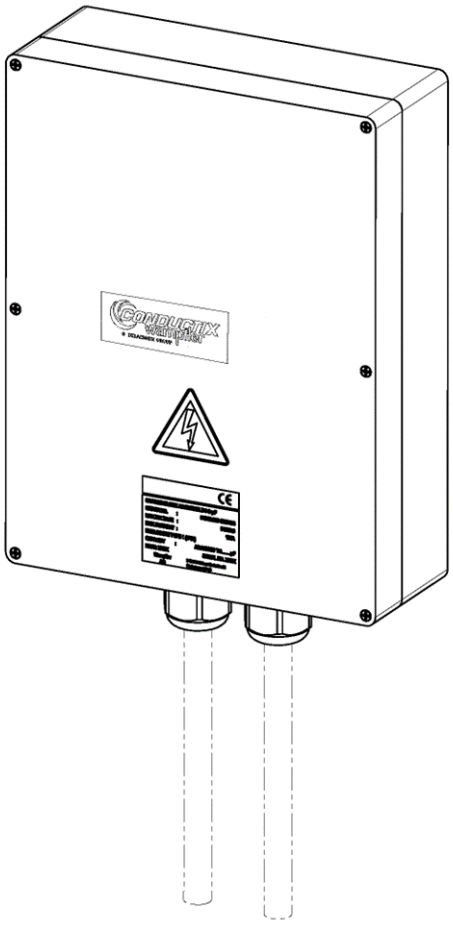
Operation Manual

Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Order Number

91008-210-3088444	Capacitor Box 80 A adjustable 2,04 µF to 2,72 µF
91008-210-3088445	Capacitor Box 80 A adjustable 3 µF to 8 µF
91012-210-3101180	Capacitor Box 125 A adjustable 2,04 µF to 2,72 µF
91012-210-3055524	Capacitor Box 125 A adjustable 3 µF to 8 µF



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Operation Manual

Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Index

1 Symbols and hints

Warning of voltage

This symbol can be found in several places in the operating instructions where special care has to be taken due to voltage which is a potential danger to the life of people. Please observe these instructions and be careful in those cases. Please carry out all health and safety regulations to ensure safety to other users as well. Always disconnect the system from the main supply prior to carrying out any work on the energy supply system.

Attention – some hints

This sign draws the attention to parts of the operating instructions where the regulations and advice and correct operational sequence must be observed to avoid any damage or destruction to the energy supply system and its components.

Temperature

This sign draws the attention to parts of the operating instructions where special care must be taken on account of heating of surfaces or on account of inductive heating of ferromagnetic material and where other special measures have to be taken. Please pass on the corresponding advice to other users too.

2 Advisory information for the user

When opened, Capacitor Boxes can contain lethal voltage depending on the state of operation.

Non-permissible removal of required components, improper operation, faulty installation or operation involves risk of severe injuries to persons and damage to components.

All electric installation and commissioning works as well as repair works and disassembly have to be carried out by qualified staff (IEC 364 respectively CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).

Qualified staff according to the safety regulations, are persons who are familiar with the installation, assembly, commissioning and operation of the energy supply system and that have the appropriate qualifications.

Conductix-Wampfler cannot be held responsible for damage or breakdown that may have been caused by not observing this manual.

This manual contains exclusively details of the specified Capacitor Box.

We reserve the right to carry out technical modifications of illustrations and statements in this instruction manual. References to other documents specifying the document number, do not include the revision index. Refer to the project handbook for a list of relevant documents.

Unless otherwise specified, all dimensions refer to the metric system, i.e. lengths are always in mm unless specified in other dimensions.

3 Intended purpose

The intended purpose of the capacitor box is for use in conjunction with other components. Capacitor Boxes are not suitable for stand alone operation and must be used in conjunction with appropriately specified components.

The Capacitor Box is used for the track tuning and reduces the inductance of the track installation by reactively compensating. Depending on the installation, capacitance will be added or removed from the Capacitor Box to create a defined track inductance. This inductance is necessary to operate primary correctly.

4 Technical data

4.1 Electrical data

4.1.1 Circuit 80 A version

- Current per Capacitor Box 80 A
- Frequency 20 kHz
- Maximum operating voltage 490 V AC

4.1.2 Circuit 125 A version

- Current per Capacitor Box 125 A
- Frequency 20 kHz
- Maximum operating voltage 490 V AC

4.1.3 Capacitance of the 2,04 µF – 2,72 µF version

- Pre-installed capacitance 2,72 µF
- Minimum / Maximum capacity 2,04 µF / 2,72 µF
- Adjustable capacitances 2,04; 2,108; 2,176; 2,244; 2,312; 2,38; 2,448; 2,516; 2,584; 2,652 and 2,72 µF

4.1.4 Capacitance of the 3,0 µF – 8,0 µF version

- Pre-installed capacitance 8.0 µF
- Minimum / Maximum capacity 3.0 µF / 8.0 µF
- Adjustable capacitances 3.0; 3.1; 3.3; 3.4; 3.6; 3.7; 3.9; 4.0; 4.1; 4.3; 4.4; 4.6; 4.7; 4.9; 5.0; 5.1; 5.3; 5.4; 5.6; 5.7; 5.9; 6.0; 6.1; 6.3; 6.4; 6.6; 6.7; 6.9; 7.0; 7.1; 7.3; 7.4; 7.6; 7.7; 7.9 and 8.0 µF

4.1.5 Connectors

- Two cable glands 20 mm² and 35 mm² Conductix-Wampfler Litz Cable (Mat.-no for 20 mm² Litz Cable: 3025567 and mat.-no for 35 mm² Litz Cable: 3033261)
- Cable attachment Soldered cable lugs M8 (Tinned copper!)
- M8 torque 9 Nm +0 / -1 Nm
- M4 Metal post torque 1.25 Nm +0 / -0.25 Nm

4.2 Mechanical data

- Dimensions — See drawings
- Color — RAL 7035
- Weight — 2,04 – 2,72 µF version approx. 2 kg
  3,0 – 8,0 µF version approx. 3 kg
- Box Material — Polycarbonate with Polyurethane sealing ring
- Protection Grade — IP54, with cable glands; enclosure type 1

4.3 Environmental data

- Storage temperature — -20°C to +60°C
- Transport temperature — -40°C to +80°C
- Operation temperature — + 5°C to +40°C (measured 50 mm from outside middle of box)
- Humidity — 95%, non condensing
- Chemical resistance — Any influence of chemicals must be checked
- Operation — The Capacitor Box may only be used in industrial environments

4.4 Installation of Capacitor Boxes

- Position — Vertical
- Orientation — Cable glands facing down.
- Shielding to Iron/Steel — In case of the presence of ferromagnetic material.
  Around the box or cables shielding may be required!
  See corresponding chapter for details.

* Note that in extreme situations where convective cooling is minimal the minimum capacitance may need to be increased to reduce heat dissipation in the box.

5 Scope of delivery

M8 screws for connections of the Litz Cable are within the scope of delivery. However, HF Litz cables, shielding plates and mounting material for the housing are not included in the scope of supply.

6 Transport and storage

The transport company must be advised of any damage that has been detected after delivery. Prior to installing or starting operation of damaged components please consult the supplier.

7 Installation

7.1 Who is authorized to carry out the installation

All installation and commissioning work as well as maintenance work and disassembly have to be carried out by qualified staff (IEC 364 respectively CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).
Qualified staff according to the safety regulations, are persons who are familiar with the assembly and installation of the energy supply system and who have the appropriate qualifications.

7.2 General advice for the installation

- After receipt of the components and prior to starting the installation work, unpack the components and check carefully for damage that may have occurred during transport or storage (damage to housings and insulation, missing parts etc.).
- Check data on the identification plate to make sure that the components meet the requirements with regard to nominal power and voltage.
- Check completeness of the documents and conformity with the delivered components.

For the installation of the Capacitor Boxes make sure that they are positioned safely and on an even surface. It has to be secured on site so that the position of the Capacitor Boxes will be permanently safe!

An improper installation of the energy supply system has a negative effect on its function, efficiency and lifetime.

It is therefore important to observe the specification for the choice of the place of installation. The guarantee will expire if this is not observed!

Follow the instructions attaching the boxes to the support structure.

7.3 Place and conditions of installation

Install the Capacitor Boxes in an environment and under conditions as specified in this document only. The boxes have to be mounted in a vertical position and attached to a solid base.

The waste heat of the Capacitor Boxes is dissipated by convection cooling only. Ensure that free flow of air is guaranteed around the boxes at any time. Protect Capacitor Boxes from additional heating, i.e. exposure to sunlight. It is essential to make sure during the mounting that the air flow is not hindered in any way by objects and that boxes are installed in a shaded area. Otherwise damage or reduction of the lifetime may result.

7.4 Electrical regulations

The general electrical operating conditions according to VDE 0100 (installation and operation of electrical equipment up to 1000 V) have to be observed. If necessary observe the local regulations when they go beyond these requirements.

8 Warnings and cautions

All electric work has to be carried out by qualified staff (IEC 364 respectively ENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules). Qualified staff according to the safety regulations, are persons that are familiar with the installation, commissioning and operation of the energy supply systems and that have the appropriate qualifications.

The Capacitor Boxes are only foreseen to be operated in conjunction with matching components.
If you are not sure whether components match contact Conductix-Wampfler. Do not put into operation before.

Dangerous voltages are stored in capacitors! Do not remove lids or other protective parts or touch connection terminals until capacitors are entirely discharged. This may take up to 5 minutes. Improper handling can result in electric shocks or burns as well as damage to the appliance!

When in operation or after operation surfaces of boxes and components inside can be hot, be careful!

