



Concorde Battery Corporation

2009 San Bernardino Road
West Covina, California, USA 91790

RG-380E/60H Series

24 VOLT 48.0 Ah, HEATED, VALVE REGULATED, LEAD-ACID, AIRCRAFT BATTERY

DECLARATION OF DESIGN PERFORMANCE

TO THE REQUIREMENTS OF

RTCA DO-293A and IEC60952

Applications: Engine Starting and Emergency Power

NOTE: Applications may not be a complete list of all applications for this battery type.

The data/information contained herein has been reviewed and approved for general release on the basis that this document contains no export-controlled information

Characteristic	Part / Clause	Requirement / Performance	Test Report / Reference
Description		<p>The RG-380E/60H series of batteries are designed for engine starting and emergency power and consist of the following batteries: RG-380E/60LH, RG-380E/60KH, RG-380E/60LSH and RG-380E/60KSH. The RG-380E/60H series of batteries are identical to the RG-380E/60 series of batteries except they incorporate a battery heating system as indicated by the suffix "H".</p> <p>The monoblock assembly for the "60" and "60H" series of batteries are electrically and mechanically identical with exception to labeling differences and the removal of vent tubes on some types. Each monoblock consists of 12 series connected cells. The cells are enclosed by a one piece container and a one piece cover, both made of high impact polypropylene, secured together with an epoxy cement. Each monoblock is equipped with an integrally molded quick disconnect dimensionally conforming to MS3509.</p> <p>The suffix's 'KH', 'KSH', 'LH' and 'LSH', as with the RG-380E/60 series, defines the outer container which houses the monoblock assembly. The 'K' defines an outer housing of fuse coated aluminum with vent louvers. The 'L' defines an outer housing of fused coated aluminum with cutouts for a monoblock with vent tubes. The 'KS' defines an outer housing identical to the 'K' though made of stainless steel. The 'LS' defines an outer housing identical to the 'L' though made of stainless steel. The added 'H' suffix signifies the incorporation of a Heater Control Unit (HCU) mounted to the outer container and a heater blanket around the monoblock. The 'K', 'L', 'KS' and 'LS' suffixes and definitions are identical to those for the RG-380E/60 series. The 'H' incorporation is the only difference between the RG-380E/60H series and the RG-380E/60 series.</p> <p>The outer housing provides the monoblock assembly with increased protection from fire with the aluminum housing being fire resistant and the stainless steel housing being fire proof. The battery hold down is incorporated into the metal cover of the housing. All battery types are equipped with identical strap handles.</p> <p>The electrolyte is a sulfuric acid and water solution and is absorbed within the battery plates and separators. There is no free electrolyte. See Material Safety Data Sheet for hazardous material identification and precautions.</p> <p>The RG-380E/60H series of batteries must be fitted with an HCU before being fitted in an aircraft. Concorde manufactures five HCU's: HCU-1, HCU-2, HCU-3, HCU-4 and HCU-7X. Each HCU is a completely passive device consisting of redundant military specification bimetallic thermal switches which turn the internal heater in the battery on or off. Temperature sensors in the form of thermistors or resistance temperature devices (RTD) may also be installed in the HCU in order to report a battery temperature signal to the aircraft. These are also passive devices. The HCU-3 control unit was installed on all test batteries and used to control the heater during testing. The HCU-3 is considered equivalent and representative of the HCU-1, HCU-2, HCU-4 and HCU-7X.</p> <p>The RG-380E/60H series with heaters deactivated is electrically identical to the RG-380E/60 series. Mechanically the RG-380E/60H series of batteries are identical to the RG-380E/60 series with exception to the HCU mounting location and heater blankets. Many of the test results from the RG-380E/60 series of batteries are considered representative of the RG-380E/60H series.</p> <p>The RG-380E/44H series uses the identical outer housing, thermal blankets, HCU and mounting method as the RG-380E/60H series. Test results for specific environmental tests may be considered representative of the RG-380E/60H series for the integrity of the HCU and outer housing assembly construction.</p>	

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Connector	IEC 60952-2	The battery series is equipped with a Type Q terminal conforming to MS3509.	
Mass	IEC 60952-2	RG-380E/60LH – 43.6 kg Max (96.0 lbs). RG-380E/60LSH – 44.5 kg Max (98.0 lbs). RG-380E/60KH – 43.6 kg Max (96.0 lbs). RG-380E/60KSH – 44.5 kg Max (98.0 lbs).	
Charging method	IEC 60952-1, 4.3	Constant potential at 28.25 V	
Any auxiliary requirement:		The RG-380E/60H series of batteries are equipped with independent AC and DC heater blankets and a mounting location for the attachment of a Heater Control Unit. HCU is required in order to operate heater blankets.	
Ventilation	DO-293A, 2.2.2	RG-380E/60LH and RG-380E/60LSH batteries are equipped with vent tubes RG-380E/60KH and RG-380E/60KSH batteries are equipped with vent louvers	
Flammability	IEC 60952-2, 6.13	RG-380E/60LH and RG-380E/60KH outer container and cover are fire resistant. RG-380E/60LSH and RG-380E/60KSH outer container and cover are fire proof.	
Spillability		Non spill	

