# MQME-270-R
## Reverse Polarity Protection Filter

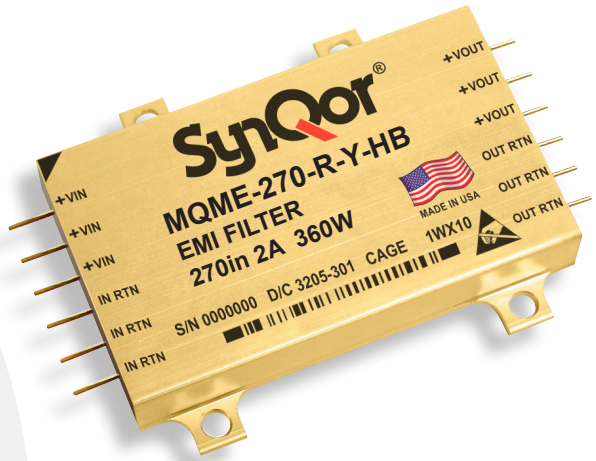
# HIGH RELIABILITY EMI FILTER

| -400V to +400V | 2A | 1.6Ω @ 125°C | >80dB @ 500kHz |
|---|---|---|---|
| Continuous Input | Output Current | Max. DC Resistance | Differential Attenuation |

**FULL POWER OPERATION: -55ºC to +125ºC**

MilQor®

The MilQor® series of high-reliability EMI filters brings SynQor's field proven technology and manufacturing expertise to the Military/Aerospace industry. SynQor's innovative QorSeal® packaging approach ensures survivability in the most hostile environments. Compatible with the industry standard format, these filters have high differential-mode and common-mode attenuation, low DC resistance, and a stabilizing bulk capacitor resistor. They follow conservative component derating guidelines and they are designed and manufactured to comply with a wide range of military standards.




DESIGNED & MANUFACTURED IN THE USA
FEATURING QORSEAL® HI-REL ASSEMBLY

### Design Process

MQME series filters are:
- Designed for reliability per NAVSO-P3641-A guidelines
- Designed with components derated per:
  - MIL-HDBK-1547A
  - NAVSO P-3641A

### Qualification Process

MQME series filters are qualified to:
- MIL-STD-810F
  - consistent with RTCA/D0-160E/F/G
- SynQor's First Article Qualification
  - consistent with MIL-STD-883F
- SynQor's Long-Term Storage Survivability Qualification
- SynQor's on-going life test

### In-Line Manufacturing Process

- AS9100 and ISO 9001 certified facility
- Full component traceability
- Temperature cycling
- Constant acceleration
- 24, 96, 160 hour burn-in
- Three level temperature screening

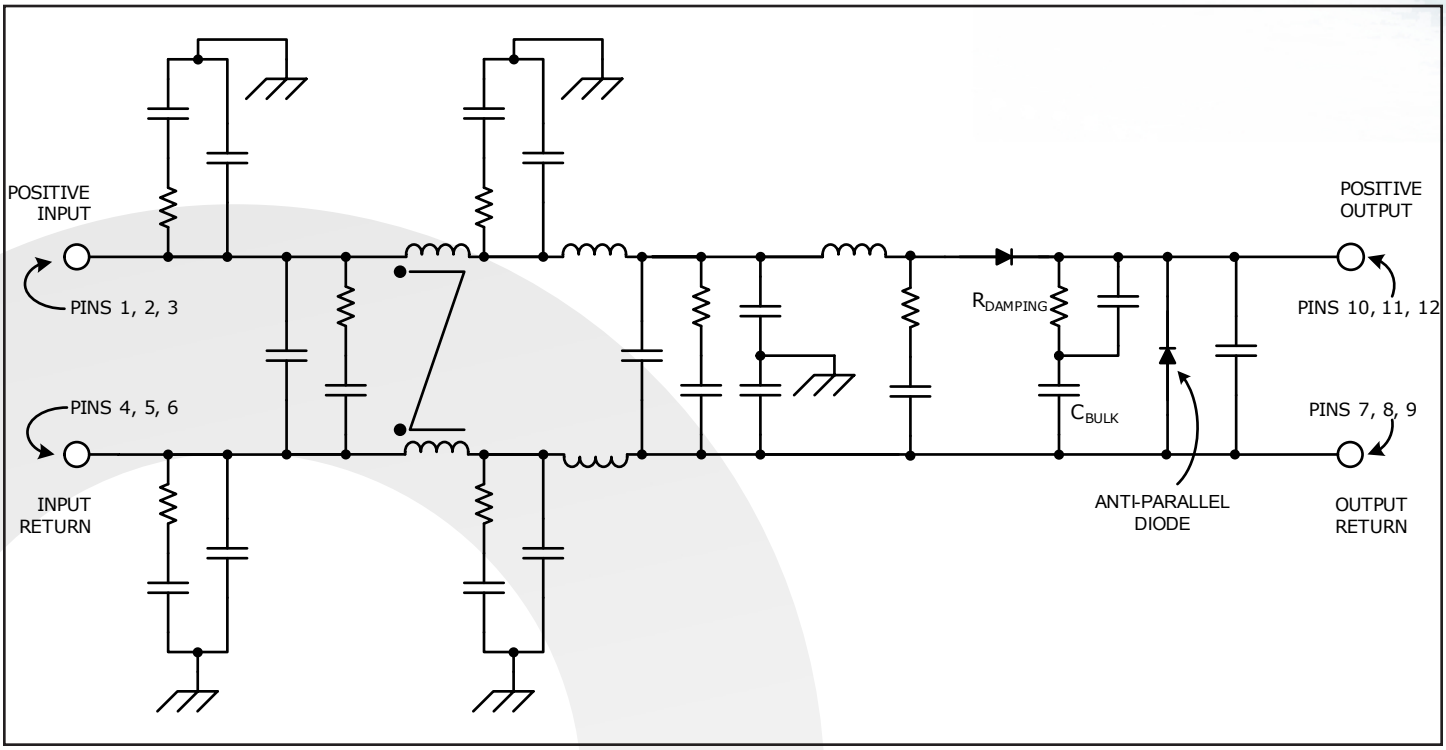
### Features

- 2A output current
- Reverse polarity protection
- Very low DC resistance
- > 80 dB differential-mode attenuation at 500kHz
- > 60 dB common-mode attenuation at 500kHz
- Stabilizing bulk capacitor and damping resistor included
- All capacitors are X7R multi-layer ceramic
- Designed to meet all MIL-STD 461 EMI and most RTCA/D0-160E/F/G Section 22 lightning requirements

