

LIVE WORKING

DELTEC® – Product range

The permanent availability of electrical energy has become a decisive factor for international competition. At the same time, power interruptions must be reduced due to increasing cost pressure. This makes it difficult to ensure the operating safety of existing installations and to perform maintenance work, as entire parts of the installation cannot be isolated and the only remaining alternative is live working.

DEHN + SOHNE has gained considerable experience in the field of live working and has developed new products which can be found in the DELTEC product range.

Isolating installations for maintenance work

Electrical equipment and low-voltage, medium-voltage and high-voltage systems such as overhead lines, transformer substations, switchgears and distribution boards, transformer cells or cable distribution cabinets cannot be isolated or can only be isolated with great effort due to undesired disconnecting times and costly work on Sundays and public holidays.

Live cleaning**Clean installations increase operating safety**

Dirty electrical installations and adverse weather conditions (moisture) can cause power failures, damage to the equipment and even personal injuries as a result of an electrical arc. In medium voltage installations, layers of dust or insulator lubricants can cause failures. In cable distribution boards and low voltage installations, cobwebs, weeds and dust are considered more likely causes.

Regular cleaning intervals

The results of surveys showed that cleaning of open indoor installations and cable distribution cabinets has to be performed at regular intervals between 6 months and 2 years depending on the type and degree of dirt.

Dry cleaning by suction combined with damp cleaning

Dry cleaning work is performed with operating heads that are used to clean or brush dirty parts of the installation while simultaneously sucking the dirt away. Loose layers of dust and cobwebs are easily cleaned with little effort. Oily and tough pollutant layers are removed by damp cleaning using sponges and special insulating cleaning liquid.

This type of work is performed according to "hot stick working" procedure.

Equipment for dry cleaning by suction

Equipment for cleaning by suction consists of a cleaning head (operating heads, brushes), intake tube with handle, extension, intake hose and suction device.

All single parts are made of plastic and are fully insulated. The shape of the brushes and operating heads is largely adapted to the parts of installations to be cleaned.

The special plug-in coupling system of the dry cleaning equipment prevents the accidental use of accessories not designed for this type of application (e.g. accessories of industrial vacuum cleaners).

Requirements for the vacuum cleaner

The vacuum cleaner used must meet the following requirements:

- The industrial suction device must have a minimum air velocity of 20 m/s and a visual control indication of the intake capacity.
- The intake hose must have a continuous inner diameter $\geq \text{Ø}30$ mm and must not contain metal parts

Equipment for damp cleaning

The equipment for damp cleaning consists of special cleaning heads (sponge supports), insulating rod with handle and extension elements. All single parts are fully insulated. The plug-in device of operating heads and sponges allows for easy and fast replacement of dirty sponges. Only approved and marked sponges may be used for these applications.

Refilling of cable ends**Refilling insulating oil into cable ends**

The newly developed refilling device considerably reduces the cable refilling procedure and makes it safer and easier. The insulating oil is then heated according to the manufacturers' specifications and filled into the cable end by simply pushing a button on the refilling lance. The compact device with rolls has a capacity of max. 5 litres of insulating oil. An insulated screw driver is used for loosening the locking screw at the cable end (insulated operating rod with interchangeable operating head). This type of work is performed according to "hot stick working" procedure.

Equipment for refilling insulating oil into cable ends

The refilling device consists of a pumping unit with a container, regulated heating, pump and refilling lance. The insulated screw driver system consists of an insulating rod with a manually operated mechanism (adjustable handle), interchangeable operating heads (straight and angled) with a safety plug-in system that supports different screw type bits. The refilling lance and the pumping unit are connected via a hose and a control line (pump ON/OFF). The refilling lance and the screw driver are fully insulated. Specially adapted plastic screws are available for different cable ends which are attached to the insulated screw driver.

Requirements for the installer**Selection of electricians for live working**

Maintenance work may only be performed by electricians with experience in the operation and maintenance of electrical installations. The electricians must be trained by completing the theoretical and practical training required for this type of work.

Training as live worker

The training for specialised live workers is based on detailed target descriptions as required by the accident prevention and insurance association for precision and electrical engineering. It includes theoretical and practical training and the issue of a "Live Working" certificate after completion of the training.

Equipment Programme for Live Working

“Live working” procedure

During the hot stick working procedure, the worker keeps a predefined distance from energised parts of the installation and carries out his work with insulating rods/operating rods.

Design of operating rods

Operating rods according to DIN VDE 0681/0682 are hand-held devices for operating, testing and shielding distances from energised equipment. They consist of one or several insulating rods rated for the nominal equipment voltage and of an operating head designed for the intended application. **Operating rods**, are e.g. **intake tubes**, **insulating rods**, **locking rods**, **refilling lances** or **insulated screw drivers**. They are marked with the  symbol on the rating plate.

An operating rod consists of a **handle**, **insulating part** and **operating head**.

The **operating head** is the part of the operating rod containing the operating element, e.g. operating heads and brushes of a cleaning kit or the sponge supports of a damp cleaning kit.

The **insulating part** is the part of the operating rod between the handguard and red ring. It provides the user with a safety distance and sufficient isolation for safe operation.

The **extension** is the part of the operating between the insulating part and operating element of the operating head. It allows the user to reach remote parts of the installation and to pass the operating head close to energised parts.

The **handguard** provides a visible barrier between the handle and the insulating part and prevents the user from making contact with the insulating part.

The **red ring** indicates the end of the insulating part in the direction of the operating head. It provides a visible barrier and prevents the user from making contact with live parts of the installation. The insulating part between the red ring and handguard may not make contact with energised components but contact with earthed components is allowed.

