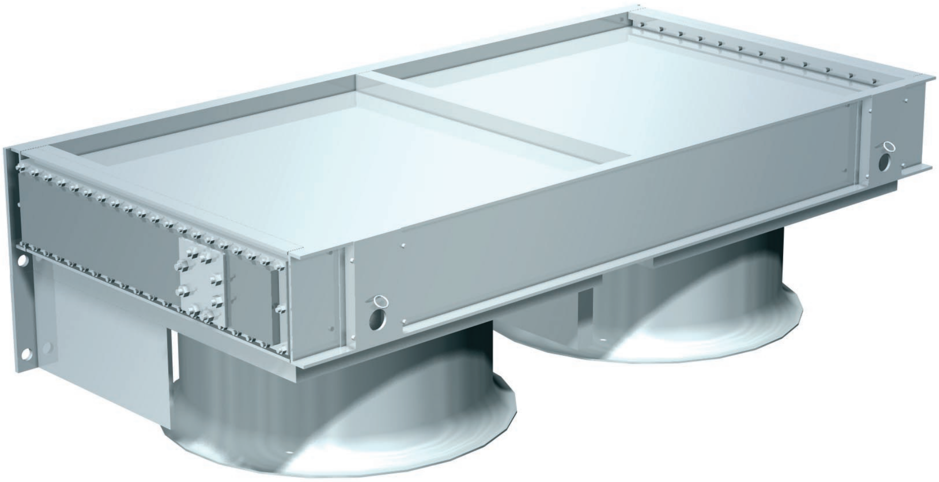


Transformer oil cooler ALFA

GB Installation, Operation and Maintenance Manual

COILTECH

Description – Safety Precautions and Warnings

General

The cooler cools transformer oil with ambient air. The transformer oil circulates by use of a pump. To be ordered separately. If the cooler has more than one fan, the fans are separated by a partition wall. This enables stepwise power regulation, by adding or deleting one fan at a time according to the cooling needs.

Labelling

The name plate is located on the connection side of the cooler and provides information about:
Manufacturer
Maximum working pressure
Test pressure
Motor data
Order No.
Year of manufacture
Dry weight
Inner oil volume

Quality system

Coiltech is certified according to quality system standard ISO 9001 and environmental management standard ISO 14001

Handling and care

Read the whole manual before handling the cooler.
The cooler must be installed in a place which is not open to the public. All work on the cooler has to be carried out by trained personnel familiar with the product and the safety regulations. The cooler surface is not designed to carry a man's weight.

Lifting

The dry weight of the cooler is stated on the name plate, which is located on the connection side of the cooler.
The cooler may be lifted by a forklift with long forks. See Figure 1a.

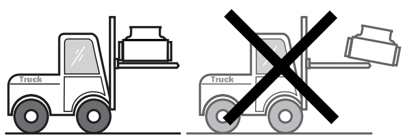


Figure 1a. Lifting by means of a truck.

Alternatively, the cooler may be lifted using the lifting eyes provided. See Figure 1b. Before lifting the cooler:
- Make sure the lifting eyes are secured and intact.
- Make sure that appropriate lifting equipment is used, and that the size of the hooks is adapted to the lifting eyes.

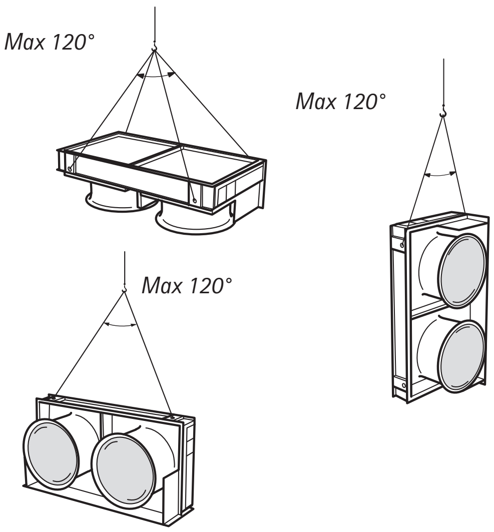


Figure 1b. Lifting by means of a crane.
Maximum crowfoot angle 120°.

