Transforming know-how into reliable energy. Siemens Transformers.

TUMETIC and TUNORMA – Oil-Immersed Distribution Transformers

Power Transmission and Distribution

SIEMENS

Transforming high standards into leading solutions

TUMETIC distribution transformer
with hermetically sealed tank

TUNORMA distribution transformer
with conservator

On the last transformation step from the power station to the consumer, distribution transformers provide the necessary power for systems and buildings. Accordingly, their operation must be reliable, efficient and, at the same time, silent.

Under the names TUMETIC® and TUNORMA®, oil-immersed distribution transformers from Siemens meet all these requirements daily again. In thousands of applications, under extreme climatic conditions and in the smallest space – in distribution systems as well as in industrial plants. What these transformers stand for can be summarized in one single word: Quality.

More than 100 years of experience – reliable partnership

The extraordinary quality is based on more than 100 years of experience of the pioneer in transformer technology – Siemens. Experience you take advantage of in all phases of your project: From technical advice via layout, design, manufacture, transport and commissioning up to the Siemens Transformer Life Management.

Oil-immersed distribution transformers from Siemens: Systematic quality …

Oil-immersed distribution transformers from Siemens are manufactured in accordance with our quality management system – certified to EN ISO 9001. Compliance with important standards, from IEC to VDE, is a matter of course, just as much as the exclusive use of high-quality materials. Qualified employees implement the demanding standards in daily practice.

So, quality is the logical result of a universal philosophy.

Checking means security – in production and testing

Every transformer consists of a large number of individual components which must interact smoothly in operation.

The high quality of Siemens transformers is therefore guaranteed by adhering to strict quality standards in production – all of them compiled in a quality assurance manual, which is also at the disposal of our customers.

Each manufacturing step is accompanied by quality checks – partly as a self-check with the associated evidence, partly by instructed quality experts. Final testing or acceptance tests are exclusively performed in the testing laboratory. And if you like to join the test of your transformer: Welcome!

State-of-the-art technology – tested and documented

Besides the routine tests for all transformers, we also take over the type and special tests on request.

For Siemens, however, quality assurance is even more. We support you in every respect as regards equipment monitoring and operation. And due to the fact that further improvement of the transformer technology is accelerated by the knowledge from daily operation, we offer you a continuous exchange of experience – for our common advantage.

Each of our factories is regularly checked for compliance with the quality guidelines by independent bodies.

… even with regard to environmental aspects

The protection of our environment and economic use of resources is more and more in the focus worldwide. This applies both to nature and growing cities, where power supply and industrial plants are often installed directly close to buildings, households and people. All Siemens factories work in accordance with an environmental management system certified to EN ISO 14001.

With Siemens transformers you are also on the safe side regarding environmental protection and sustainability. For especially high demands we offer special designs – as the following examples show:

- Environmental protection by alternative coolants and transformer fluids: Here, mineral oil is the most common, but not the only option. Ester and silicone are to be recommended for special requirements as regards fire safety and ecology (see also page 7 “Transformer fluid”)
- Everything is all right in water protection areas – by designing the tank as a double tank
- No problems with radiation: Siemens offers low-radiation transformers complying with the strict Swiss standards – and conforming to the future European standards already today.

Oil-immersed distribution transformers from Siemens: Exactly matching your demand

The decisive factors for the layout of a distribution transformer are just your requirements, which we use for adjusting the different parameters – from the rated power to the vector group, from the coolant to the taps.

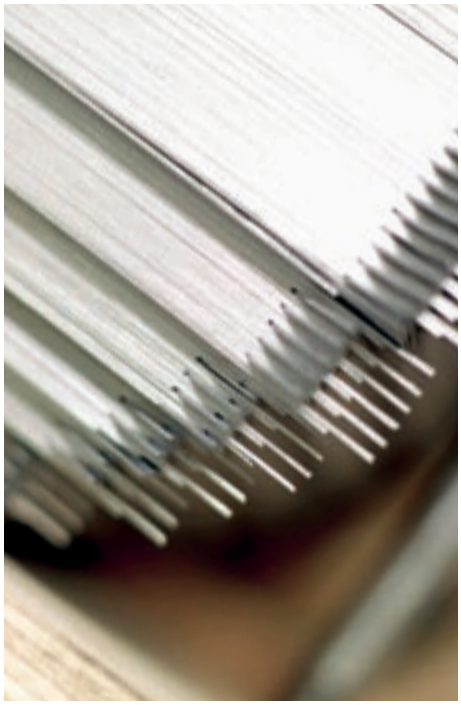
Of course the most different combinations are possible, which results in custom-made distribution transformers for almost every field and place of application.

Tailored to the requirements of practice – an example:

An urban industrial plant requires an especially ecological transformer. The Siemens solution fully meets this requirement – from biodegradeable transformer fluid up to extreme reduction in radiation. The sound level is at the limit of audibility, and the loss values are really acceptable – with no-load losses 30% below the lowest loss range C which is presently defined in the European standards.

Custom work – in macrocosm and in microcosm

Low losses, low noise: The iron core



Whether in design, manufacturing methods or materials – the cores of Siemens transformers represent the latest state of technology. The silicon-alloyed electric sheet steel used is grain-oriented, cold-rolled and insulated on both sides, guaranteeing low losses and noise – and these values are even improved by laser treatment.

Numerically controlled cutting machines provide for careful treatment in the cutting process in order to avoid mechanical tension in the core and thus unwanted properties right from the beginning. Standard use of step-lap cutting additionally minimizes losses and noise.

Systematically safe: The winding

The winding as the centerpiece of the transformer must be especially protected – both against high electrical stress due to external overvoltages and against mechanical overloads by short circuits.

Siemens transformers are systematically designed to meet these requirements. The windings are made of copper or aluminum. Low-voltage windings are made of strip or flat wire, and the high-voltage windings are manufactured from round or profile wire. The use of insulating paper that is partially coated with epoxy resin ("diamond-dotted paper") bonds the winding into a compact block while drying and increases the short-circuit capacity additionally.

The layer insulation is adapted to the occurring alternating voltage strain in daily operation. Large-scale oil channels are provided in order to secure sufficient cooling of the windings and to avoid "hot spots". All leads are short-circuit and surge-proof, contributing to the high reliability of the transformer – with an above-average service life.

Tightness decides: The tank

Whether during transport or operation – the tank must be absolutely tight under mechanical stress. Preconditions to achieve this are constructional experience, the most modern calculation methods and high-quality welding work.

