Avionic 3-Phase AC Line Filter

85 to 140 Vrms (L-N)	3 Arms	1 kW @ 115 Vrms (L-N)	700 mΩ @ 100°C	>40dB @ 200 kHz
Input Voltage	Output Current	Output Power	Max Resistance per Phase	Attenuation

Full Power Operation: -40°C to +100°C

The AeroQor AC Line EMI Filter brings SynQor's field proven technology and manufacturing expertise to the Avionics COTS Component marketplace. SynQor's innovative 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 and low series resistance. They follow conservative component derating guidelines and they are designed and manufactured to the highest standards.

AeroQor®

Operational Features

- -40°C to +100°C Operation
- 3 Arms output current
- Low series resistance
- 40 dB @ 200 kHz noise attenuation (2.3 Arms per phase)
- Meets common EMC standards in properly designed system with SynQor APFIC modules.

Designed and manufactured in the USA

Specification Compliance

- RTCA/DO-160G
- Airbus ABD0100.1.8
- Boeing 787B3-0147
- Boeing D6-36440
- Boeing D6-44588
- CE marked

In-Line Manufacturing Process

- AS9100 and ISO 9001 certified facility
- Full component traceability

Contents

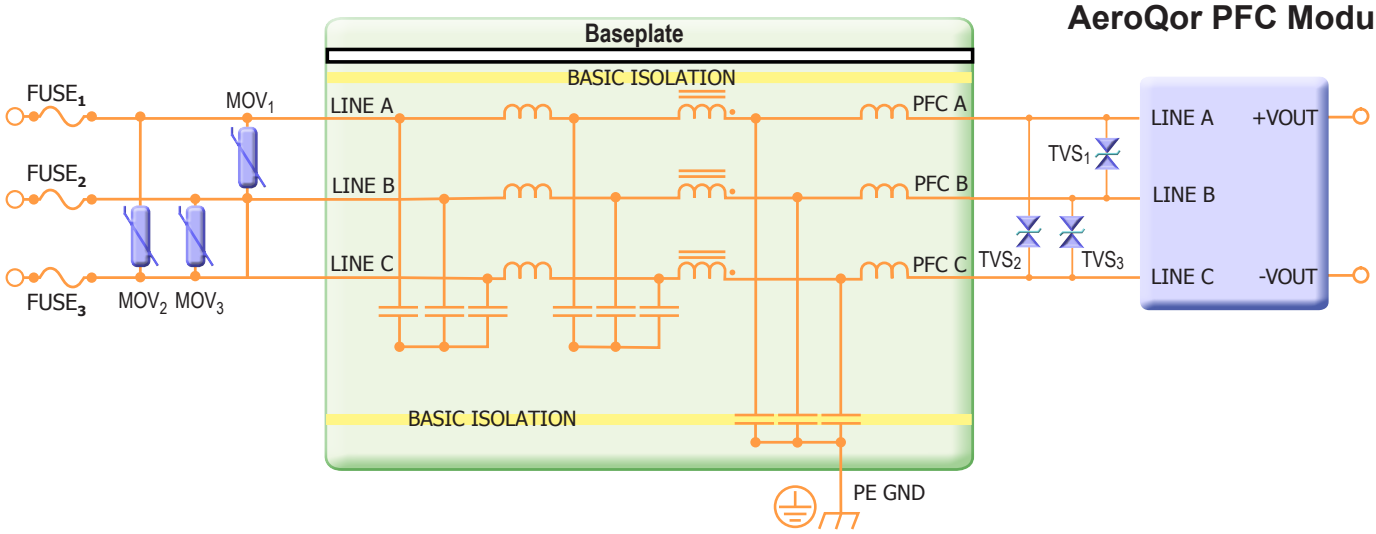
Mechanical Features

- Industry standard Quarter-brick size
- Size: 1.536" x 2.386" x 0.50" (39.01 x 60.6 x 12.70 mm)
- Weight: 3.3 oz (93 g)