9 Commissioning

Capacitor Boxes have to be commissioned in conjunction with other corresponding components.
For commissioning it is recommended to have the secondary components installed on a vehicle and all vehicles present during commissioning. If it is a replacement, make sure to have the same configuration on the Capacitor Boxes as being applied in the Capacitor Box to be replaced! If in doubt, tune the system newly (Conductix-Wampfler specialist bay be required).

10 Operation

Capacitor Boxes are not designed for independent operation. They have to be operated in conjunction with corresponding rail components. Therefore no specific details about the operation are given here. Do not operate Capacitor Boxes with the lids removed or in any non touch proof state at any time!

Since capacitors are always subject to a certain aging, which can be accelerated by specific operating conditions, i.e. high ambient temperatures, we strictly recommend to check on the state of the Capacitors Boxes on a regular basis (see Maintenance and Repair for further details).
Do observe specified operating conditions.

11 Maintenance and repair

Since capacitors are always subject to a certain aging, which can be accelerated by specific operating conditions, i.e. high ambient temperatures, we strictly recommend to check on the state of the Capacitors Boxes on a regular basis. Do observe specified operating conditions. Make sure the system is switched-off and free of stored energy, before executing any action requiring an opening of a Capacitor Box.

Please check regularly (recommended monthly) that there isn't any damage visible from the outside of the Capacitor Box.

Check at least every 3 months if the free air flow of the cooling air is not hindered. In case free air flow is not given, remove any obstacles. If you notice strong soiling, do control more frequently.

Check the capacitor boxes for damage burn marks or any other indication of faulty operation at least on a yearly basis. If there is any indication of higher stress or wear, check in shorter intervals and take adequate action to identify the root cause. If qualified personnel is available, we recommend to measure capacitance in adequate intervals (please be aware that Capacitor Boxes are configured and may have different values within a system). If no qualified personnel is available, consult Conductix-Wampfler for available support and conditions.

We recommend to measure the capacitance of each Capacitor Box at least every two years. If the capacitance is varying to the prior measured value by 0,5 – 1 µF, do consult Conductix-Wampfler for adequate measures. If variations are bigger than 1 µF, the Capacitor Box needs replacement.
If a Capacitor Box must be substituted ensure the replacement Capacitor Box it has the same capacitance as the Capacitor Box it is replacing.

Repair work is only possible at Conductix-Wampfler.

12 Disassembly / re-use

If it is necessary to exchange the Capacitor Boxes due to damage or to install it in another place, verify that no damage will occur during disassembly.

For installation in another place, observe the described mounting and commissioning instructions. Improper application, wrong installation or operation involve the danger of severe injuries to persons and damage to objects.

All electric work have to be carried out by qualified staff (IEC 364 respectively. CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE 0110 and national safety rules).

Qualified staff according to the safety regulations, are persons that are familiar with the installation, assembly, commissioning and operation of the energy supply system and that have the appropriate qualifications.

12.1 Safety advice for disassembly and disposal

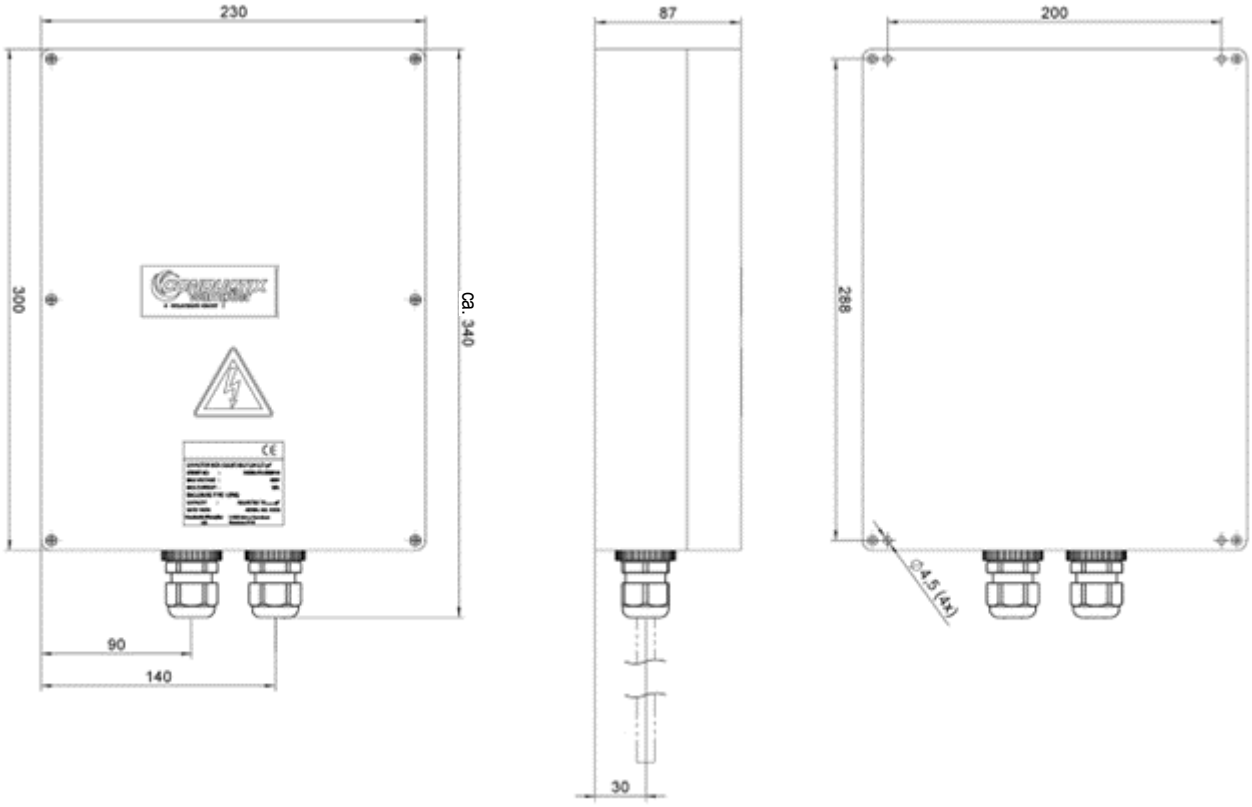
1. Disconnect system from the mains voltage
2. Make sure the system cannot be powered up again accidentally
3. After disconnecting the track supply from the supply voltage wait at least 5 minutes for internal discharging before opening any Capacitor Boxes.
4. Dismount the Capacitor Boxes
5. Dispose of components in a specific way → Recycling.

12.2 Recycling

The unit contains components that have to be disposed of in a specific way. If it is not used any longer, it will have to be recycled properly.

13 Dimensions of Capacitor Boxes

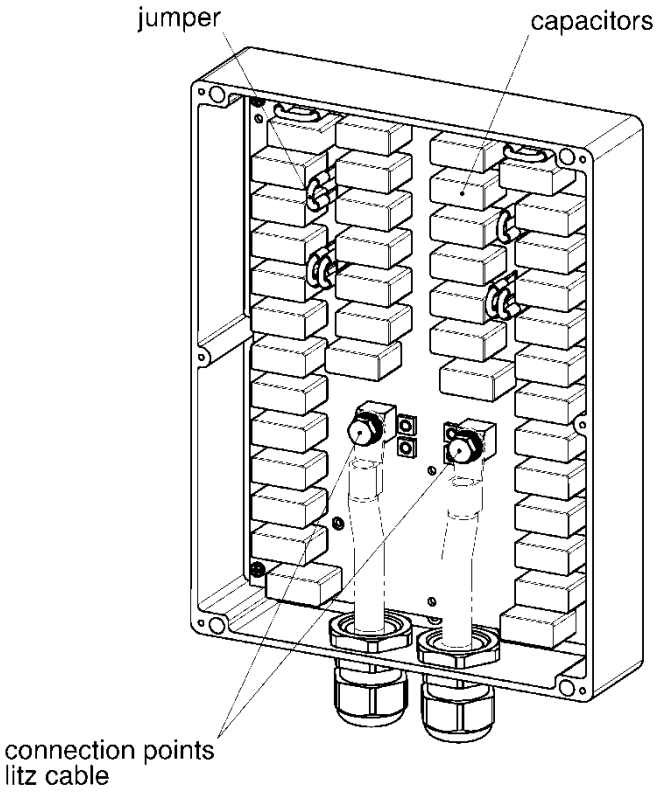
Dimensions



Install Capacitor Boxes so that the cable glands are facing down.

14 Capacitor Box Insight

14.1 Insight 2,04 – 2,72 µF version

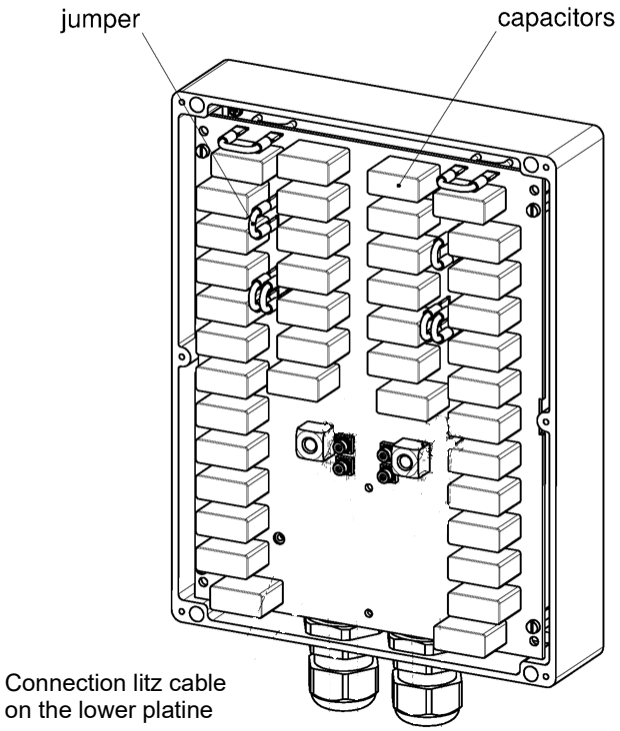


The Capacitor Box is equipped with a single capacitor board.

