall also be performed repeatedly if necessary.

\[ Iₑ = \frac{Iₙ}{fₑ \cdot fₜ \cdot f₁ \cdot f₂} \] [A]

1ₑ: RECOMMENDATIONS FOR DETERMINING THE NOMINAL CURRENT

Estimated example for crane installations: Sum up of the nominal currents for two motors with the strongest output.

\[ Iₙ = Iₙ₁ + Iₙ₂ + Iₙ₃ \] [A]

If only one power output is known:

\[ Iₑ = \frac{P \cdot 1000}{\sqrt{3} \cdot U \cdot (\cos \varphi \cdot \eta) \cdot fₚ} \] [A]

2. CHECK OF VOLTAGE DROP

Rough calculation for determining the voltage drop ∆U:

\[ ∆U = \sqrt{\frac{3 \cdot L \cdot Iₚ \cdot (\frac{Z}{1000})}{1000}} \] [V]

Iₚ: CALCULATION OF START-UP CURRENT

The order of the motors size does not depend on their power output but on 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:

\[ Iₚ = Iₚ₁ + Iₚ₂ \] [A]

If only one power output is known:

\[ Iₚ = X + Iₙ \] [A]

Note:

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 bending radius (page 8) needs to be taken into account.

For reasons of mechanical strength, the diameter of control cables should not be less than 1.5mm². We recommend to include spare conductors for multicore control cables.

LEGEND TO FORMULA

- P = Power [kW]
- U = Voltage [V]
- L = Total cable length [m]
- Z = Effective impedance [Ω/km]
- ∆U = Recommended ∆U <3%
- \( \cos \varphi \) = 0.6 from table 1 (page 7)
- \( \cos \varphi \cdot \eta \) = 0.8 estimated
- fₑ = 1.0 when individual power rating is known
- fₚ = 0.9 only total power is known
- fₑₑ = Reduction factors for intermittent service (page 7)
- fₜ = Reduction factor for increased ambient temperature. For ambient temperatures above 30°C, the reduction factors on page 7 shall apply.
- fₚₚ = 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.
- fₚ₂ = Reduction factor for multilayer coiling. The factors on page 7 should be taken into account for multilayer cables.
- They apply for diameters of up to 10 mm²
- Iₚ = Starting current [A]
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 (l1 = 1 m), or on rolls or round smooth supports (l1 = 1 to 3 m)
Horizontal cable payout in one or two directions

REEL STATIONARY
(Cable fixpoint at moving equipment), horizontal cable payout in one or two directions on rolls or smooth supports (l1 = 3 m)

REEL ON MOVING EQUIPMENT (6) OR REEL STATIONARY (7)
(CABLE FIX POINT AT MOVING EQUIPMENT)
Free horizontal cable payout in one or two directions. For payout in one travel direction: „f“ is determining the loop depth if the suspended cable length „L“ is larger than „l“.

LEGEND TO DRAWINGS (EXAMPLES 1–7)
l = max. operational length of cable (m)
(with cable payout in two travel directions = half travel length)
L = max. operational length [m] between reel and cable fixpoint
h = Installation height = distance from cable tray or cable fixpoint to reel center [m]
LF = Cable fixpoint
f = max. cable loop depth [m], relating to cable fixpoint “LF”
l1 = Rolls or support distance [m]

LEGEND TO DRAWINGS (EXAMPLES 8 AND 9)
l = operational length of cable
L = max. sloping cable length (m). Also consider additional weight (e.g. control switch)
LF = Cable fixpoint

LIFTING OPERATION
Cable payout vertical or steeply sloping (8)
Cable payout vertical or steeply rising (9)

NOTE
For applications 2, 4, 5 and reels beyond the listed capacities please fill in the questionnaire on page 21 and consult your local agent or our factory.

1) The sloping cable length is relevant for cable reel selection. Also consider additional weight (control switch).
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>23</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2.5</td>
<td>30</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>41</td>
<td>1.00</td>
<td>1.03</td>
</tr>
<tr>
<td>6</td>
<td>53</td>
<td>1.00</td>
<td>1.04</td>
</tr>
<tr>
<td>10</td>
<td>74</td>
<td>1.03</td>
<td>1.09</td>
</tr>
<tr>
<td>16</td>
<td>99</td>
<td>1.07</td>
<td>1.16</td>
</tr>
<tr>
<td>25</td>
<td>131</td>
<td>1.10</td>
<td>1.23</td>
</tr>
<tr>
<td>35</td>
<td>162</td>
<td>1.13</td>
<td>1.28</td>
</tr>
<tr>
<td>50</td>
<td>202</td>
<td>1.16</td>
<td>1.34</td>
</tr>
<tr>
<td>70</td>
<td>250</td>
<td>1.18</td>
<td>1.38</td>
</tr>
<tr>
<td>95</td>
<td>301</td>
<td>1.20</td>
<td>1.42</td>
</tr>
<tr>
<td>120</td>
<td>352</td>
<td>1.21</td>
<td>1.44</td>
</tr>
<tr>
<td>150</td>
<td>404</td>
<td>1.22</td>
<td>1.46</td>
</tr>
<tr>
<td>185</td>
<td>461</td>
<td>1.23</td>
<td>1.48</td>
</tr>
<tr>
<td>240</td>
<td>540</td>
<td>1.23</td>
<td>1.49</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 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>
<td></td>
</tr>
</tbody>
</table>