Special attention is paid to corrosion protection. Pretreatment of the surface by sandblasting contributes to corrosion protection, just like multicoating with preset drying times for each layer. On request, hot-dip galvanization provides for even better protection.

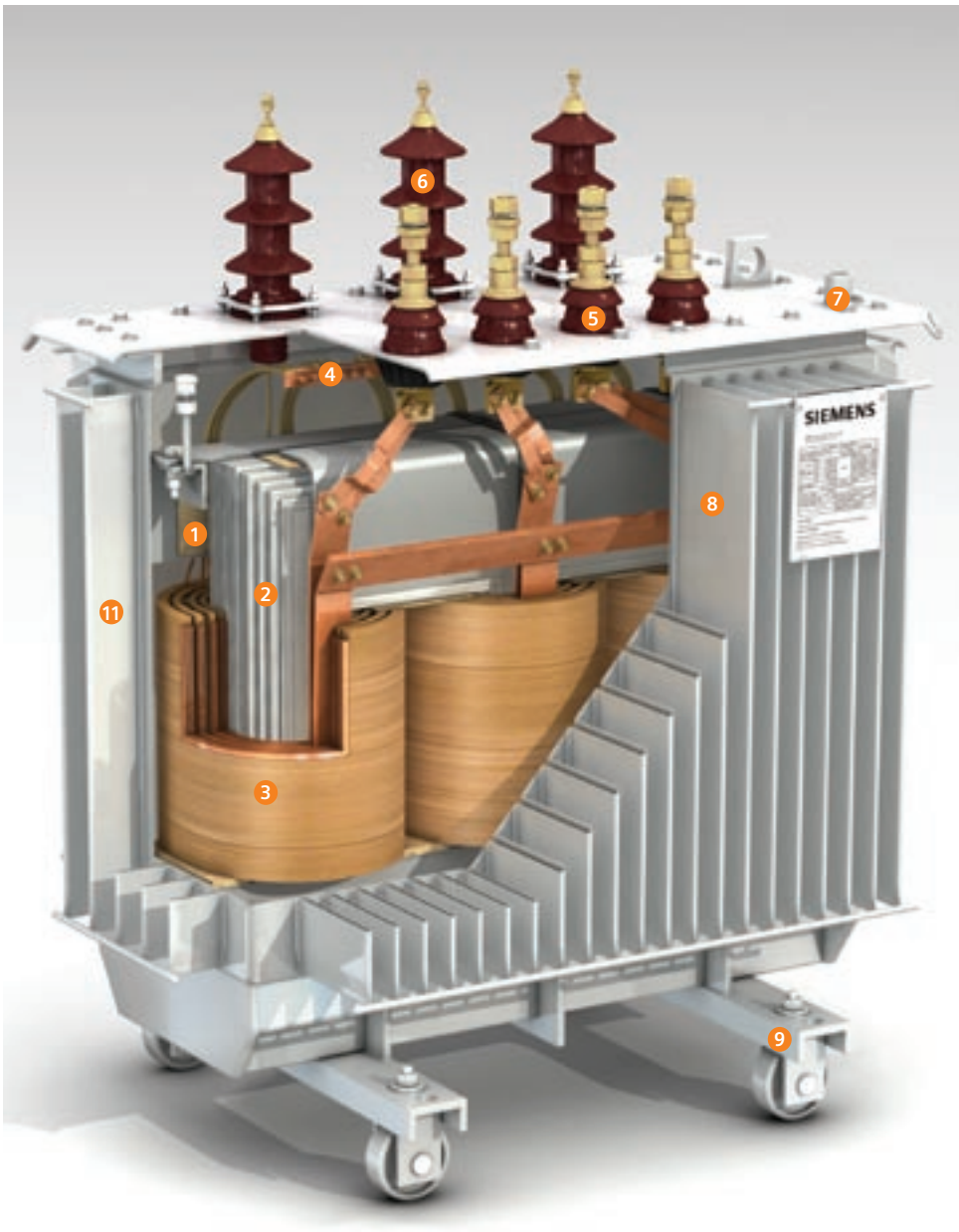
The tank must dissipate the entire heat loss of the transformer into the ambient air. This makes the volume of the transformer fluid change. In hermetically sealed transformers, the corrugated walls absorb the change in volume. In the case of expansion tank transformers, the conservator compensates this change.

The sheet-steel lids of Siemens transformers are bolted together with the tank – or welded on request. In any case the steel thickness and the bracing is dimensioned in such a way that the lid withstands the stress of transport and operation.

From oil to ester: The transformer fluid

Insulating and cooling – these tasks represent high requirements for the transformer fluid: It must be insensitive to high temperatures, to the influence of air oxygen and catalysts; furthermore it has to be resistant to aging and noncorrosive. Siemens uses the adequate fluid for each customer requirement and application:

- **Mineral oil**, which complies with the specifications of the international standards for insulating oils, IEC Publication 60296 – for distribution transformers without special requirements
- **Silicone oil**, which is self-extinguishing in case of fire. Due to its high fire point above 300 °C it has been classified as a K-liquid according to IEC 61100.
- **Ester**, which is nonhazardous to water and has a very good biodegradability. Additionally, ester offers high fire safety due to its high fire point above 300 °C, and has also been classified as a K-liquid according to IEC 61100.



Oil-immersed 630-kVA distribution transformer TUMETIC:
View into the inside

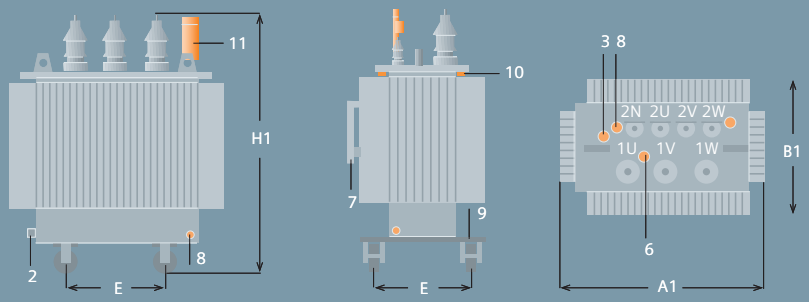
1. **Core and windings**
   Both are held together by a pressed structure and bolted together with the tank lid. The complete unit can be lifted out of the tank.
2. **Core**
   High-quality electric sheet steel, most modern core design and optimized lamination provide for low-loss and noise-optimized operation.
3. **Windings**
   Construction and materials guarantee a long service life.
4. **Tap changer**
   Used to adjust the ratio to the local voltage conditions. It can be adjusted from outside in de-energized condition.
5. **Low-voltage bushings**
6. **High-voltage bushings**
7. **Thermometer bag**
   Important accessory for temperature monitoring.
8. **Tank**
   The TUMETIC design shown here is hermetically sealed. Elastic corrugated walls take up the volume changes of the transformer fluid.
9. **Truck**
   Plain transport wheels can be aligned for longitudinal or transversal movement.
10. **Conservator**
    In the TUNORMA type, it is equipped with an oil level indicator and a filling socket.
11. **Corrosion protection**
    The surface gets a multicoating in the standard color cement gray (RAL 7033). Special colors or galvanization are possible.