Technical Diagrams

ACF-U-115-3PH-QG
SynQor 3-Phase AC Line Filter

SynQor Isolated 3-Phase AeroQor PFC Module



Suggested Parts:

MOV 1-3:	300VAC, 60J; (EPCOS S10K300E2)
TVS 1-3:	430 Vpk, 20 J; (Littelfuse AK3-430C or Bourns PTVS-430C-TH)
Fuse 1-3:	250 Vrms, 10 A; (Littelfuse 0216010.XEP)

ACF-U-115-3PH-QG Electrical Characteristics

Operating conditions: Vin = 115 Vrms L-N (199 Vrms L-L) @ 400 Hz; 2.3 Arms per phase; baseplate temperature = 25°C unless otherwise noted.
Full operating baseplate temperature range is -40 °C to +100 °C. Specifications subject to change without notice.

Parameter	Min.	Typ.	Max.	Units	Notes & Conditions
ABSOLUTE MAXIMUM RATINGS					
Input Voltage					
Continuous			200	Vrms L-N	346 Vrms L-L
Transient			900	Vpk L-L	100 ms transient
Isolation Voltage			2150	Vdc	Input/Output to baseplate/PE GND
Operating Case Temperature	-40		100	°C	Baseplate temperature
Storage Case Temperature	-55		125	°C	
RECOMMENDED OPERATING CONDITIONS					
Input Voltage (Continuous)	85	115	140	Vrms L-N	147 to 242 Vrms L-L
Input Frequency	45		800	Hz	
Output Current Range			3.0	Arms	Per phase
ELECTRICAL CHARACTERISTICS					
Series Resistance Rs					Per phase
Tcase = 25 ºC		500		mΩ	
Tcase = 100 ºC			700	mΩ	
Total Power Dissipation					
Zero Load, 400 Hz		2.0		W	
Zero Load, 60 Hz		1.3		W	
3 Arms (per phase) @ 400 Hz, Tcase = 25 ºC		16		W	
3 Arms (per phase) @ 400 Hz, Tcase = 100 ºC			21	W	Guaranteed by design
Total Differential Capacitance		0.40		µF	Per Phase, Y connected
Internal Resistance (line-line)		3.0		MΩ	Discharges capacitors for safe handling
Reactive Power (per phase)		13		VAR	At 400 Hz; scales with line frequency
Common-Mode Capacitance (per phase)		4.7		nF	To PE GND Pin
Differential-Mode Attenuation, 200 kHz		50		dB	See Figure A
Common-Mode Attenuation, 200 kHz		40		dB	See Figure A
Isolation Resistance	100			MΩ	Any pin to PE GND
RELIABILITY CHARACTERISTICS					
Calculated MTBF per Telcordia SR-332, Issue 2		137		kHrs.	Ground Benign, Tb = 70 °C
Calculated MTBF per MIL-HDBK-217F		141		kHrs.	Ground Benign, Tb = 70 °C
Calculated MTBF per MIL-HDBK-217F		15		kHrs.	Airborne Inhabited Cargo, Tb = 70 °C

BASIC OPERATION AND FEATURES

This module is a differential-mode and common-mode passive EMI filter designed to interface a 3-Phase AC power source with a SynQor Isolated 3-Phase PFC module.

A typical application would place the AeroQor AC line filter close to the AC input power entry point. The AC Line Filter's PE GND pin would be connected to the chassis ground that is common with AC input power protective earth or other earthed point used for EMI measurement. There are no connections to the metal baseplate, which may also be connected to the chassis ground if desired.

Do not connect the inputs & outputs of multiple AeroQor 3-Phase AC line filters in parallel. Connecting filters in this manner may result in slightly imbalanced currents flowing in the three paths of each filter. These imbalanced currents will cause the internal common-mode chokes to saturate and thus degrade common-mode attenuation.