TABLE 3: MULTIPLIER FOR MULTILAYER COILING

<table>
<thead>
<tr>
<th>Number of complete layers LZ on the reel</th>
<th>1NON</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction factor f_1</td>
<td>0.80</td>
<td>0.61</td>
<td>0.49</td>
<td>0.42</td>
</tr>
</tbody>
</table>

TABELLE 4: MULTIPLIER FOR MULTILAYER COILING UP TO 10 MM²

<table>
<thead>
<tr>
<th>Number of conductors</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>Reduction 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>

1) Also applies to spiral coils
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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**TABLE 5: MINIMUM BENDING RADIUS**

<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 or thickness of the flat cables</td>
<td>over 8 to 12</td>
<td>over 12 to 20</td>
</tr>
<tr>
<td>Fixed installation</td>
<td></td>
<td>3 x d</td>
<td>4 x d</td>
</tr>
<tr>
<td>Free movement</td>
<td></td>
<td>4 x d</td>
<td>5 x d</td>
</tr>
<tr>
<td>For entry</td>
<td></td>
<td>4 x d</td>
<td>5 x d</td>
</tr>
<tr>
<td>For positive guidance</td>
<td></td>
<td>5 x d</td>
<td>5 x d</td>
</tr>
<tr>
<td>Guide roller</td>
<td></td>
<td>7.5 x d</td>
<td>7.5 x d</td>
</tr>
</tbody>
</table>

---

1) with reel operation
2) The suitability for this operating mode needs to be assured through special structural characteristics.
## MOTOR CABLE REELS WITH MAGNETIC COUPLING DRIVE

<table>
<thead>
<tr>
<th>Type Designation</th>
<th>Motor Code</th>
<th>Number of Poles</th>
<th>Slip Ring Material</th>
<th>Number of Poles for Slip Ring Body</th>
<th>Slip Ring Size</th>
<th>Gear Sizes</th>
<th>Magnetic Coupling Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTM 300 S 7 M 36</td>
<td>R1</td>
<td>1</td>
<td>Brass slip ring</td>
<td>36</td>
<td>1.8</td>
<td>Bevel – helical gear unit = R1</td>
<td></td>
</tr>
<tr>
<td>LTM 530 N 4 M 60</td>
<td>95</td>
<td>2</td>
<td>Copper slip ring</td>
<td>95</td>
<td>5</td>
<td>Flat spur gear = 95 + 96</td>
<td></td>
</tr>
<tr>
<td>LTM 15/40 H 4 K 240</td>
<td>128 / 88</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>Bevel – helical gear unit = 48 – 168</td>
<td></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**
- **N = 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 = R1**
  - Flat spur gear = 95 + 96
  - Bevel – helical gear unit = 48 – 168
- **Magnetic coupling sizes**
## 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  |

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
- **N** = 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 ampere (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
for monospiral wrap
For voltages up to 1000 volt and payout in two directions
For voltages exceeding 1000 volt: r min. = 15 x 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 max.</th>
<th>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>924994</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>924995</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>924996</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 max.</th>
<th>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>926576</td>
<td>924742</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>75/60(1)</td>
<td>925073</td>
<td>925002</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>83/80(1)</td>
<td>926573</td>
<td>925003</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.

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.
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</th>
</tr>
</thead>
<tbody>
<tr>
<td>VURN 350</td>
<td>23</td>
</tr>
<tr>
<td>VURN 500</td>
<td>42</td>
</tr>
<tr>
<td>VURN 660</td>
<td>52</td>
</tr>
</tbody>
</table>

**LRN SERIES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRN 350</td>
<td>16</td>
</tr>
<tr>
<td>LRN 500</td>
<td>24</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>
<thead>
<tr>
<th>Type</th>
<th>Weight</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>i</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>921380</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>921390</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>921400</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>80</td>
<td>921410</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>90</td>
<td>921720</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-G8X3-0755320</td>
<td>50</td>
<td>970579</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>970580</td>
</tr>
</tbody>
</table>
CABLE GRIPS