Mounting

The cooler must be secured to a fundament or to special brackets mounted for this purpose. The fundament and the brackets must be stable enough to bear up the dry weight of the cooler plus the weight of the transformer oil.

Operating pressure

The cooler may only be used in a system, which has been approved for the maximum working pressure (MWP, bar) and the maximum working temperature (MWT, °C) indicated on the name plate.

Connections

The pipe couplings of the cooler may not be forced to carry the dead weight of the piping system, nor to take up the expansion forces of the piping system. We recommend installing of compensators between the couplings and the piping.
NOTE: Mechanical loads and impacts can damage the cooler.

Cleaning

Only use environmentally acceptable cleaning agents, which will not damage the cooler.

High temperatures

When the heat exchanger is in operation, the connection chamber, the casing and the cooling air leaving the cooler can be quite hot.

Environments with risk of explosions

The cooler is not designed to be used in environments where there is a risk of explosion.

Installation

Transport

Check for any damage caused during transport or unloading. Parts with high damage risk are the plate surfaces of the heat exchanger, the lifting eyes and the connection header. The cooler is designed to withstand normal loads during transport. Any transport damage has to be reported immediately to the hauler and to Coiltech. Information about the damage should also be written on the consignment note.

Mounting

The free space underneath the cooler must be at least 600 mm according to Figure 2 below.
The cooler should be placed in such a way that the necessary airflow is not impeded. See figure 2.
Other relevant dimensions are indicated on the dimensional drawing for each cooler size.

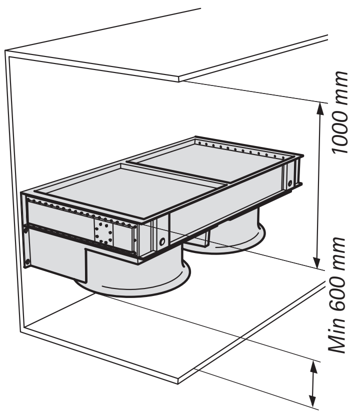


Figure 2. Horizontal mounting, distance from floor.

Mechanical requirements

The cooler must be secured to a fundament. The cooler is provided with securing holes. See the relevant dimensional drawing.

Venting/drainage

The connection header is provided with nipples for venting and drainage. The system should be thoroughly vented before commissioning.

Electrical requirements

The motor must be protected by a contactor, which should be adjusted to trip when the motor current exceeds Imax, the maximum permissible motor current (see tables 2a and 2b). This protection is necessary, since some motors may be overloaded before the airflow reaches the designated temperature. The risk of motor damage is minimal, since the motor is cooled by the cool ambient air. The phase leads L1, L2 and L3 and the protective earth lead are connected as indicated in Figure 6a or Figure 6b.
When the fan motor is electrically connected, make sure the fan rotates in the direction of the arrow. The arrow is located on the outside of the fan ring.

Cable runs

When mounting cable runs, it is important to be cautious in order to avoid damaging the heat exchanger.

Dismounting

Before removing the cooler from the system, you have to make sure that the oil has been drained. See the comment above about venting/draining.
NOTE: Any products potentially harmful to the environment must be collected in suitable containers, which can be sent for disposal or recycling.
The cooler may not be lifted before all oil has been drained.

Maintenance and service

General

The cooler should be inspected regularly to prevent operating problems.
The following checks should be done:

1. Noise or vibration - may be due to a damaged motor bearing or a damaged impeller.
2. Mountings - make sure no load-carrying screws or threads are damaged.
3. Electrical - check for visible damage and test the safety switch.
4. Fin body - check that the fins are clean and intact.

Cleaning the heat exchanger

The heat exchanger is preferably cleaned by means of high-pressure washing.

