MODVAR Low voltage reactive power compensation modules
Installation manual
MODVAR
Low voltage reactive power compensation modules

Before installation, read this manual carefully and keep at the disposal of personnel in charge of installation, maintenance and operation.

1.0 Safety
For the safe use of MODVAR modules, please ensure:
- Installation and maintenance is undertaken only by authorised and qualified personnel, in accordance with current local regulations
- Isolation of the equipment from the supply before working
- Wait 5 minutes after isolating supply before handling
- After 5 minutes short-circuit the capacitor terminals with a piece of insulated cable to confirm discharge

Failure to follow the safety rules may lead to bodily injury, premature failure of the capacitors, or other material damage to installations.

2.0 Inspection on receipt
Inspect the packing and immediately report any damages. Unpack the MODVAR module and check that:
- Data on the label correspond to those of your purchase order.
- MODVAR module is not damaged.
- Any loss or damage should be notified immediately to your nearest ABB agent.

2.1 Storage-transportation-handling
Store indoors, in dry, dust free and non-corrosive environments, protected from vibrations or shocks.
Storage in initial packing is recommended.
Storage temperature:
- Minimum: -40°C / -40°F
- Maximum: 75°C / 167°F
3.0 MODVAR modules layout

There are two types of MODVAR modules:
- MODVAR complete in one tray
- MODVAR segregated

MODVAR complete in one tray
1. Discharge resistor 4. Fuse and fuse base
2. Capacitor 5. Contactor

MODVAR segregated
1. Reactor 4. Mounting plate
2. Fuse and fuse base (not shown) 5. Cables
3. Contactor 6. Discharge resistors
7. Capacitors

Figure 3.1: MODVAR all in one power modules

Figure 3.2: MODVAR segregated (reactor and capacitors are mounted on separate trays to reduce thermal stress on capacitors)
MODVAR
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3.1 MODVAR dimensions

Figure 3.3: MODVAR dimensions

Figure 3.4: MODVAR dimensions
4.0 Mechanical installation

MODVAR modules must be fixed horizontally so as to allow airflow circulation (see blue arrows in the figure below).

MODVAR modules must be fixed on a rigid frame with two M6 screws (not provided).

Make sure that the rigidity of the support and the screws are sufficient to bear the weight (about 50 kg) of the MODVAR module(s).

Air clearances: 25 mm to walls and flange to flange between modules.

Figure 4.1: MODVAR air flow direction
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4.1 Airflow and cooling requirement

The service conditions specified in the IEC 60831-1 section 4 are applicable.

As per IEC 60831-1 section 3.21, the ambient temperature for capacitors is the air temperature around the capacitors itself and not around the cubicle.

The cross-section of air inlet and outlet must be adapted to the air flow.

Air should flow from the bottom to the top of the cubicle as illustrated on the opposite picture.

One fan per 6 MODVAR columns blowing a minimum air flow of 525 m³/h is necessary.

**Design guideline**

The difference between ambient temperature outside the cubicle and measured temperature must be lower than 10°C. To meet that requirement, the temperature probe must be located on top of the air duct.

**Note:** An over temperature protection device must be fitted and set to 55°C to protect the capacitors against thermal stress.
4.2 Electrical installation

Electrical connection overview

1. Fuses
2. Cable from fuses to contactor
3. Contactor
4. Cable from contactor to reactor
5. Reactor
6. Cable from reactor to capacitor
7. Discharge resistors
8. Capacitors

Supply cable sizing
The cables must be sized for a current of 1.5 times nominal current (I_n) minimum. The nominal current can be calculated with the following formula:

\[ I_n = \frac{Q_n}{415V \cdot \sqrt{3}} \] [1]

Formula abbreviations
- Q_n - reactive power output in kvar
- V_n - line voltage, phase-to-phase

The temperature around the cables must also be considered according to cable manufacturer.

Figure 4.3: MODVAR electrical connection diagram
Contactor for capacitor switching
Capacitor switching leads to transient operating conditions. Therefore, the use of standard contactors is not acceptable and can be dangerous for the safety of people as well as the installations.

The ABB UA75 contactors are specially designed to switch capacitors where inrush current peaks are less than or equal to 100 times nominal rms current.

Earthing
Earthing is achieved through fixing points of the MODVAR mounting tray.

Fuses and fuse base
The fuses are made with non-isolated gripping lugs, double indicator and contact blades compliant to DIN VDE 0636 Part 201 and IEC 60269-2-1.

Please refer to the ABB contactors for capacitor switching application guide for the contactor’s dimensions as well as the additional inductance in case of inrush current peak.

Fuses fit into a three phase bus mounting fuse base (provided). Suitable for use with up to 30 x 10mm bus bar.
5.0 Commissioning
With the equipment isolated from the supply, check:
- Cabling is properly connected (including earth)
- Ambient ventilation is adequate
- Correct tightness of the connections

6.0 Operation
The MODVAR module capacitor unit is delivered with factory-installed discharge resistors to comply with IEC 60831 and allow a decrease of the residual voltage to less than 50V after 1 min. disconnection from supply.
During operation, make sure the delay before the MODVAR is re-energised is not shorter than 40 sec. Failure to follow this rule may cause damage to and reduce the lifetime of the capacitor.