Install Capacitor Boxes so that cable glands are facing down.

Litz cable connections have to be tightened with a torque of 9 Nm (+0 / -1 Nm).
Over tightening or under tightening poses a fire risk.

14.2 Insight 3,0 – 8,0 µF version



Connection litz cable
on the lower platine

The Capacitor Box is equipped with two capacitor boards in two layers. For the following purposes they are named “top” and “bottom”. “Top” is the first board when you are opening the box. The “bottom” board is the one behind the “top” board.

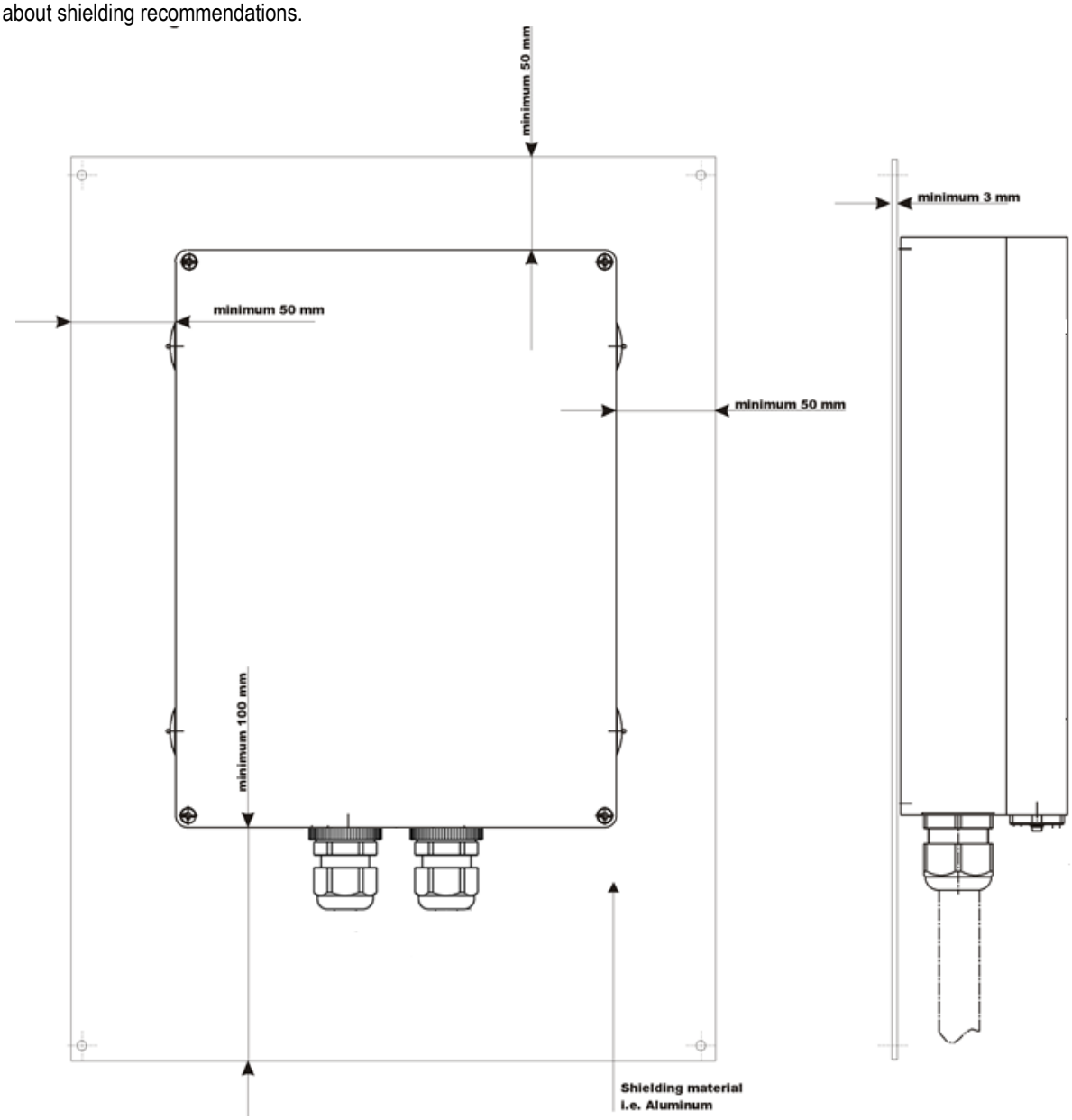
Install Capacitor Boxes so that cable glands are facing down.

Connect the Track Litz Cable always to the lower Capacitor Board.

Litz cable connections have to be tightened with a torque of 9 Nm (+0 / -1 Nm).
Over tightening or under tightening poses a fire risk

15 Back Shielding of Capacitor Box

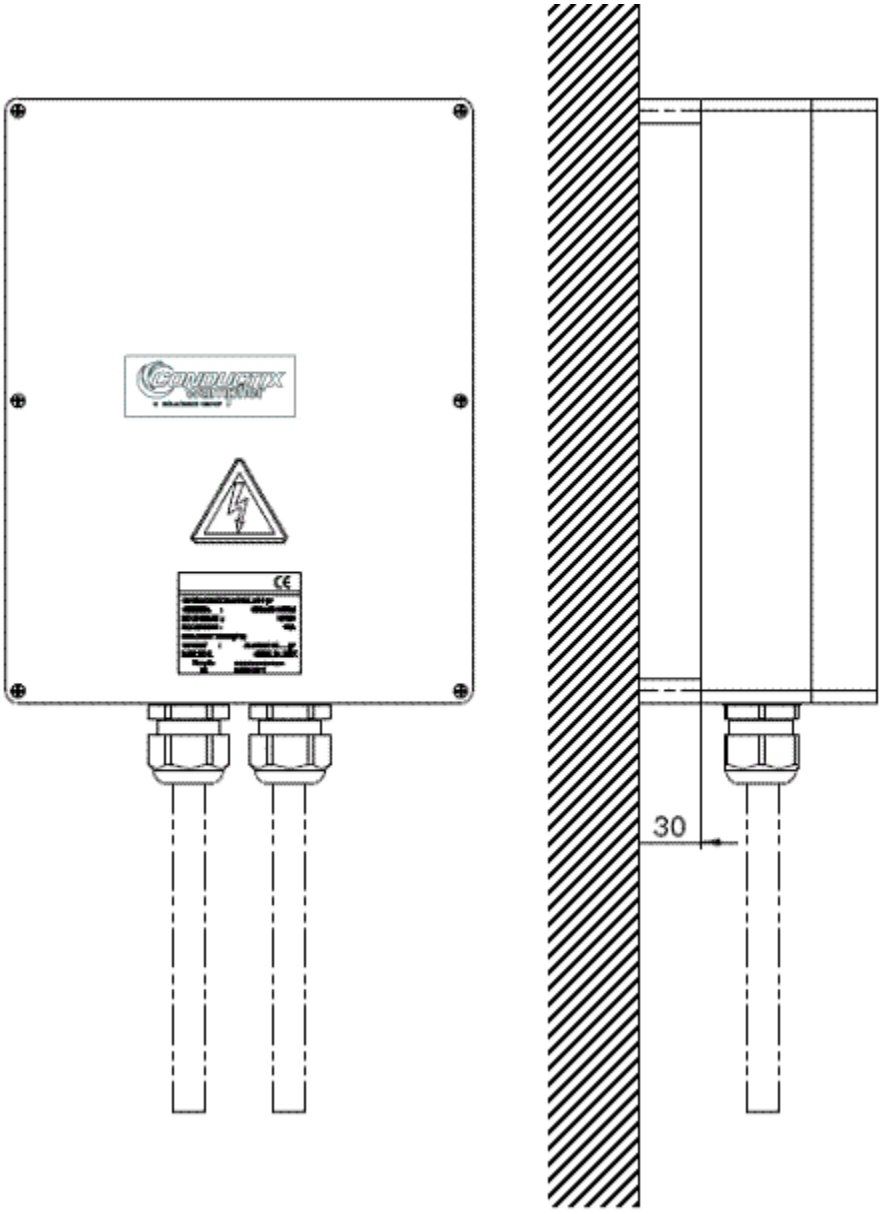
If the wall or the support structure where the Capacitor Boxes are attached contain significant amounts of steel or iron, aluminium shielding between cables containing 20 kHz and this material is necessary. Please refer to the corresponding chapter for details about shielding recommendations.



Cables need to be bundled and then installed together.
Please observe the mounting instructions on the installation of cables.

16 Enhanced Convection Cooling

To improve convection cooling it is optionally possible to install the Capacitor Box with some distance to any support structures, i.e. walls.

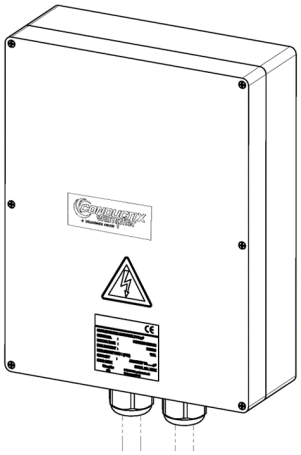


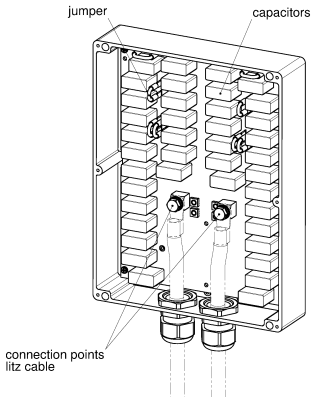
17 Sequence of assembly work

17.1 Soldering of cable lugs

The following does not describe the necessary works for the preparation of the Litz Cables.