Perfectly prepared for any task – whether “standard” or “special”

TUMETIC and TUNORMA – two transformer types, many applications. The standard design already covers a wide range of requirements, but as we know from long years of experience, special applications ask for special solutions. That is why Siemens offers a wide variety of useful additional solutions, assembly appliances and devices. Here are some examples:

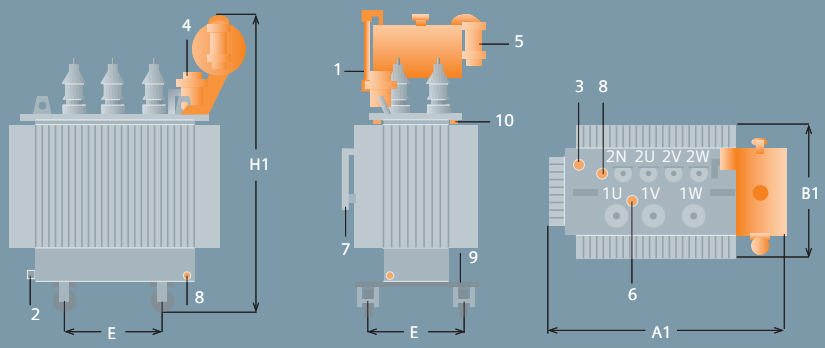
- Safe-to-touch outside-cone and inside-cone plug-in bushings on the high-voltage side instead of porcelain bushings
- Transformer connection terminals on the low-voltage side with or without covers.
- Bar bushings on the low-voltage side with or without covers.
- Air-filled cable connection boxes for special protection requirements.
- All relevant protection and monitoring devices for distribution transformers.

TUMETIC distribution transformers
(hermetically sealed tank)



2 Oil drain valve
3 Thermometer pocket
6 Adjustment facility for tap changer
7 Rating plate (movable)
8 Earthing terminal
9 Pulling lug, ø 30 mm
10 Lashing lug
11 Filling tube

TUNORMA distribution transformers
(with conservator)



1 Oil level indicator
2 Oil drain valve
3 Thermometer pocket
4 Buchholz relay (on order)
5 Dehydrating breather (on order)
6 Adjustment facility for tap changer
7 Rating plate (movable)
8 Earthing terminal
9 Pulling lug, ø 30 mm
10 Lashing lug

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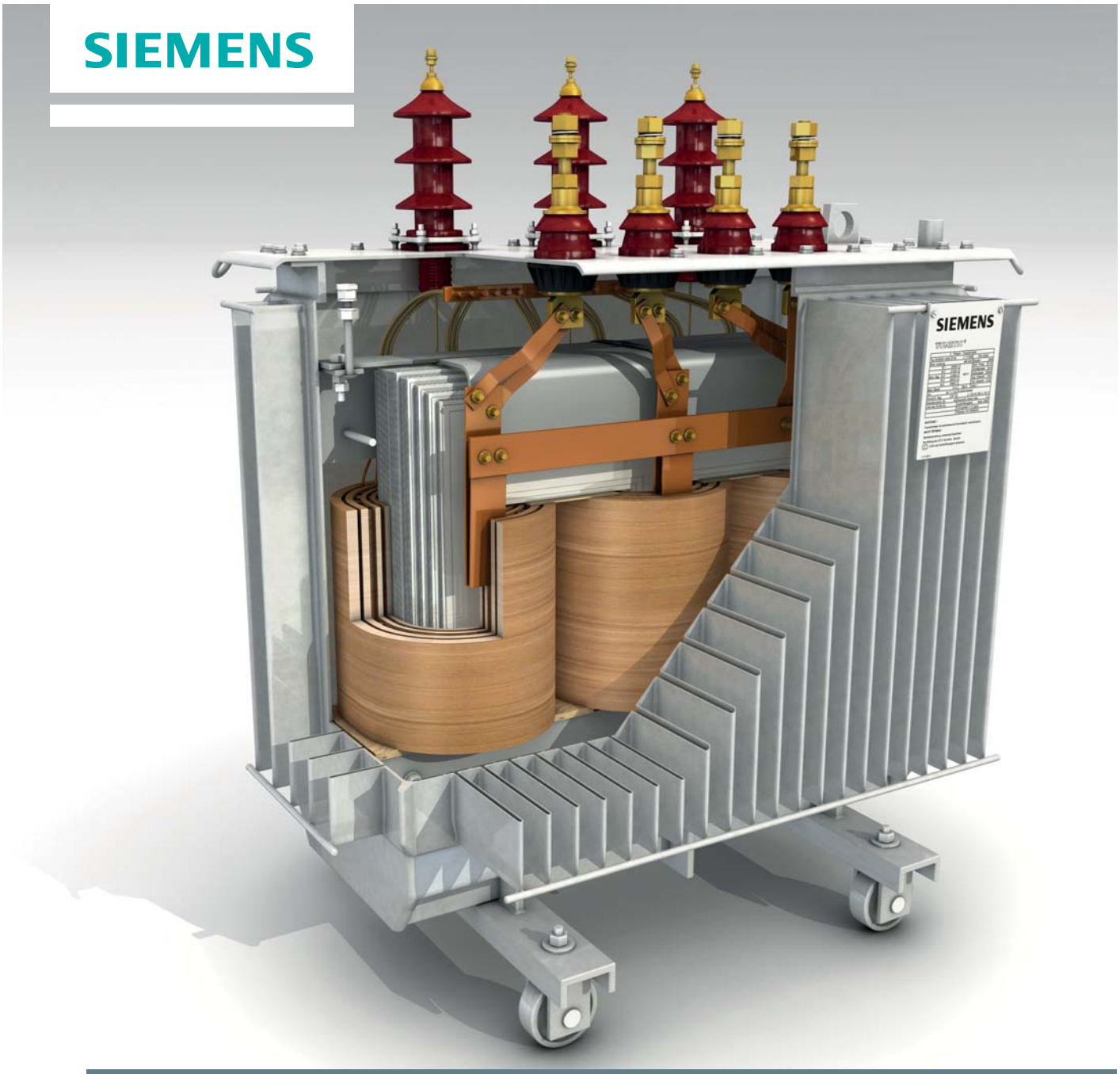


