GEAFOL- / CARECO-
Cast-resin transformer

Operating instructions

siemens-energy.com

Edition 04/2025

Content:

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Warning notice concept

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent material damage. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to material damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ **DANGER**
Indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ **WARNING**
Indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ **CAUTION**
Indicates that minor personal injury can result if proper precautions are not taken.

NOTICE!
Indicates that material damages can result if proper precaution are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their education and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING!

Siemens Energy products may only be used for the applications described in the catalog and in the relevant technical documentation. If products or components from other manufacturers are used, these must be recommended or approved by Siemens Energy. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Disclaimer of liability

We have reviewed the contents of this publication to ensure consistency with the product described.

Nevertheless, deviations cannot be excluded, so we do not guarantee complete compliance. The information in this printed document is regularly reviewed, and necessary corrections are included in subsequent editions.

1 General information and safety instructions

1.1 General information

Note
Siemens Energy AG does not accept any liability for damage and failures that result from the non-compliance of these operating instructions.

The present operating manual is part of the delivery of GEAFOL-/CARCEO transformers. Keep the operating instructions near the transformer. Read the operating manual before handling the transformer and follow the instructions. This ensures a hasard-free and trouble-free operation.

Note
For a special version of the transformer or the transformer with additional devices, the special contractual agreements and technical documents apply in addition to this operating manual.

Please note the additional operating manual provided.

The described transformer corresponds to the technical standard at the time of printing this operating manual.

Siemens Energy AG reserves the right to change individual components and accessory parts in the interest of further development. The changes serve to improve the performance and safety. The significant features are retained. The operating instructions are always being updated with new contents.

The latest version of the operating instructions, the installation declaration, and conformity can be found on the Online Support:

https://www.siemens-energy.com/global/en/home/products-services/product/geafol-dry-type-distribution-transformers.html

If you have any technical questions, please contact Technical Support

(kirchheim-sck.energy@siemens-energy.com)

Or the contact addresses on the back of these instructions.

1.2 Intended use

The transformer is inteded for use in commercial sector.

The transformer is built and delivered according to the latest state of technology. Unauthorized change affect operational safety and are not permitted.

The transformer is designed for the application described in the technical data or the requirements of the EN 60076-11 standard. Do not operate the transformer outside the specified power limit. Different operating conditions require an additional contractual agreement.

1.3 Basic obligation

The company operating the unit must ensure that all persons assigned to work on the transformer have read and understood these operating instructions and that they comply with them in all points in order to:

- To avert danger to life and limb of the user and third parties.
- Ensure the operational safety of the transformer.
- Prevent loss of use and environmental damage due to incorrect hangling.

Comply with the following safety instructions:

Perform work on the transformer only when there is no voltage.

Secure the transformer against unintentional switch-on, e.g. looking the key switch. Place a warning notice at the drive connection point which clearly indicates that work is in progress on the transformer.

Carry out all work carefully and with “safety” in mind.

Observe the relevant regulations on occupational safety and environmental protection during all work.

Pay attention to the information on the transformer’s rating plates. The rating plates must be free of paint and dirt. Replace any missing or illegible rating plates.

Immediately switch off the transformer in case of unexpected changes during operation.

Secure the transformer with appropriate protections against approach or contact.

Take appropriate protective measures to prevent accidental contact with parts and equipment that heat up to over +70 °C.

Store fastening materials for safety devices securely when removing them. Reattach the removed safety devices before commissioning.

Do not place objects on the transformer.

Do not perform welding work on the transformer. Do not use the transformer as a ground point for welding work.

Carry out equipotential bonding in accordance with applicable regulations and guidelines by electrical engineering specialists.

Observe the permissible tightening torques oft he fastening bolts.

Replace bolt that have become unusable with new bolts in the same strength class and design.

Siemens Energy AG only assumes the warranty for original spare parts.

The manufacturer who installs the transformer in a plant must include the regulations contained in the operating instructions in its own operating instructions.

Do not climb/step on the transformer, attachement or the switching connection tubes.

If you have any questions, please contact the manufacturer's factory (See back of these operating instructions).

1.4 The five safety rules

For your personal safety and to avoid material damages, always follow the safety instructions and the following five safety rules according to EN 50110-1 "Working in a de-energized state" during all work. Apply the five safety rules in the order listed before starting work.

Five safety rules :

1. Disconnect – Also disconnect the auxiliary circuit

2. Secure against reconnection

3. Determine the absence of voltage

4. Ground and short-circuit

5. Cover or enclose neighbouring live parts

1.5 Particular types of hazards

DANGER!

High Voltage!
Do not approach the transformer or remove protective covers until the transformer is de-energized.

WARNING!

Extreme surface temperatures!

There is a risk of burn on hot surface above +55°C.
Measure the surface temperature before working on the transformer.
Do not touch the transformer as long as the surface temperature is not below +55°C.

WARNING!

Sharp edges and corners!
General risk of injury due to sharp edges and corners.

WARNING!

Risk of falling!
Do not climb on the transformer.
Only use self-locking climbing assistance.

WARNING!

Magnetic field!
The transformer generated a magnetic field.
People with pacemakers must stay at least 3 m away from the transformer.

1.6 Information on occupational safety and protective equipment

Read the instructions!

Wear protective gloves!

Wear safety glasses!

Wear safety shoes!

Secure the transformer against being switched back on during work!

Please contact us in case of defects or unclear operating conditions!

2 Scope

These operating instructions apply to cast-resin transformers in three-phase or single-phase design including all special transformers such as converter and star point transformers of the series

GEAFOL / GEAFOL Neo; Typ 4G... and
CARECO / CARECO Neo; Typ 4G...

3 Usage

Unless otherwise agreed, the transformers are designed in accordance with the applicable standards for the following cooling air values:

- 40 °C at any given time
- 30 °C monthly average of the hottest month
- 20 °C annual average

Cast-resin transformers for installation heights above 1000 m above sea level are identified as such on the rating plate, which indicates the maximum permissible installation height.

3.1 Classification in accordance to IEC 60076-11

GEAFOL-/CARECO Transformers fulfil the classes defined in EC 60076-11.
The respective version can be found on the nameplate (See Chap. 4.3)

Environmental class E

The environmental class takes into account air humidity, moisture precipitation, and pollution.

Environmental class	Description
E0	No condensation, contamination negligible
E1	Occasional condensation, Contamination possible to a limited extent, Proof through testing
E2	Frequent condensation or heavy contamination, or both at the same time, Proof through testing

GEAFOL/CARECO: Standard E2

Fire class

The fire class takes into account the possible fire consequences.

Fire class	Description
F0	Special measures to limit the fire hazard are not provided
F1	The characteristics of transformer limit the fire hazard, Proof through testing

GEAFOL/CARECO: Standard F1

Climate class

The following climate classes are available for GEAFOL/CARECO transformers:

Climate class	Temperature for Transport and storage	Operation
C2*)	to -25°C	to -25°C
C3)**	to -40°C	to -25°C
C4	to -50°C	to -40°C

*) Standard for CARECO-transformers
**) Standard for GEAFOL-transformers

Corrosion protection

The corrosion protection, is carried out according to ISO 12944 based on the customer's specification in the following classes:

Corrosion protection class	Description
C2H	e.g. Interior, rural areas
C4H	e.g. Industrial atmosphere. Coast
C5H	e.g. aggressive atmosphere, Offshore
CX	Extreme

GEAFOL/CARECO: Standard: C2H, C4H,
other classes on request

Frequency of energization

The frequency of energization on is limited max. 3 times a day, max. 50 times a year, unless otherwise agreed.

Load shedding conditions for machine transformers

Max. voltage rise during load shedding 140% of U_{nenn} for max. 5 seconds.

Operating conditions

The requirements at the installation site according to IEC 60076-11, chap. 4.2 must be observed, in particular with regard to :

- Grounding of the transformer
- Protection of the transformer against overvoltages
- Waveform of mains voltage
- Symmetry of the applied voltage
- Environmental conditions concerning biological environment conditions, chemically active substances, mechanically active substances, mechanical conditions

Regenerative mode

CAUTION!
The transformer may only be used in regenerative mode (Step-Up) with an appropriate protective device.

4 Description

4.1 Transformer components

The transformer consists of the following components:

1 **Low-voltage connections**
2 **Lifting lugs**
3 **Lashing lugs**
4 **High-voltage connections**
5 **Delta connection**
6 **Grounding screw**
7 **Lower press frame**
8 **Transport wheels**
9 **Pulling lugs**
10 **High-voltage tapings**
11 **Casted high-voltage winding**
12 **Terminal block for sensors**
13 **Upper press frame**
14 **Low-voltage winding**

Image 4-1: Components of the GEAFOL NEO cast resin transformer (Notice: This image is a standard and does not cover all Types form)

Core

Only double-sided insulated, grain-oriented, cold-rolled electrical sheets are used for the iron core.