17.2 Attaching Track Cables





1.
Make sure that the cables are long enough and that they have the same length to be laid in parallel.

2.
Remove lid from the Capacitor Box.

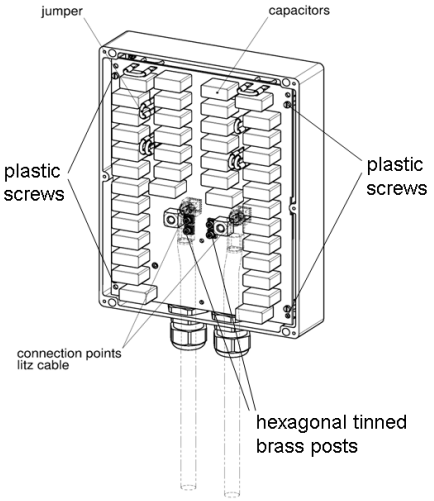
3.
In the case of the 3.0 – 8.0 µF version, the top board must be removed. Unscrew the four plastic and four metal M4 screws, and place them safely aside together with any washers present.

4.
Run the track cables through the cable glands.

5.
Connect the cables to the capacitor board using the M8 bolts. Tighten bolts with a torque of
9 Nm (+0 / -1 Nm). USE ONLY STAINLESS STEEL ACCESSORIES (A4 QUALITY)
TO ATTACH THE LITZ CABLE!

6.
Tighten the glands so that the entry is sealed

7.
Adjust the board(s) by adding or removing jumpers on the board(s). The adequate jumper settings please find in the following chapters 18.1 and18.2.



8.
In the case of the 3.0 – 8.0 µF version – depending on the setting (see chapter 18) - the top board must first be reinstalled.
Before mounting, test that the four hexagonal tinned brass posts in the middle of the board are still secure by applying 1 Nm (+0 / -0.5 Nm) clockwise.
Tighten the metal screws on the metal posts to 1,25 Nm (+0 / -0.25 Nm). Plastic screws should be lightly secured.

9.
Close Capacitor Box with the lid. Make sure, the lid covers the housing neatly.

10. When tuning is accurate mark Box with value adjusted to.

Cables need to be bundled and then installed together.
Please observe the mounting instructions on the installation of cables.

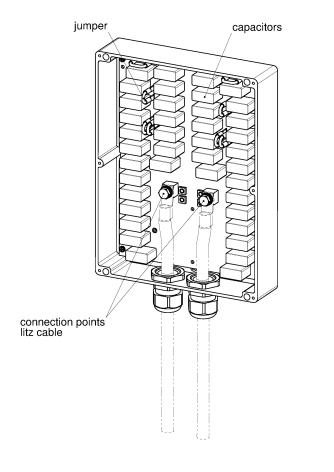
18 Adjustment of Capacitor Boxes

Adjustment of Capacitor Box shall be done by Conductix-Wampfler personnel or other specially qualified personnel only!

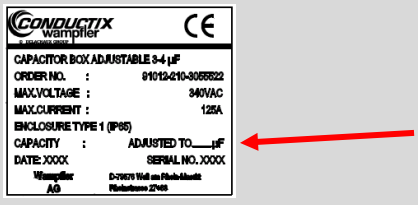
Make sure the entire system is switched off and mains connection is removed before opening the Capacitor Box! Observe safety rules!

When adjusting the Capacitor Box by adding or removing jumpers make sure:

- No physical force is applied to the Capacitor body
- Use pliers to insert or remove bridges
- Ensure spade connectors are tight fitting
- Remove any jumpers taken out of the Capacitor Box before operating it
- Make sure there are no loose parts remaining in the Capacitor Box



Mark adjusted Capacitor Boxes with the value that they are adjusted to on outside in the designated space on the type plate.



Capacitor Boxes are set up with individual capacitance; therefore they can not be replaced randomly. Replacement of Capacitor Boxes is only possible if the setup of the box corresponds.
Check carefully!

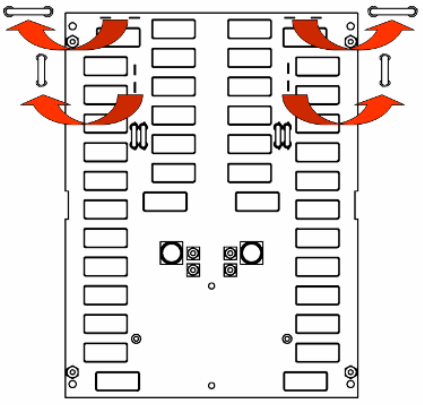
18.1 Adjustment 2,04 – 2,72 µF version

To adjust the Capacitor Box to a specific capacitance, **remove** jumpers as shown in the following drawings:

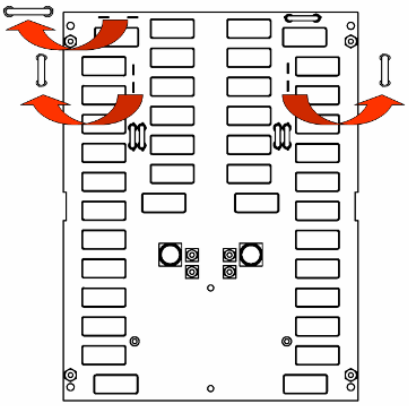
Warning: The capacitance must never be lower than 2,04 µF, and for that reason the four lower wire jumpers closest to the track cable connectors must never be removed in the box.

The configurations shown below take into account the above rules.

Capacitance
2,04 µF



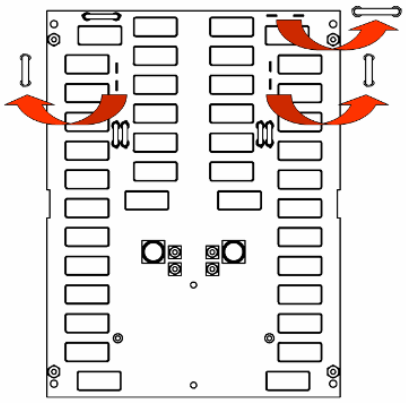
Capacitance
2,108 µF



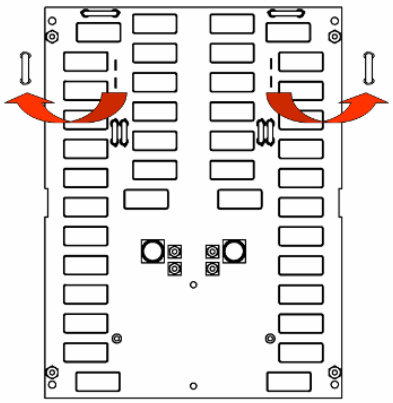
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

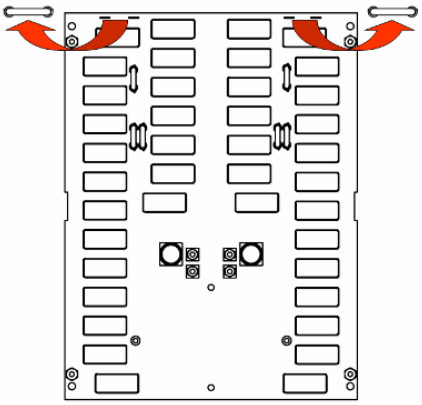
Capacitance
2,244 µF



Capacitance
2,312 µF



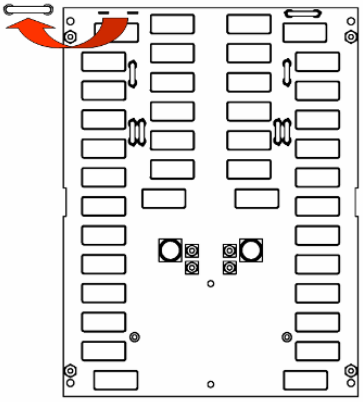
Capacitance
2,448 µF



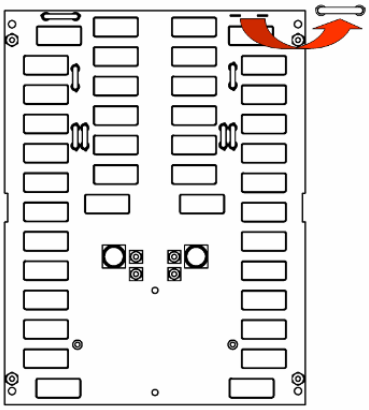
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

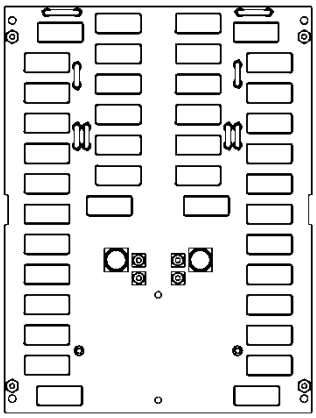
Capacitance
2,516 µF



Capacitance
2,652 µF



Capacitance
2,72 µF



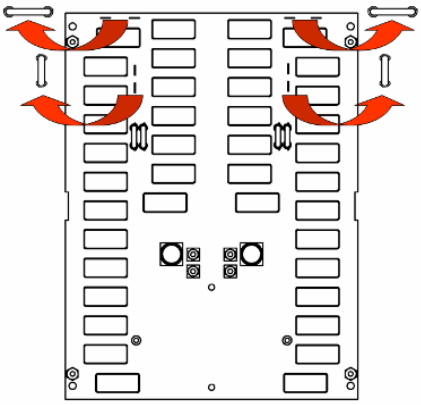
18.2 Adjustment 3,0 – 8,0 µF version

To adjust the Capacitor Box to a specific capacitance, **remove** jumpers as shown in the following drawings:

Warning:
- the capacitance of the bottom board must always be higher than the capacitance of the top board, otherwise too much current will flow through the four M4 metal connecting posts.
- when two boards are used in a box, never have less than 2 µF on each of the boards
- if the top board is taken out of the box make sure that the remaining bottom board is effectively having a minimum of 3 µF (the four lower wire-jumpers closest to the track cable connectors must never be removed).