Operation and Maintenance Instructions

Hermetically sealed liquid-immersed distribution transformers 50 to 2500 kVA

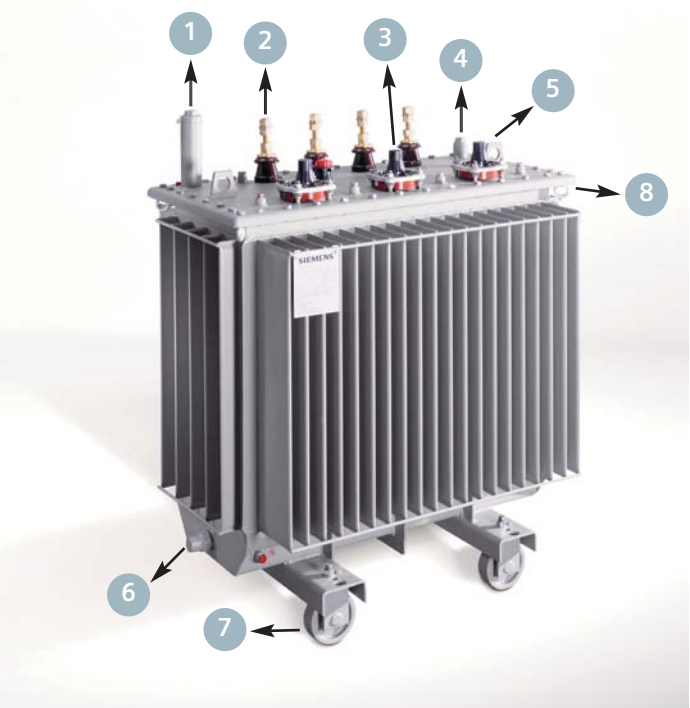
Hermetically sealed liquid-immersed distribution transformers 50 to 2500 kVA

Operating Instructions

Contents Page

Application Area

These operating instructions are for hermetically sealed liquid-immersed three-phase distribution transformers with rated power of 50-2500 kVA and up to max 36 kV equipment voltage. They are also applicable for single-phase transformers.
The instructions are generally valid for mineral oil-immersed transformers, but equally applicable if any other liquid is used for insulation.
See chapter on cooling and dielectric liquid.



Hermetically sealed transformer, completely immersed in liquid, tank with flexible corrugated wall

1 Liquid filling tube (if applicable)
2 Low voltage bushing
3 High voltage bushing
4 Thermometer pocket (if applicable)
5 Lifting lug
6 Drain valve (if applicable)
7 Rollers (if applicable)
8 Lashing lug

Description

Tank

Hermetically sealed liquid-immersed distribution transformers are usually made with cooling fins. All four sides are made of corrugated metal plates that are welded together on the four corners. Some special tanks have cooling fins on only 1, 2 or 3 sides.

The number, depth and length of the cooling fins are calculated in such a way as to provide a safe dissipation for the heat generated inside the transformer. The cooling fins of the transformer tanks provide the necessary mechanical stability and resist cyclical pressure changes for the entire lifetime of the transformer.

At the bottom of the transformer tank (in the “basin”), you can find the drain valve as prescribed by EN 50216-4. Its purpose is to drain the cooling liquid. Some models are made without a drain valve.

The lower frame equipped with rollers is connected to the basin. The rollers (if applicable) can be easily adjusted for lengthwise or crossways moving.
The earthing of the transformer can be provided by M12 earthing bolts. See the outline drawing (to be found among the transport documentation) for the exact position of earthing bolts.
At the shorter end of the cover there is a thermometer pocket as prescribed by EN 50216-4. Its exact location is marked in the outline drawing. Some models are made without a thermometer pocket.

The liquid filling tube serves for filling up with liquid and also as the holder of a safety tool (safety valve or hermetic safety device). Some models are made without a liquid filling tube; in their case liquid should be drained through the filling opening on the top cover of the transformer.

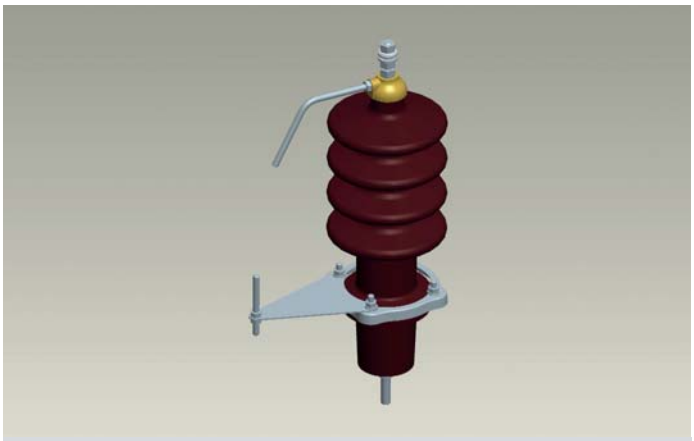
Tap changer

Tap changers are placed horizontally under the cover. They serve to change the tapping of the high voltage coils, and to switch between serial-parallel or delta-star connections of coil sections.

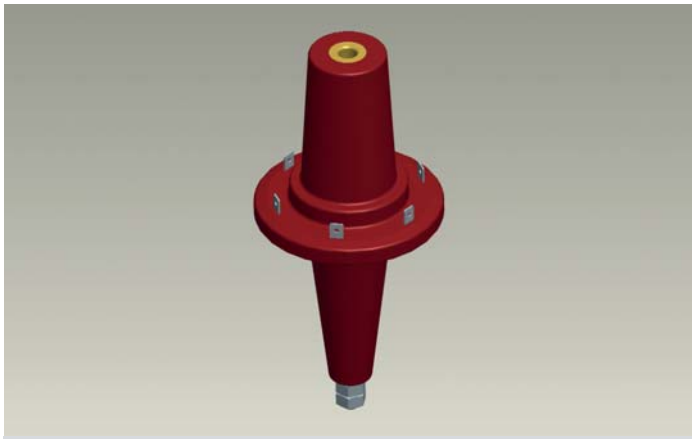
Operation of the top changer is possible on the cover, only if the transformer is de-energized.