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum permitted strain 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>901620</td>
</tr>
<tr>
<td>VLZ 2</td>
<td>1165</td>
<td>20–30</td>
<td>901621</td>
</tr>
<tr>
<td>VLZ 3</td>
<td>1400</td>
<td>30–40</td>
<td>901622</td>
</tr>
<tr>
<td>VLZ 4</td>
<td>1630</td>
<td>40–50</td>
<td>901923</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. permitted strain $^{1)}$ kg</th>
<th>For cable cross section</th>
<th>Length of wire mesh measure $L_2$</th>
<th>Mesh length dimension $L_s$</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>900391</td>
</tr>
<tr>
<td>VLZK 9</td>
<td>110</td>
<td>7 to 9</td>
<td>120</td>
<td>290</td>
<td>900392</td>
</tr>
<tr>
<td>VLZK 12</td>
<td>130</td>
<td>9 to 12</td>
<td>135</td>
<td>340</td>
<td>900393</td>
</tr>
<tr>
<td>VLZK 15</td>
<td>210</td>
<td>12 to 15</td>
<td>180</td>
<td>390</td>
<td>900394</td>
</tr>
<tr>
<td>VLZK 20</td>
<td>260</td>
<td>15 to 20</td>
<td>220</td>
<td>450</td>
<td>900395</td>
</tr>
<tr>
<td>VLZK 25</td>
<td>260</td>
<td>20 to 25</td>
<td>275</td>
<td>510</td>
<td>900396</td>
</tr>
<tr>
<td>VLZK 30</td>
<td>400</td>
<td>25 to 30</td>
<td>350</td>
<td>610</td>
<td>900397</td>
</tr>
<tr>
<td>VLZK 40</td>
<td>580</td>
<td>30 to 40</td>
<td>370</td>
<td>660</td>
<td>900398</td>
</tr>
</tbody>
</table>

$^{1)}$ Calculated for triple security
CABLE SUPPORT ROLLERS

APPLICATION
Mainly used in connection with plug and 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>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>without support</td>
<td>110</td>
<td>-</td>
<td>130</td>
<td>924450</td>
</tr>
<tr>
<td>TR 80/300 B 200</td>
<td>3.25</td>
<td></td>
<td>300</td>
<td>-</td>
<td>320</td>
<td>924460</td>
</tr>
<tr>
<td>TR 80/500 B 200</td>
<td>4.50</td>
<td></td>
<td>500</td>
<td>-</td>
<td>520</td>
<td>924470</td>
</tr>
<tr>
<td>TR 80/110 B 200 H</td>
<td>3.50</td>
<td>with support</td>
<td>110</td>
<td>80</td>
<td>130</td>
<td>924480</td>
</tr>
<tr>
<td>TR 80/300 B 200 H</td>
<td>5.15</td>
<td></td>
<td>300</td>
<td>250</td>
<td>320</td>
<td>924490</td>
</tr>
<tr>
<td>TR 80/500 B 200 H</td>
<td>6.90</td>
<td></td>
<td>500</td>
<td>400</td>
<td>520</td>
<td>924500</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 and 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>&lt;21.5</td>
<td>100</td>
<td>205</td>
<td>10</td>
<td>14</td>
<td>921420</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>921430</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>921440</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>921450</td>
</tr>
</tbody>
</table>
INSTALLATION SEQUENCE

CABLE REEL WITH GUIDE ROLLER AND FEEDPOINT FUNNEL

\[ x = \frac{D_d}{\pi} \]

- \( D \) = outer cross section - Reel body
- \( d \) = inner cross section - Reel body

\[ y = \text{Installation height} \]
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 length: 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 length: 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: verstellbar
Winding length: 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.
QUESTIONNAIRE

Company _____________________________________________ Date: _____________________________________________
Tel: _____________________________________________ Fax: _____________________________________________
E-mail: _____________________________________________ Internet: _____________________________________________

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__________% ED
   1.4. Environmental conditions _____________________________________________

2. Type of application (see page 6)
   Example _____________________________________________

3. Reel type
   ☐ random wrap ☐ monospiral wrap

4. Mounting height from center of reel to cable pickup surface
   _________________m

5. Working travel of equipment in motion
   _________________m

6. Cable payout
   ☐ one-way ☐ two-way
   l= ____________________________ m

7. Operational length of active cable
   (Midway feed-point cuts the length of cable needed in half)
   7.1. For vertical lift (example 8)
   l= __________ m L= ______ m
   7.2. Loads in addition to cable weight (pendant controls or receptacles)
   ________________kg

8. Chosen Cable (Number of copper conductors x wire size)
   8.1. Weight of cable
   ________________mm²
   ________________kg/m
   ________________mm
   ________________kW
   ________________V _________ Hz
   l₁ = x l₂ = __________ A

9. Full operating load or maximum horsepower of equipment
   9.1. Nom. amperage (nominal current – I₁)
   ________________A
   9.2. Start-up amperage (start-up current – I₂)
   ________________A
   9.3. Voltage rating / frequency _________V _________ _________Hz

10. What percentage of the total installed ampacity will work simultaneously
    ________________% ED

11. Number of phase collector rings required
    (Our cable reel slipring assemblies always include one non-insulated ground)
    ________________ pcs.

12. How many cycles of the equipment per hour?
    ________________ cycles

13. Operating hours per day
    ________________ hours

14. Speed of travel or lift
    ________________ m/min

15. Acceleration
    ________________ m/sec²

16. Details for reel drive motor
    16.1. Voltage / frequency
    ________________V _________ Hz
    16.2. Duty cycle
    ________________ % ED

17. Limit switch for travel or lift required
    ☐ yes ☐ no

Remarks: ____________________________________________________________________________________________________________________________