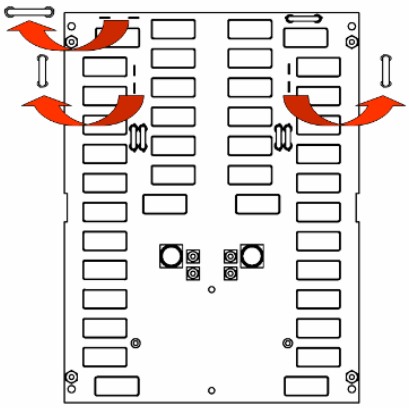
The configurations shown below take into account the above rules

Capacitance
3,0 µF



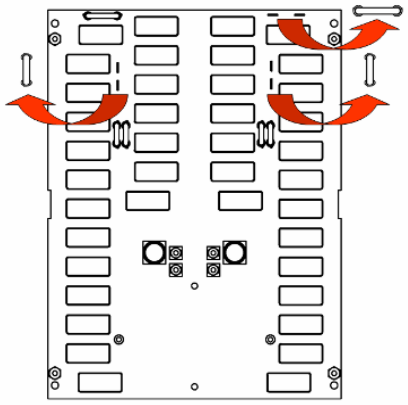
Top board is removed

Capacitance
3,1 µF



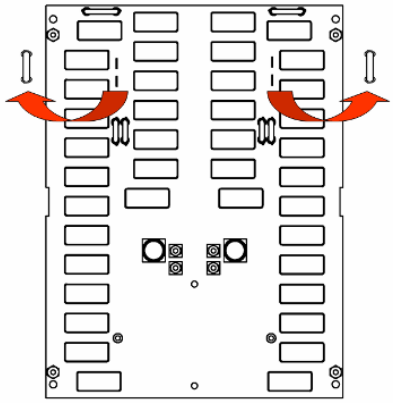
Top board is removed

Capacitance
3,3 µF



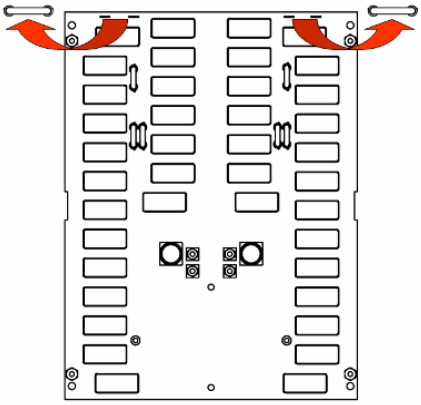
Top board is removed

Capacitance
3,4 µF



Top board is removed

Capacitance
3,6 µF

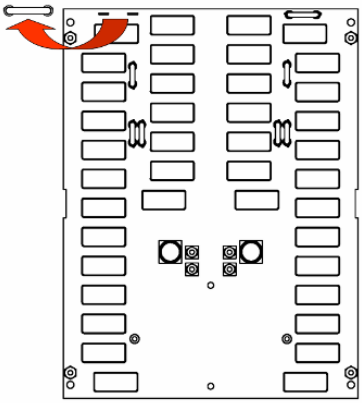


Top board is removed

Capacitor Boxes adjustable

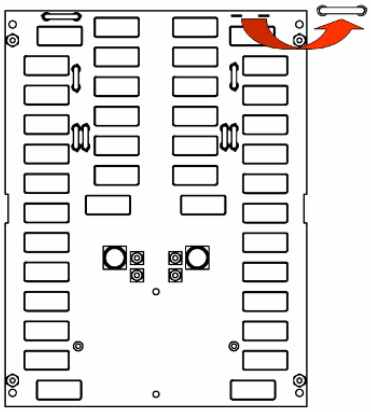
80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
3,7 µF



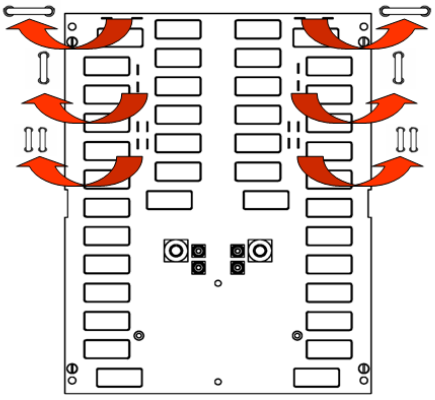
Top board is removed

Capacitance
3,9 µF



Top board is removed

Capacitance
4,0 µF



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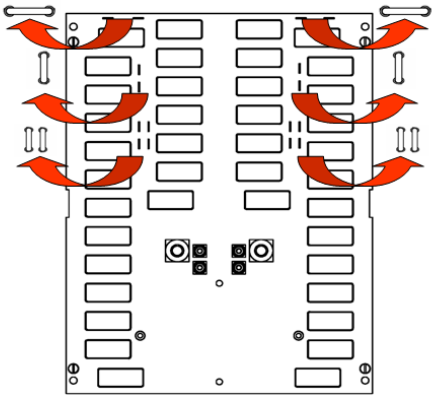
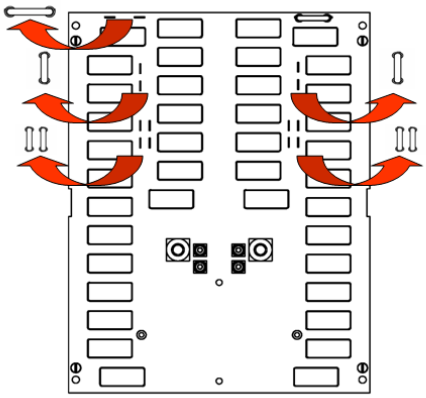


Top

Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
4,1 µF



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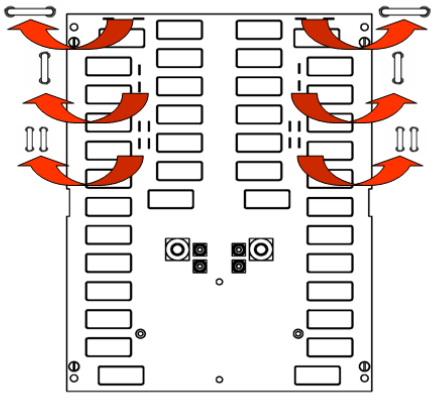

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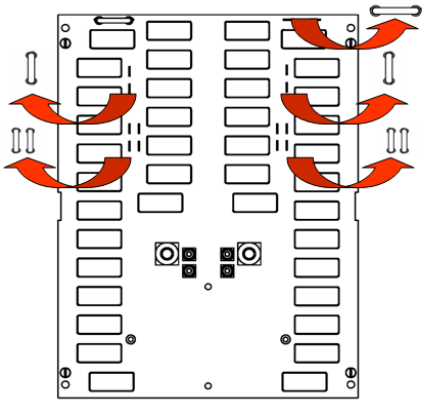
Capacitance
4,3 µF



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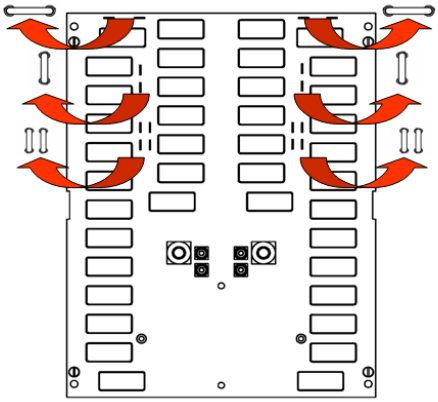

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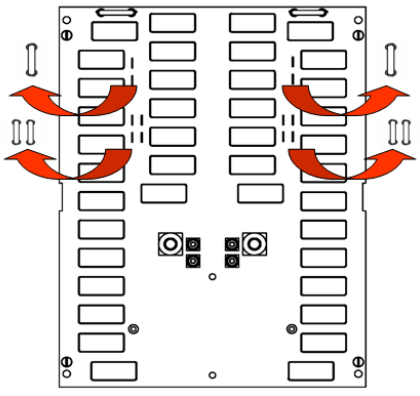
Capacitance
4,4 µF



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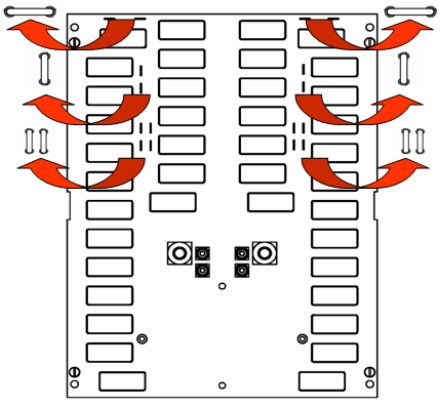

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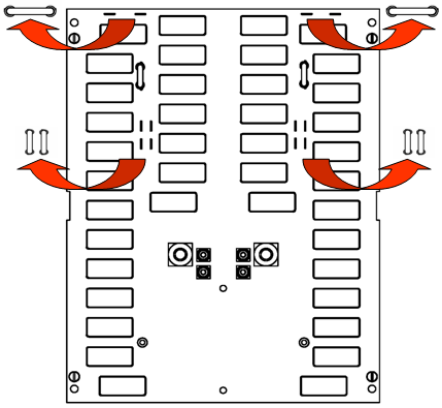
Capacitance
4,6 µF