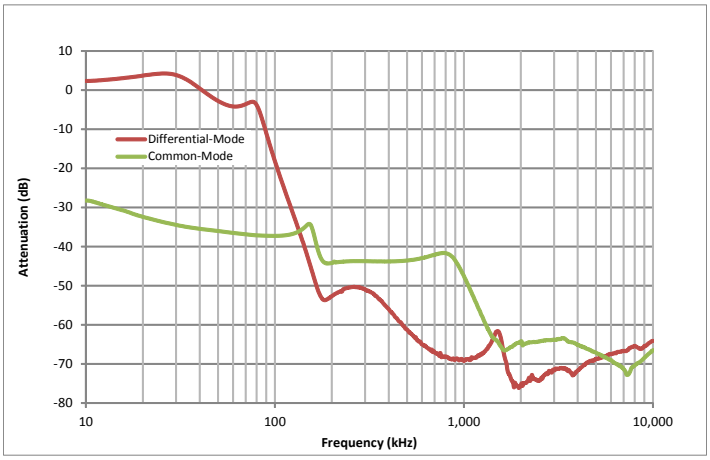


Figure A: *Typical Common Mode and Differential Mode Attenuation provied by the filter as a function of frequency. Source resistance is 50Ω.*

Standards & Qualification

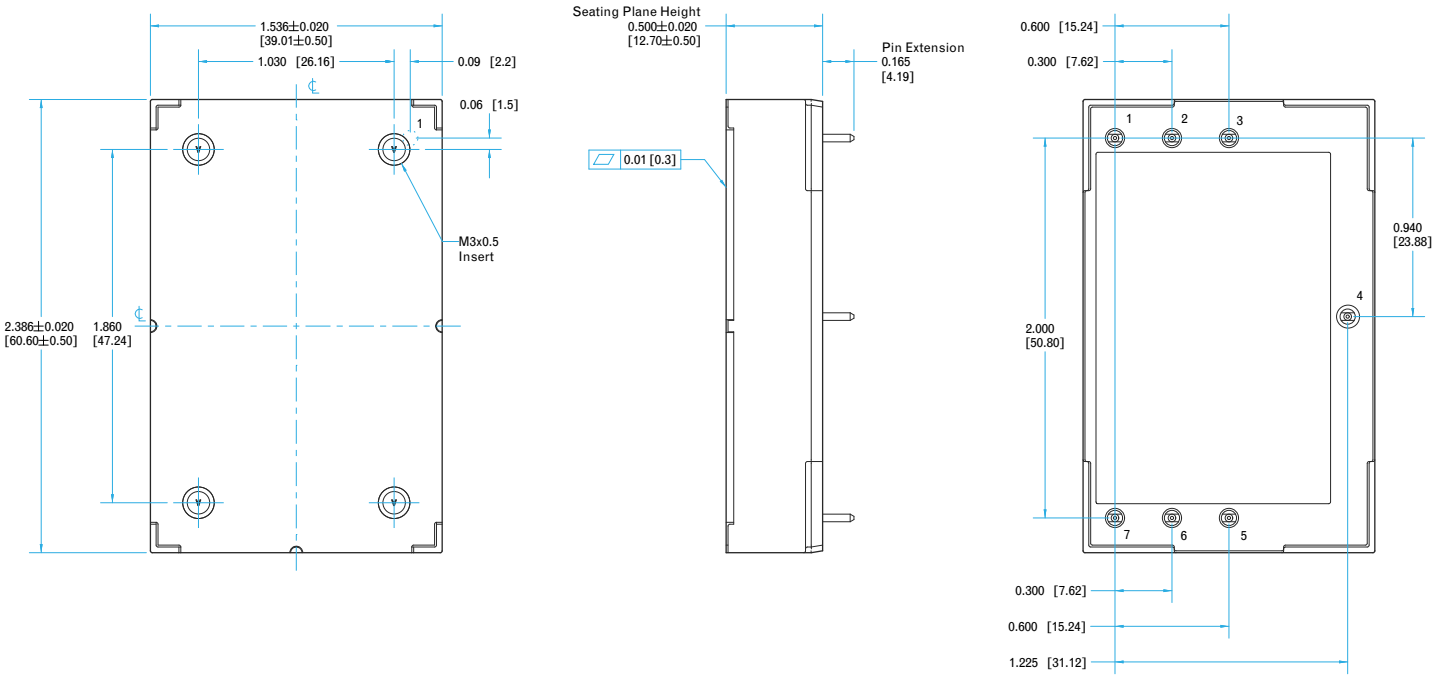
Category Description	3-Phase 115Vrms Specification Compliance
Input Voltage	787B3-0147, D6-44588, Airbus ABD0100.1.8, RTCA/DO-160G
AC Current Inrush	RTCA/DO-160G 16.7.5
Switching Transients	787B3-0147, D6-44588, Airbus ABD0100.1.8, RTCA/DO-160G, EN61000-4-4, EN61000-4-5
Voltage Spikes	787B3-0147, D6-44588, Airbus ABD0100.1.8, RTCA/DO-160G, EN61000-4-6
Frequency Transients	787B3-0147, D6-44588, Airbus ABD0100.1.8, RTCA/DO-160G
Harmonic Content	787B3-0147, D6-44588, Airbus ABD0100.1.8, RTCA/DO-160G, EN61000-3-2, MIL-STD-1399
DC Content on Input Voltage	787B3-0147, D6-44588, Airbus ABD0100.1.8, RTCA/DO-160G
Audio Frequency Conducted Susceptibility	D6-36440, RTCA/DO-160G
Audio Frequency Conducted Emissions	D6-36440, RTCA/DO-160G
Induced Signal Susceptibility	D6-36440, RTCA/DO-160G, EN61000-4-6
Conducted Emissions	D6-36440, RTCA/DO-160G, EN55011/22
Magnetic Effect	D6-36440, RTCA/DO-160G, EN61000-4-11
Radiated Emissions	D6-36440, RTCA/DO-160G, EN61000-4-3
Electrostatic Discharge	D6-36440, RTCA/DO-160G, EN61000-4-2
Electrical Bonding and Grounding	D6-36440, D6-44588, UL 60950-1
Lightning Susceptibility	D6-36440, D6-16050-5, RTCA/DO-160G
Reliability	Telcordia, MIL-HDBK-217F

