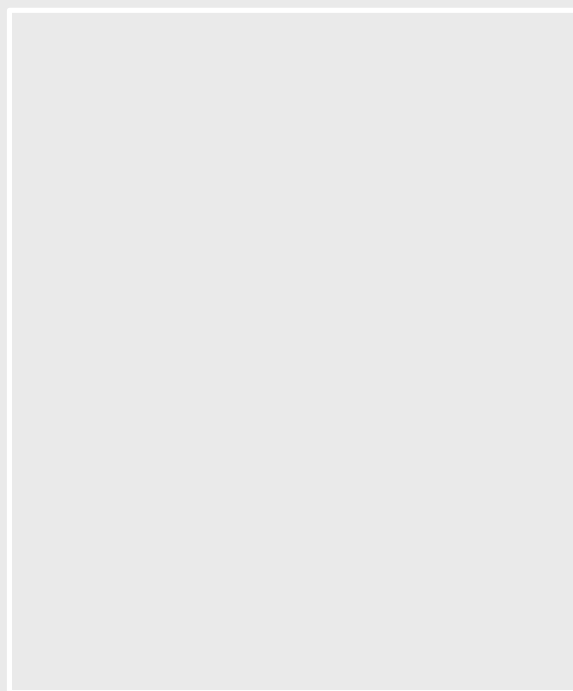


Operating Instructions

IOSK 72.5 ... 550

MANUAL

70788001



TRENCH



70788001

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1 Safety

1.1 Warnings



Defective or inadequate grounding poses a danger to life in case of contact with the transformer. In addition, the monitoring function of the transformer is not guaranteed if grounding is defective or inadequate.



Unused capacitive taps CT must always be grounded inside the terminal box. Otherwise high voltage will be operating inside the terminal box leading to sparking and damage of the transformer.

Unused current transformer windings must be shorted.

1.2 Grounding instructions

There must be a low-resistance path to the system ground from at least one grounding connection of the transformer. The connection must be mechanically robust and durable to carry the system's short-circuit current.

2 General Information

2.1 Product description

Scope and purpose

This instruction manual applies to outdoor current transformers, models IOSK with manufactured in 1993 and later.

These conventionally designed inductive transformers step the current down proportionally for measurement and protective devices.

This instruction manual gives information on the handling and operation of the above-mentioned transformers after factory testing.

Construction

Design

A transformer as described here consists of a toroidal current transformer built into the head.

Between the aluminium head and base sections, a porcelain or composite insulator is fixed in place with Portland cement.

All transformers are hermetically sealed and employ oil-paper insulation. Changes in oil volume due to temperature variations are accommodated by the stainless steel bellows or expansion cell (alternative).

External insulation

External high-voltage insulation is assured by the flashover distance and creepage distance of the porcelain or composite insulators. The shape of the sheds and the creepage distance are adapted to the voltage level and ambient conditions at the intended service location.

Instructions for maintenance of the insulator surface can be found in the section 4.

Primary terminals

The primary connections are located on the head of the transformer. These are configured to order and tailored to the requirements of the specific installation.

The schematic diagram of the transformer indicates how the step-down ratio can be changed in units having this capability.

Secondary terminals

The secondary terminals are located in the splash proof terminal box at the base of the transformer.

The schematic drawing indicates the labelling of the terminals.

Grounding terminal

The transformer is provided with at least one grounding terminal on the base.

Strictly follow the grounding instructions in section 3.4.