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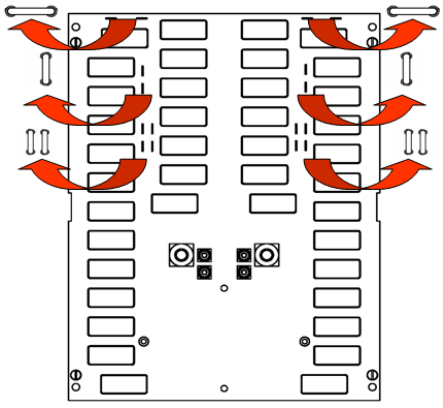

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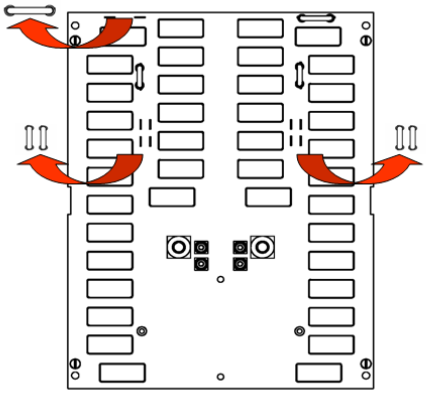
Capacitance
4,7 µF



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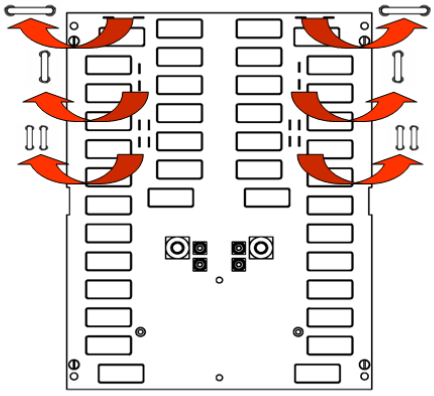

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Capacitance
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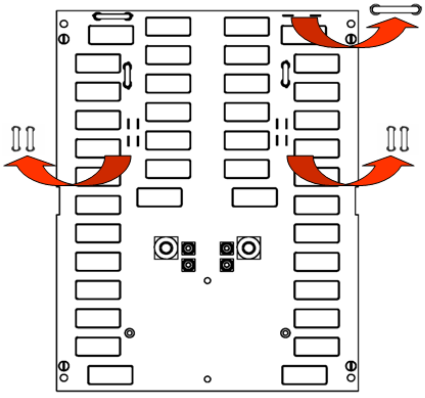

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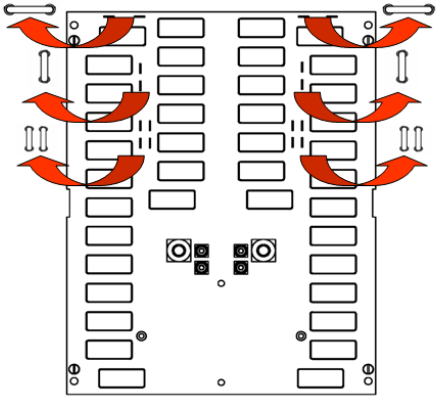

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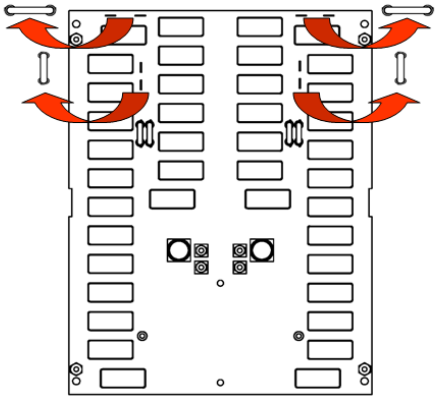
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
5,0 µF



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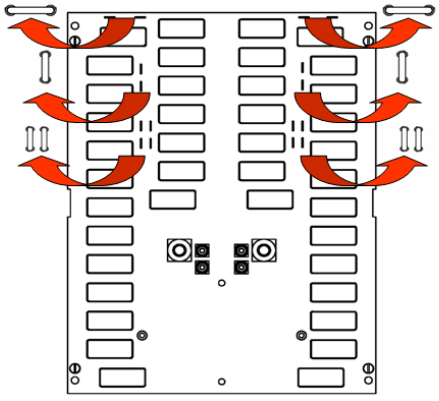

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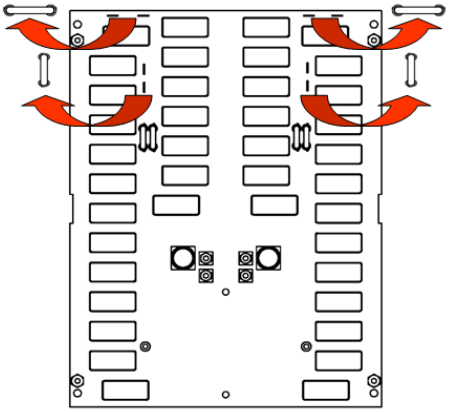
Capacitance
5,1 µF



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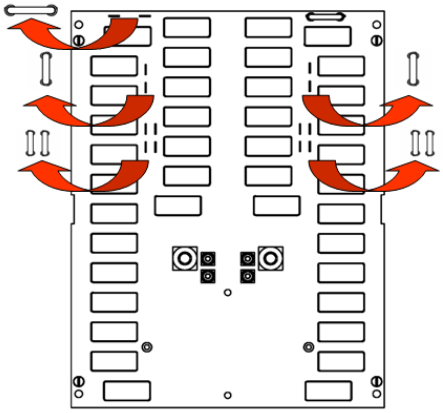

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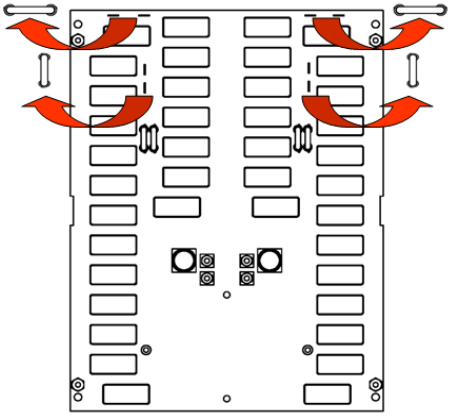
Capacitance
5,3 µF



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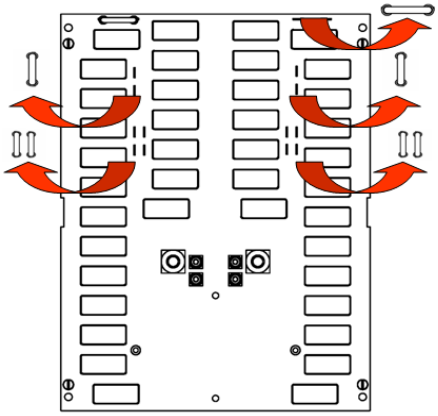

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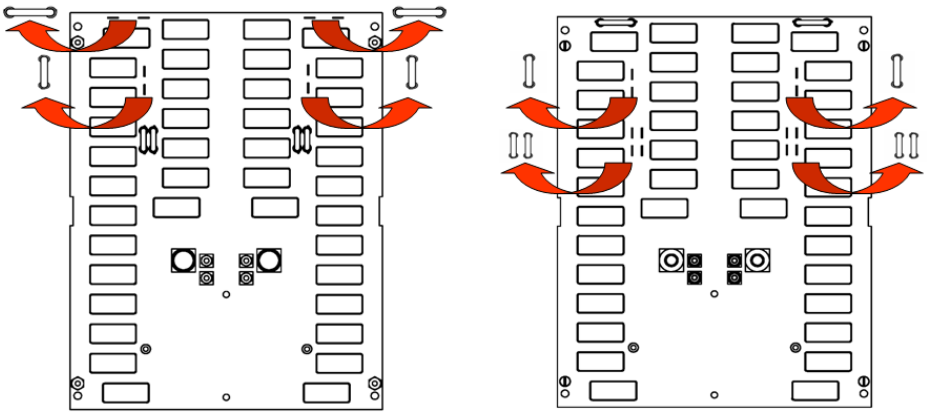
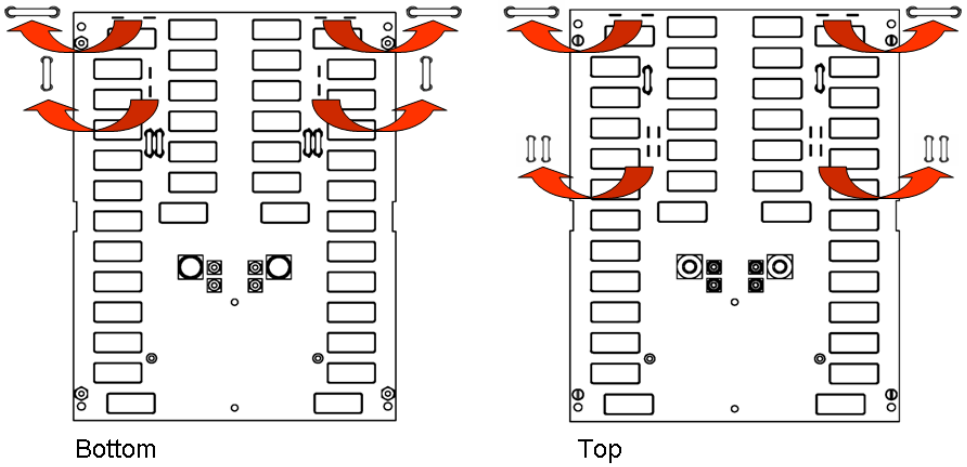
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