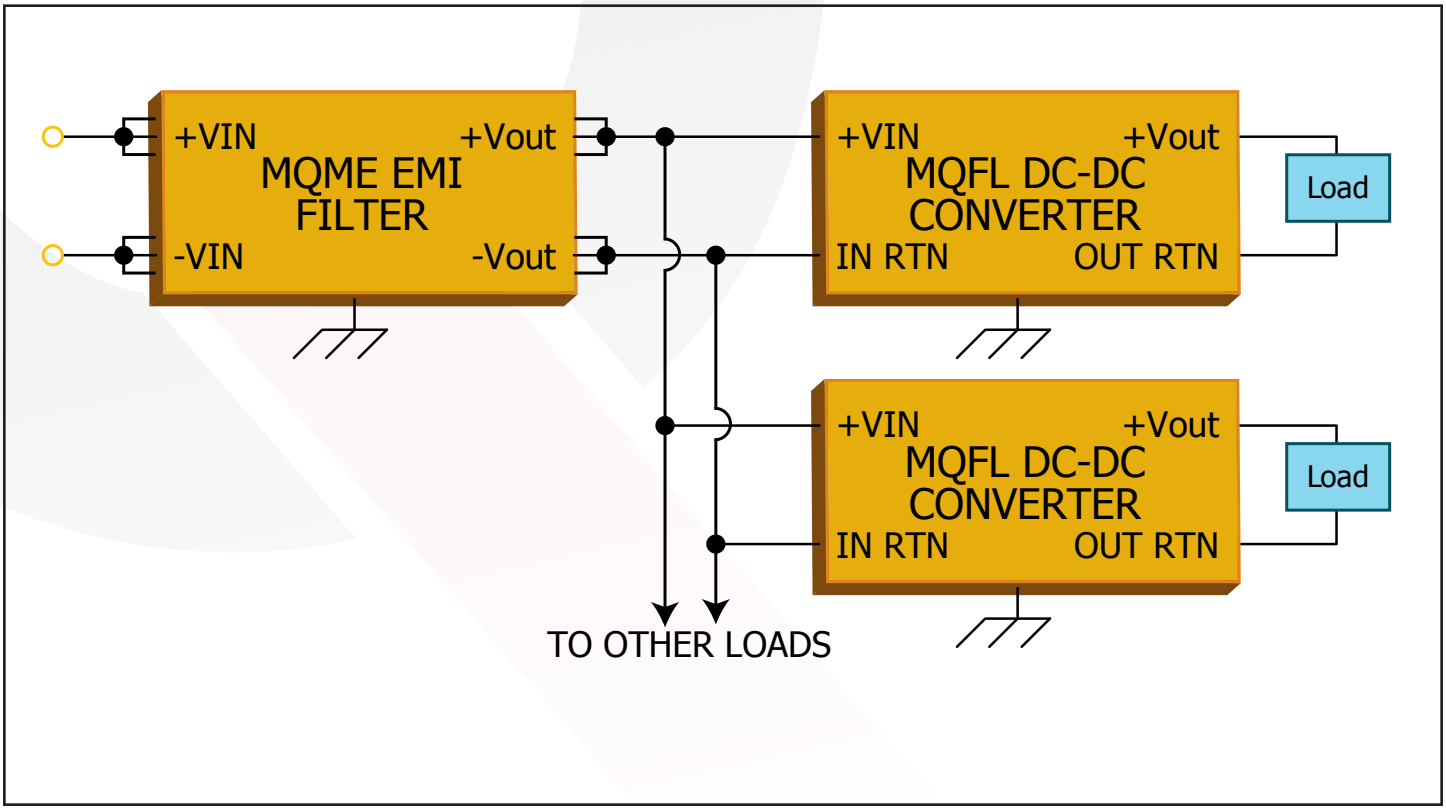
### Specification Compliance

MQME series filters (with MQFL converters) are designed to meet:
- MIL-HDBK-704-7 (A through F)
- RTCA/DO-160 Section 16, 17, 18
- MIL-STD-461 (C, D, E, F)
- RTCA/DO-160E/F/G Section 22

## BLOCK DIAGRAM




## TYPICAL CONNECTION DIAGRAM



# MQME-270-R Electrical Characteristics

| Parameter<br>Specifications subject to change without notice | Min. | Typ. | Max. | Units | Notes & Conditions<br>Vin=270V DC ±5%, P= 320W unless otherwise specified | Group A Subgroup[3] |
|---|---|---|---|---|---|---|
| **ABSOLUTE MAXIMUM RATINGS** | | | | | | |
| Input Voltage | | | | | See Note 1 | |
| Continuous | -800 | | 800 | V | | |
| Transient (≤1 s) | -1000 | | 1000 | V | | |
| Isolation Voltage (I/O to case, I to O) | | | | | | |
| Continuous | -500 | | 500 | V | | |
| Transient (≤1 s) | -1000 | | 1000 | V | | |
| Output Current | | | 3 | A | | |
| Operating Case Temperature | -55 | | 125 | °C | HB grade Products, See Note 6 | |
| Storage Case Temperature | -65 | | 135 | °C | | |
| Lead Temperature (20 s) | | | 300 | °C | | |
| **ELECTRICAL CHARACTERISTICS** | | | | | | |
| Input Voltage | | | | | | |
| Continuous | -400 | | 400 | V | See Note 1 for negative limits | 1, 2, 3 |
| Transient (≤1 s, Rs* = 0 Ω) | -500 | | 500 | V | " | |
| Transient (≤100 ms, Rs* = 0 Ω) | -1000 | | 1000 | V | See Note 1 | |
| Output Voltage (continuous) | Vout = Vin - (Iin x Rdc) - Vd | | | V | | 1, 2, 3 |
| Output Current (continuous) | | | 2 | A | | 1, 2, 3 |
| Power (continuous) | | | 320 | W | See Note 5 | |
| DC Resistance (Rdc) | | | | | | |
| TCASE = 25°C | | | 1.3 | Ω | | 1 |
| TCASE = 125°C | | | 1.6 | Ω | | 3 |
| Rectifier Drop (Vd) | | 0.8 | | V | | |
| Power Dissipation (2A output current) | | | | | | |
| TCASE = 25°C | | | 6.5 | W | | 1 |
| TCASE = 125°C | | | 7.5 | W | | 3 |
| Anti-Parallel Diode | | | | | | |
| Forward Current | | | | | | |
| Continuous | | | 0.2 | A | | 1, 2, 3 |
| Transient (≤ 8 ms) | | | 2 | A | | |
| Forward Voltage (@ 0.1 A) | 0.4 | | 1 | V | | 1, 2, 3 |
| Total Differential-Mode Capacitance | | 1 | | µF | Measured across input or output pins | |
| Total Common-Mode Capacitance | | 0.44 | | µF | Measured between any pin to case | |
| Bulk Capacitor | | 0.6 | | µF | | |
| Damping Resistor | | 10 | | Ω | | |
| Noise Attenuation | | | | | See Figure 1 | |
| **INPUT VOLTAGE SPIKE SUPPRESSION** | | | | | | |
| Output Voltage Deviation due to a Spike | | | | | See Note 2 | |
| Input Voltage Spike (Centered on Vin) | | | | | | |
| ±200V, 10µs, Rs ≤ 0.5Ω, \| Q \| ≤ 250µC | -50 | | 150 | ΔV | MIL-STD-461C (CS06). See Note 4 | |
| ±400V, 5µs, Rs ≤ 0.5Ω, \| Q \| ≤ 250µC | -50 | | 150 | ΔV | MIL-STD-461C (CS06). See Note 4 | |
| ±600V, 10µs, Rs = 50Ω | -50 | | 150 | ΔV | RTCA/DO-160E | |

