

# Installation regulations

Overhead conductors (including OPGW/OPPC)



**Lumpi-Berndorf Draht- und Seilwerk GmbH**

# 1. General points

The generally applicable accident prevention and safety regulations of the relevant country apply to the handling and installation of Lumpi-Berndorf conductors, as well as, in general terms, the installation regulations in accordance with DIN 48207 and EN 50182, Annex E, supplemented by the points of this regulation, which take precedence.

It should be noted that, in principle, overhead conductors are only intended for one-off assembly. Disassembly and renewed assembly should generally be avoided, as should moving the conductors back and forth. Rewinding the conductors onto other cable drums must be avoided as a matter of principle. In exceptional cases, rewinding may take place following prior consultation with and/or in the presence of Lumpi-Berndorf.

Overhead conductors must be installed under conditions that are as clean as possible.

Surface-treated conductors with hydrophilic properties require special care to prevent contamination and damage.

The contact between the assembly personnel and the conductor must be restricted as far as possible. Where such contact cannot be avoided, new, clean gloves must be used.

This regulation provides general information and notes for the storage, handling and installation of Lumpi-Berndorf conductors. These procedures and notes are intended as guidelines, as each installation is unique and is influenced by the local conditions and the existing requirements and customer wishes.

Other information, such as minimum separation distances, sag and regulation tables and specific conductor data does not constitute the object of this regulation.

Items of installation equipment not mentioned in the present regulation are not approved for use with Lumpi-Berndorf conductors. The use of such devices without the express consent of Lumpi-Berndorf Draht- und Seilwerk GmbH takes place at the customer's risk.

Waste must be disposed of in accordance with national regulations.

## 1.1 Function

Lumpi-Berndorf conductors are used to transfer electrical energy/data and/or provide a protective function in the event of lightning strikes and short-circuit currents. In order to do justice to the high requirements of the overhead conductors, the utmost care and professional handling by trained personnel is required during transport, loading and unloading, cable pulling and assembly.

## **2. Specification**

### **2.1 Transport and storage**

#### **2.1.1 Transport**

The cable drums may only be transported with the drum axle in a horizontal position. The cable drums must be secured on the loading bed to prevent movement. It is prohibited to tip or throw the cable drums from the means of transport. The cable drums must therefore be unloaded using suitable lifting equipment.

The cable drums may be moved a short distance ( $\leq 10$  m) on the ground, only in the opposite direction to that in which the conductor unrolls (see roll direction arrow).

#### **2.1.2 Storage**

The casing may not be removed until shortly before installation. A visual inspection of this cover makes it easy to determine any transport damage.

The cable drums must be stored in an upright position (horizontal axle) and on a suitable base surface (e.g. squared timbers). In order to prevent damage caused by moisture, the drum must not touch the ground during storage.

The storage temperature should not fall below  $-30^{\circ}\text{C}$  and not exceed  $80^{\circ}\text{C}$ . Suitable measures must be taken to protect the cable drums from external influences.

In environments that attack metals and wood, the cable drums must be stored in warehouses.

### **2.2 Preparations**

#### **2.2.1 Preparatory works**

Before installation starts, it must be guaranteed that the conductors cannot be damaged by brief contact at any time. Obstacles must be removed or appropriate protective equipment must be used.

It must be ensured that the conductor parameters, along with this installation regulation, are brought to the attention of all of the assembly personnel.

#### **2.2.2 Cable drums**

Conductors may be delivered on steel or wooden drums.

In the event that wooden drums are used, the nuts on the draw bolts and the axle plate fixing bolts must be tightened before moving the drums at the storage location and before starting the cable pulling work. This must be suitably documented.

The U-hooks that are used to secure the inner end of the conductor must be loosened to the point that the conductor end can be moved freely.

In the case of steel drums, the inner end of the conductor must be loosened.

The casing boards must be removed using suitable tools, without damaging the conductor.

### 2.2.3 Deflection pulleys (wheels)

The pulley diameter must equate to at least 30 x the conductor diameter. The following additional requirements apply to ropes with a CFCC core:

**Conductors with a CFCC core:** The pulley diameter must equate to at least 30 x the conductor diameter or must equate to at least 60 x CFCC core conductor diameter. Whichever diameter is bigger must be used. Creasing of the conductors with a CFCC core must be avoided in all circumstances.

The minimum jaw width must equate to 1.5 x the conductor diameter.

The pulleys must have bearings that enable them to move freely and the running surface must be clean, undamaged and free from scoring and notches. Only uncoated light metal pulleys or light metal pulleys with a hard and smooth plastic coating may be used.