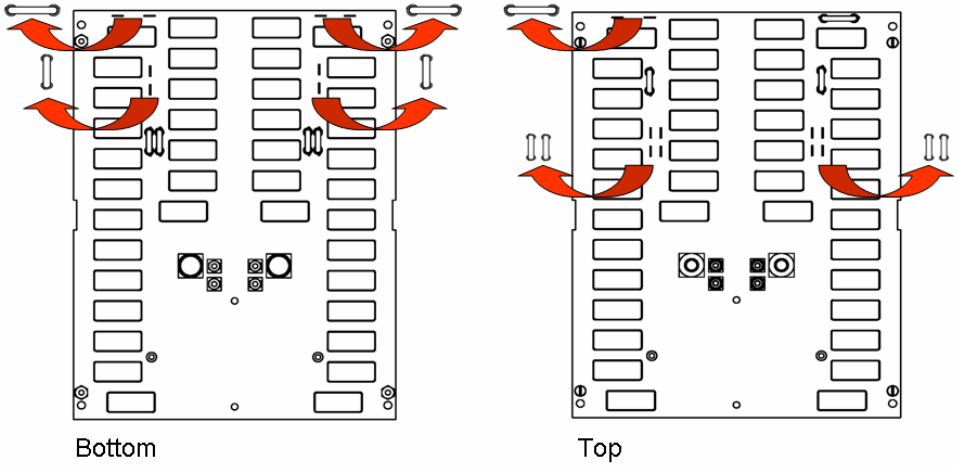
Capacitance
5,4 µF



Capacitance
5,6 µF



Capacitance
5,7 µF



Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
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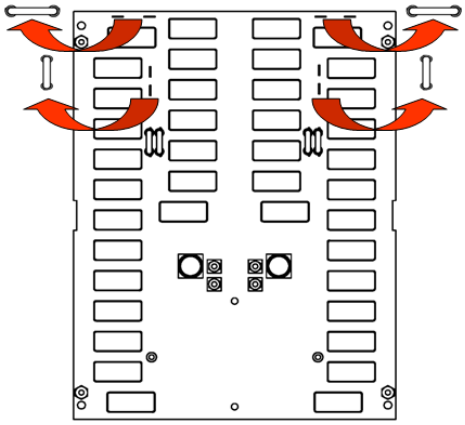

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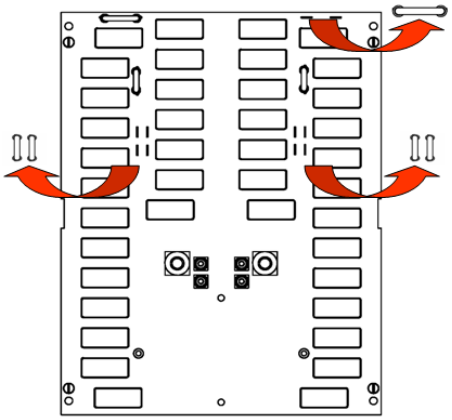

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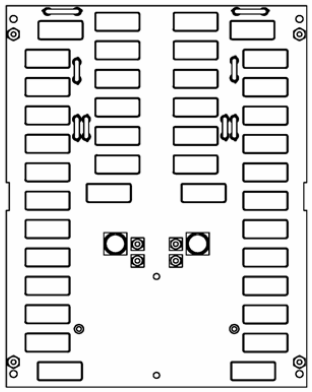
Capacitance
6,0 µF



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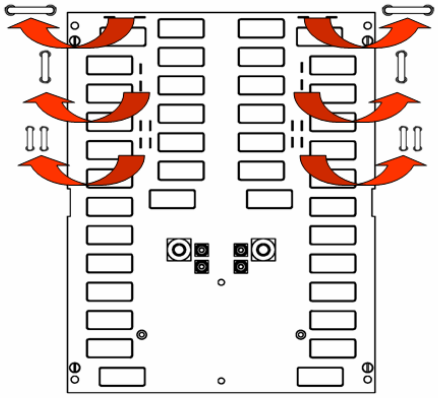

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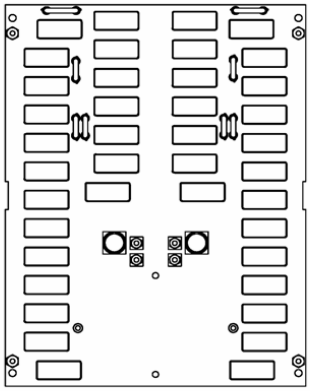
Capacitance
6,1 µF



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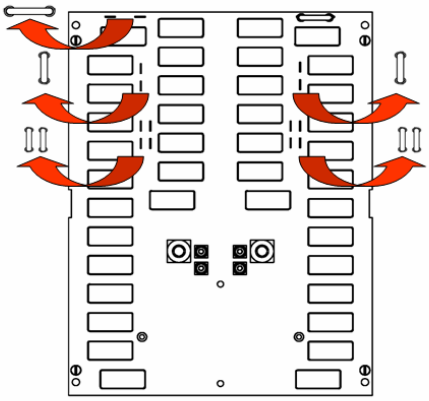

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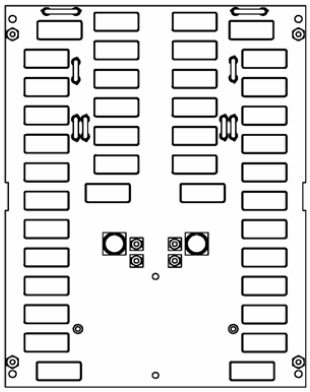
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
6,3 µF



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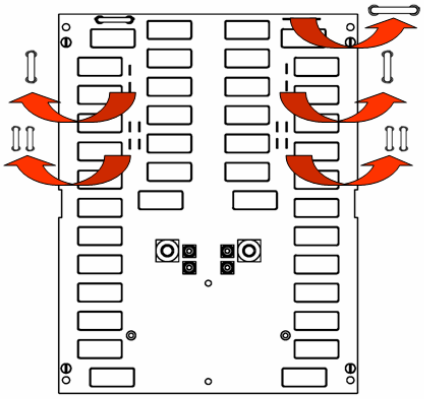

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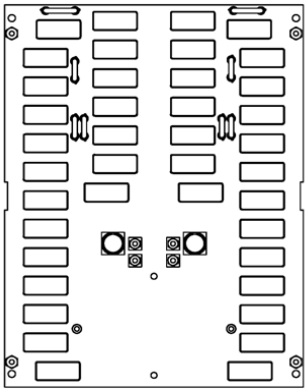
Capacitance
6,4 µF



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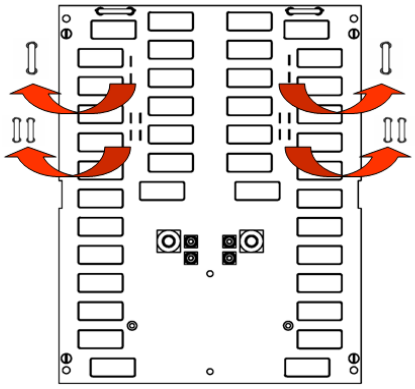

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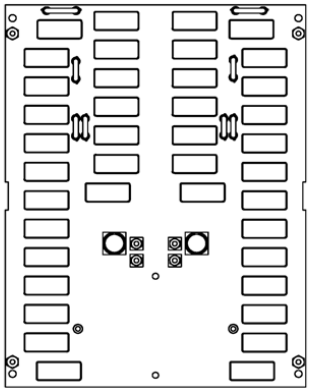
Capacitance
6,6 µF



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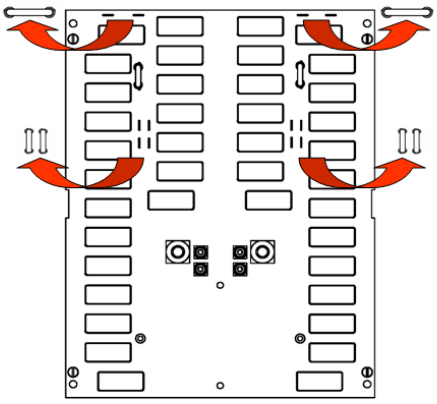

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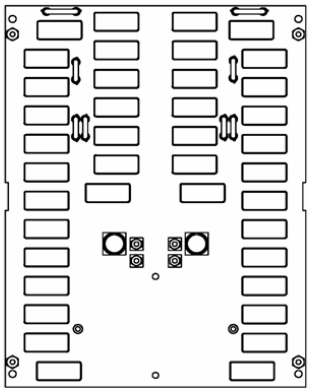
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
6,7 µF



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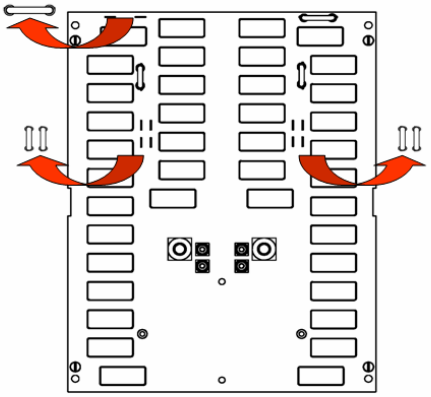

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Capacitance
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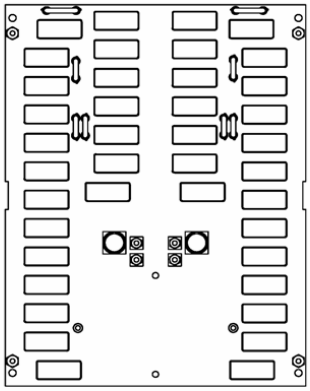