* Rs = Source Impedance

## MQME-270-R Electrical Characteristics (Continued)

| Parameter<br>Specifications subject to change without notice | Min. | Typ. | Max. | Units | Notes & Conditions<br>Vin=270V DC ±5%, P= 320W unless otherwise specified | Group A Subgroup[3] |
|---|---|---|---|---|---|---|
| **ISOLATION CHARACTERISTICS** | | | | | | |
| Isolation Voltage (any pin to case) | | | | | | |
| Continuous | -500 | | 500 | V | | 1 |
| Transient (≤ 100 µs) | -800 | | 800 | V | | |
| Isolation Resistance (any pin to case) | 100 | | | MΩ | | 1 |
| **RELIABILITY CHARACTERISTICS** | | | | | | |
| Calculated MTBF (MIL-STD-217F2) | | | | | | |
| GB @ Tcase = 70ºC | | 32 | | $10^6$ Hrs. | | |
| AIF @ Tcase = 70ºC | | 1.2 | | $10^6$ Hrs. | | |
| **WEIGHT CHARACTERISTICS** | | | | | | |
| Device Weight | | 79 | | g | | |

**Electrical Characteristics Notes**

1. While the filter will survive these input voltage limits, the filter's output voltage will be outside the limits for an MQFL converter input voltage range.
2. Verified by qualification testing and analysis.
3. Only the ES and HB grade products are tested at three temperatures. The C grade products are tested at one temperature. Please refer to the Construction and Environmental Stress Screening Options table for details.
4. With an external 2uF capacitor in series with a 5ohm resistor connected across the output of the MQME filter module.
5. Product of input current and output voltage must be less than 320W
6. The specified operating case temperature for ES grade products is -45ºC to 100ºC. The specified operating case temperature for C grade products is 0ºC to 70ºC.

* Rs = Source Impedance

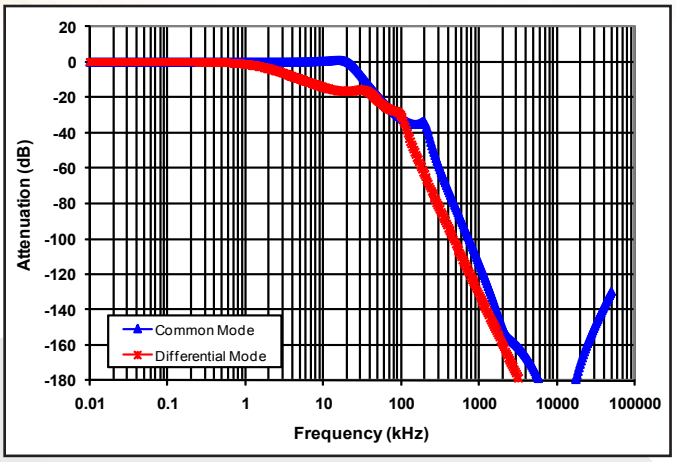



Figure 1: Typical Common Mode and Differential Mode Attenuation provided by the filter as a function of frequency. Both input lines are connected to chassis ground through 50Ω resistors. The filter case is also connected to chassis ground.

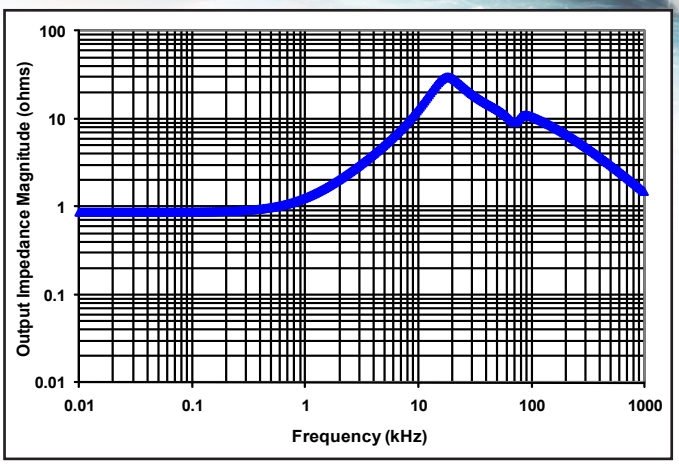



Figure 2: Typical Output Impedance (magnitude) of the filter looking back into its output pins with the input pins connected to a source with zero source impedance.