Bushings

Bushings used on the high voltage side are usually according to Standard EN 50180. Frequently used models:



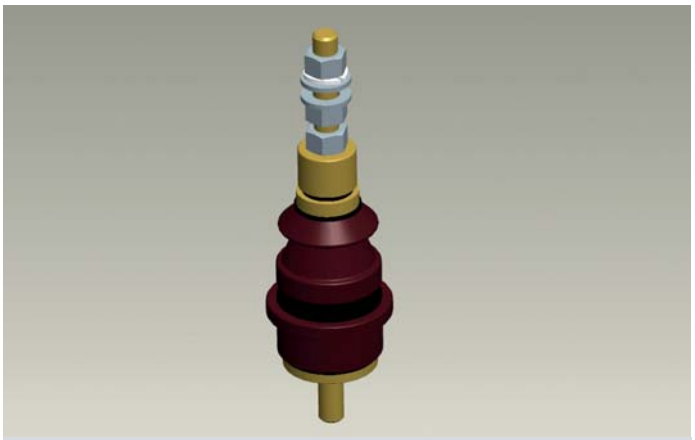
Porcelain bushing (Um=12-36 kV; Im=250-1000 A)



Plug-in outer cone bushing
(Um=12-36 kV; Im=250-1000 A)

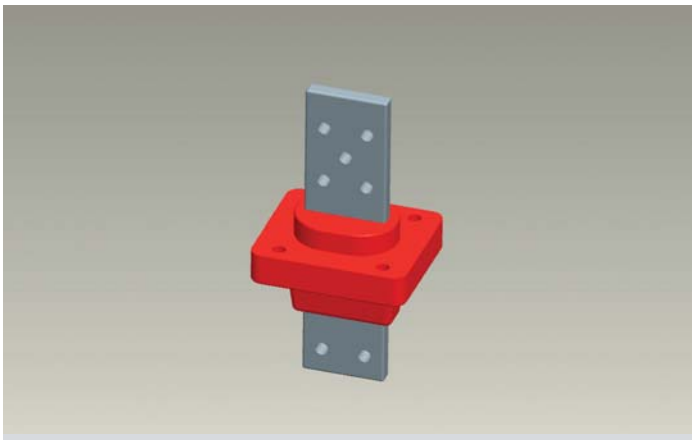
Plug-in inner cone bushing
(Um=12-36 kV; Im=250-1000 A)

Bushings used on the low voltage side are usually selected from among the following models:



Porcelain bushing
as per standard EN 50386
(Um=1.1 kV; Im=250A - 3150A)

Porcelain bushing
as per standard DIN 42539
(Um=3.6 kV; Im=250A - 3150A)



Busbar bushings
as per standard EN 50387
(Um=1.1 kV; Im=250A - 2500 A)

The connection parts of the low voltage bushing can be different according to client's specifications (see on the outline drawing).

Upon client's request, the high voltage porcelain bushings may be equipped with coordinating spark-gaps in order to provide curved diversion against impulse voltage. The size of the spark-gap between the horns can be changed. For the recommended values, see the outline drawing.

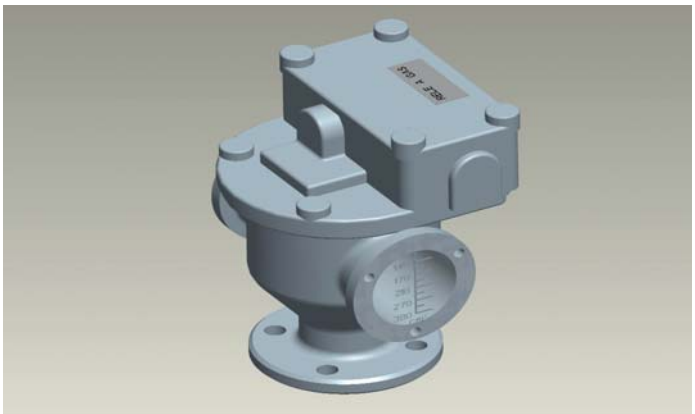
Safety devices

Thermometer

As an option, different types of temperature measuring devices can be connected to the transformers. All of these are built in to the thermometer pocket on the cover, serving to measure the temperature of the liquid in the warmest part, right under the cover. The so-called dial type thermometers are equipped with a local screen and one or more contact points. A separate device should be used for the evaluation of the PT100-based sensors' signals. (The model delivered is provided on the outline drawing, and the original manual is included.)

Gas relay

As an option, transformers may also be ordered equipped with a Buchholz (gas) relay installed onto their cover. The Buchholz relay accumulates gases deriving from any internal fault of the transformer and the air that may get into the transformer through leaks. The error alert is generated by embedded electrical contacts. (The model delivered is provided on the outline drawing, and the original manual is included.)



Pressure relay

As an option, transformers may also be ordered equipped with a pressure sensor installed onto their cover. The pressure sensor has the function of giving an alert if the overpressure generated inside the transformer exceeds the value set by the manufacturer. The error alert is generated by embedded electrical contacts. (The model delivered is provided on the outline drawing, and the original manual is included.)

Integrated safety device

As an option, transformers may also be ordered equipped with an integrated safety device installed onto their cover. The integrated safety device provides information about temperature, pressure, liquid level and gases formed due to internal fault. A detailed description is available in the original manual of the device. (The model delivered is provided on the outline drawing, and the original manual is included.)

If the safety device is installed at a later stage, it is important to read the instructions regarding the opening of Siemens transformers (see Installation).

Cooling and dielectric liquid

Transformer oils are made from mineral oils through distillation and refining.
They have a low viscosity; their density is around 0.86 g/cm^3 at 20 °C; their flash point is between 140 and 160°C and their dielectric characteristics are excellent.

Quality requirements are set by standard IEC 60296. The transformer is filled up with a liquid according to the client's request. The default type can be found on the rating plate and in the technical description.

Waste treatment, disposal: used transformer oil qualifies as hazardous waste as per Directive 2000/532/EC on the list of hazardous waste, where it is coded 13 03 07* EWC, among mineral-based non-chlorinated insulating and heat transmission oils. Waste treatment should be in accordance with corresponding legislation.

Upon the client's request, the transformer can be filled up with silicon liquid as well (as per standard IEC 60836) or synthetic organic ester (as per standard IEC 61099). These must never be mixed with mineral oil. The default dielectric liquid type can be found on the rating plate and in the technical description.

Safety Instruction

Signal terms and definitions

DANGER!

The signal means that physical injuries may occur if the required safety rules and instruction are not kept.

➠ Always comply with the safety instructions.

ATTENTION!

The signal means that product or environmental damage may occur if the relevant safety rules are not kept.