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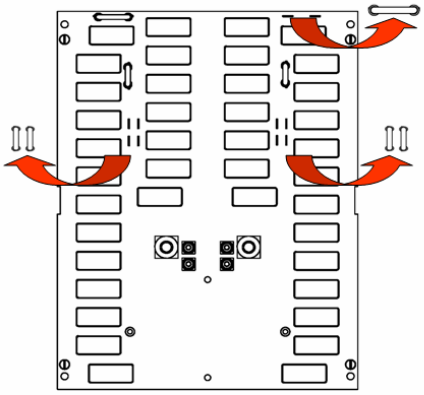

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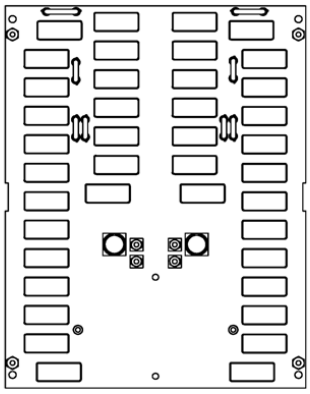
Capacitance
7,0 µF



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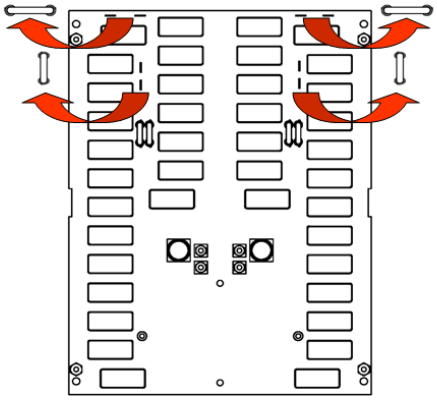

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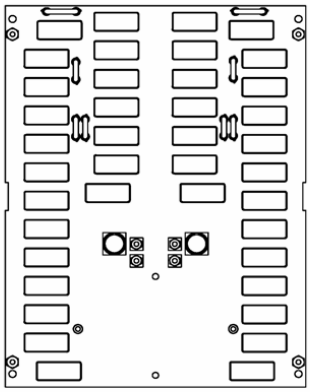
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
7,1 µF



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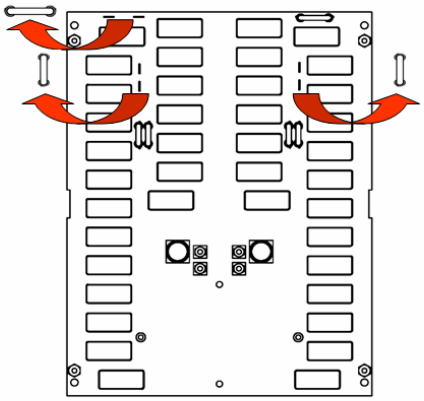

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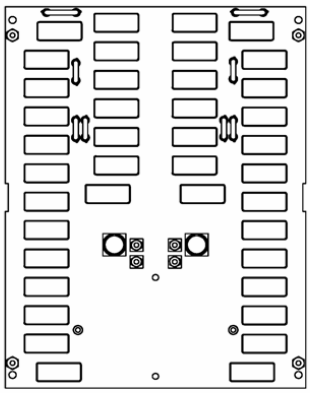
Capacitance
7,3 µF



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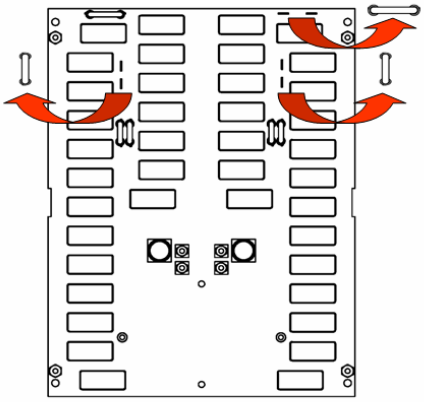

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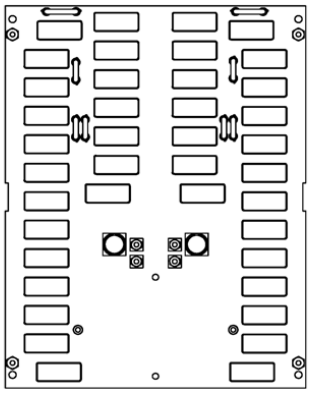
Capacitance
7,4 µF



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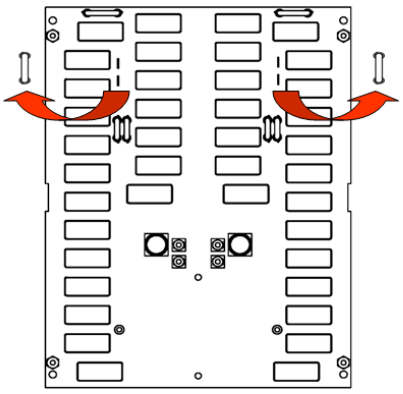

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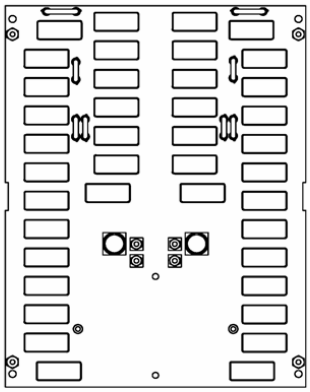
Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

Capacitance
7,6 µF



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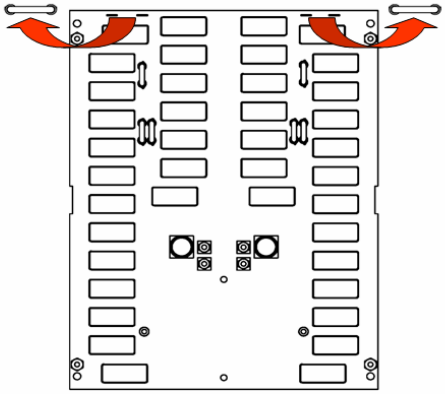

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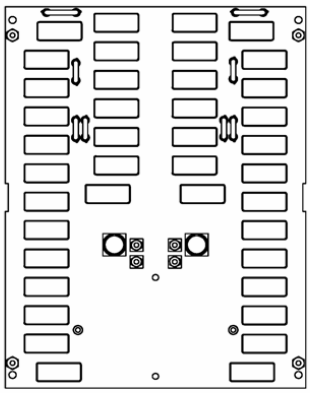
Capacitance
7,7 µF



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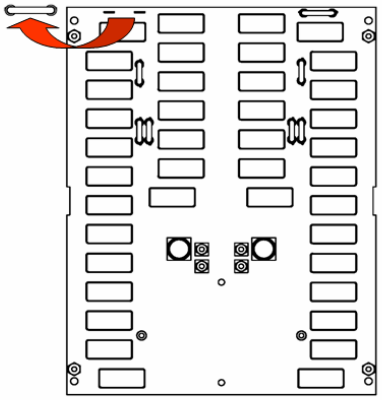

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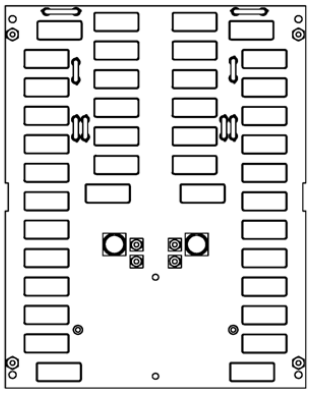
Capacitance
7,9 µF



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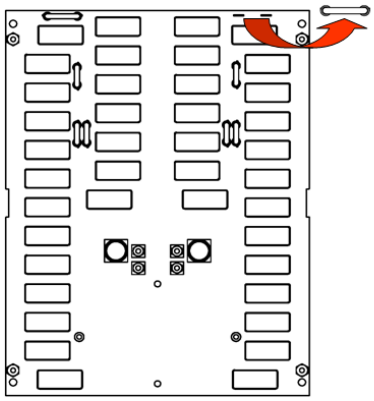
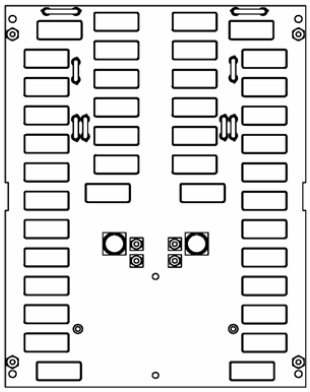


Top

Capacitance
8,0 µF



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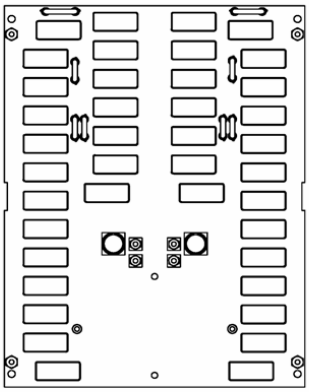

Top

19 Tools required for attachment and adjustment

Name	Specification	Application
Flat Screw driver	4 - 5 mm	Flat plastic corner M4 screws
Philips / Pozi	Nr. 2	Open box lid (Flat 5mm also possible)
Hexagonal extension wrench	13 mm	Fasten M8 Track cable bolts
Allen / Inbus key	3 mm	Loosen and fasten the four metal M4 retaining screws connecting top board to bottom board (version 3,0 – 8,0 µF only).
Flat nose pliers		Removing and inserting (wire) jumpers
Torque wrench		For tightening M8 and M4 metal screws (see chapter 4)

Measurement tools for tuning measurements as well as material for terminating the HF Litz cable not included in the list!

Operation Manual

Capacitor Boxes adjustable

80 A / 125 A Track, 2,04 µF to 8 µF

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