7.0 Maintenance
Ensure safety procedures are completed (see paragraph “1.0 Safety”). Maintenance frequency depends on working conditions. As minimum annual maintenance should include:
- Removal of dust deposits, cleaning of all parts.
- Check of tightness of all electrical connections.
- Check of ambient temperature.
- Check condition of discharge resistors.
- Check for capacitance of CLMD capacitors.

Harmonics
Installation of capacitors on networks disturbed by harmonics may require special precautions especially when there is a risk of resonance phenomena. Please ensure that your installation is as per the over current rating according IEC 60831 standards. Contact ABB for technical support.
8.0 Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range</td>
<td>415V, 50Hz</td>
</tr>
<tr>
<td>For other voltages please consult ABB</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Three phase</td>
</tr>
<tr>
<td>Net output power Q at 415V</td>
<td>12.5kvar, 25kvar, 50kvar</td>
</tr>
<tr>
<td>Discharge resistors</td>
<td>Included</td>
</tr>
<tr>
<td>Discharge time: less than 50V in 1 minute</td>
<td></td>
</tr>
<tr>
<td>System connection</td>
<td>Fuse base mounted on busbar (max 30x10mm)</td>
</tr>
<tr>
<td>Earth</td>
<td>Earth the mounting plate</td>
</tr>
<tr>
<td>Fixing</td>
<td>Two M6 screws to the supporting rail (M8 holes on mounting plate)</td>
</tr>
<tr>
<td>Protection degree(according to IEC 60529)</td>
<td>IP00</td>
</tr>
<tr>
<td>Installation</td>
<td>Indoor</td>
</tr>
<tr>
<td>Weight</td>
<td>12.5kvar 25kg</td>
</tr>
<tr>
<td></td>
<td>25kvar 35kg</td>
</tr>
<tr>
<td></td>
<td>50kvar 50kg</td>
</tr>
<tr>
<td>Maximum ambient temperature</td>
<td>Class D according to IEC60831:</td>
</tr>
<tr>
<td></td>
<td>Maximum average over 1 year: 35°C</td>
</tr>
<tr>
<td></td>
<td>Maximum average over 24h: 45°C</td>
</tr>
<tr>
<td>Minimum ambient temperature</td>
<td>-25°C</td>
</tr>
<tr>
<td>Fuse</td>
<td>ABB gG or gl. 50, 63, 100 and 125 A</td>
</tr>
<tr>
<td>Contactor</td>
<td>ABB UA75</td>
</tr>
<tr>
<td>Control voltage</td>
<td>230/240V at 50Hz</td>
</tr>
<tr>
<td>Required clearance</td>
<td>25 mm minimum to walls</td>
</tr>
<tr>
<td>Capacitor losses</td>
<td>Less than 0.5 W/kvar (discharge resistor losses included)</td>
</tr>
<tr>
<td>Contactor and fuses losses</td>
<td>With UA75 contactor: 0.82 W/kvar</td>
</tr>
<tr>
<td>Tolerance on capacitance</td>
<td>0% +10%</td>
</tr>
<tr>
<td>Capacitor voltage test</td>
<td>Between terminals: 2.15xUn for 10 seconds</td>
</tr>
<tr>
<td></td>
<td>Between terminals and earth: 3kV for 10 sec: Un ≤ 450V</td>
</tr>
<tr>
<td></td>
<td>Lightning impulse voltage: 8 kV: Un ≤ 690V</td>
</tr>
<tr>
<td>Overload capability</td>
<td>Overvoltage tolerance: 10% for maximum 8h in every 24h and 30% for maximum 1min</td>
</tr>
<tr>
<td>(according to IEC 60831)</td>
<td>Maximum permissible current: 1.3x In.</td>
</tr>
<tr>
<td>Altitude</td>
<td>Up to 1000m</td>
</tr>
<tr>
<td>Compliance</td>
<td>IEC 60831 part 1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>CE marked</td>
</tr>
<tr>
<td>Cooling</td>
<td>Forced air cooling: 120cm³/h</td>
</tr>
</tbody>
</table>
Table 8.1: Typical label of a MODVAR module

<table>
<thead>
<tr>
<th>Un (V)</th>
<th>F (Hz)</th>
<th>Qn (kvar)</th>
<th>L (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>


Ui: 3kV  Cat: -25°C  Self-healing,dry

<table>
<thead>
<tr>
<th>Resistance (phase/phase):</th>
<th>Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (phase/phase):</td>
<td>μF</td>
</tr>
</tbody>
</table>

Warning:
After disconnecting from supply, wait 2 min and check for absence of residual voltage before handling the parts

S/N:  
PN:  
Made in Australia

Figure 8.1: Typical label of a MODVAR module
Contact us

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