The leg and yoke cross-sections are graded with different sheet widths.The outer legs have a bevel cut. The legs and yokes are connected with 45° cuts and the middle legs with an arrow cut in the yoke transition. Optionally, special plates are used to reduce noise.

Windings

The high-voltage coils are made of aluminum or copper foil and high quality insulating foils. Several individual coils are connected in series and form a winding strand, which is casted with casting resin under vacuum.The winding ends and the taps are guided on threaded bushings and casted. The low-voltage coils are made of aluminum/copper strips and resin-impregnated insulating foils (prepreg).

Insulation

The insulation structure is dimensioned according to the surge voltage distribution. It ensures freedom from partial discharche up to twice the rated voltage, as well as thermal resistance and mechanical strength.

Support

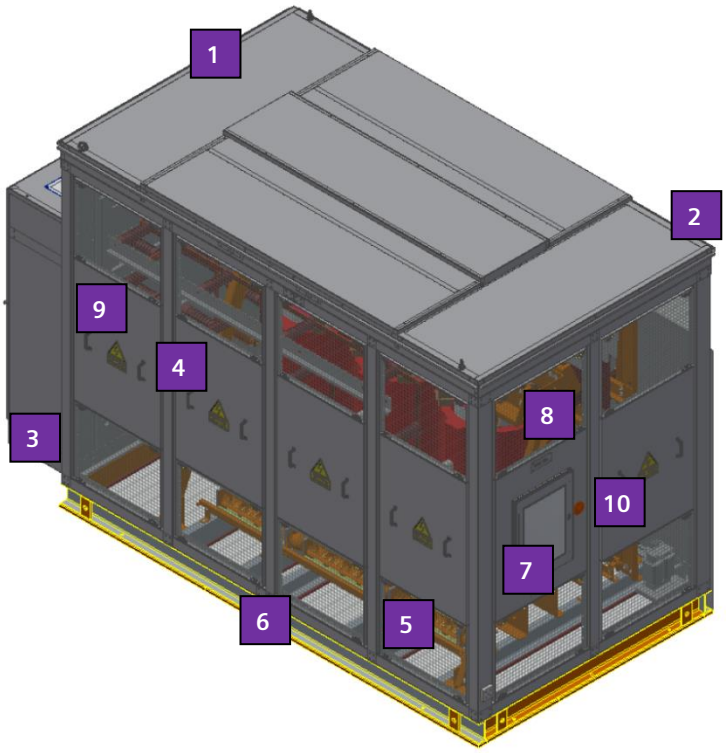
The press construction tailored to the special characteristics of the band/foil windings and the elastic clamping of the coils ensure both high short circuit strength and a very low noise level.

With GEAFOL/CARECO Neo there is no need to clamp the coils.

4.2 Components of the enclosure

The transformer consists of the following components:

1. Roof
2. Rain gutter
3. Ventilation grid
4. Cover with grab handle
5. Enclosure frame
6. Base frame
7. Control box
8. Nameplate
9. Warning stickers
10. Remote display thermometer



4.3 Information on nameplate

On the transformer and the enclosure (if available) there is a nameplate with the rated values and define operating conditions.

Notice!
The information provided on the order-specific nameplate may differ in scope, order, and values from the following example of the nameplate.

Description of the information on the nameplate:

1	Manufacturer name
2	Type name
3	Product description
4	Manufacturing code Siemens-Energy
5	Series numbers
6	Grounding bolt
7	Reference standard
8	Year of construction
9	Rated High-voltage()
10	Rated Low-voltage (
11	Rated frequence
12	Vector group according to IEC 60076-1 Chap. 7
13	Cooling type (AN = Air natural, AF=Air forced -With fan)
14	Enclosure protection class IP-class
15	Transformer weight
16	Rated current
17	Voltage
18	Rated current
19	Max. Voltage
20	Insulation level/ Test voltage
21	Impedance voltage
22	Max. short-circuit duration
23	Temperature Class HV/LV according to IEC
24	Environment-/Climate-/Fire protection class
25	Application according to the relevant standard
26	Switchable connection voltage HV
27	Current strength during cooling type
28	Current strength during cooling type
29	No-load power loss P_0
30	Short-circuit power loss Pk
31	Core material code
32	Matieral winding HV
33	Matieral winding LV
34	Electr. No-load performance
35	Energy efficiency measured
36	Energy efficiency guaranteed value
37	Core mass
38	Coil mass HV
39	Coil mass LV
40	Manufacturer address
41	Country of origin of goods
42	Order number Siemens Energy
43	Matrix code in the link to SE page
44	Logo regarding conformity to standard
45	Wiring HV, LV
46	HV Voltage at switching position

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43

High Voltage: 1V, 1U, 1W

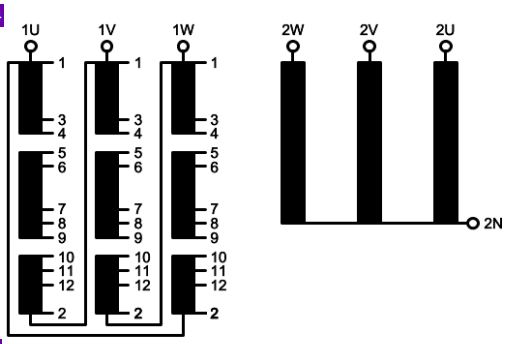
45

Low Voltage: 2V, 2W, 2U

GEAFOL Neo 2 44

3	Three - phase dry type transformer for indoor installation				
4	Type 4GY6467-1EC	S.-No. 5 K843640		IEC 60076-11: 2018	6
	Rat.capacity	7 2500 kVA		Year 2023	8
				Rat.freq. 50 Hz	11
		10		Vect.group Dyn11	12
9	Rat.volt. 8-11;4-5 20000 V	415 V		Type of cool AN	13
				Enclosure IP00	14
				Tr.-weight 7.12 t	15
16	Rat.current 72.2 A	17 3478 A		Encl.-weight t	18
19	Um 24.0/1.1 kV	Insul.level		AC50-LI125 / AC3	20
21	Imped.volt 19 10.5 %	Max.sh.-circ.-duration		2 s	22
		Therm.class HV/LV		F / F	23
24	Environmental / climatic / fire behaviour classes: E3 / C3 / F1				
25	Rectifier transformer EN 61378-1 K:13				
26	HV reconnectable 20 / 15 kV				
27	Rated current (AN, 2500 kVA): HV1 72.2 A /HV2 96.2 A / LV 3478 A				
28	Rated current (AF, 3500 kVA): HV1 101 A /HV2 134.7 A / LV 4869 A				
		P0 measured value 29 2.986 kW			
		Pk measured value 30 5.610 kW			
31	Core material GOES	Core mass 37 4.08 t			
32	Nature of conductor HV AL	Conductor mass HV 38 1.30 t			
33	Nature of conductor LV AL	Conductor mass LV 39 0.52 t			
34	Electrical power required for no-load operation: Pc0 0.00 kW				
35	PEI measured value %	KPEI measured value			
36	PEI guaranteed value %				

H4ELZ131 D-73230 Kirchheim 40 Made in Germany 41 39657047 42



High Voltage 46					
Voltage V	Connections		Voltage V	Connections	
21000	9 - 10	4 - 5	16000	9 - 10	3 - 6
20500	8 - 10		15500	8 - 10	
20000	8 - 11		15000	8 - 11	
19500	7 - 11		14500	7 - 11	
19000	7 - 12		14000	7 - 12	

5 Transport, incoming goods, storage

5.1 Unloading, lifting with crane

⚠ **WARNING!**
The crane system and lifting device must be designed for the weight of the transformer! (The weight of the transformer is indicated on the nameplate).

Observe the national requirements regarding workig with heavy loads.

CAUTION!
Do not push or pull the delta switching connection during loading.

GEAFOL/CARECO transformers can be lifted using the lifting lugs provided for this purpose on the upper press frame. The lifting lugs are marked with a pictogram (Image 5-1).

The transformer must be lifted and transported with four individual strands. The instructions on the warning signs at the lifting lugs must be observed (see image 5-2, 5-3).

⚠ **WARNING!**
The crane hooks must be hooked into the upper press plate from the outside to the inside (see image 5.4).
If this is not possible, then shackles should be attached to the lifting lugs.

ATTENTION!
The crane hooks must only rest on the lugs.
The size of the crane hook must be selected accordingly. (see image 5-5).
The crane hooks must not touch the upper yoke under any circumstances (see image 5-6).

Pressing the crane hooks in the upper yoke leads to damage to the upper yoke.