To avoid the risk of damage to the conductor surface, you must ensure that appropriate, smooth and damage-free running surfaces (e.g. made of hard plastic) are provided when using surface-treated conductors.

The conductor must run into the roller centrally and must not slip from the jaw flange into the middle so as to avoid damage and torque forces. Where necessary, the deflection pulley should be suspended at a height/at an angle using suitable equipment.

For pulling up the conductor, the pulleys must not have any copper particles or other materials that attack the metals used.

If no fitting lengths are used, a pressed connector must be deployed to ensure that the conductor can pass through without damage.

In general, only single pulleys are permitted.

Tandem pulley suspension gear is only permitted if the conductor is not deflected by more than 5° per pulley.

### 2.2.4 Cable brake

The diameter of the brake drum must be **at least** 30 x d (d = conductor diameter).

The brake must have a hydraulic or mechanical fine adjustment device.

The running grooves must be clean, undamaged and free from scoring and notches. Smooth, hard plastic coatings of the running grooves must be provided for surface-treated conductors. In any case, the difference in diameter between the individual running grooves must be  $\leq 1$  mm.

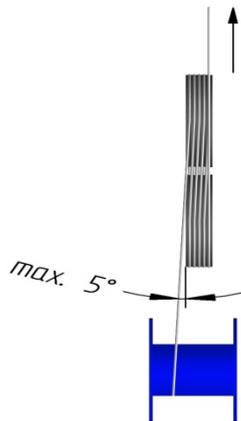
Braking of the Lumpi-Berndorf conductor in the drum stand must be carried out so as to prevent overtravel.

An overhead conductor may not be deflected by more than 5° without suitable pulleys (see Point 2.2.3). As a result, it is necessary to position the drum stand in line with the

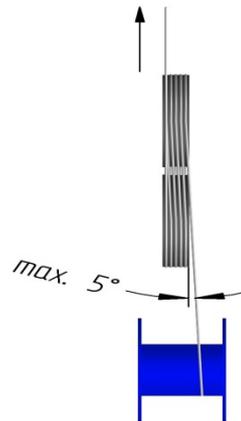
brake. The separation distance between the drum stand and the brake must be at least 5 m, but should ideally be 10 x the drum width or more.

The conductor must be pulled into the brake in line with the diagrams below, depending on the lay direction of the outer layer.

Conductor with right-hand lay



Conductor with left-hand lay



In the case of hollow conductors, in connection with high installation tensile stresses, the brake drum grooves must be adapted to the conductor diameter. This is to prevent the hollow conductor becoming permanently deformed in the area of the brake drum cable wrap.

The conductor manufacturer must always be contacted if higher installation tensile forces than those listed in Point 2.2.5 are to be expected.

### 2.2.5 Installation tensile force

The installation tensile force of Lumpi-Berndorf conductors must not exceed 20% of the mathematical breaking load in accordance with the data sheet.

In the case of OPGW/OPPC and hollow conductors, the installation tensile force must not exceed 16% of the mathematical breaking force in accordance with the data sheet.

A cable brake with adjustable braking force must be used for stringing. The winch must have an adjustable tensile force limitation with automatic shut-down.

For all cable pulling, the installation tensile force must be documented without breaks over the entire length.

### 2.2.6 Installation speed

The maximum speed is 5,000 m/h.

### 2.2.7 Earthing

The assembly company must ensure that the equipment is earthed in accordance with the regulations.

## 2.3 Installation

### 2.3.1 Installation

The pull cable (front cable) must be non-twisting; braided cables are preferably used. A rotating shackle must be mounted between the overhead conductors and all the front cables so that any torsional stress is not transferred to the cable, even under tensile load.

The cable must always be pulled off the drum from above and in the direction of travel with the cable brake.

At angled masts, the cable may be pulled through without being cut if the following conditions are observed:

- Installation without grinding by means of appropriate pulley arrangement
- Suitable positioning of the deflection pulleys in order to prevent the cable moving upwards in the pulley jaw
- Compliance with the minimum bending radii

The cables must run straight into the feed roller (first deflection pulley).

Suitable pulling grips and/or other appropriate cable pulling fittings must be mounted on the cables.

The pulleys should generally be secured so that the cables do not rise up at the jaw flange.

In general, the information set out in EN 50182, Annex E must be observed.

We wish to point out that the feed roller guide of the cable brake is not suitable for deflecting cables.