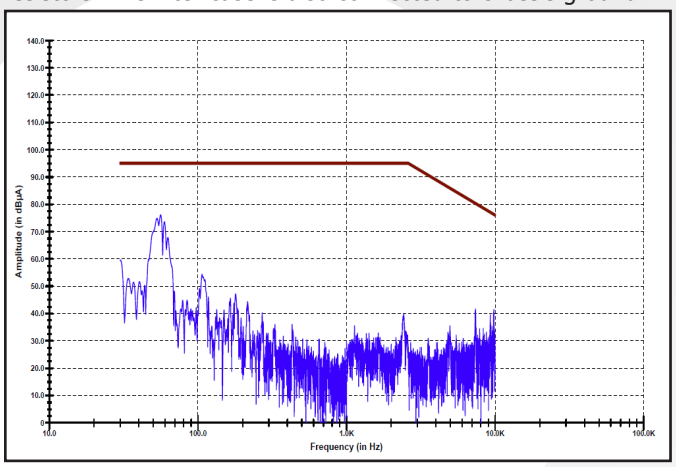



Figure 3: MIL-STD-461E Method CE101 Low Frequency Conducted Emissions. Limit line (in brown) is the 'Submarine Applications DC Curve'. Setup described on Page 6.

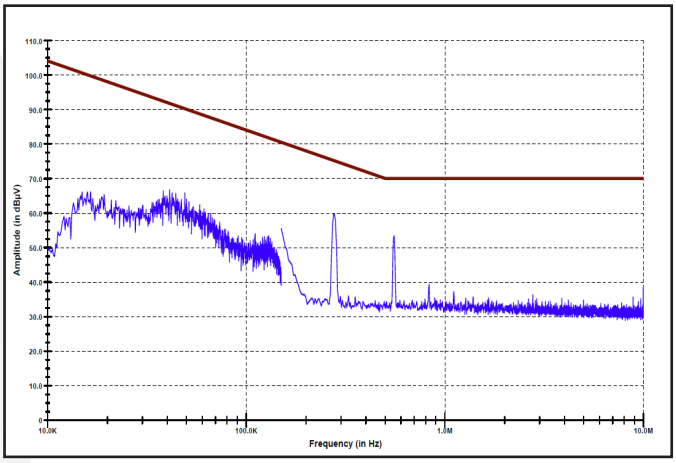



Figure 4: MIL-STD-461E Method CE102 High Frequency Conducted Emissions. Limit line (in brown) is the 'Basic Curve'. Setup described on Page 6.

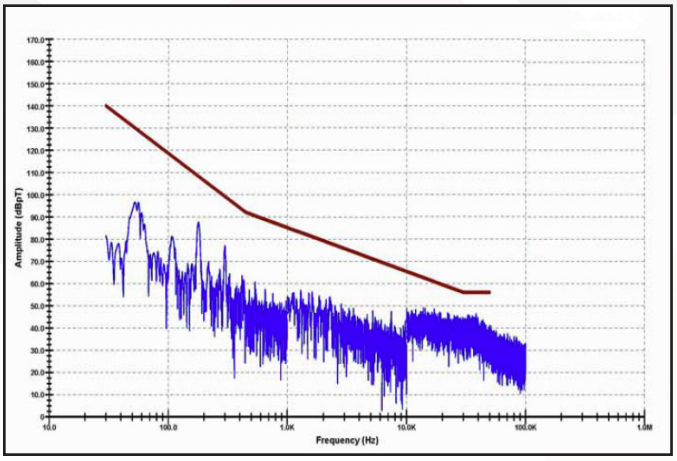



Figure 5: MIL-STD-461E Method RE101 Low Frequency Radiated Emissions. Limit line (in brown) is the 'Standard Curve' from MIL-STD-461C Method RE01, which is more strict than all RE101 limits. Setup described on Page 6.

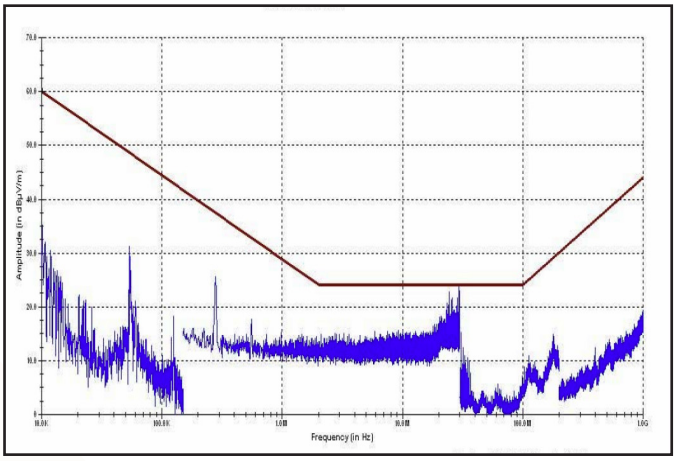



Figure 6: MIL-STD-461E Method RE102 High Frequency Radiated Emissions. Limit line (in brown) is the 'Submarine External to Pressure Hull Curve'. Setup described on Page 6.

## BASIC OPERATION AND FEATURES

The MQME-270-R is a multi-stage differential-mode and common-mode passive EMI filter designed to interface a power source with one or more SynQor DC/DC converters (or other loads that create EMI). Each stage of this filter is well damped to avoid resonances and oscillations, and only X7R multi-layer ceramic capacitors are used. Figure 1 shows the typical differential and common-mode attenuation provided by this filter when the source impedance is 50W to chassis ground on each input line.

The MQME-270-R EMI filter includes a large bulk capacitor (also X7R) with a series damping resistor to correct for the unstabilizing effect of a converter's negative input resistance. A white paper discussing this negative input resistance and the need for corrective damping can be found on the SynQor website (see Input System Instability application note). Figure 2 shows the magnitude of the filter's output impedance when the filter input is connected to a stiff voltage source.

When used with SynQor's DC/DC converters, the MQME-270-R EMI filter is designed to pass all of the relevant MIL-STD-461C/D/E/F requirements to their most stringent limits. The MIL-STD-461 Compliance Matrix Table lists these requirements and describes the setup used to pass them. Figures 3 - 6 show results from selected conductive and radiated emissions tests.