NOTICE!
When lifting with load handling devices, small paint damage may occur at the lifting points. This damage has no effect on the use or service life of the transformer.

Image 5-1: Marking lifting lugs for crane hooks

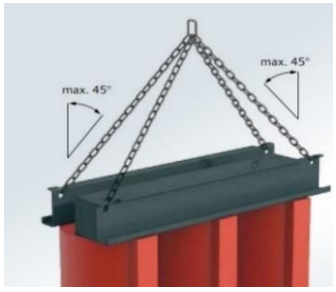


Image 5-2: Correct lifting of the transformer on 4 lifting lugs

Image 5-3: NOT correct lifting of the transformer

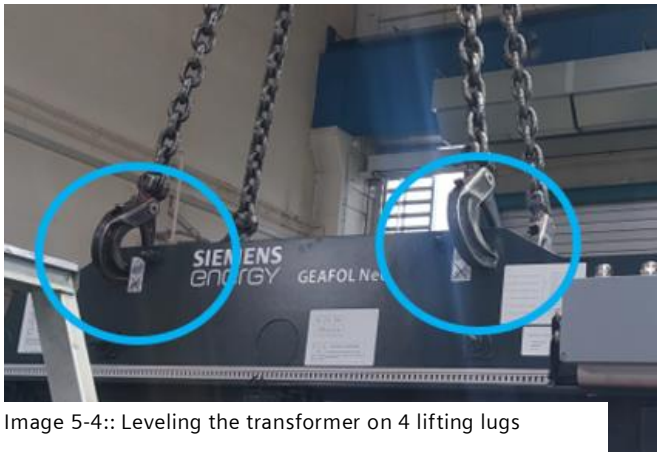


Image 5-4:: Leveling the transformer on 4 lifting lugs

Image 5-5:: Crane hook with distance to upper yoke

Image 5-6:: Crane hook rests on upper joke

5.2 Transport by road and sea

NOTICE!
This specification does not replace the legal requirements for load securing. The country-specific legal requirements for load securing must be complied with.

⚠ **WARNING!**
Loading and transport of the transformer may only be carried out in the direction of travel!

The transformer is designed for acceleration of 10 m/s² or 1,0 g in all directions during transport. For this, the transformer must be fixed as follows.

To fix the transformer to the loading area, an anti-slip mat must be used or the transformer must be fixed to the cross members on the floor of the loading area. Tie-down straps are then attached to the lashing lugs of the upper press frame from the inside. (see image 5-4).

The tie-down straps must not rest on the coils or the leads. When tensioning the tensioning straps, ensure that the tension is applied evenly to the opposite tensioning straps.

ATTENTION!
One-sided pulling on the tie-down straps can lead to a permanent inclined position of the transformer!

Road transport on an open trailer

If the transport is carried out with an open trailer (low-loader), it is necessary to cover the transformer completely with a tear-resistant and waterproof tarpaulin. The permissible clearance heights and road clearances must be clarified in advance.

Transport by sea

Only use seaworthy wooden crates for transportation by sea. During sea transportation, the package is subject to stresses that must be taken into account when selecting the means of transport, packaging and load securing.

For the manufacture and execution of seaworthy packaging, only the regulations of the current "Packaging Guideline of the HPE" must be taken into account.

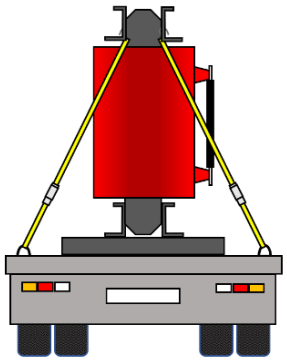


Image 5-7: Lashing the transformer to the loading area

Image 5-8: Lashing the transformer to the loading area

Image 5-9: Lashing the transformer to the loading area

Unloading and lifting with forklift truck

When using a forklift truck, the forks must be inserted into the transport bridges.

ATTENTION!
If forklift transport prohibition signs are placed on the lower part of the transformer, forklift transport is generally not allowed!

Forklift transports are only permitted if the transporter ensures that :

- The transformer is moved horizontally (Image 5-10) and
- Adequate protection against tipping over and falling is ensured, and
- Damage to the iron core located between the press frame and any other accesories, such as fan or grounding switches is safely prevented.

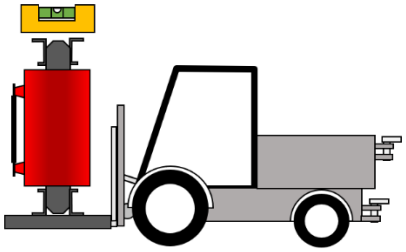


Image 5-10: Horizontal transport of the transformer with a forklift

Handling of transformers in wooden crates

Observe the markings on the crate regarding handling. Only attach the chains or slings required for transport by crane to the areas of the crate marked for this purpose.

If the crates are moved with the forklift trucks, please note the following points:

- Check the specified weight of the goods and ensure that the forklift has sufficient load capacity.
- Make sure that the forks of the forklift are long enough to prevent the goods from tipping over.
- Pay attention to the center of gravity of the crate and ensure that the goods are adequately secured, if necessary by additional tensioning/bracing.
- Be aware of your working environment and the limited visibility of the forklift driver.

with a forklift

5.1 Unpacking, examination

GEAFOL/CARECO transformers must be unpacked in covered areas and inspected immediately for transportation damage. All recognizable damage must be noted in the transport documents and confirmed by the supplier. The sender must be informed immediately in order to enable suitable claims settlement with the assistance of the transport insurer if necessary.

NOTICE!
When lifting the load handling devices, small paint damage may occur at the lifting points. This damage has no effect on the use or service life of the transformer.

Placement of accessories

Trigger devices and small parts are attached to the transformer at the connection tubes in a package using adhesive tape. Other accessories are attached to the substructure of the transformer in a package (Image 5-12).

The wheels of the transformer are openly attached to the wooden planks. For reasons of transport security, the wheels are bolted to the cross member instead of underneath it.

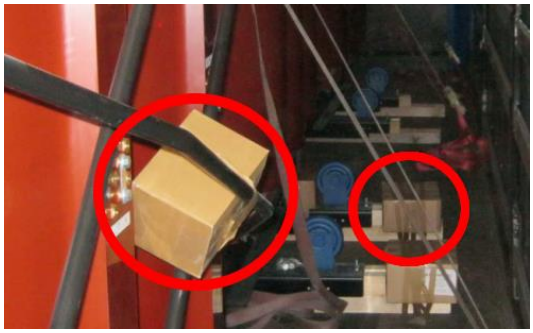


Image 5-12: Attachment of accessories

Data logger of vibrations (Optional)

At the customer's request or as specified by Siemens Energy, transformers are equipped with data logger sensors for continuous recording of vibrations. During the entire transport route, the device stores the vibrations that occur. The recorded data can be read out and transmitted wirelessly. Details can be found in the barcode on the product.

The data logger is located on the frame of the transformer. (See image 5-13)

In the case of transport damage, Siemens Energy may request the transmission of the data from the data logger from the customer.

Image 5-13: Data logger for vibrations

5.2 Storage of transformers

Storage environment

If the transformer is not put into operation immediately, it must be stored in a covered, dry room protected from the sunlight. For transport on-site or during any potential interim storage, the transformer must be packed in a protective foil. This effectively prevents the ingress of dust and foreign objects. To avoid the formation of condensation, a dehumidifier (e.g. Silica gel) must be added in sufficient quantities.

Image 5-14: Long-term packaging

Long-term storage

For storage exceeding 6 months, seaworthy packaging must be carried out. This effectively prevents the ingress of dust and foreign objects.

The desiccant must be replaced after 12 months, and the condition of the goods must be checked. Then the foil of the transformer must be cleaned again.

5.1 Moving, bringing in

Assembly and moving with wheels

Wheels can optionally be attached to move the transformer. For transformers with base frames, wheels can be mounted with thru axles. The wheels can turned 90°.
In this case, the thru axles are secured with locking tabs on both sides (Image. 5.15)

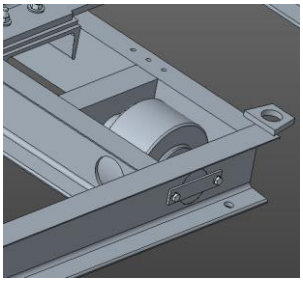


Fig 5-15: Wheels with thru axle and securing

To attach the transport wheels, the transformer must be placed on a substructure so that the transport wheels can be attached.

When a transformer is moved on wheels, the lifting lugs in the lower press frame should be used as point of application. (see image 5.16)

Image 5-16: Transformer with wheels and lifting lugs on the lower press frame

The tie rod between the towing vehicle and the transformer must be mounted as horizontally as possible (see image 5.17).