Parameter	# Units	Test Conditions
QUALIFICATION TESTING		
Cold Temperature - Ground Survival	5	RTCA/DO-160G Section 4.5.1
Hot Temperature - Ground Survival	5	RTCA/DO-160G Section 4.5.3
Cold Temperature - Operating	5	RTCA/DO-160G Section 4.5.2
Hot Temperature - Operating	5	RTCA/DO-160G Section 4.5.4
Temperature Variation	5	RTCA/DO-160G Section 5.3.1
Temperature Cycling	5	MIL-STD-810G Method 503.5 – Procedure I
Humidity	3	RTCA/DO-160G Section 6.3.1 (Category A)
Waterproofness - Condensing	3	RTCA/DO-160G Section 10.3.1 (Category Y)
Fungus Resistance	1	MIL-STD-810G Method 508.6
Vibration - Fixed Wing and Helicopter	5	RTCA/DO-160G Sections 8.5.2 (Level B4), 8.8.3 (Levels G and F1)
Operational Shock and Crash Safety	5	RTCA/DO-160G Section 7.2.1, 7.3.1, and 7.3.3 (Category B)
Altitude - Steady State	2	RTCA/DO-160G Section 4.6.1; 70,000 ft (21 km), see note
Altitude - Decompression	2	RTCA/DO-160G Section 4.6.2
Design Marginality	5	Tmin-10 °C to Tmax+10 °C, 5 °C steps, Vin = min to max, 0-105% load
Life Test	5	95% rated Vin and load, units at derating point, 1000 hours
Solderability	15 pins	MIL-STD-883, Method 2003

Parameter	Notes & Conditions
STANDARDS COMPLIANCE	
CE Marked	

Note: An external input fuse must always be used to meet these safety requirements. Contact SynQor for official safety certificates on new releases or download from the SynQor website.