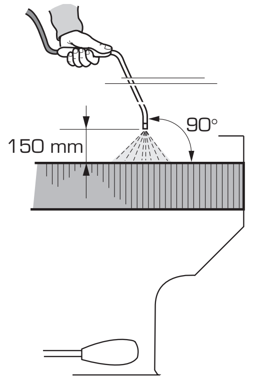


Figure 3. Cleaning the heat exchanger

To enable cleaning against the airflow direction, the safety screen at the fan exit should be removed. See Figure 3. First spray the entire heat exchanger with an environmentally acceptable solvent under low pressure. High-pressure clean with water after 10 - 12 minutes. The nozzle should be aimed perpendicularly to the fin surface, at a distance of at least 150 mm. There may not remain any traces of solvent after cleaning, for that would cause new dust particles to stick to the surface. Fins deformed during cleaning may be straightened by means of a fin comb (QLAZ-20), which can be ordered from Coiltech.

Fan motor

The fan motors are designed to have a life of about 25 000 operating hours at 40°C, and about 40 000 operating hours at 20°C. The fan motors are permanently lubricated. At changing of bearings, consideration must be taken to the motor ambient temperature, for the right-choice of grease. The motors and fan impellers can be accessed by first removing the protective screen (guard). If the refrigeration unit is switched off for a longer period there is a danger of motor damage owing to condensation and static load on bearings causing the film of lubrication to be penetrated. If the refrigeration unit is to be periodically switched off (more then one month), the motors must be fitted with heating inside the motor windings in order to prevent condensation. The motors must be rotated manually or given a warm-up run at least once a month in order to prevent the film of lubrication covering the bearings from being penetrated.
An alternative to electrical heating is to connect two series DC phases from a source providing a total output as per table 1. This method is for motors of less that 10 kW only. To calculate DC, use the Ohms law formula:

$$U_{(v)} = \sqrt{P_{(w)} \times R_{(\ )}}$$

where R is the resistance in the series windings. Resistance should be measured using a precision ohmmeter.

Table 1 Heating windings

Motor size	*Output*
90 – 132	*25 W*
160 – 180	*50 W*

Another alternative is to use single-phase AC (between 10 and 15% of rated voltage) between the two series-connected phases.
The windings heating shall be disconnected when the motors are running.

Draining

The motors are equipped with drain holes in the lowest part of the motor. This openings shall be open. At maintenance of the motors, the drain holes shall be checked and cleaned from clogging.

Repair work

Parts and materials suggested by Coiltech must be used; otherwise the warranty will become void.

Maintenance and service

Long-term storage

If the cooler has to be stored for longer periods of time (in a Scandinavian climate, this means more than 1 month), the following rules apply:

1. The cooler should be stored indoors, oriented in accordance with its working position.
   This ensures the draining holes for the motor to remain functional.
2. If the cooler is stored in a damp place, the external coating must be examined to make sure there are no damaged spots. Damaged spots should be repainted.
3. The fan exit should be covered with reinforced plastic sheets or some other mechanical protection against water and contaminants, which may harm the plate body and/or the motors. A panel or the like must pro tect the free fin surface mechanically.
4. The connection couplings of the cooler should be clo sed by threaded steel plate covers, which seal the connection chamber by means of rubber gaskets.
5. During storage, the motors shafts should be turned by hand at least once every 3 months.

Spare parts

For units with a very high up-time requirement, the operator is advised to keep a spare motor and impeller.
Motors and impellers are normally available from Coiltech spare parts depots.
When keeping spare electric motors it is important to check them regularly and replace certain parts. Follow the instructions from the motor manufacturer.
Motors must always be stored indoors in dry and dust-free rooms.
When installing a spare motor, the lowest draining hole must be opened. This hole is normally located behind the motor

Replacing fan and motor

At vertical air flow, contact Coiltech for further information.