⚠ **WARNING!**
Do not pull abruptly or from above on the lashing lugs. (Danger of tipping over)

⚠ **WARNING!**
The transformer only with a rigid connection.

⚠ **WARNING!**
The center of gravity of the transformer is in the upper half. Make sure that you transport the transformer horizontally.

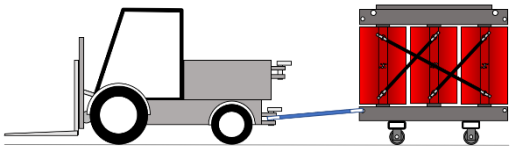


Image 5-17: Moving the transformer on wheels with pull rod

⚠ **WARNING!**
Moving the transformer on the transport wheels is only permitted on a solid, level surface.

NOTICE:
Moving the transformer on the transport wheels is permitted up to max. 50m.

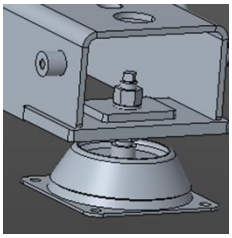


Image 5-18: Moving the transformer with transport wheels

If the transformer is equipped with machine feet (option), these may only be installed after the transformer has reached its final position.

Use the threads on the machine feet to align the transformer horizontally and tighten the bolt to secure it.

Transport locks and stiffeners for transportation

CAUTION!
Transformers may be fitted with transport locks, which must be removed before installation. These transport locks are marked with a yellow signal color or a sticker (Image 5-19).

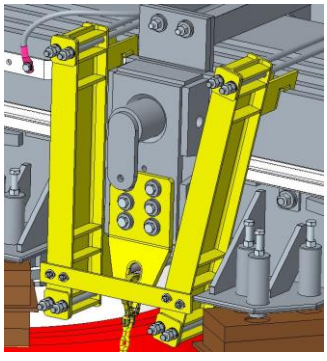


Image 5-19: Stiffeners for transportation

⚠ **WARNING!**
If these transport locks, including threaded rods or other clamping devices are not removed, the transfoprmer can be destroyed when switched on!

5.2 Lifting the transformer on support plates (Optional)

For a slight lifting of a transformer weighing over 20 tonnes, support plates are optionally attached to the side of the base frame (see image 5-20). A machine jack can be attached to each of these support plates.

WARNING!
Compare the sum of the lifting capacity of the individual machine jacks with the total weight of the transformer.

⚠ **WARNING!**
Do not lift the transformer only on a support plate! Always use all lifting points.

⚠ **WARNING!**
Do NOT lift the transformer at points other than the base frame.

⚠ **DANGER!**
Do not work under transformer as long as lifting rams are under load!

The lifting is done with hydraulic machine jacks in small steps. After lifting, the transformer frame is secured with a temporary stable support, e.g. with hardwood and lowered onto it. This reduces the risks of a machine jack failure.

After carrying out the relevant measure, such as placing an insulation mat or removing the wheels, the temporary support must be removed, and the lifting stamps of the machine jacks should be lowered evenly and slowly.

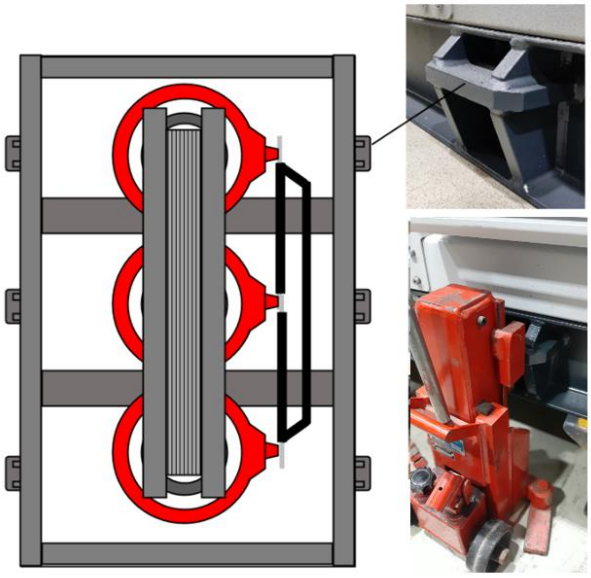


Image 5-20: Lifting of transformer with support plates

5.3 Enclosure (Optional)

Introduction

For transformers that have been installed in protective enclosures by the manufacturer, there are some special considerations that must be taken into account regarding the handling.

Delivery conditions

Depending on the size, the transformer is already fully installed in the enclosure. For large transformers, the upper part of the enclosure is supplied as a separate package and the transformer is located in the lower part of the enclosure.

Assembly aids on the enclosure

If required, eyelets are attached to the enclosure as mounting aids (see image 5-21). Please note that these eyelets are only to be used for the assembly/disassembly of the respective enclosure element, for example, the roof section. These eyelets are not sufficient to move the enclosure with the transformer.

⚠ **WARNING!**
Lifting the transformer by the lugs of the enclosure will lead to damage to damage to the enclosure and the transformer!

Moving the transformer with enclosure

Transformers that are installed in enclosures cannot be transported by forklift. The transport must only be carried out by crane. The slings or chains required for transport must only be attached to the transformer itself. For this purpose, it may be necessary to dismantle the roof part of the enclosure (Image 5-22).

Load securing during transport

If the transformer has a base frame (see red marking, figure 5-23), attach the clamping devices to the eyelets of the base frame.

If the transformer does not have a base frame, then the load securing is done at the core. For this purpose, the corresponding covers or ventilation grilles of the enclosure must be removed. In individual cases, it may be necessary to move a switch box mounted on the enclosure downwards in order to fix the tensioning straps to the core (Image 5-24). The cables of the control box are extended accordingly.

After the assembly of the enclosure, the disassembled parts must be returned to their original position in accordance with the dimensional drawing.

Image 5-21: Lugs/eyelets for lifting the enclosure

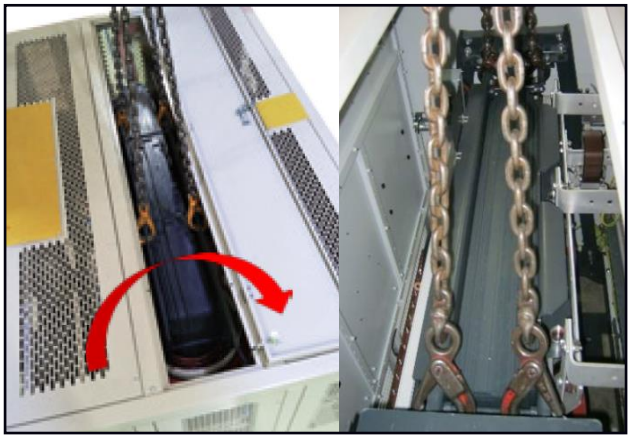


Image 5-22: Opening of the enclosure roof to attach the crane hooks to the transformer

Image 5-23: Opening of the enclosure roof to attach the crane hooks to the transformer

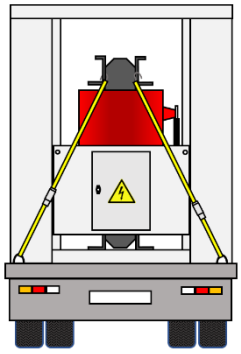


Image 5-24: Opening of the enclosure to fix the transformer during transport

5.4 Covers on switch tubes and high-voltage taps

Transformers of the GEAFOL-/CARECO COMPACT series have covers on switching connections and high-voltage taps (See image 5-25).

This covers are essential components of the insulation system. The transformer must only be operated if these covers are correctly installed.
Damaged covers must be replaced BEFORE switching on the transformer. A structural modification of the covers is not permitted!

⚠ **WARNING!**
Switching on the transformer with missing or damaged covers can cause electrical flashovers.

Image 5-25: Covers on switch tubes and HV taps

CAUTION!
The scews for fastening the switch tubes can have different lengths. Mixing up the screws can lead to the torque being reached without the switch tubes being pressed sufficiently against the contact surfaces.

Image 5-26: Arrangement of the washers on switch tubes on the HV connection

5.5 Installation

The transformer must be positioned on a stable, flat surface.

Cast-resin transformers should only be installed in covered, dry rooms or cells protected from sunlight (protection class at least IP 20). They are also suitable for outdoor installation (protection class at least IP 23) with the appropriate special coating and the use of an open-air enclosure.

GEAFOL/CARECO cast-resin transformers require a sufficient supply of fresh air to dissipate the heat loss. The guideline value is 200 m³ of fresh air per hour per kW of power loss; more informations can be found in the GEAFOL Planning guidelines.

5.6 Minimum clearances

It is important to ensure that the air gaps from the surface of the resin coils to the walls, busbars, grounded parts, and other elements are maintained in accordance with the relevant installation and safety guidelines. (see chart 5-1 and Fig. 5-14).