Encased Mechanical



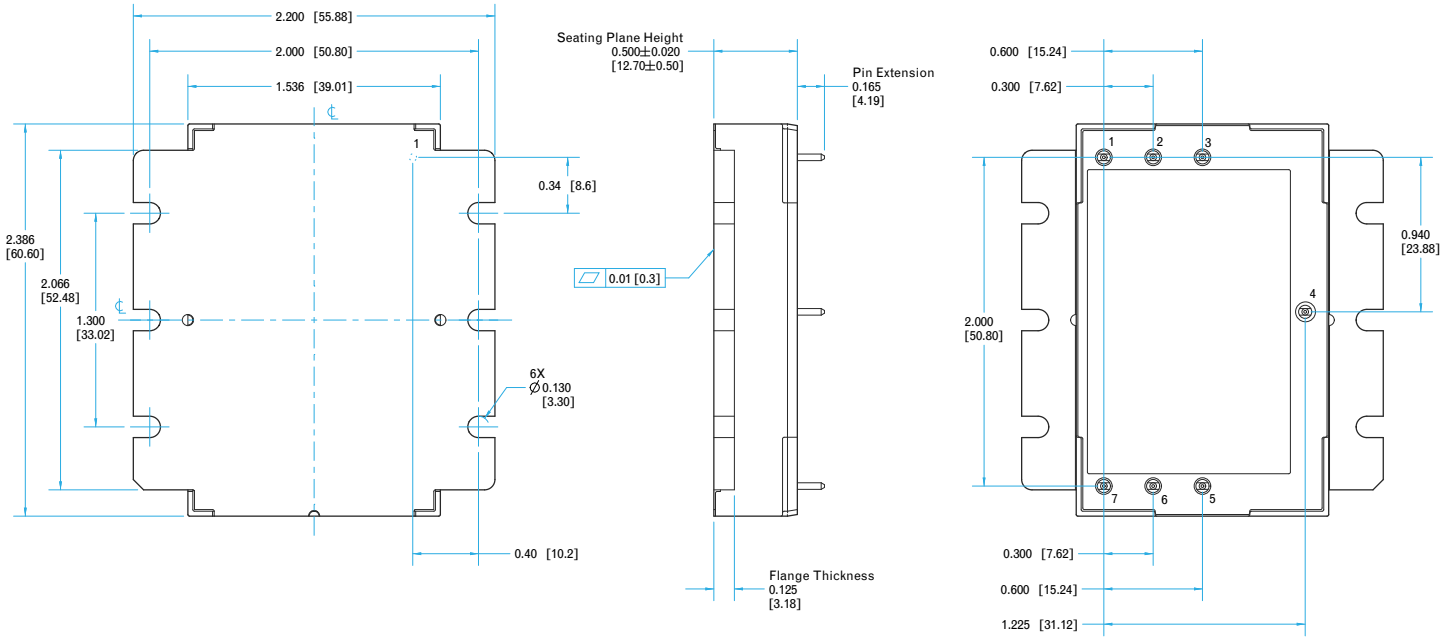
NOTES

1) Applied torque per M3 screw should not exceed 6in-lb. (0.7 Nm).
   Screw is not to exceed 0.100" (2.54 mm) below the surface of the baseplate.
2) Pins are are 0.040" (1.02mm) diameter, with 0.080"
   (2.03mm) diameter standoff shoulders.
3) All Pins: Material - Copper Alloy
   Finish: Matte Tin over Nickel plate
4) Total weight: 3.3 oz (93 g)
5) All dimensions in inches (mm)
   Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm)
   x.xxx +/-0.010 in. (x.xx +/-0.25mm)

PIN DESIGNATIONS

Pin	Name	Function
1	LINE A	AC Line Input A
2	LINE B	AC Line Input B
3	LINE C	AC Line Input C
4	PE GND	Protective Earth
5	PFC C	Filter Output C
6	PFC B	Filter Output B
7	PFC A	Filter Output A

Flanged Mechanical Diagram



NOTES

1) Applied torque per M3 or 4-40 screw should not exceed 6in-lb. (0.7 Nm).
2) Pins are are 0.040" (1.02mm) diameter, with 0.080" (2.03mm) diameter standoff shoulders.
3) All Pins: Material - Copper Alloy
   Finish: Matte Tin over Nickel plate
4) Weight: 3.5 oz (99 g)
5) All dimensions in inches (mm)
   Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm)
   x.xxx +/-0.010 in. (x.xx +/-0.25mm)