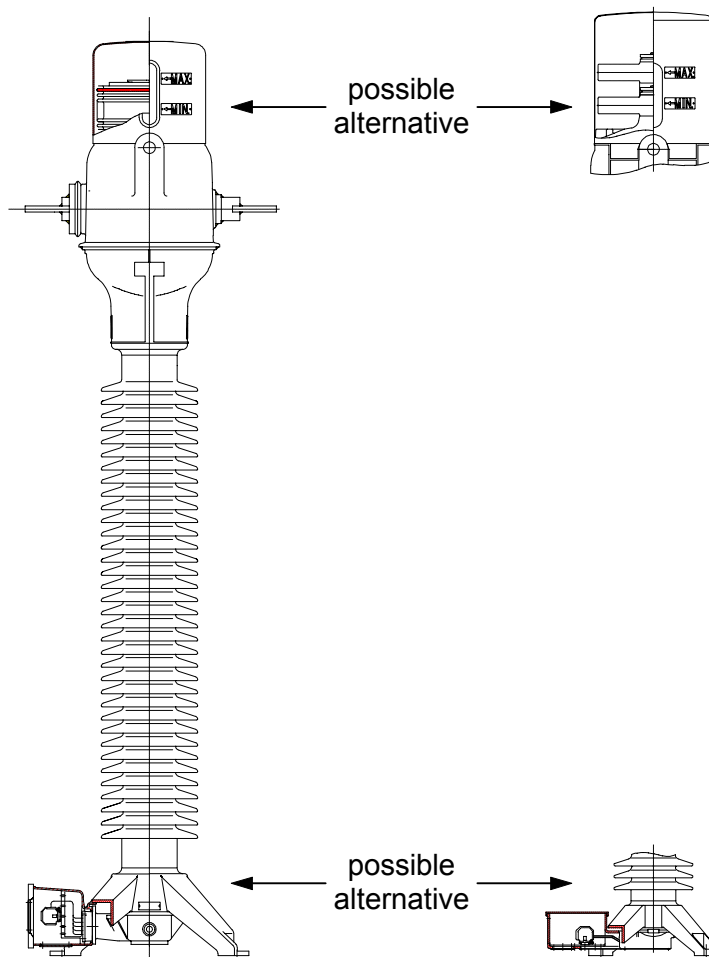


Fig. 1: IOSK simplified drawing with alternatives

2.2 Packing material, Transportation, Storage, Unpacking

Delivery

Transformers are shipped in either the vertical or horizontal position.

Depending on distance and scope of delivery, ordinary means of transport (rail, ship, truck, air freight) are employed. Packaging includes the required supports and cushioning to prevent damage during the required shipment.



Observe all transport markings on the packaging.

Unpacking and inspection upon arrival

Inspect the packaging and contents immediately after receipt of the shipment at the installation site. Possible damage includes

- Damage due to impact (porcelain damage, broken glass)
- Oil leakage (cracked porcelain)
- Bent metal parts (terminals, connectors etc.)

If damage is found on inspection, the following actions should be taken:

- a) Notify the insurance carrier immediately.
- b) State on acknowledgement of receipt that the forwarder is liable.
- c) In order to prevent expiration of deadline for claims against the forwarder, send a registered letter notifying the forwarder of his liability.

If goods have been shipped at Trench's risk, the following additional actions should be taken:

- d) Notify Trench (Technical Support) of the damage as soon as possible,

Fax +33.389/67.26.63
Telephone +33.389/70.23.23
E-Mail aftersales@trench.fr

- e) A copy of the registered letter to the forwarder should be sent to Trench.

Trench France SA
16, rue du Général Cassagnou
Boîte postale 80070
F-68302 Saint-Louis
France

- f) In addition, Trench should be asked for the address of the damage assessor having jurisdiction, who will evaluate the damage on site.

Transport on site and storage

If no damage is found, use the same precautions in on-site transport as during shipment.

For long-distance transport, it is recommended that the transformer be left in its original packaging or repackaged.

If the transformer must be stored for an extended time before being put in service, the following actions should be taken:

- a) Store the transformer, with or without packaging, in a protected, well-ventilated place and in such a way that it cannot fall over.
- b) Under no circumstances may the transformer be stored horizontally for an extended period of time (max. 3 months).
- c) Remove the shipping protection around the metal bellows as instructed in section 3.2.

The temperature limits for storage are the same as for service. Avoid extreme pollution and safeguard porcelain sheds against possible damage. In addition protect the packaging against rotting.

3 Installation, Commissioning

3.1 Place of installation

The transformer must be installed on a horizontal, flat and level surface. If the surface is not flat, insert shims at the hold-down positions as needed in order to eliminate distortion stresses.

3.2 Erection

After releasing the fasteners, lift the transformer out of the packaging as shown in Fig. 2. The weight of the transformer is indicated on the rating plate. Hoisting gear should be adequate for the weight of the transformer. Avoid jerky movement of the crane. When moving the transformer horizontally, secure it against swinging.

Erection and transport

The transformer may be shipped in either the vertical or horizontal position.