When installed at an altitude of over 1000 meters above sea level, the minimum distances according to Chart 5-1 must be increased by one percent for every 100 meters of elevation that exceeds 1000 meters.

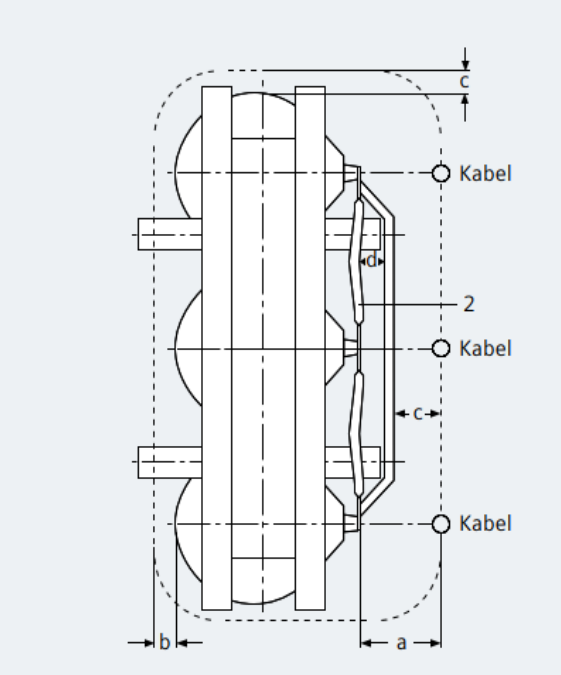


Image 5-27: Minimum clearances around cast-resin transformers with bare taps and delta connections

IEC 60076

Voltage class	Rated lightening impulse with stand voltage	Minimum clearances (see 5.27)			
[kV]	[kV]	a[1) 4)] [mm]	b[2)] [mm]	c[2)] [mm]	d[3)]
12	75	120		55	
24	95	160		85	
24	125	220		105	
36	145	270		125	
36	170	320		170	
52	250	480		300	
72,5	325	630		450	

CSA C22.2 No. 47-13

Voltage class	Rated lightening impulse with stand voltage	Minimum clearances (see image 5.27)			
[kV]	[kV]	a[1) 4)] [mm]	b[2)] [mm]	c[2)] [mm]	d[3)]
8,7	45	100		50	
15	60	130		55	
18	95	180		85	
25	110	250		125	
34,5	150	300		170	
46	200	450		300	
72,5	250	600		450	

IEEE (ANSI C57.12.55)

Voltage class	Rated lightening impulse with stand voltage	Minimum clearances (see image 5.27)			
[kV]	[kV]	a[1) 4)] [mm]	b[2)] [mm]	c[2)] [mm]	d[3)]
5	30	140		40	
8,66	45	165		50	
15	60	203		55	
24	110	279		125	
34	150	381		170	

1) If there are HV taps on this side, then the value in column a applies to the distance b, otherwise the value in column c applies.

2) Distance from bare live parts to walls or HV cable.
In the case of transformers with complete insulation at the outlets and switching tubes (bottom and top), the values of dimension c shall be used for the minimum distances of measure a.

3) The distance d between shift tubes is defined by the manufacturer's factory by design.

4) In practice, this minimum distance can be reduced if the dielectric tests are successfully completed.

Chart 5-1

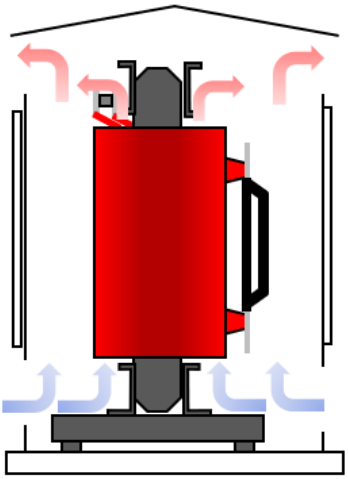
5.7 Ventilation of the transformer room

Heat loss occurs during operation of the transformer. It must be discharged from the transformer room.
A good cooling effect is achieved when the cooling air flows in from the lower part of the room and is discharged outside below the ceiling (see image 5-15).
The cooling type is shown on the nameplate. The code of the cooling type is shown in Chart 5-2.

Note:
A transformer designed to a defined rated power with natural air cooling, and for a higher rated power with forced cooling, is marked with AN/AF. This can be seen on the nameplate.

		Symbole
Coolant	Air	A
	Water	W
Coolant movement	Natural	N
	Forced	F

Chart 5-2: Symbol of the cooling type



5-28: Ventilation of transformer room

CAUTION!
Operate the transformer with at least the cooling type specified on the nameplate.

If the cooling effect is too low, a ventilation system can be retrofitted. Make sure that the ventilation ducts are not covered. If the supply air is heavily polluted, it must be filtered.

Make sure that there is no condensation above the transformer that steadly drips into the transformer.

If the transformer is regularly switched off for several days, make sure that no condensation occurs during this time.

6 Electrical connection

⚠ **DANGER!**
Cast-resin transformers are not safe to touch. Work must only be carried out in a de-energized state. In this context, the relevant regulations must be observed.

ATTENTION!
When connecting the transformer, do not step/climb on the switching connection tubes, high-voltage connections, busbars, or insulators!

CAUTION!
Foreign metallic objects in the coils can destroy the transformer! The coils must be covered during connection.

6.1 Cable routing

GEAFOL/CARECO transformers allow many connection combinaisons, both from above and below.
When connecting cables, care must be taken to ensure that they receive appropriate strain relief and are routed in such a way that the voltage clearances comply with the relevant regulations. The minimum clearances for cable connections must be observed in accordance with Chapter 5, Chart 5-1.

6.2 Connection of high-voltage

The connection to the high-voltage coils (HV) is made to the designated connection surfaces of the switching connection tubes or to connection terminals on the encapsulated safety edge or to the cast supports of the high-voltage coils (for star connection).

CAUTION!
For transformers with covers on the upper connections of the high voltage (see Chapter 5.4), the high voltage must always be connected to the lower connections
(see image 6.4).

6.3 Surface preparation of the high voltage connections

Connection made of copper or brass

If copper or brass connections are present, these must be made bare.

Connection with galvanized aluminum

If the high voltage connection is made of galvanized aluminum, this must only be cleaned with a cloth.

ATTENTION!
Removing the zinc layer on the high voltage connection leads to the formation of an oxide layer, which greatly increases the contact resistance between the coil and the coil and can destroy the coil.
.

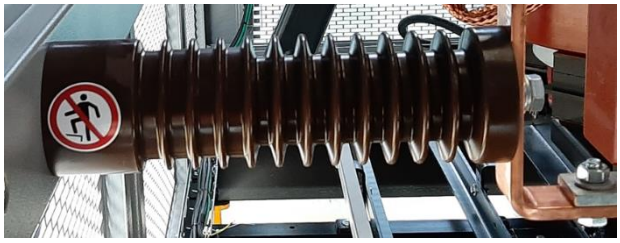


Image 6-1: Do not step/climb on switch tubes, busbars or insulators!

Image 6-2: Exemple of cable routine

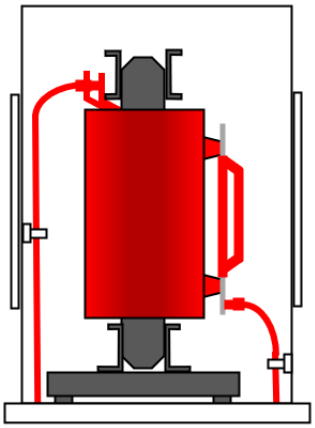


Image 6-3: Connection GEAFOL/CARRECO transformer from below

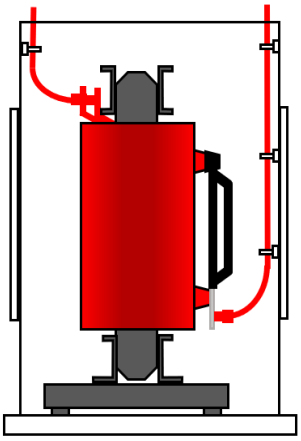


Image 6-4: Connection GEAFOL/CARRECO COMPACT from the top (Standard design)

6.4 Connection of low-voltage

On the low-voltage side, the connection is made at the aluminum or copper connections provided for this purpose. Here, too, care must be taken to ensure that cables receive appropriate strain relief, so that unacceptable mechanical stresses at the connection are avoided.

If the low-voltage connection is made with busbars, an expansion band (flexible connector) must be installed between the transformer and the busbars (image 6-7). This keeps mechanical stresses away from the transformer and largely prevents the transmission of structure borne transformer noise. Detailed specifications for busbar fittings are listed in DIN 43673.