PIN DESIGNATIONS

Pin	Name	Function
1	LINE A	AC Line Input A
2	LINE B	AC Line Input B
3	LINE C	AC Line Input C
4	PE GND	Protective Earth
5	PFC C	Filter Output C
6	PFC B	Filter Output B
7	PFC A	Filter Output A

Ordering Information

Part Numbering Scheme					
Family	**Input Frequency**	**Input Voltage**	**Package Size**	**Thermal Design**	**RoHS**
ACF	**U:** 45 - 800 Hz	**115-3PH:** 115Vrms (L-N) 3Φ	**QG:** Quarter-Brick Giga	**C:** Encased Threaded **V:** Flanged	**G:** RoHS

Example: ACF-U-115-3PH-QG-C-G

RoHS Compliance: The EU led RoHS (Restriction of Hazardous Substances) Directive bans the use of Lead, Cadmium, Hexavalent Chromium, Mercury, Polybrominated Biphenyls (PBB), and Polybrominated Diphenyl Ether (PBDE) in Electrical and Electronic Equipment. This SynQor product is 6/6 RoHS compliant. For more information please refer to SynQor's RoHS addendum available at our RoHS Compliance / Lead Free Initiative web page or e-mail us at rohs@synqor.com.

Validation, Verification & Certification

USA Manufacturing Facility: AS9100 & ISO 9001 Certified

SynQor considers in-house manufacturing to be a core competency and strategic advantage. All SynQor products are manufactured in our manufacturing facility at our corporate headquarters in Boxborough, MA, USA, utilizing state-of–the art equipment and proprietary assembly techniques. By maintaining both AS9100 and ISO9001 certifications, SynQor is able to provide the same level of attention to detail in our manufacturing processes as we do in our products. We utilize proprietary in-house developed manufacturing data and document control systems that allow us to operate in a paperless manufacturing environment, providing both maximized manufacturing efficiency and flexibility. Ultimately, our manufacturing expertise remains in-house, allowing us to maintain complete control over the quality and traceability of our product down to the component level to meet the most stringent customer and industry requirements.

Design, Engineering & Manufacturing Process

SynQor employs a stringent, ECO controlled, 5-stage product development process, starting with product concept design and ending with manufacturing integration. We believe that a solid design and DFM review process leads to efficient manufacturing, higher performance, and enhanced reliability. By designing for reliability, SynQor greatly reduces the chance of field defects and increases product integrity.

Concept Design	Design & Verification	Proof of Design	Proof of Manufacturing	Manufacturing Integration
• Generate electrical specification • Review performance requirements • Design simulation • Schematic • Qualify new components • Breadboard • Prelim thermal analysis	• Full layout • DFM/DFT Review • Build engineering prototypes • Debug circuit • Worst-case electrical testing • Component stress analysis • Stability analysis • Abnormal electrical testing • Specification review • Preliminary datasheet	• Build units and electrically characterize • Verify electrical performance • Verify component stress analysis • Statistical variations • Thermal analysis and imaging • HALT testing • Complete datasheet	• Controlled Production Build • ATE testing • Yield analysis • Validate and finalize manufacturing processes and Tooling • 1000 hour life test • Qualification testing (humidity, vibration, DMT, PTC, thermal and mechanical shock, altitude and solderability)	• Processes transfer • Full documentation release (SCD's, BOM, processes, procedures, etc.) • Release qualification reports • Release final datasheet • Transfer units to finished goods

Contact SynQor for further information and to order:

Phone:	978-849-0600
Toll Free:	888-567-9596
Fax:	978-849-0602
E-mail:	power@synqor.com
Web:	www.synqor.com
Address:	155 Swanson Road Boxborough, MA 01719 USA

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 7,765,687

7,787,261 8,149,597 8,644,027

WARRANTY

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