1. Disconnect the main power supply.
   Put the lockable safety switch in the OFF position, and lock it.
2. Remove the screws holding the safety screen and remove the screen.
3. Release the screw on the cover. The two socket head cap screws that are now visible in the fan hub are released and placed in the holes provided alongside. Then tighten the screws a little on a time until the impeller wheelis released from the shrink-fit taper, figure 4.
4. Disconnect the electrical cable from the terminal block.
5. Remove the screws which secure the motor to the motor shelf.
   Lift out the motor.
6. For installation of fan and / or motor. Perform these points in reverse order. Use a torque wrench when tightening load-bearing screwed connections.
7. When installing the impeller wheel on the motor shaft apply some kind of corrosion protection to the shaft and the screw.
8. Before starting the motor, check if the impeller rotates inside the fan ring, and make a trial start to check that the impeller rotates in the direction indicated by the arrow.

Motor weight:	Max. 20 kg
Impeller weight:	5.3 kg

Tightening torque

M8	25 Nm
M10	45 Nm
M12	70 Nm

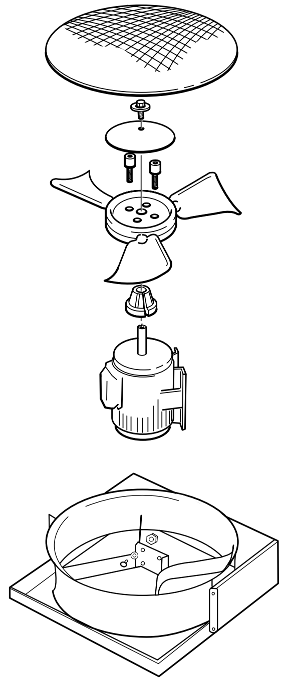
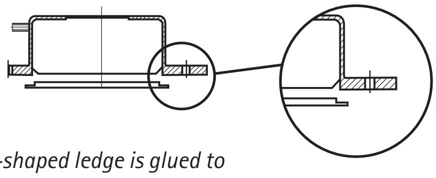


Figure 4. Motor mounting

Maintenance and service

Replacing the connection header gasket

If the connection header must be removed (which is not part of normal maintenance), we recommend replacing the O-ring gasket. A new gasket may be ordered from your local retailer or from Coiltech.



The U-shaped ledge is glued to the partition wall using Loctite 415. The gasket may not pass over the O-ring.

Figure 5a. Header profile, with partition wall and packing as well as tube plate with O-ring.

Air vent and drain nipple

The connection chamber of the heat exchanger is provided with an air vent and a drain nipple, connection thread M16.
The nipples have a copper gasket made of solid full annealing copper (DIN 7603 A), this gasket should be replaced every time the nipple is released.

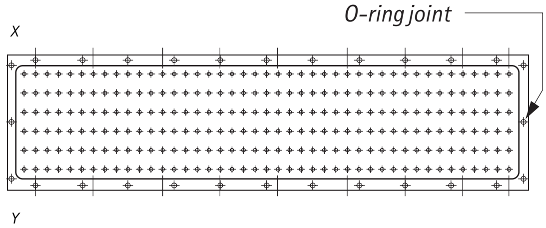


Figure 5b. Tube plate with a groove for an O-ring

1 The O-ring gasket is jointed on the middle of the short side of the tube plate, and is cut 8 - 10 mm longer than the circumference of the O-ring groove, after placing the gasket in the O-ring groove on the tube plate. The joint should be bevelled.
The ends are pressed against each other. This extra length will ensure that the gasket will fit in the groove when the chamber cover is tightened.

2 Cut an U-ledge for the partition wall.
The ends are cut flat and the ledge length is made equal to the distance inside the O-ring in the tube plate. The U-shaped ledge is glued to the partition wall.

3 Check if the header is clean on the inside, and does not have any visible damage.

4 Mount the header.
Tighten the screws alternately on the X and the Y side towards the O-ring gasket joint, according to Figure 5b.
Tightening torque: 70 Nm.