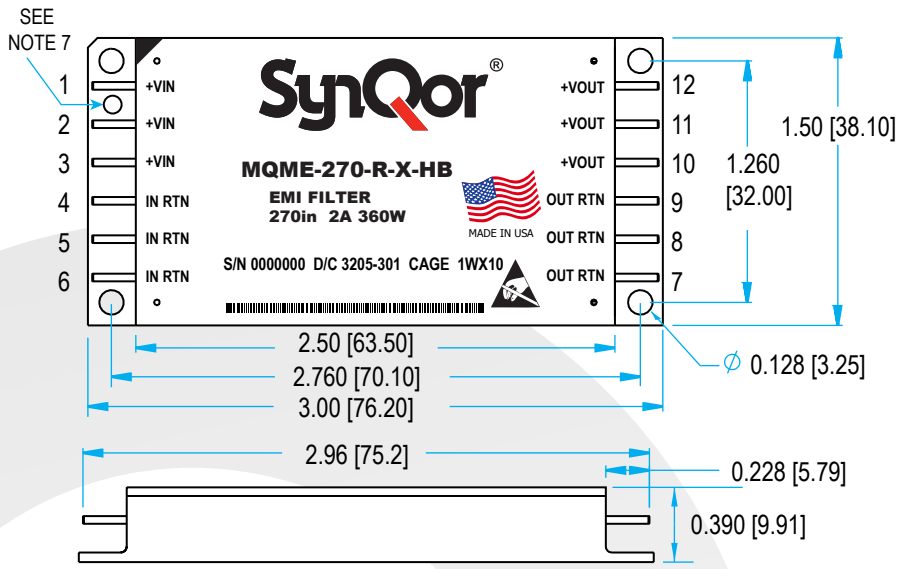
The filter is also designed to pass the waveform types and applications specified in RTCA/DO-160E/F/G Section 22 (Lightning Induced Transient Susceptibility) to Level 4 (some waveforms / applications require external transient suppression circuitry). The Section 22 Compliance Matrix Table lists these waveforms and applications and describes the setup used to pass them.

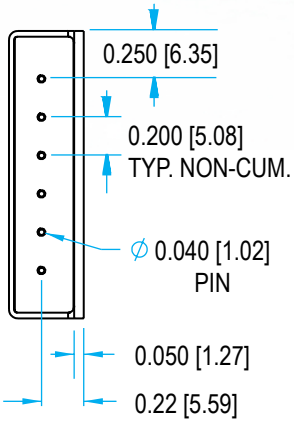
A typical application would place the MQME filter close to the input of the DC/DC converter, with the cases of the filter and the converter connected together through a ground plane. Both cases are electrically conductive, so connection to the cases can be made with the fasteners used to secure the device.

Do not connect the outputs of multiple MQME-270-R filters in parallel. Connecting filters in this manner may result in slightly unequal currents to flow in the positive and return paths of each filter. These unequal currents may cause the internal common-mode chokes to saturate and thus cause degraded common-mode rejection performance.

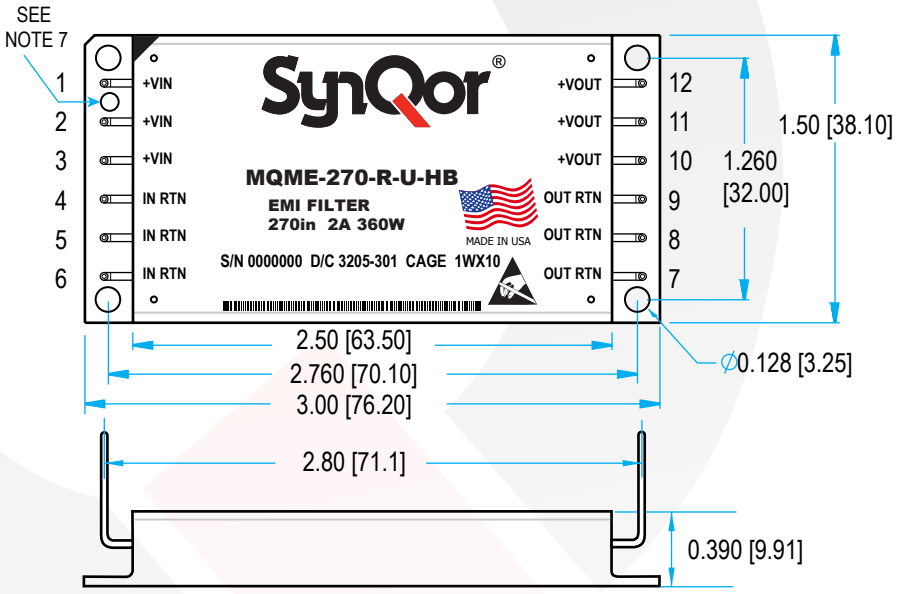
REVERSE POLARITY PROTECTION: The MQME-270-R EMI filter has a series-connected diode. This diode blocks reverse current flow if the filter's input voltage is mistakenly connected with the wrong polarity. The anti-parallel diode, working with the reverse polarity diode, ensures that the filter's output voltage goes only slightly negative during this time, and therefore satisfying the minimum input voltage specifications of SynQor's MQFL converters.

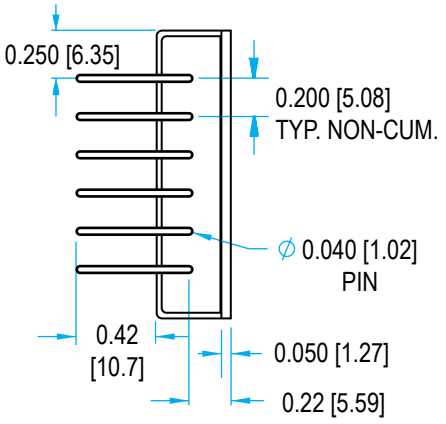
The reverse polarity diode also preforms a useful function during negative polarity spikes and surges, and during brief power interrupts. Since it stops current from flowing negatively through the EMI filter back toward the source, thediode allows the total bulk capacitor (located both within and external to the filter) to better hold up the output voltage during these transients.