➠ Always comply with the safety instructions.

General instruction

Independent of the safety instruction specified in this description, local rules, regulations, directives and standards regarding the operation of electrical equipment, as well as the protection of labour, health and the environment, are valid.
The five safety rules of electrotechnics must be kept during the maintenance of the products and their parts described in this manual:

– De-energising
– Ensuring that there is no switching-back
– Verifying uncharged (off-voltage) state.
– Earthing and short circuiting.
– Enclosing or covering adjacent parts under voltage.

Proper use.

The Transformer and its accessories are in compliance with the legal rules, prescriptions and standards valid at the time of delivery. They are suitable for proper use with a high level of safety.

DANGER!

Requirements for the trouble-free and safe operation of the transformer:

- Always take into consideration Operation and Maintenance Instructions
- Employ only qualified personnel.
- Ensure that transport and storage of the device are done in a professional way.
- Ensure that the installation and commissioning of the device are done in a professional way.
- Pay close and continued attention to operation and maintenance.
- Observe the installation, operation and safety regulations valid at the site of installation.

DANGER!

In case of faulty transport, falling units can cause injury to persons or damage to the unit.

- Make sure that the lifting and transport devices suit the requirements of composition and load capacity.
- Ensure even load distribution and centre of gravity.
- In case of rigging by crane, make sure to use all lifting lugs as indicated on the outline drawing. Asymmetric lifting may lead to damage to the product or physical injury.
- The transformer can only be moved by fork lift truck by lifting it on the spots marked with stickers. Ensure even load distribution and be aware of the risks of tipping.

Checking after delivery.

Transformers leave the factory filled up with liquid and ready for operation. Their completeness and intactness must be checked upon arrival to site.

Should there be any damage done to the product, responsibilities and allocation of costs should be discussed with the transporter, if possible, in the presence of a Siemens representative. The factory, too, should be informed via the Siemens representative.

ATTENTION!

Detailed information on liquid leakage in the "Liquid leakage" chapter.

Installation

Siemens transformers can be installed indoors or outdoors. The type of the product can be found in the technical description.

ATTENTION!

Relevant standards regarding installation and safety, as well as the instructions of safe operation issued by the local authority, should be strictly followed.

If the transformer is an indoor type, it must be installed in a covered space, in a so-called transformer cell. Ventilation of the cell should be ensured to provide proper cooling for the transformer.

The transformer should be positioned at an appropriate distance from the walls of the cell in order to allow unobstructed airflow for the cooling.

If the transformer is installed equipped with rollers, at least two of the rollers have to be fixed to prevent displacement.

If standard transformers are installed at an altitude higher than 1000 m it has to be considered that, with the increase in altitude and the decrease in the air's density, the dielectric strength of the air - a determining factor in the external arching distances (approximately 6% decrease per 500 m) - also decreases. The dissipating heat volume of the tank and hence the performance of the transformer, therefore, also tend to decrease (by about 2% per 500 m).

Preparation for operation

Separately shipped temperature measuring and controlling devices (if any) have to be screwed into the thermometer pockets filled with oil.

Unused thermometer pockets should also be filled up with oil to prevent corrosion. The pockets are sealed with a 1" screw-plug.

The safety devices are usually equipped with a connection. The connections have to be connected to the circuit leading into the control room (see original user manuals of the devices and the wiring diagram).

All screws and all threaded joints have to be checked for tightness. Screws connecting to the bushings have to be tightened with the nominal torque set in chart no. 1. These torque values are set assuming the use of grease or oil lubricant. The torque value has to be

verified after a few weeks, and the screws have to be tightened if needed.

Nominal current	250 A	630 A	1250 A	2000 A	3150 A
Bushing stem (copper or bronze)	M12	M20	M30	M42	M48
	20 Nm	70 Nm	-	-	-
Bushing terminal (steel bolt)	M12	M12	M12	M12	M12
	40 Nm	40 Nm	40 Nm	40 Nm	40 Nm

For other connecting parts please follow the manufacturer's instructions.

Chart no. 1 nominal tightening torque

The tank and cover have to be earthed in accordance with the specifications.
Hermetically closed transformers are completely filled up with liquid. There is no need to check the liquid level. Upon the client's request an liquid level indicator can be included; in this case we enclose specific instructions for the liquid level indicator.

Preliminary Checks

Check the data provided on the rating plate on the transformer tank. If the transformer is operated in parallel with another transformer, particular attention should be paid to the voltage ratio, the vector group and the impedance voltage. The tap changer should be set to a system voltage matching the supply network voltage, and the same is true for the other commutators (if the transformer is a dual voltage device).

Reliability of the earthing should be checked. Bushing insulators should be cleaned. The functioning of the Buchholz (gas) relay should be checked (using the test button), and the temperature control device should also be checked according to the operating manual.

As a quick check-through and in order to ensure that there is no serious damage done to the device that cannot be seen externally but may have been done during transport, it is advisable to check and verify uninterrupted conduction, as well as the insulation resistance between the windings and between the windings and the earth by an isolation resistance meter (e.g. a 3000V one by Megger).
In a new transformer the insulation resistances are normally more than 1000 Mohms.

It is of fundamental importance to make certain that the insulators are clean and dry during testing.

The voltage ratio has to be controlled with an appropriate measuring instrument at every tapping position and/or at every tapping outlet. The result has to be the same at all three phases.

After these preparatory measures the transformer can be connected to the network. Afterwards it can be run with no load, then loaded. If, however, the transformer is operated in parallel with another one, it is necessary to make sure, before the establishment of the parallel connection, that there is no potential difference between the corresponding terminals of the transformers.

Operation

Operation under nominal conditions

The transformer operates under nominal conditions if nominal current runs on the secondary side, while nominal voltage is connected to the primary side. The full load secondary voltage is different from a nominal no-load voltage, and this is caused by the voltage change due to the load current that also depends on the power factor of the load. The change in voltage, when converted to the secondary nominal voltage, is proportional to the load current and at nominal current it can reach the impedance voltage value given in the rating plate. Inductive load causes voltage drop, while capacitive load (negative power factor) causes voltage increase.

Overload capacity

Standard IEC 60076-7 Loading guide for oil-immersed power transformers forms the basis of the load capacity of oil immersed transformers with universal validity, in which life span is taken into account. It is necessary to remember that the observed oil temperature values that can be measured at overload are not indicative of the actual temperatures of the coils.