When lifting or erecting, always support by two lifting eyes (two on vertical or horizontal either head or one each on head and base). If the transformer must be returned to the horizontal position, note the shipping position with the terminal box facing up. Provide appropriate support for transformer in horizontal position.

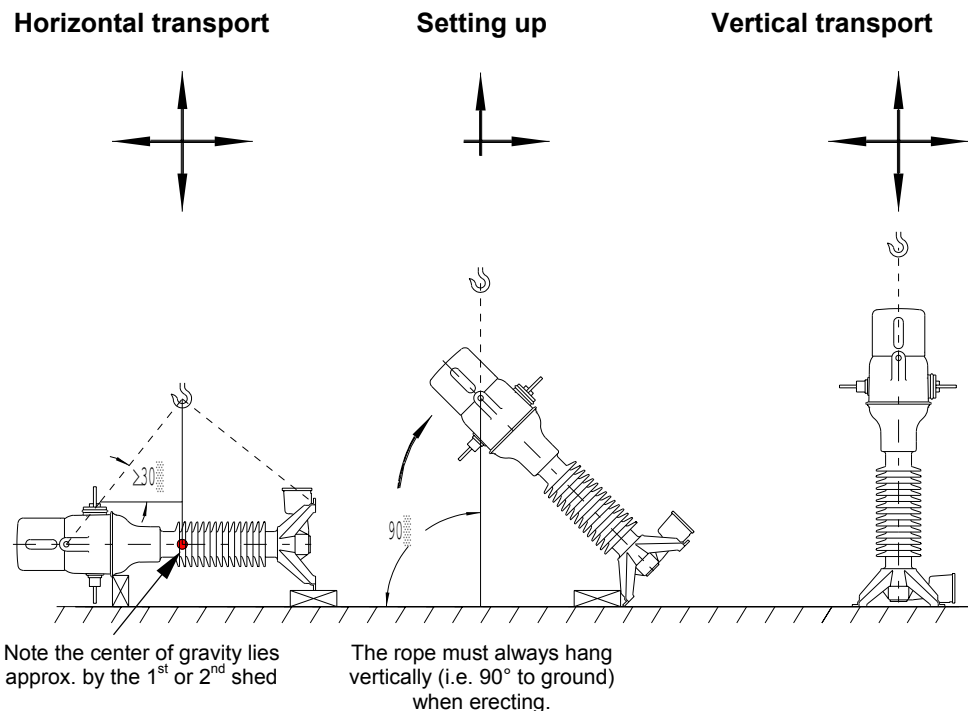


Fig. 2 Erection of the transformer



Transformer is top-heavy

Transport protection of metal bellows / metal expansion cell

After shipping and on-site transport, remove the cap (1) to expose the cardboard tube (2) used to protect the bellows during transport. Remove the cardboard tube (2).

Alternative: The metal expansion cell is supported by foam plastic blocks (4) which must be removed. After removing the transport protection replace the cap, securing with the two pre-positioned slot-head screws (3).

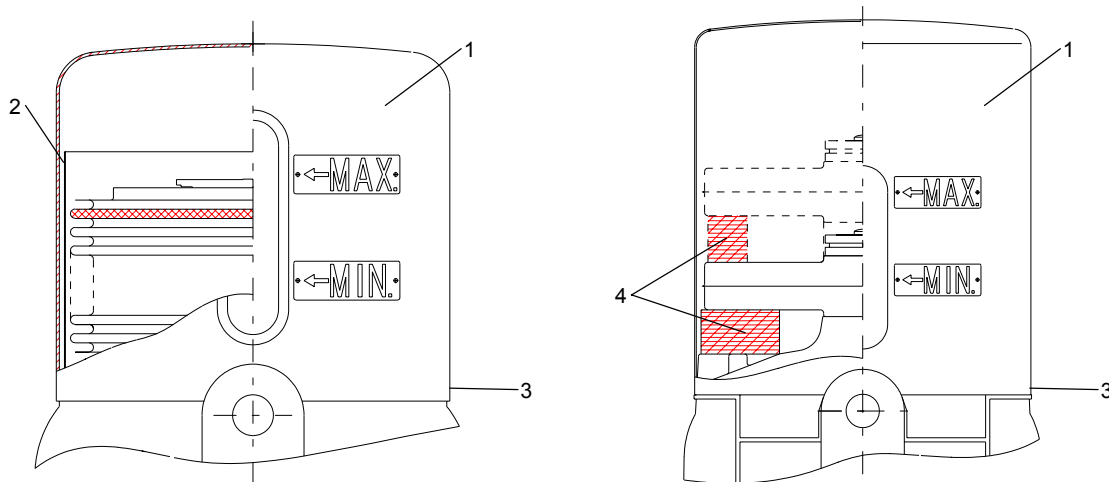


Fig. 3 Transport protection

3.3 Mounting

The transformers are delivered completely mounted, there are no mounting works necessary.