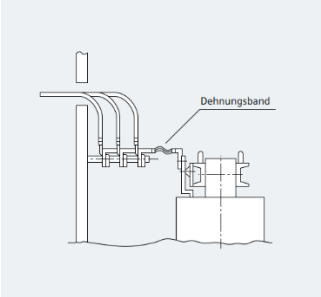


Image 6-5: Transformer connection with cable lug

6.5 Surface preparation

Before making bolted or clamping connections, the invisible, thin, but poorly conductive oxide layer on the aluminum or copper surface must be removed. The contact surfaces to the customer connection must be made metallically bright. After each opening of the contact point, the entire preparation process must be carried out again on the connection surfaces before it is bolted back together.

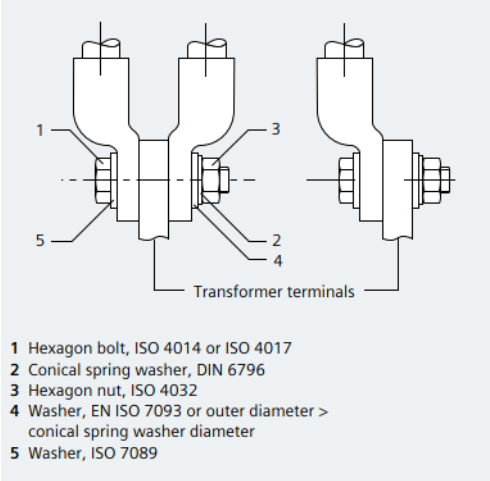


Image 6-6: Low-voltage connection technology with cable lug

6.6 Connection material

For bolted connections, parts in a corrosion-protected design must be used. Bolts of strength class 8.8 or 10.9 must be used. In order to transfer the bolt force to the largest possible contact surface, rigid washers must be placed under the bolt head and nut. Additionally, spring elements are required to elastically absorb thermal stresses, compensate for plastic deformations, and thus maintain the required minimum contact pressure at all time.
Both conditions can be met by using clamping washers according to DIN 6796, which are particularly used for busbars fittings.

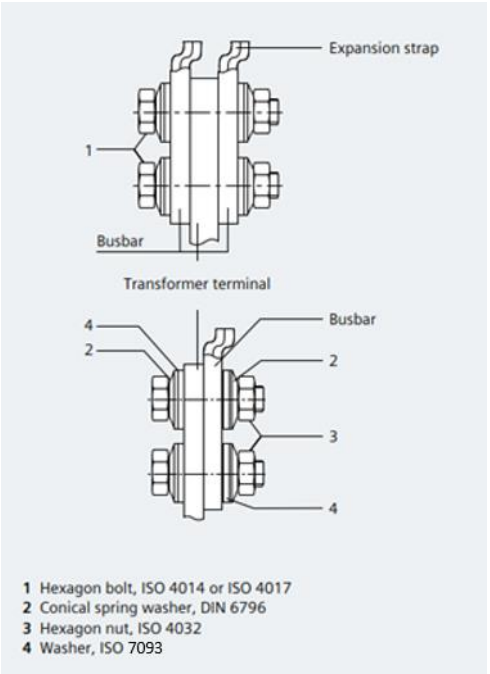


Image 6-7: Low-voltage connection technology with expansion band

Connections between copper and aluminum

In indoor areas where condensation is likely to form or aggressive gases are present, and when connecting to copper busbars, a unilaterally copper-plated aluminum sheet e.g., a product known under the trade name “Cupal”, must be inserted between the Cu-Al connection points so that its aluminum side is in contact with the aluminum connection (Image 6-8).

All edges of this sheet must protrude several milimeters to ensure that any corrosion that may occur at the transition zone remains outside the contact area. Corrosion can be largely avoided by applying a protective coating to the cut edges of this Cupal sheet.

Tinned connections can be combined with bare aluminum or copper.

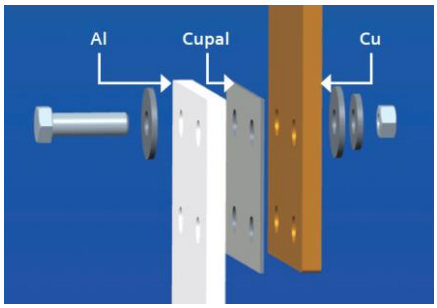


Image 6-8: Connection of aluminum and coppers bars with cupal sheet

6.7 Contact pressure

The bolts are tightened with a torque wrench. This ensures that the bolts connections are made with sufficient contact pressure.
For tightening the non-greased bolt connection, the tightening torques specified in Chart 6-1 should be applied.

To compensate for settling phenomena, the screw connections must be tightened after a few hours. The torque must not be greater than in the original assembly.

Bolt	Anzugsmoment [Nm] trocken (Fettfrei)
M 6	10
M 8	20
M 10	45
M 12	75
M 16	140

Chart 6-1: Tightening torques for the phase connections and taps

6.8 Grounding of the transformer

Is it important to ensure that installed accessories, which are connected to the transformer after assembly, have the required grounding connection. Transformer enclosures must also be grounded in accordance with the known grounding regulations.

The grounding bolts are located on the end side of the lower press frame (See image. 6-8). A PE wiring must be connected here at one position. The dimensioning of the PE wiring is defined by specific regulations at the installation site.
For transformer with enclosure, there are corresponding ground connections on the outside of the enclosure.

Image 6-9: Bolt for grounding connection

Image 6-8: Connection box for temperature monitoring

6.9 Change in operating voltage

By changing the position of the switching jumpers on the high-voltage taps, the voltage of the transformer can be adjusted according to the nameplate. (Image 6-10)
The numbering of the taps can be seen on a notice on the upper press frame of the transformer or on the high-voltage coils themselves. (Image 6-12)

⚠WARNING!
The switch jumper may only be reconnected in a de-energized state.

⚠CAUTION!
Only switch jumpers and screws included in the scope of delivery may be used.

⚠CAUTION!
If the operating voltage change, the switch jumpers must be checked for damage before reusing it and clean the contact surfaces of the switching lugs and taps.

⚠CAUTION!
Operating the transformer at a higher voltage that does not correspond to the position of the switching jumpers at the high-voltage taps can cause damage to the transformer.

⚠ATTENTION!
Different positions of the switching jumpers on the indivudual coils can lead to the destruction of the transformer. After reattachement, the screws of the switching jumpers must be tightened to the torque according to the information sign. (Image 6-10)

Covers on taps (GEAFOL COMPACT)
To remove the vacuum under the silicone cap, press the silicone cap inwards with your finger.

If there are covers over the switching tabs, these must be reassembled after the intervention (Image 6-12)

Clean the sealing surfaces before reassembling.
Make sure that there is no residual moisture in the cover.

Turn the nuts onto the threaded pins by hand until the washer sits on the cover. Use a wrench and turn the nut 1 1/4- turns further.

GEAFOL®

3 - Phasen - Transformator für		
Typ	4GB6244-3EY	F.-Nr.
Bem.-Leistung		16
Verb. 5-6	10500 V	
Verb. 4-6	10250 V	
Bem.-Spg. 4-7	10000 V	
Verb. 3-7	9750 V	
Verb. 3-8	9500 V	

Image 6-10: Specification of the voltages depending on the position of the switch tabs on the nameplate (SAMPLE)

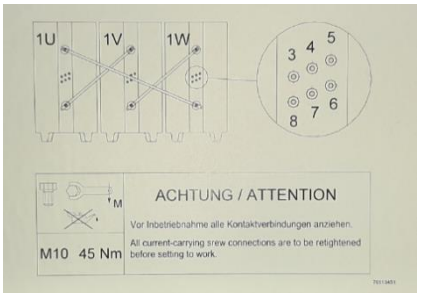


Image 6-11: Notice sign on the transformer regarding numbering and tightening torque of the switching lugs

Image 6-12: Cover on tap

6.10 Electrical connection control cabinet (Optional)

At the customer's request, the transformer will be equipped with a control cabinet. The control devices and monitoring units are installed in this control cabinet (Image 6-13).

The control cabinet contains the circuit diagram as well as the operating instructions for the individual electrical components.

⚠ DANGER !
Even when the transformer is switched off, the control cabinet can still be energized!

The electrical connection may only be made by qualified personnel (See Chap. 1)

Image 6-13: Control cabinet in enclosure

6.11 Control devices (Optional)

To generate warning and error messages based on the sensor signals, different control and monitoring devices are offered for GEAFOL/CARERCO transformers, depending on the type and number of sensors (Image 6-14). Likewise, fans can be controlled and adjusted with it.

For transformers with a enclosure a spart of the scope supply, the tripping devices are located in the control cabinet of the enclosure.
Information for connection and operation of the monitoring devices can be found in the respective operating instructions.
Test the function of the trigger devices during commissioning.