Star-point load

The following type of continuous load is permissible on the secondary terminals of the three-phase transformer:
For a Yyn vector group, it is 10% of the nominal current, while in the case of a Dyn, Yzn or Dzn vector group it is 100% of the nominal current.

Maintenance

In general

ATTENTION!

Maintenance can only be performed by qualified and authorized personnel, in full compliance with the rules of technical safety.

Before any maintenance operation is performed, all switches before and after the transformer must be switched off. Every line connection must be short-circuited and earthed. Standard EN 50110 must be observed.

Siemens transformers have low maintenance needs.

Siemens' hermetically sealed liquid-cooled transformers must not be opened and its bushings must not be de-aerated.

Hermetical sealing ensures that no moisture gets into the insulating liquid of the transformers; never therefore take an liquid sample from the transformer.

Tightness

It must be checked that the transformer runs with no oil leak at standard operating temperature.

Tap changer

If the transformer voltage ratio needs to be changed, the tap changer of the de-energized transformer should be switched through all the tapping positions several times in order to clean the contact surfaces. After this, the desired transfer ratio can be set based on the connection diagram.

Safety devices

Operation of the safety devices should be checked according to the enclosed original manuals.

Bushings

Bushings have to be cleaned and checked for potential damage, and the proper position of the arcing horns. The fixing and the lead out screws have to be tightened if needed.(see chart no. 1.)

Earthing

The earthing of the transformer must be checked.

Filling up the dielectric liquid

Low liquid levels can cause serious damage to the transformer. If you are not sure whether the transformer is in proper condition, please contact a Siemens representative before a liquid refill.

Though the dielectric liquid needed for filling was obtained directly from the transformer's manufacturer or from the liquid's manufacturer in sealed barrels, the condition of which seems entirely satisfactory, it is still advisable to check the dielectric stability of the liquid in every barrel.

Hoses, pumps and containers used for filling must be cleaned beforehand and flushed with the new, treated liquid.

Should the transformer be urgently opened, for example for mounting a protective device in contact with the liquid, repairs, replacing a bushing or a gasket, the procedure is as follows:

ATTENTION!

On transformers without a filling tube and/or a drain valve, a professional repair involving the hermetic seal can only be carried out with tools ordered from the manufacturer. Contact a Siemens representative.

1. Drain the cooling and dielectric liquid through the drain valve, until the flow stops.

2. Take the threaded nut off the filling tube or take the protective device off and drain the liquid until the liquid level is approximately 50 mm below the cover (check it through the filling tube with a level meter).

3. Carry out the necessary work on the transformer.

CAUTION!

The contents of the liquid's safety data sheet must be kept in order to avoid injuries or damage to health, and the necessary personal protective equipment must be provided.

Hermetic sealing of the transformer

Hermetic sealing of the transformer must be performed at 20 °C (tolerance ± 3 °C), according to the following:

1. Fill up the transformer and the filling tube with cooling liquid. Meanwhile the transformer has to be tilted by approx. 10° so that the filling tube is in the highest position and any air bubbles can come up.

2. De-aerate the High Voltage porcelain bushings (if applicable).

3. Fill up the filling tube completely, put back the screw-plug or the protective device and the gaskets, and then seal the transformer.

4. No change in pressure through liquid drain should be made unless otherwise stated in the rating plate. (Do not take off the screw-plug or the protective device again.)

Spare parts

When ordering spare parts, the type and serial number of the transformer must be given. Both can be found on the rating plate.

Troubleshooting

Liquid leakage

If a leakage continues for a long time at a threaded connection point, the gasket will become damaged and lets in the air and, with it, moisture will get into the transformer. It should first be attempted to tighten the screws, and if this yields no result the gasket must be replaced. The material of the gaskets depends on the dielectric liquid used.
In the case of mineral oil and synthetic organic ester: oil resistant rubber (NBR)
If silicon liquid and any other dielectric liquid is used, please contact a Siemens representative to help choose the appropriate type of gasket.
If a liquid leakage is discovered along the welds, call our service team by all means.

DANGER!

It has to be ensured that dielectric liquid from the transformer does not get into the ground, sewers, surface water or groundwater.
A slight dribble or leakage can be collected with liquid-absorbing cloths or wipes. In the event of a larger amount of spillage or flowing, the spread of the liquid must be prevented through confining it using liquid-absorbing materials (sand, sponge loop, sewer seal, to be followed by removing it with liquid selective materials. The resulting waste is hazardous waste, and all relevant regulations must be followed during its treatment.
If the dielectric liquid caused environmental pollution, the responsible authorities must be informed according to the regulations.

Liquid temperature too high

If the environmental temperature exceeds the maximum environmental temperature (usually 40°C), ventilation must be increased. To check against transformer overload, currents must be measured. Requirements of parallel operation must be checked (nominal ratio, nominal short circuit impedance), and also the settings of the tap changer if the transformer is connected parallel to the busbar. Check the thermometer, too.

Safety device becomes active

If the transformer is shut down by any of the safety devices, please do not switch it back on without identifying the reason for the activation of the safety device. Further details can be found in the original user manual of the safety device.

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SIEMENS

Vedlikeholdsbeskrivelse for oljefylte transformatorer TUMETIC og TUNORMA

1 Rengjøring

Intervall for vedlikehold bestemmes etter behov og vil avhenge av omgivelser og miljø, men årlig rengjøring vil normalt sikre god driftssikkerhet (pålitelighet). Klut/fille og varmt vann vil være nok i de fleste tilfeller, såfremt transformatoren ikke står i industrielt miljø med korrosiv atmosfære. Da kan kjemikalier evt. såpe benyttes.
NB! Det er viktig å fjerne støv, skitt, salt, fett etc. fra isolatorene.

2 Sjekking av oljekvalitet

2.1 Transformator med ekspansjonstank, TUNORMA.
Kontroller oljenivået i ekspansjonstanken, vent med evt. etterfylling.
Når oljen er ny vil den være blank eller lys gul, men med tiden vil oksidasjonen gi oljen en stadig mørkere farge. Dette er normalt dersom det skjer gradvis over tid.
Oljen har en viss evne til å holde vann oppløst. I ekspansjonstanken vil oljen bli nedkjølt. Dersom det er oppløst vann tilstede vil vannet kondensere til mikroskopiske dråper, som igjen slår seg sammen til synlige dråper.
Vann er tyngre enn olje og vil derfor legge seg som synlige blærer i bunnen av ekspansjonstanken. Vannet kan normalt fjernes ved å åpne plugg/krane under ekspansjonstanken. Dersom nødvendig kan man ta av inspeksjonsglasset(ene) og gjøre rent innvendig med en klut. Fyll på ny olje.