3.4 Terminals

Grounding

There must be a low-resistance path to the system ground from at least one grounding connection of the transformer. The connection must be mechanically robust and durable to carry the system's short-circuit current.



Safety notice: Defective or inadequate grounding poses a danger to life in case of contact with the transformer. In addition, the monitoring function of the transformer is not guaranteed if grounding is defective or inadequate.

High-voltage connection

Before connecting cables, clean all contamination from the contact surfaces, so that a good electrical contact is insured. Contact grease will prevent premature oxidation. Use corrosion-proof screws for connections. In order to guarantee permanent contact pressure, use spring washers with all bolt connections.

Aluminium must not be placed in contact with copper-based material unless special precautions are taken. Seal such connections at the point of contact with a weatherproof coating or use Cupal separators.

High-voltage feeders should be sized so that no excessive mechanical loads are imposed on the transformer in case of temperature changes or short circuits.

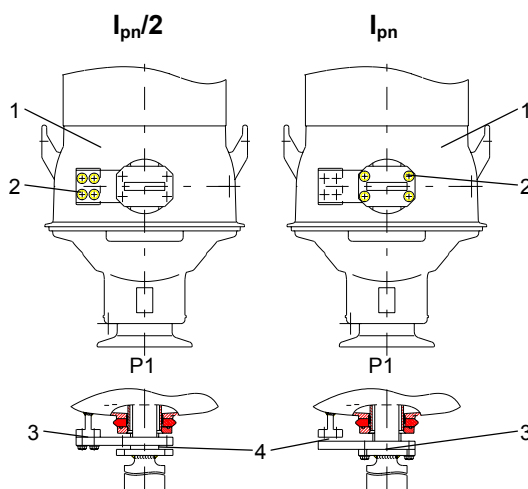
Primary reconnection of the current transformer (optional)

Change to the desired primary winding circuit before putting the transformer in service.

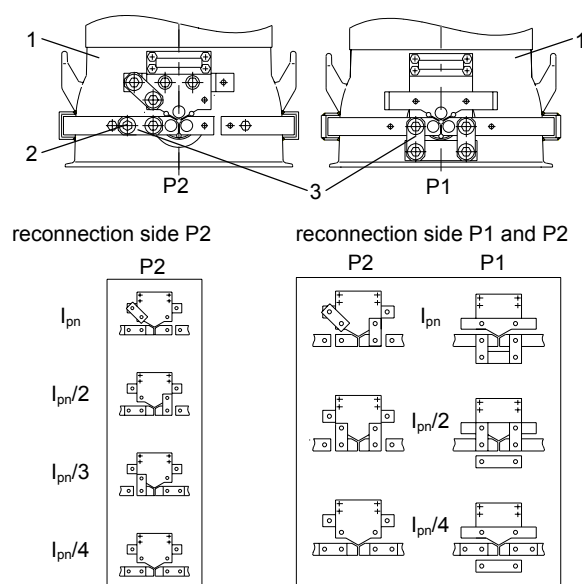
Clean aluminium - aluminium connections with emery cloth and coat with contact grease. Tighten Connections enough to produce the required contact pressure.

Tightening torque for bolts of primary reconnection: 60 Nm

Primary reconnection 1:2



Primary reconnection 1:2:3:4



- 1 Transformer head
- 2 4 screws M12 for reconnection
- 3 Active contact surface
- 4 Travel of reconnection terminal ≈ 10 mm

- 1 Transformer head
- 2 Screws M12 for reconnection
- 3 Reconnection terminal

Fig. 4 Primary reconnection

Secondary terminals

Before working on the secondary terminals, always verify that the system is not energised. Caution is also advised when stray electromagnetic fields from nearby components that are in operation may be present.

Make the secondary connection in accordance with the pertinent schematic diagram. The cross section of the secondary lines should be sized adequately to insure the accuracy of the transformer.