Image 6-14: Display of the trigger device (SAMPLE)

6.12 Temperature monitoring

The sensors of the temperature monitoring system measure the winding temperature of the coils. This serves as overload protection against excessive heat generation in the transformer windings.

The temperature monitoring system of GEAFOL/CARECO-transformers consists of cold conductors (PTC) according to DIN 44082 or resistance thermometers (PT 100) according to IEC 60751 and optionally the associated monitoring devices.
The terminal block or connection block, the connection diagram of the temperature monitoring, and the specification of the limit temperatures are standardly located on the upper frame (Image 6-14)

The temperature values for the warning, alarm triggering or fan control functions must be set on the triggering device or monitoring system.

6.13 Fan (Option)

⚠ **DANGER!**
De-energize the fans before you start working on the transformer!

CAUTION!
Do not block the rotors of the fan while working on the transformer. This can lead to the destruction of the fan.

A fan control unit is required for temperature-dependent switching on of the fans (AN/AF operationg mode). Switching on and off is done via an adjustable time or temperature in the control unit.
Depending on the version, the fan is already connected to a built-in trigger device or is intended for the connection to a control device provided by the customer.
The connectors are located on the bottom side of the transformer, on the fan-motor of the single fan (Image 6-15) or in the cable duct of the fans (Image 6-16).

- Pay attention to the correct voltage and frequency of the fan
- Connect the fan according to the fan's operating manual
- Check the function of all fans as part of commissioning
- Ensure that the fans are rotating in the correct direction

Notice:
The control devices of types T154 and NT935 optionally have a setting in which the fans undergo a short test lasting 5 to 10 minutes every 96 hours. This function test is deactivated in the standard factory setting. If this option is activated, the operation must take precautions to prevent accidents.

Image 6-15: Power connector for fan (Example)

Image 6-16: Power connection for fan on the motor (Example)

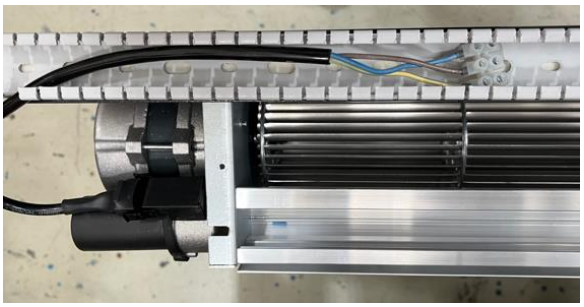


Image 6-17: Power connection for fans in the cable duct (Example)

Switching temperatures for fans and warning messages

The following temperatures are to be set on the monitoring devices of the fans. The relevant temperature class is indicated on the nameplate.

Action	Temp. class IEC			IEEE	
	B	F	H	F	H
Error message	130°C	160°C	180°C	160°C	180°C
Warning message	130°C	140°C	160°C	135°C	155°C
Fan on	90°C	120°C	140°C	80°C	80°C
Fan off	80°C	110°C	130°C	70°C	70°C

Chart 6-2

6.14 Siemens Energy Sensformer® (Option)

The sensformer is used to digitally transmit the measurement data in real time. An overview of the status of the individual transformers is possible through an app. In the event of an error message, a push notification can be sent. The connection of the Sensformer is located in the box at the front side of the upper press frame or in the control cabinet of the enclosure (see image 6-18).

The app for the sensorformer is available free of charge on various app stores.

Image 6-18: Sensformer box

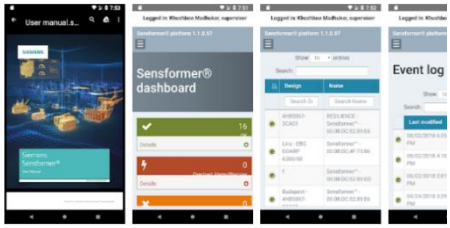


Fig. 6-19: Sensformer app

6.15 Infrared window

Infrared windows are used to visualize the thermal radiation of the transformer (Image 6-20)

Image 6-20: Infrared window on the transformer enclosure

7 Commissioning

The transformer must be cleaned and there must be no foreign objects.

- Compare the technical data of the rating plate attached to the transformer with the customer's requirements
- Tighten all contact connection to the torques according to Chart 6.1.

ACHTUNG!
If the ambient conditions are outside the specification of the transformer (e.g. ambient temperature too low), the appropriate conditions must be established before switching on.

When switching on larger transformers, occasional visible spark formations may occur externally (especially in the area of the core and the clamped parts), which subside after short time. This effect is physically conditioned, has no impact on operational safety, and does not represent a quality defect.

ACHTUNG!
The inrush currents of GEAFOL/CARECO transformers can exhibit long decay times due to the low damping. The exact value can be taken from the test protocol.

ATTENTION!
The height and decay time must be taken into account when selecting the fuses and/or relay times.

If protection settings are incorrect, the transformer will be switched off during the transient response of the current. This leads to high overvoltages in the transformer windings and can cause damages in rare cases.

8 Inspection and cleaning

GEAFOL/CARECO transformers are largely maintenance-free.

Before starting maintenance work, the transformer must completely be switched off. All terminal must be short-circuited and grounded. The safety rules must be followed.

⚠ **DANGER!**
Make sure that the transformer is de-energized before approching the transformer or do not remove protective covers. Secure the transformer against unauthorised switching on.

CAUTION!
Dust and dirt are the main causes of transformer overheating and increase the risk of an electrical short circuit.

CAUTION!
Make sure that the used tools and cleaning equipment are completely removed from the transformer.

CAUTION!
Do not use cleaning equipment with metal brushes. Loose metal wires can cause severe damage to the transformer. Do not use sharp-edged tools!

⚠ **DANGER!**
Do not switch on the transformer until it is completely dry!

CAUTION!
The tightening torques on current-carrying components may be considerably lower than steel parts according to Chart 6.1. Please observe the corresponding markings on the components.

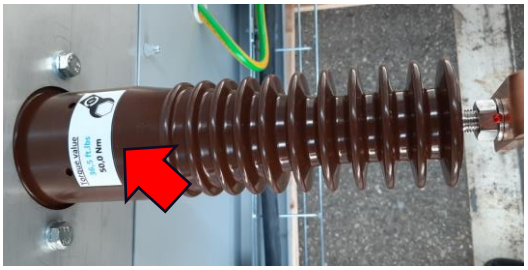


Image 8-1: Specification of the torques of a current-carrying conductor

Removing and attaching covers to switching tubes

If covers are present on the switching tubes, remove the clamp of the cover and pull the cover off the connection cone at the transformer.

If the cover has not been removed for several years, it may be necessary for the cover to be strongly adhered to the connection cone of the transformer. In this case, try to twist the cover back and forth and pull the cover off from the inside.

Then check the tightening torques on the switching tubes and conduct a visual inspection.

Then slide the cover onto the connection cone until the bolt of the contact connection is felt through the cover (see image 8-2).

Image 8-2: Fulfilling the end position of the cover at HV termination

Position the pipe clamp and tighten the hex nut of the clamp until the front edge of the white marking on the band is flush with the enclosure of the clamp (See image 8-3).

If the clamp is replaced, 5 turns must be made on the hexagon of the tube/pipe clamp.

Image 8-3: Position of the color marking on the clam after tightening

Overview inspection activities

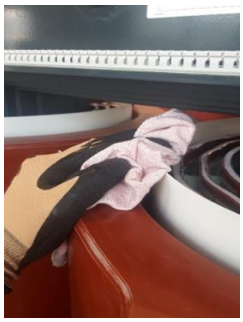
Action	Time interval (Recommendation)	Description of the activity
Visual check	Commissioning, 1x per year	• Inspection of pollution, damage, soot deposits, infestation by animals • Checking that the current-carrying connections are corrosion-free
Cleaning the transformer	Commissioning, 1x per year/ In case of pollution several times a year	• Cleaning the top side of the upper joke and vacuuming the cooling channels on the upper and lower joke (if available). • Vacuuming or blowing out of loose particles dirt in the cooling channels of the high and low voltage coils using a vacuum cleaner or compressed air. • Rub down the dirty surfaces of the transformer with a cloth soaked in a commercially available surfactant-based cleaner. Then wipe with a dry cloth. • Cleaning of auxiliary equipment such as fans, surge arresters, connection terminals and the mounting substructure. • Cleaning the floor and the walls around the transformer  Fig. 8.2: Blow out the cooling channels  Fig. 8.3: Blow off upper yoke  Fig. 8.4: Cleaning high voltage coil
Bolted connection of all current-carrying connections and groundings on the tranformer	Every 2 years	• Control of the torque of the bolted connections of all current carrying connections and terminals, the high-voltage taps, and the connections from the system to system in double-decker transformers. The value of the tightening torques see Chap. 6, Chart 6.1. • Note: When using mechanical torques wrenches, care must be taken that during repeated tightening, the locking washers and spring rings are not pressed flat. From the 6 year onwards, the tightening torque should be reduced by 5 Nm compared to the specification when using mechanical torque wrenches.
Bolted connections for electrical customer connection	To be defined by the customer	• The responsibility for the connections made by the customer lies with the customer.
Controll of the warning functions	Commissioning, 1x per year and after error messages	• A visual check of the clamp connections on the transformer and in the control cabinet on the enclosure (if available). • Carry out the funktion check according to the specifications of the operating instructions of the sensor/evaluation device.
Fan check (if available)	Commissioning, 1x per year	• Check the fans for their function, runway, clanliness and operating characteristics according to the specific operating instructions.

