

Regulation for Installing

Phase Conductors and Earth Wires, as well as OPGW/OPPC (PCEWOP)

made from
aluminium, aluminium alloy, steel, aluminium clad steel, HACIN
and combinations of these materials
with and without surface treatment



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 PCEWOP, as well as, in general terms, the installation regulations in accordance with DIN 48 207 and EN 50182, Annex E, supplemented by the points of this regulation, which take precedence.

It should be noted that, in principle, PCEWOP are only intended for one-off assembly. Disassembly and renewed assembly should generally be avoided, as should moving the PCEWOP back and forth. Rewinding the PCEWOP 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.

PCEWOP must be installed under conditions that are as clean as possible.

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

The contact between the assembly personnel and the PCEWOP 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 PCEWOP. 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 PCEWOP 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 PCEWOP. The use of such devices without the express consent of Lumpi-Berndorf Draht- und Seilwerk GmbH takes place at the customer's risk.

1.1 Function

Lumpi-Berndorf PCEWOP 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 PCEWOP, the utmost care and professional handling by trained personnel is required during transport, loading and unloading, stringing and assembly.

2. Specification

2.1 Storage and transport

2.1.1 Transport

The PCEWOP drums may only be transported with the drum axle in a horizontal position. The PCEWOP drums must be secured on the loading bed to prevent movement.

It is prohibited to tip or throw the PCEWOP drums from the means of transport. The PCEWOP drums must therefore be unloaded using suitable lifting equipment.

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

2.1.2 Storage

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

The PCEWOP drums must be stored in an upright position (horizontal axle) and on suitable 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°C and not exceed 80°C . Suitable measures must be taken to protect the PCEWOP drums from external influences.

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

2.2 Preparations

2.2.1 Preparatory works

Before installation starts, it must be guaranteed that the PCEWOP 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 PCEWOP parameters, along with this installation regulation, are brought to the attention of all of the assembly personnel.

2.2.2 PCEWOP drums

PCEWOP 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 stringing work.

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

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

The lagging boards must be removed using suitable tools, without damaging the PCEWOP.

2.2.3 Deflection pulleys (wheels)

The pulley diameter must equate to at least 30 x the conductor diameter. With supporting masts and an angle of deflection $<15^\circ$, the pulley diameter can be decreased to 25 x the conductor diameter.

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.

Smooth plastic coatings must be provided for 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 = PCEWOP 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.

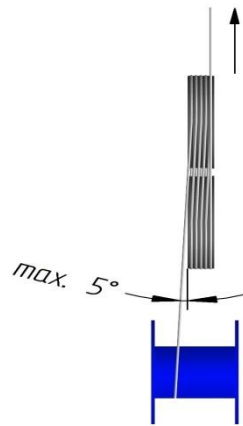
Smooth, hard plastic coatings of the running grooves must be provided for surface-treated PCEWOP.

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

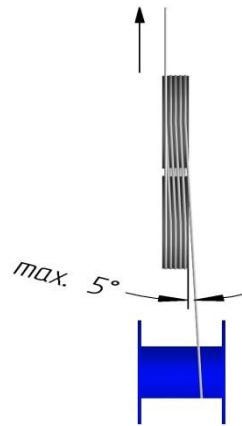
An PCEWOP may not be deflect by more than 5° without suitable pulleys (see Point 2.2.3). As a result, it is necessary to position the drum stand in line with the brake. The separation distance between the drum stand and the brake should be at least 5 m, but ideally 8 m or more.

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

PCEWOP with right-hand lay



PCEWOP 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 cable diameter. This is to prevent the hollow conductor becoming permanently deformed in the area of the brake drum cable wrap.

The PCEWOP 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 PCEWOP must not exceed 20% of the calculated 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 calculated breaking load in accordance with the data sheet.

A cable brake with adjustable tensile force limitation and automatic shut-down must be used for installing the PCEWOP.

For OPGW/OPPC and hollow conductors, the installation tensile force must be documented without breaks over the entire length.

2.2.6 Installation speed

The maximum speed is 4,000 m/h.

2.2.7 Earthing

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

2.3 Installation

2.3.1 Installation

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

The PCEWOP must always be pulled off the drum from above and in the direction of

travel with the cable brake.

At angled towers, the PCEWOP 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 PCEWOP moving upwards in the pulley jaw
- Compliance with the minimum bending radii

The PCEWOP must run straight into the feed roller (first deflection pulley). Suitable pulling grips and/or other appropriate PCEWOP pulling fittings must be mounted on the PCEWOP.

The pulleys should generally be secured so that the PCEWOP 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 PCEWOP.

The Lumpi-Berndorf PCEWOP are tied off in an appropriate manner so as to ensure grip and friction between the individual wire layers. If the PCEWOP 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 ends of the OPGW/OPPC in the factory seal the cable. 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 stringing and introduction of the OPGW/OPPC into the joint boxes 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 stringing, 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 OPGW/OPPC (approx. 10 cm) must be sawn off. Here the end of the OPGW/OPPC that is released must be tied off in a suitable manner, otherwise the cable could spring open.

2.3.2 Installation temperature

The minimum installation temperature is -20°C .

For OPGW/OPPC, the minimum installation temperature is -10°C .

If the outside temperature is lower, stringing is not permitted and must therefore be ceased.

2.4. Travel on PCEWOP

In order to fit warning spheres, reflectors, spacers or similar, cable wagons may travel on new, undamaged PCEWOP provided that the following conditions are met:

- The cable wagon must be fitted with plastic rollers or with plastic-coated metal rollers, the diameter of which must be at least 200 mm (4 rollers per PCEWOP)
- The vertical load on the PCEWOP per carrier roller must not be greater than 1500 N
- During travel on the PCEWOP, the PCEWOP tensile force must not exceed 30% of the calculated breaking load of the PCEWOP. The breaking load for the type of PCEWOP can be found in the relevant data sheet.

Moreover, the regulations of the network operator in question apply to travel on PCEWOP.

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.

2.6. Stretching cables

With any stressing of PCEWOP, attention must be paid to the necessary tower stability.

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

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

2.7. Securing the PCEWOP to the tower

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

3. Applicability of warranty conditions

Compliance with these installation instructions constitutes a prerequisite for provision of warranty services from Lumpi-Berndorf Draht- und Seilwerk GmbH in accordance with the agreed warranty conditions.