The Lumpi-Berndorf conductors are tied off in an appropriate manner so as to ensure grip and friction between the individual wire layers. If the conductor is cut in the course of installation, or the tie is removed for other reasons, it must be ensured that the individual wire layers remain securely connected with one another and that no movement of the individual wire layers relative to one another occurs.

The protective caps applied to the cable ends of the OPGW/OPPC in the factory seal the conductor. They prevent water penetrating into the stainless steel loose tubes.

These protective caps may not be removed until the fibres are spliced.

This means that cable pulling and introduction of the OPGW/OPPC into the sleeves takes place with the protective caps fitted. Particular care must be taken to ensure that the protective caps are not damaged by pulling grips. However, if it is vital that the protective caps be removed for cable pulling, new caps must be applied once again in a professional manner after pulling.

It should be noted that the ends of the loose tubes are fully sealed. Protective caps are available from Lumpi-Berndorf Draht- und Seilwerk GmbH.

In order to remove the caps, the whole end of the conductor (approx. 10 cm) must be sawn off. In this process, the end of the conductor that is released must be tied off in a suitable manner, otherwise the conductor could spring open.

### 2.3.2 Installation temperature

The minimum installation temperature is  $-20^{\circ}\text{C}$ .

For OPGW/OPPC, the minimum installation temperature is  $-10^{\circ}\text{C}$ .

When the outdoor temperature is lower, conductor installation is not permitted and must therefore be ceased.

## 2.4. Travel on conductors

In order to fit warning spheres, reflectors, bundle spacers or similar, cable wagons may travel on new, undamaged conductors in accordance with the instructions from the line owner provided that the following conditions are met:

- The pulleys used in the cable wagon must not damage the conductor. For surface-treated conductors, the drive wheels in particular must be designed so that the coating/surface condition is not altered.
- The vertical load on the conductor per carrier roller must not exceed 1500 N, in order to prevent wires with an aluminium surface in the outer layer from deforming.
- During travel on the conductor, the cable tensile force must not exceed 30% of the mathematical breaking force of the conductor. The breaking force for the type of conductor can be found in the relevant data sheet.

## 2.5. Assembling fittings

The assembly instructions issued by the fittings manufacturer must be observed.

Colour-coated surfaces may be cleaned mechanically with suitable brushes.

In doing so, care must be taken not to damage the wires.

The brushes must not incorporate any materials that attack the metals used (e.g. copper, brass).

If follow-up treatment of cleaned and/or damaged areas of coating is required, suitable colourants may be purchased in small containers (touch-up paint).

The follow-up treatment involves applying the paint by hand.

### 2.5.1 Severing conductors with a CFCC core

When severing the conductor using various methods, corresponding safety regulations must be observed. As for all other activities, these regulations must be implemented via a workplace evaluation (Section 4 ASchG [Austrian Protection of Employees Act]) by a person with professional expertise (Section 1299 ABGB [Austrian Civil Code]). This will specify the necessary PPE for each method.

When severing using **conductor cutters**, we recommend the following PPE: FFP3 mask, long-sleeved workwear, tightly-sealed safety goggles (EN166 - tightly-sealed), gloves (EN388) and appropriate skin protection.

When severing using **angle grinders**, we recommend the following PPE: FFP3 mask, long-sleeved workwear, tightly-sealed safety goggles (EN166 - tightly-sealed) and appropriate skin protection.

For both severing methods, it is recommended that the workplace should be cleaned using a vacuum cleaner with filter class H (H as per DIN EN 60335-2-69).

## **2.6. Stretching conductors**

With any stretching of conductors, attention must be paid to the necessary mast stability.

50% of the mathematical breaking load (RTS) is applied constantly for 1 hour as tensile load.

The changes in the length of the conductors that occur during this process must be documented, as well as the forces applied. After stretching, the force on the conductors must not be relieved so as to fall below 10% of the RTS.

## **2.7. Securing the conductors to the mast**

Lumpi-Berndorf conductors should be anchored in the standard manner. Hollow conductors require special handling in the process of fixing them to the mast. All fittings must be agreed between the fittings manufacturer and the customer.

## **3. Applicability of warranty conditions**

Compliance with these installation regulations and evidence of specialist instruction of assembly personnel (e.g. by an overhead conductor specialist as per EN50182 TÜV®) are required for warranty services from Lumpi-Berndorf Draht- und Seilwerk GmbH in accordance with the agreed warranty conditions.

## **4. Changes to the previous version**

2.2.3 Pulley diameter "CFCC" adjusted

2.2.4 Brake drum diameter standardised

2.5.1 Editorial changes