2.2 Silika Gel ventilator eller tørkeapparat.
Silika Gel ventilator har evnen til å absorbere fuktighet fra luft og vil forandre farge til gul når den opptar fuktighet. Skjer det, må den taes ut og tørkes i ovn.
Silika Gel tørkeapparat fungerer som ventilatoren, men har innebygget tørkeenhet, og er vedlikeholdsfri.

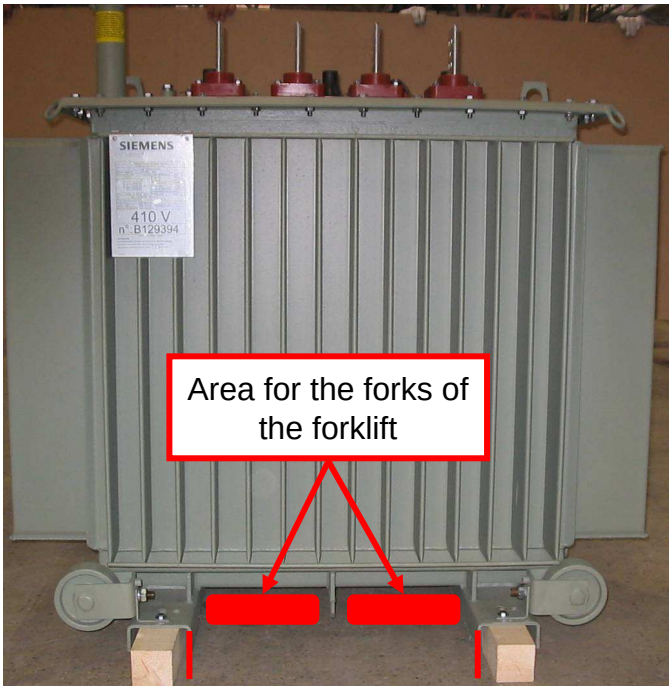
2.3 Hermetisk tette transformatorer, TUMETIC.
Kontroll av oljen skal ikke utføres untatt ved feil og reparasjon.

3 Nettstasjons-transformator.

3.1 Skifte av transformator.
Nettstasjonen er koblet fra nettet.
Følg alle sikkerhets- og driftforskrifter vedr. jording av ALLE innkommende kabler og linjer.
Skru av løfteboltene på taket til nettstasjonen, og ta av taket.
Frigjør transformatoren og løft den ut.

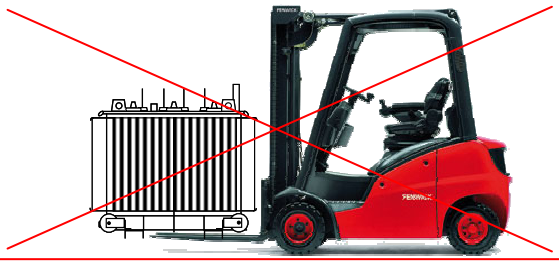
Attachment 2.CONDITIONS OF LOADING / UNLOADING

Handling transformer with forklift truck

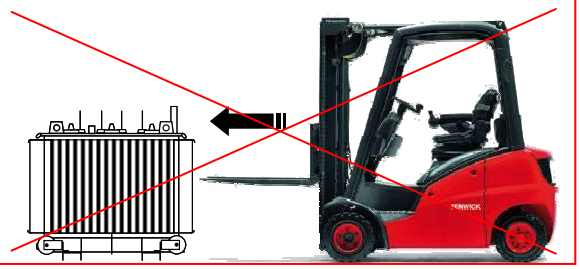


between
395 mm and 545 mm

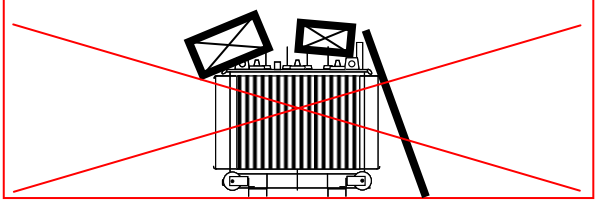
DO NOT TAKE THE TRANSFORMER BY THE SIDE



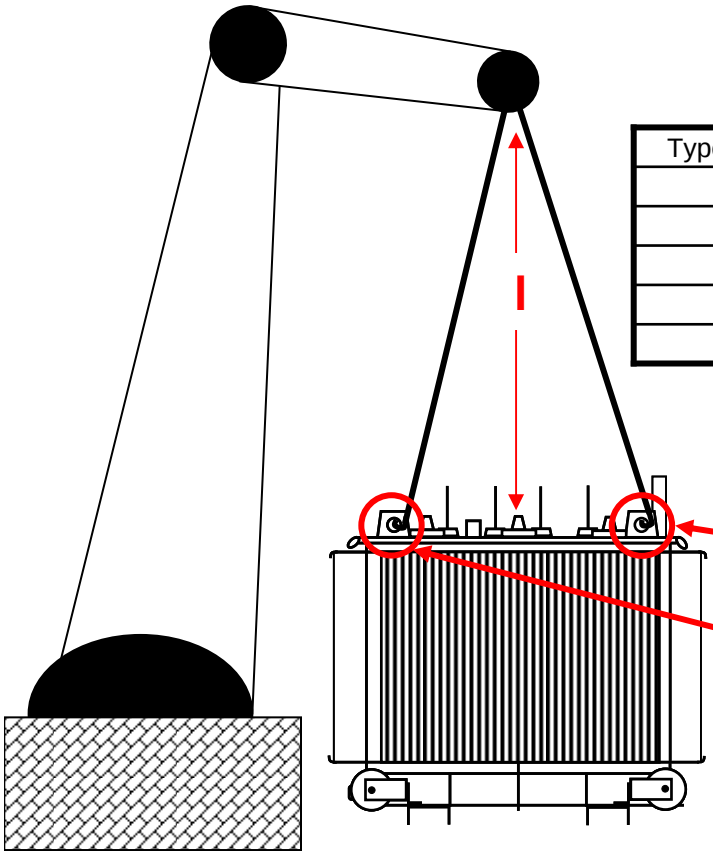
DO NOT PUSH THE TRANSFORMER



DO NOT LAY ANYTHING ON THE TRANSFORMER



Handling transformer with crane



Respect the minimum length of the belts

Type of transformer	Minimum length of belt (l en mm)
160 kVA	2470
250kVA	2520
400kVA	2750
630kVA	2800
1000kVA	3240

Pick up the transformer by the hooks on the top