**Case X**




**Case U**

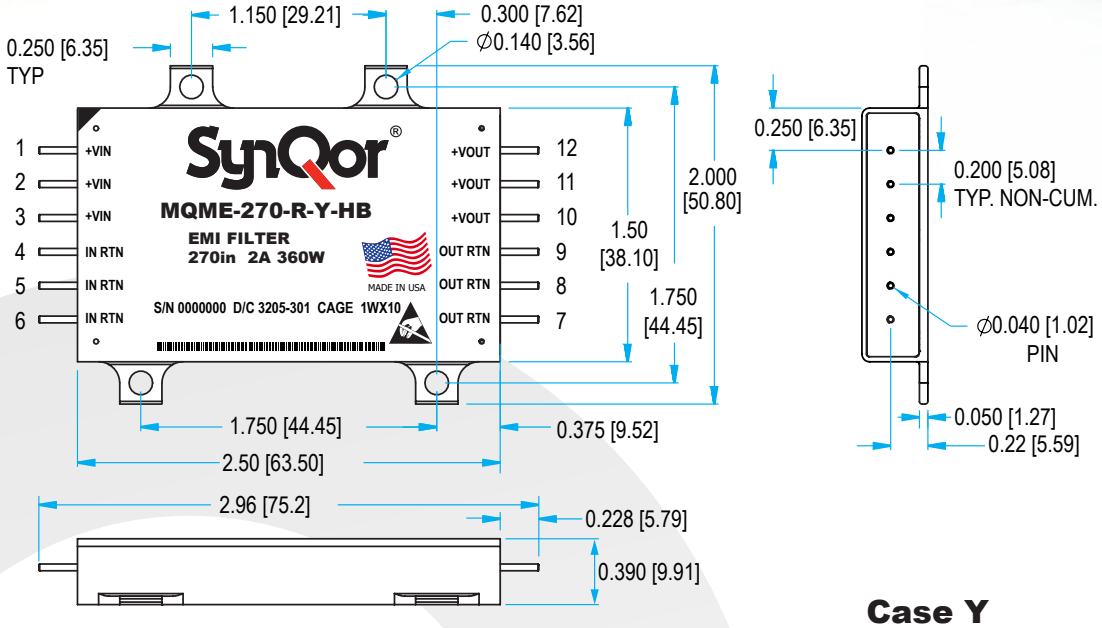
## NOTES

1) Pins 0.040" (1.02 mm) diameter
2) Pins Material: Copper Alloy
   Finish: Gold over Nickel plating, followed by Sn/Pb solder dip
3) All dimensions in inches (mm) Tolerances: x.xx +/-0.02 in. (x.x +/-0.5 mm)
   x.xxx +/-0.010 in. (x.xx +/-0.25 mm)
4) Weight: 2.8 oz (78.5 g) typical
5) Workmanship: Meets or exceeds IPC-A-610C Class III
6) Print Labeling on Top Surface per Product Label Format Drawing
7) Pin 1 identification hole, not intended for mounting (case X and U)

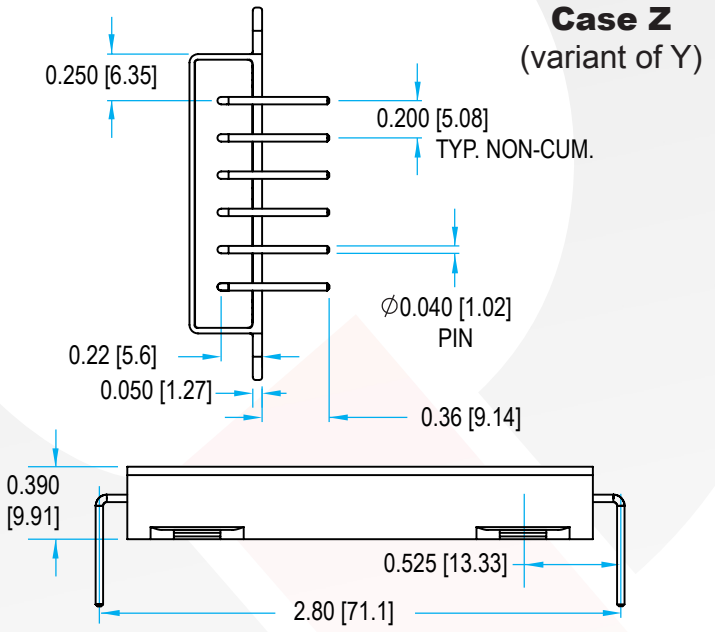
## PIN DESIGNATIONS

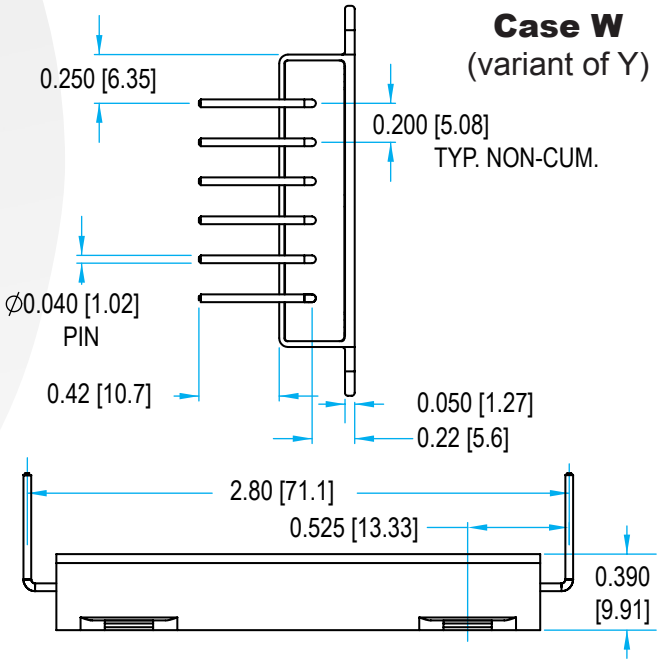
| Pin # | Function |
|---|---|
| 1 | Positive input |
| 2 | Positive input |
| 3 | Positive input |
| 4 | Input return |
| 5 | Input return |
| 6 | Input return |

| Pin # | Function |
|---|---|
| 7 | Output Return |
| 8 | Output Return |
| 9 | Output Return |
| 10 | Positive output |
| 11 | Positive output |
| 12 | Positive output |




## Case Y




## NOTES

1) Pins 0.040" (1.02 mm) diameter
2) Pins Material: Copper Alloy
   Finish: Gold over Nickel plating, followed by Sn/Pb solder dip
3) All dimensions in inches (mm) Tolerances: x.xx +/-0.02 in. (x.x +/-0.5 mm)
   x.xxx +/-0.010 in. (x.xx +/-0.25 mm)
4) Weight: 2.8 oz (78.5 g) typical
5) Workmanship: Meets or exceeds IPC-A-610C Class III
6) Print Labeling on Top Surface per Product Label Format Drawing
7) Pin 1 identification hole, not intended for mounting (case X and U)