Safety notice: Always short the secondary terminals of unused windings of the current transformer. If several ratios are present, the highest must always be shorted.

The schematic drawing indicates the labelling of the terminals.

Tighten stud type terminals to the respective maximum torque as following chart.

Entrelec		Cuprodur	
M6	M8	M8	M10
4.5 Nm	6.0 Nm	10 Nm	10Nm

3.5 Commissioning

Observe all in-house regulations applicable for placing the transformers in service.

Check that the insulators free external pollution and defects.

Inspect the transformer for damage, and in particular for oil leaks.

Make sure that the bellows in the head are correctly positioned for the given temperature.

Inspect the primary and secondary connections to make certain that no wiring errors have been made. Verify that the contacts are good. The grounding connection must be made to the base of the transformer.

Check the transformer secondary leads for continuity.

4 Maintenance, Diagnostics

4.1 Auxiliary material

Contact grease for primary terminals and primary reconnection.

4.2 Maintenance

By virtue of appropriate electrical and mechanical design and the complete exclusion of air, the current transformer will provide trouble-free service over an extended period of time without requiring maintenance.

4.3 Diagnostic recommendations

We recommend that the following checklist be employed when inspecting the current transformer.

Natural ageing of the material, electrical overload or mechanical forces can lead to a situation where the instrument transformer has to be taken out of service. This manual recommends methods for analysing the instrument transformer to decide if the unit is still in healthy conditions, risk conditions or has to be taken out of service.

If the results of some inspections are between normal conditions and the limits for units to be taken out of service the time intervals for the inspections has to be decreased.

If there is a significant difference in the results in only one instrument transformer in a three phase system, this unit should be considered as a risk unit.

For better investigations of old instrument transformer the time intervals for the tests can be decreased. (e.g. when the results of DGA are still OK but there is a remarkable increase of the gases compared to the previous analysis).

Trench should be informed when the measured values of an instrument transformer exceed the normal values or concentrations.

Inspection checklist

Inspection intervals	A	B	C	D	E	F	G	H	I	J	K	L
Before energising, after any movement of transformer	o	o	o	o	o	o	o	o				
Routine inspection (approx. 1-year interval)					o	o		o				
After every 10 years in service (approx.)	o	o			o	o	o	o	o		o	
After electrical overloads (primary or secondary)				o						o		o
Before re-energising, after change of burden or connections	o	o	o	o			o					
After excessive mechanical loads on transformer (due to being dropped, storm or earthquake)		o				o						
When secondary current readings are doubtful		o	o	o							o	

Possible inspections

A	Verify correct grounding Check the tightness of screws holding the ground connection to the base.
B	Verify that all connections are sound Connections, including screw-type connections, must be mechanically tight and exhibit a low contact resistance. They must also be kept free of corrosion.
C	Verify that unused secondary windings of the current transformer are shorted The burdens (including line impedance) connected to the secondary windings of the current transformer must not exceed the rated value (see rating plate). Unused secondary windings must be shorted in the terminal box of the transformer. Failure to follow this instruction may lead to destruction of the secondary insulation. The voltage across open secondary terminals can exceed 10 kV .
D	Measure secondary currents against specified values The step-down ratio can be measured by injecting a current of 5% of rated current, at rated frequency, through the primary connections. Disconnect the primary connection from the high-voltage line before performing this test. Connect a low-resistance ammeter to the respective secondary terminals of a core. Short the other windings of the current transformer. The measured step-down ratio should not differ greatly from the nominal value. If there is a large discrepancy, damage must be suspected and the transformer shall not be returned to service without further tests.
E	Check bellows position The bellows position indicator must be between the "Min." and "Max." marks at all ambient and service temperatures. In a three phase system all bellows indicators must be in about the same position between min and max. (a difference should be clear detectable from the ground - about 3 cm or more). If the position of a bellows indicator is above max. or below min. the unit is to be taken out of service.
F	Examine for traces of oil The following parts of the transformer must be checked for oil traces: • Head • Primary terminals • Terminal box (at multi-terminal bushing) • Oil drain valve • Insulator at points of contact with head and base sections is an oil leakage detected, the unit is to be taken out of service.