Chart 8-1

9 Faults

⚠ **DANGER!**
Check that the tranformer is de-energized before approaching the transformer or that you do not remove protective covers.

CAUTION!
Only qualified personnal are allowed to rectify faults on the transformer.

In the event of faults that cannot be rectified by the customer himself, a service center of Siemens AG must be informed.

When making inquiries, please include the factory number.
The factory number is indicated on the rating plate.

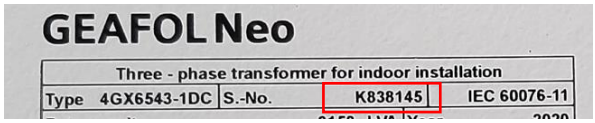


Image. 9.1: Factory number of rating plate

Product Support Dry-type transformers:

Telephone: +49 7021 9954 134
E-mail: kirchheim-sck.energy@siemens-energy.com
Website: siemens-energy.com/geafol

ATTENTION!
Returns of transformers to Siemens Energy must be carried out in accordance with Chap. 5!

Standard spare parts

Part designation	Siemens Energy Kirchheim Material-No.
Measuring resistor PT100	4170004730
Thermistor tripping device MSF 220 K (PTC)	4170010437
PTC Thermistor 120° (Fan on)	4102642197
PTC Thermistor 140° (Warning winding)	4102642213
PTC Thermistor 160° (Tripping winding)	4103946662
PTC Thermistor 170° (Tripping core)	4170020002
Trigger device T119 (3xPTC)	4106894836
Trigger device T154 (4xPT100)	4170010212
Trigger device NT538 AD(8xPT100)	4170036322
Trigger device NT935 AD (4xPT100)	4170195860
Fan switching device VRT600	4170033802
High-voltage connection insulation cap COMPACT	4170258641
Pipe clamp cover COMPACT	4170261722

Tabelle 9-1

Potential faults

Faults	Potential causes	Testing steps / Remedy
Transformer too hot, warning / alarm message from the temperature sensors on the coils	Persistent overload	Check load / load distribution, reduce load if necessary
	Cooling channels in coils dirty	Check the cleanliness of the cooling channels in the coils, if necessary clean them, see chap. 8
	Bad ventilation, ambient temperature too high	Check the ventilation ducts on the enclosure, fan and cooler, replace defective component if necessary
	Sensor defective	Check the function of the relevant sensor, if necessary, replace the sensor
Transformer too hot, warning / alarm message from the temperature sensors of the core monitoring	Persistent overvoltage	Check voltage, if necessary reduce the voltage Check the position of the tappings at the HV coils (see chapter 6.11)
Short circuit (triggering a monitoring unit)	Inrush current too high	Adjust inrush current
	Dirt	Clean the transformer, see chap. 8
	Humidity too high	Check ventilation, remove water, clear water drainage
Soot traces on the transformer (Tracking)	Dirt	Clean the transformer, see chap. 8
	Bolt connections on live parts are loose	Check bolt connection, see chap. 8
Chipped material on the high-voltage coil with soot formation	Short circuit in coil	Call customer service – do not switch the transformer on again!
Smell	Evaporation after commissioning	No action – the smell disappears after a few hours
	Dirt in the coils or on the core	Clean the transformer
Unusual noises	High-voltage too high	Check the voltage, if necessary reduce the voltage
	Vibration of the enclosure, Components loose	Tightening of loose components, attach vibration dampers if necessary
Fan is not running	Fan cooling temperature not reached	Check the temperature on the transformer
	Fan connections loosened	Check the cable connections
	Start temperature for fan incorrectly set	Check the temperature on the control device
	Fan defective	Contact Siemens Energy Service

Chart 9-2

10 Recycling and disposal

GEAFOL/CARECO transformers still have advantages at the end of their life cycle: Without risk to the environment, 94% of the material can be recycled.
The protection of the environment and the conservation of its resources are high-priority corporate goals for us. A global environmental management system in accordance with ISO 14001 ensures compliance with the law and sets high standards for this purpose. Environmentally friendly design, technical safety and health protection are fixed objectives right from the development stage of our products.

Follow the local regulations for disposal.

Recyclable materials in components

Speparate the components for recycling according to the following categories:

- Electronic scrap, e.g. sensors
- Iron scrap (transformer core, press frame)
- Aluminum/copper (winding of high and low voltage coil, bus bars)
- Non-ferrous metals, copper, brass (power lines, leads)
- Insulating materials (winding of high and low voltage coil)

11 Relevant standards

No.	Heading
IEC 60076-11	**Power transformers Part 11: Dry-type transformer**
IEC 60076-1	Power transformers Part 1: General
IEC 60076-2	Power transformers– Part 2: Overtemperatures for liquid filled transformers
IEC 60076-3	Power transformers Part 3: Insulation level, voltage tests and external clearances in air
IEC 60076-5	Power transformers Part 5: Short circuit resistance
IEC 60076-10	Power transformers Part 10: Determination of the noise level
IEC 60076-12	Power transformers Part 12: Loading guide for dry-type transformers
IEC 60076-16	Power transformers Part 16: Transformer for wind turbines applications
IEC 61936-1	Power installations with rated alternating voltages above 1 kV – Part 1: General terms
EN 50708-2-1	Power transformers : Additional European requirements Part 2-1: Medium power transformers
EN 50708-3-1	Power transformers: Additional European requirements Part 3-1: Large power transformers
IEC 60721-3-4	Classification of environmental conditions– Part 3-4: Classes of influencing factors and their limit values
IEEE Std. C57.12.01	General Requirements for Dry-Type Distribution and Power Transformers
IEEE Std. C57.12.91	Test Code for Dry-Type Distribution and Power Transformers

UK CA

Sir W. Siemens Square,
Frimley, Surrey,
GU16 8QD, UK

12 Declaration of conformity

SIEMENS energy

EG Konformitätserklärung/
EC Declaration of Conformity

Produktbezeichnung: *Product identification:*	GEAFOL / GEAFOL Neo; Typ 4G... CARECO / CARECO Neo; Typ 4G...
Hersteller: *Manufacturer*	Siemens Energy Global GmbH & Co. KG
Anschrift: *Address*	Hegelstrasse 20, 73230 Kirchheim unter Teck, Germany

Das oben beschriebene Produkt ist konform mit den Vorschriften folgender Europäischer Verordnung:

The product described above is in conformity with the provisions of the following European Regulation:

EU 548/2014	Mitteilung der Kommission im Rahmen der Umsetzung der Verordnung (EU) Nr. 548/2014 der Kommission zur Umsetzung der Richtlinie 2009/125/EG des Europäischen Parlaments und des Rates hinsichtlich Kleinleistungs-, Mittelleistungs- und Großleistungstransformatoren. *Commission communication in the framework of the implementation of Commission Regulation (EU) No 548/2014 on implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to small, medium and large power transformers.*
EU 2019/1783	Verordnung zur Änderung der Verordnung (EU) Nr. 548/2014 der Kommission zur Umsetzung der Richtlinie 2009/125/EG des Europäischen Parlaments und des Rates hinsichtlich Kleinleistungs-, Mittelleistungs- und Großleistungstransformatoren *Commission Regulation amending Regulation (EU) No 548/2014 on implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to small, medium and large power transformers*

Die Konformität mit der Richtlinie wird nachgewiesen durch die Einhaltung der folgenden Normen:

Conformity to the directives is assured through the application of the following standards:

Referenznummer *Reference number*	Ausgabedatum *Edition*	Referenznummer *Reference number*	Ausgabedatum *Edition*
EN 50708-2-1	2020-05	EN IEC 60076-11	2018-08
EN 50708-3-1	2020-05		

Unterzeichnet für und im Namen von:/ *Signed for and on behalf of:*
Siemens Energy Global GmbH & Co. KG

Kirchheim unter Teck, 19.11.2020
Ort / *place* Datum der Ausstellung/ *Date of issue*

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