## PIN DESIGNATIONS

| Pin # | Function |
|---|---|
| 1 | Positive input |
| 2 | Positive input |
| 3 | Positive input |
| 4 | Input return |
| 5 | Input return |
| 6 | Input return |

| Pin # | Function |
|---|---|
| 7 | Output Return |
| 8 | Output Return |
| 9 | Output Return |
| 10 | Positive output |
| 11 | Positive output |
| 12 | Positive output |

## Lightning Induced Transient Susceptibility

### RTCA/DO-160E/F/G Section 22 Compliance Matrix

This table shows the RTCA/DO-160 Section 22 requirements/limits that will be met* by a stand-alone setup comprised of:

- MQME-270-P Filter
- MQFL-270-05S Converter
- 120W Resistive load
- Metal Chassis Plane

| RTCA/DO-160E/F/G | RTCA/DO-160E/F/G Section 22 | | |
|---|---|---|---|
| | Waveform | Maximum Level Passed | Test Conditions |
| **Pin Injection** | 3 | 4 | Signal applied to +Vin pin. Input Return pin connected to system ground |
| | 4 | 4† | |
| | 5a | 4† | |
| **Single- and Multiple-Stroke Cable Induction** | 2 | 4** | Signal applied to unshielded power cable bundle |
| | 3 | 4 | |
| **Single- and Multiple-Stroke Ground Injection** | 4 | 4 | Signal applied between metal ground plane and system ground |
| | 5 | 4 | |
| **Multiple-Burst Cable Induction** | 3 | 4 | Signal applied to unshielded power cable bundle |

* Requirement is deemed to have been met as long as transient deviations in the converter's output voltage remain within ±10% of its initial value.

† For these waveforms at Level 3 and above, an external transient suppressor of sufficient energy rating must placed across the filter's input pins to keep the differential transient input voltage below +200V/-50V. Negative polarity waveforms may cause power flow to the converter to be interrupted long enough to cause a graceful shutdown and restart of the converter. Also, the reverse voltage protection feature of the -R filter is required to protect the converter (but not the filter) from negative polarity waveform.

** For this waveform at a Level 4 and above, external transient suppressors of sufficient energy rating must be added between the filter's input power pins and its case to keep the common-mode transient input voltage below +800V.

| Met by any MQME Filter | Met by a MQME Filter with Reverse Polarity Protection having external Transient Suppression |
|---|---|

## EMI

# Military Standard 461 Compliance Matrix

This table shows the MIL-STD-461 requirements/limits that will be met* by the stand-alone setups indicated below:

- MQME-270-P Filter
- MQFL-270-05S Converter
- 120W Resistive load
- Metal Chassis Plane

| Mil-Std-461 | MIL-STD-461C | |
|---|---|---|
| | Requirement | Most Stringent Limit Listed |
| Conducted Emissions | CE01<br>CE03<br>CE07 | Class A5 (Submarine)<br>Class A5 (Submarine)‡<br>Class A1 (Aircraft) |
| Conducted Susceptibility | CS01 | Class A5 (Submarine) |
| | CS02 | Class A5 (Submarine) |
| | CS06 | Class A1/A5 (Aircraft/Sub) |
| | CS10 | Class A5 (Submarine) |
| | CS11 | Class A5 (Submarine) |
| Radiated Emissions | RE01<br>RE02† | Class A5 (Submarine)<br>Class A5 (Submarine) |
| Radiated Susceptibility | RS01<br>RS02<br>RS03 | Class A5 (Submarine)<br>Class A1/A5 (Aircraft/Sub)<br>Class A4 (Surface Ship) |

| Mil-Std-461 | MIL-STD-461D/E/F | |
|---|---|---|
| | Requirement | Most Stringent Limit Listed |
| Conducted Emissions | CE101<br>CE102 | Submarine<br>Basic Curve |
| Conducted Susceptibility | CS101 | Curve #2 |
| | CS106 | (461F Only) |
| | CS114 | Curve #5 |
| | CS115 | Basic Waveform |
| | CS116 | Imax = 10A |
| Radiated Emissions | RE101 | Navy |
| | RE102† | Submarine |
| | | Fixed Wing Internal, >25 meters Nose to Tail |
| Radiated Susceptibility | RS101<br>RS103 | Army<br>Aircraft External |

* Susceptibility requirements/limits are considered to be met as long as transient deviations in the converter's output voltage remain within ±10% of its initial value.

† Met with metal screen shield covering the filter, converter, and resistive load.

‡ In almost every case the limit listed is the most stringent of the requirements. The one exception is CE03 - High Frequency Broadband Conducted Emissions, Converter with Passive Filter. In this case the filter and converter passed the A1 limit. The filter and converter pass the CE03 - Narrowband Conducted Emissions at the A5 limit level.

| | |
|---|---|
| Met by any MQME Filter | Met by a MQME filter having an external 2µF capacitor in series with a 5Ω resistor connected across the output of a MQME filter module |

## CONSTRUCTION AND ENVIRONMENTAL STRESS SCREENING OPTIONS

| Screening | Consistent with MIL-STD-883F | C-Grade (specified from 0 °C to +70 °C) | ES-Grade (specified from -45 °C to +100 °C) | HB-Grade (specified from -55 °C to +125 °C) |
|---|---|---|---|---|
| Element Evaluation | | No | Yes | Yes |
| Internal Visual | IPC-A-610 Class 3 | Yes | Yes | Yes |
| Temperature Cycle | Method 1010 | No | Condition B (-55 °C to +125 °C) | Condition C (-65 °C to +150 °C) |
| Constant Acceleration | Method 2001 (Y1 Direction) | No | 500 g | Condition A (5000 g) |
| Burn-in | Method 1015 | 24 Hrs @ +125 °C | 96 Hrs @ +125 °C | 160 Hrs @ +125 °C |
| Final Electrical Test | Method 5005 (Group A) | +25 °C | -45, +25, +100 °C | -55, +25, +125 °C |
| Mechanical Seal, Thermal, and Coating Process | | | Full QorSeal | Full QorSeal |
| External Visual | Method 2009 | Yes | Yes | Yes |
| Construction Process | | | QorSeal | QorSeal |

MilQor® Hi-Rel converters and filters are offered in three variations of environmental stress screening options. All ES-Grade and HB-Grade MilQor Hi-Rel converters use SynQor's proprietary QorSeal® Hi-Rel assembly process that includes a Parylene-C coating of the circuit, a high performance thermal compound filler, and a nickel barrier gold plated aluminum case. Each successively higher grade has more stringent mechanical and electrical testing, as well as a longer burn-in cycle. The ES- and HB-Grades are also constructed of components that have been procured through an element evaluation process that pre-qualifies each new batch of devices.