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G	Inspect that the terminal box is clean and well sealed The terminal box must be kept clean, dry and free from insects. The vent hole in the bottom of the terminal box should be sealed with a piece of metal screen. If rainwater has entered the terminal box, inspect the rubber weather stripping of the door and if necessary tighten the stainless steel screw which holds the terminal-box door shut.		
H	Inspect porcelain insulator and clean if necessary Minor damage to the porcelain sheds can lead to hairline cracks, which are initially too small to see, and later to oil loss. In case of damage, a thorough examination is recommended. Heavy pollution of the insulators combined with moisture can lead to phenomena ranging from surface corona discharge to flash-over. Keep insulators clean in accordance with local (plant) experience and clean as necessary. Follow applicable safety rules when cleaning (also see IEC/TR 60815).		
I	Perform overall corrosion check on metal parts Inspect connections for corrosion, especially if unlike metals are in direct contact with one another. If necessary, improve corrosion protection by painting.		
J	Check temperature Internal damage can cause the external housing to heat up by more than 60°C above the ambient temperature. After energisation it may take as long as 20 hours for the final temperature to be reached. Measure the temperature on the head of the current transformer. This measurement should be performed within approx. 5 minutes after disconnection. Excessive temperatures (over 100°C) can also be detected by the vaporisation of water droplets sprinkled on the housing. A non-contact thermovision temperature measurement is recommended.		
K	Check oil Ageing of the oil is largely prevented by the complete sealing of the transformer. It is recommended that an inspection with removal of a sample be performed after 10 years of service. Sampling should take place only in dry weather; the method set forth in the separate instruction manual E 8291.1 should be used. The sample should be taken only by a trained specialist and analysed by a qualified laboratory. Trench has such a laboratory and trained experts. Whenever a sample is removed, the volume of oil withdrawn should be made up with new oil of the same quality and type. A measurement of the tan δ at 90 °C (IEC 60250), the breakdown voltage UD (IEC 60156) and the water content in the oil (IEC 60814) is recommended. Depending on the results of the oil test and other inspection procedures, Trench may recommend an oil change.		
		normal conditions or concentrations	limits units to be taken out of service
	tan δ at 90°C	< 0.1	>0.2
	UD in kV	> 60	< 50
	H2O in PPM at 20 °C	< 10	>20
L	Perform gas in oil analysis The sample should be taken only by a trained specialist, in accordance with instructions E 8291.1, and analysed by a qualified laboratory. Trench has such a laboratory and trained experts, who are also competent to interpret the results of oil in gas analyses. For additional information see IEC 60567. The contents of the following gases should be analysed: Hydrogen (H2), Carbonmonoxide (CO), Carbondioxide (CO2), Methane (CH4), Ethan (C2H6), Ethylen (C2H4) and Acetylene (C2H2). The dissolved gases can show partial discharges (PD), discharges of low and high energy, thermal faults in oil and thermal faults in paper. Additional measurement of Oxygen (O2) and Nitrogen (N2) can be important for indication of leakage and information of the quality of oil sampling. For additional information see IEC 60599.		
	Values of the following gases in vpm, µl/l	normal conditions or concentrations	limits units to be taken out of service

	H_2 CO CO_2 CH_4 C_2H_6 C_2H_4 C_2H_2	< 300 < 330 < 900 < 30 < 25 < 4 < 1	> 1000 > 1000 > 2000 > 75 > 70 > 25 > 10
	Partial discharge measurement The PD Measurement as diagnostic tool can only be used if there are suitable equipment to measure on-site (see IEC 60270). For tests in the laboratory the limits of IEC 60044-1 are recommended. Because of the high noise on-site the partial discharge is not recommended for routine check of the instrument transformers, but only as additional information method.		

4.4 Spare parts

For any kind of repair please contact Trench.

5 Onward Transfer

5.1 Resale

Trench has to be informed about every resale of the transformers. Otherwise every liability has to be rejected. In case of resale the re-seller has to hand over the complete equipment (**including this manual**). Every liability because of not following the above rules is in the hand of the re-seller.

5.2 Shut down procedure

If the transformer is taken out of service for a longer period of time the instructions in section 2.2 has to be followed.

5.3 Disposal

Used insulating oil : Mineral oil according to IEC 60296

The oil is transparent and free of particles. It does not contain PCB (no detectable).

For the production of this transformer only environmental friendly materials are used.