Technical specifications/Connection diagram

Operating data

Max. operating pressure:	0,2 MPa
Max. operating temperature:	100 °C
Test pressure:	0,3 MPa

Heat exchanger

The heat exchanger in the cooler is made of tubes that have been expanded mechanically to the fins. The fins are in one piece, without slits or joints, to prevent dust particles and fibres from sticking to the fin body. The connection chamber of the heat exchanger, in which the oil is distributed, is provided with a venting and draining nipple, with an M16 thread. The pipe couplings comply with DIN 2633, ANSI 16.5 150Lb, or square stud bolt flange coupling DN100.

Motor/fan

The fan motor is a fully encapsulated foot-mounted squirrel-cage motor, made of die-cast aluminium. The axial fan is directly mounted on the motor shaft and made of aluminium plates fitted to an epoxy-coated steel hub. The impellers are statically balanced according to ISO 1940, class G6.3.
The fan exits are protected by safety screens, which may be removed for an inspection of fan and motor, or for cleaning the heat exchanger body.

Protection classes

The fan motor is protected to the IP55 class, with open draining holes at the lowest point of the motor.

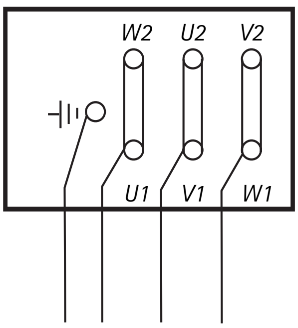


Figure 6a. Circuit diagram of a -connected single speed motor.

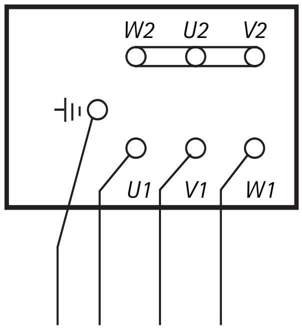


Figure 6b. Circuit diagram of a Y-connected single speed motor.

Weight and volume

The dry weight and the inner volume of the cooler are indicated on the name plate.

Motor data

The motor data is also stated on the name plate.

Table 2a.
Motor data for a supply voltage of 400 V, 50 H

Fan speed		Rated	Rated	Imax 1)	Starting	Weight
r/min	Code bbbb	power kW	current A	A	current Id/In	kg
320	5016	0,7	4,6	6,4	1,78	58
445	5012	1,5	5,98	7,4	4,7	62
550	5010	2,4	8,0	9,5	3,75	68
710	5008	5,5	13	14,3	5,38	85
960	5006	13	27	28,8	6,11	93

Table 2b.
Motor data for a supply voltage of 480 V, 60 Hz

Fan speed		Rated	Rated	Imax 1)	Starting	Weight
r/min	Code bbbb	power kW	current A	A	current Id/In	kg
425	6016	1,1	5,1	6,8	3,14	58
565	6012	3,2	10,4	112,8	3,37	94
695	6010	3,9	11,4	13,7	4,82	97
865	6008	8,6	18,1	20,3	5,69	105

1) According to IEC-34-1

Product code

Cooler ALFA-a-bbbb-cc-d-e-2

Cooler size **(a)**
1 = single fan unit
2 = double fan unit

Motor data **(bbbb)**
frequency-number of poles

Mounting arrangement **(cc)**
See catalogue sheet

Number of liquid passes, 1 or 3 **(d)**

Tube spiral turbulator insert **(e)**
0 = without insert
1 = turbulator insert in 1/3 of the tubes
2 = turbulator insert in 2/3 of the tubes
3 = turbulator insert in all tubes

Internal design number

COILTECH

Coiltech AB, SE-614 81 Söderköping, Sweden
Phone +46 121 191 00
Fax +46 121 101 01

Coiltech, Afrikalaan 303, BE-9000 Gent, Belgium
Phone +32 9 218 71 30
Fax +32 9 218 71 39

www.coiltech.com

ECO COILS & COOLERS

Head Office:
IT-33050 POCENIA (UD), Via Giulio Locatelli, 22, Italy
Phone +39 0432 772 001
Fax +39 0432 779 594
www.ecogroup.com
info@ecogroup.com

Condesign Infocom AB 036-30 83 80
10037 GB 05.10 BA