## MIL-STD-810F Qualification Testing

| MIL-STD-810F Test | Method | Description |
|---|---|---|
| **Fungus** | 508.5 | Table 508.5-I |
| **Altitude** | 500.4 - Procedure I | Storage: 70,000 ft / 2 hr duration |
| | 500.4 - Procedure II | Operating: 70,000 ft / 2 hr duration; Ambient Temperature |
| **Rapid Decompression** | 500.4 - Procedure III | Storage: 8,000 ft to 40,000 ft |
| **Acceleration** | 513.5 - Procedure II | Operating: 15 g |
| **Salt Fog** | 509.4 | Storage |
| **High Temperature** | 501.4 - Procedure I | Storage: 135 °C / 3 hrs |
| | 501.4 - Procedure II | Operating: 100 °C / 3 hrs |
| **Low Temperature** | 502.4 - Procedure I | Storage: -65 °C / 4 hrs |
| | 502.4 - Procedure II | Operating: -55 °C / 3 hrs |
| **Temperature Shock** | 503.4 - Procedure I - C | Storage: -65 °C to 135 °C; 12 cycles |
| **Rain** | 506.4 - Procedure I | Wind Blown Rain |
| **Immersion** | 512.4 - Procedure I | Non-Operating |
| **Humidity** | 507.4 - Procedure II | Aggravated cycle @ 95% RH (Figure 507.5-7 aggravated temp - humidity cycle, 15 cycles) |
| **Random Vibration** | 514.5 - Procedure I | 10 - 2000 Hz, PSD level of 1.5 $g^2$/Hz (54.6 $g_{rms}$), duration = 1 hr/axis |
| **Shock** | 516.5 - Procedure I | 20 g peak, 11 ms, Functional Shock (Operating no load) (saw tooth) |
| | 516.5 - Procedure VI | Bench Handling Shock |
| **Sinusoidal vibration** | 514.5 - Category 14 | Rotary wing aircraft - helicopter, 4 hrs/axis, 20 g (sine sweep from 10 - 500 Hz) |
| **Sand and Dust** | 510.4 - Procedure I | Blowing Dust |
| | 510.4 - Procedure II | Blowing Sand |

First Article Testing consistent with MIL-STD-883F

| MIL-STD-883F Test | Method | Description |
|---|---|---|
| Electrical Tests | 5005 | |
| Physical Dimensions test | 2016 | |
| Resistance to Solvents test | 2015.13 | |
| Solderability test | 2003.8 | |
| Lead Integrity test | 2004.5 | |
| Salt Atmosphere test | 1009.8 | Condition “A” |
| Adhesion of Lead Finish test | 2025.4 | |
| Altitude Operation test | 1001 | Condition “C” |
| ESD Sensitivity | 3015.7 | Class 2 |
| Stabilization Bake test | 1008.2 | Condition “C” |
| Vibration Fatigue test | 2005.2 | Condition “A” |
| Random Vibration test | 2026 | Condition “II K” |
| Sequential Test Group #1 | | |
| Life Test – Steady State test | 1005.8 | |
| Life Test – Intermittent Duty test | 1006 | |
| Sequential Test Group #2 | | |
| Temperature Cycle test | 1010.8 | Condition “C” |
| Constant Acceleration test | 2001.2 | Condition “A” |
| Sequential Test Group #3 | | |
| Thermal Shock test | 1011.9 | Condition “B” |
| Temperature Cycle test | 1010.8 | Condition “C” |
| Moisture Resistance test | 1004.7 | With Sub cycle |
| Sequential Test Group #4 | | |
| Mechanical Shock test | 2002.4 | Condition “B” |
| Variable Frequency Vibration test | 2007.3 | Condition “A” |

## MilQor Filter Family Matrix

The tables below show the array of MilQor filters available. When ordering SynQor converters, please ensure that you use the complete part number according to the table in the last page.Contact the factory for other requirements.

| Product Family Designator | Continuous Input Voltage | Power (Amperage) Rating | Version (see table below) | Features Available (In Addition to Passive Filter Components) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Enable Pass-Through Circuitry | Transient Suppression Circuitry | Soft-Start Circuitry | Reverse Polarity Protection Circuitry |
| **MQME-28** | 40V | 320W (20A) | P | | | | |
| **MQME-28E** | 70V | | T | • | • | • | • |
| | | | T6 | • | • | • | • |
| **MQHE-28** | 40V | 160W (10A) | P | | | | |
| **MQHE-28E** | 70V | | | | | | |
| **MQHE-270** | 400V | 160W (1A) | P | | | | |
| **MQME-270** | 400V | 320W (2A) | P | | | | |
| | | | R | | | | • |
| **MQME-270L** | 400V | 200W (3A) | P | | | | |
| | | | R | | | | • |

## PART NUMBERING SYSTEM

The part numbering system for SynQor's *MilQor* DC-DC converters follows the format shown in the table below.

| Model Name | Input Voltage Range | Version | Package Outline/Pin Configuration | Screening Grade |
|---|---|---|---|---|
| MQME<br>MQHE | 28<br>28E | P<br>T<br>T6 | U<br>X<br>Y<br>W<br>Z | C<br>ES<br>HB |
| | 270<br>270L | P<br>R | | |

Not all combinations make valid part numbers, please contact SynQor for availability. See the Product Summary web page for more options.

**Example: MQME-270-R–Y–ES**

## APPLICATION NOTES

A variety of application notes and technical white papers can be downloaded in pdf format from the SynQor website.

### PATENTS

SynQor holds numerous U.S. patents, one or more of which apply to most of its power conversion products. Any that apply to the product(s) listed in this document are identified by markings on the product(s) or on internal components of the product(s) in accordance with U.S. patent laws.
SynQor's patents include the following:

| | | | |
|---|---|---|---|
| 6,896,526 | 6,927,987 | 7,050,309 | 7,085,146 |
| 7,765,687 | 7,787,261 | 8,149,597 | 8,644,027 |

**Contact SynQor for further information and to order:**

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Warranty
SynQor offers a two (2) year limited warranty. Complete warranty information is listed on our website or is available upon request from SynQor.