VLT® Sine-wave Filter MCC 101

Output filters are differential mode low-pass filters that suppress the switching frequency component from the drive and smooth out the phase-to-phase output voltage of the drive to become sinusoidal. This reduces the motor insulation stress and bearing currents.

By supplying the motor with a sinusoidal voltage waveform, the switching acoustic noise from the motor is also eliminated.

Thermal losses and bearing currents
The sinusoidal voltage supply to the motor reduces hysteresis thermal losses in the motor. Since the motor insulation lifetime is dependent on the motor temperature, the sine-wave filter prolongs the lifetime of the motor.

The sinusoidal motor terminal voltage from the sine-wave filter furthermore has the advantage of suppressing bearing currents in the motor. This reduces the risk of flashover in the motor bearings and thereby also contributes to extended motor lifetime and increased service intervals.

Quality and design
All filters are designed and tested for operation with the VLT® AutomationDrive FC 302, VLT® AQUA Drive FC 202, and the VLT® HVAC Drive FC 102. They are rated for the nominal switching frequency of the FC series and therefore no derating of the drive is needed. The enclosure is designed to match the look and quality of the FC series drives.

Advantages
- Compatible with all control principles including flux and VVC+
- Parallel filter installation is possible for applications in the high power range

Range
3 x 200 – 500 V, 2.5 – 800 A
3 x 525 – 690 V, 4.5 – 660 A

Enclosures
- IP00 and IP20 wall-mounted enclosures rated up to 75 A (500 V) or 45 A (690 V)
- IP23 floor-mounted enclosures rated 115 A (500 V) or 76 A (690 V) or more
- IP54 both wall-mounted and floor-mounted enclosures rated up to 4.5 A, 10 A, 22 A (690 V)

Mounting
- Can be mounted side by side with the drive for ratings up to 75 A (500 V) and 45 A (690 V)

Feature | Benefit
--- | ---
Supplies the motor with a sinusoidal voltage waveform | Prevents flashover in motor windings
Eliminates over-voltages and voltage spikes caused by cable reflections | Protects the motor insulation against premature aging
Reduces electromagnetic interference by eliminating pulse reflection caused by current ringing in the motor cable. This allows the use of unshielded motor cables in some applications. | Trouble-free operation
Eliminates acoustic noise in motor | Noiseless motor operation
Reduces high frequency losses in motor | Prolongs service interval of motor

Perfect match
for applications with short motor cables, older motors, 690 V applications with general purpose motors, frequent braking, or aggressive environments
Specifications

Voltage rating
3 x 200 – 500 V and
3 x 525 – 690 V

Nominal current $I_n$ @ 50 Hz
2.5 – 800 A (500 V)
4.5 – 660 A (690 V)
For higher current ratings, mount sine-wave filters in parallel

Motor frequency
For 2.5 – 10 A (500 V):
– 0-60 Hz without derating
– 61-120 Hz with derating
For 10-800 A (500 V) and full 690 V range:
– 0-50 Hz without derating
– 51-100 Hz with derating

Ambient temperature
-25° to 45°C without derating

Minimum switching frequency, $f_{\text{min}}$
1.5 kHz – 5 kHz, depending on filter type

Maximum switching frequency, $f_{\text{max}}$
8 kHz

Overload capacity
160% for 60 sec at 10-minute intervals

Enclosure ingress protection rating
IP00 and IP20 for wall-mounted enclosures rated up to 75 A (500 V) or 45 A (690 V).
IP23 for floor-mounted enclosure rated 115 A (500 V) or 76 A (690 V) or more.
IP54 both wall-mounted and floor-mounted enclosures rated 4.5 A, 10 A, 22 A (690 V)

Approvals
CE, UL 508

Relative sound pressure measurements from the motor with and without sine-wave filter

Performance Criteria

<table>
<thead>
<tr>
<th>Motor insulation stress</th>
<th>VLT® dU/dt filter</th>
<th>VLT® Sine-wave filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100 m cable (shielded/unshielded) complies with the requirements of IEC60034-17* for general purpose motors. Above this cable length the risk of double pulsing* increases.</td>
<td>Provides a sinusoidal phase-to-phase motor terminal voltage. Complies with IEC-60034-17* and NEMA-MG1 requirements for general purpose motors with cables up to 500 m (1 km for enclosure size D and above).</td>
<td></td>
</tr>
</tbody>
</table>

| Motor bearing stress | Slightly reduced, mainly in high power motors | Reduces bearing currents caused by circulating currents. Does not reduce common-mode currents (shaft currents). |


<table>
<thead>
<tr>
<th>Max. motor cable length</th>
<th>100 m - 150 m</th>
<th>With guaranteed EMC performance: 150 m screened</th>
</tr>
</thead>
<tbody>
<tr>
<td>With guaranteed EMC performance: 150 m unscreened</td>
<td>Without guaranteed EMC performance: up to 500 m (1 km for enclosure type size D and above).</td>
<td></td>
</tr>
</tbody>
</table>

| Acoustic motor switching noise | Does not eliminate acoustic switching noise from the motor | Eliminates acoustic switching noise from the motor caused by magnetostriction |

<table>
<thead>
<tr>
<th>Relative size</th>
<th>15 – 50% (depending on power size)</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative price</td>
<td>50%</td>
<td>100%</td>
</tr>
</tbody>
</table>

* Not 690 V