Electrical Performance

Rated Capacity (C1)	DO-293A, 2.2.2 IEC 60952-1, 5.1.1	48.0 Ah	
Capacity at -18°C	DO-293A, 2.2.3 IEC 60952-1, 5.1.2	30.0 Ah when discharged at the C1 rate.	
		40 Ah (with heater blanket energized for 1 hour prior to discharge)	
Capacity at -30°C	DO-293A, 2.2.4 IEC 60952-1, 5.1.3	22.0 Ah when discharged at the C1 rate.	
		30 Ah (with heater blanket energized for 1 hour prior to discharge)	
Capacity at +50°C	DO-293A, 2.2.5 IEC 60952-1, 5.1.4	48.0 Ah when discharged at the C1 rate.	
Power Rating +23°C	DO-293A, 2.2.6.1 IEC 60952-1, 5.2.2.1	I _{pp} = 1600 A I _{pr} = 1200 A	
Power Rating -18°C	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.2.2	I _{pp} = 1200 A I _{pr} = 950 A	
Power Rating -30°C	DO-293A, 2.2.6.3 IEC 60952-1, 5.2.2.3	I _{pp} = 900 A I _{pr} = 700 A	
Rapid Discharge Capacity at 23°C	DO-293A, 2.3.1 IEC 60952-1, 5.3.1	30.0 Ah when discharged at 10 times the C1 rate to 10 volts.	
Rapid Discharge Capacity at -30°C	DO-293A, 2.3.2 IEC 60952-1, 5.3.2	8 Ah when discharged at 10 times the C1 rate to 10 volts.	
		14 Ah (with heater blanket energized for 1 hour prior to discharge)	
Charge Retention	DO-293A, 2.4 IEC 60952-1, 5.4	+23 C - Rating value for design = 85 %	
		+50 C - Rating value for design = 70 %	
Storage	DO-293A, 2.5 IEC 60952-1, 5.5	DO-293A - 1 year storage life test in process	

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Charge Stability	DO-293A, 2.6 IEC 60952-1, 5.6, Class I	OK. Max battery temperature on charge = 52°C. Charge current fell during the charge period. Capacity at end of test was greater than the C ₁ .	
Short-Circuit Current	DO-293A, 2.7 IEC 60952-1, 5.7	Peak current = 2755 A Last recorded current = 1876 A at 5 s	
Charge Acceptance	DO-293A, 2.8 IEC 60952-1, 5.8	+23°C = 97.5 %	
		-18°C = 108 % (with DC heaters energized)	
		-18°C = 98 % (with AC heaters energized)	
		-40°C = 164 % (with DC heaters energized) -40°C = 191 % (with AC heaters energized)	
Insulation Resistance	DO-293A, 2.9.1 IEC 60952-1, 5.9.1	The RG-380E/60H series successfully met the test requirements.	
Dielectric Strength	DO-293A, 2.9.2 IEC 60952-1, 5.9.2	The RG-380E/60H series successfully met the test requirements.	
Duty Cycle Performance	DO-293A, 2.10 IEC 60952-1, 5.10	100 cycles successfully completed.	
Water Consumption Test	DO-293A, 2.11 IEC 60952-1, 5.11	N/A	
Overcharge Endurance	DO-293A, no requirement IEC 60952-1, 5.12	Not tested	
Cyclic Endurance	DO-293A, 2.12 IEC 60952-1, 5.13	100 cycles successfully completed.	
Deep Discharge	DO-293A, 2.13 IEC 60952-1, 5.14	After sitting in a discharged condition for 4 weeks. Battery recovered 100% of its initial capacity.	
Induced Destructive Overcharge	DO-293A, 2.14 IEC 60952-1, 5.15	All test requirements were successfully met.	
Electrical Emissions	DO-293A, 2.15 IEC 60952-1, 5.16	N/A, Battery contains no active electronics.	
Environmental Performance			
Vibration	DO-293A, 3.1 IEC 60952-1, 6.1	Qualified to DO-293A and DO-160G, Random Vibration test per Curve C, section 8 of DO-160G, 1 hour per axis.	
Acceleration	DO-293A, no requirement IEC 60952-1, 6.2	Not tested	
Operational Shock	DO-293A, 3.3.1 IEC 60952-1, 6.3, Class I	Qualified to DO-293A and DO-160G, Category B.	
Crash Safety Shock	DO-293A, 3.3.2 IEC 60952-1, 6.4	Qualified to DO-293A and DO-160G, Category B.	
Explosion Containment	DO-293A, 3.4 IEC 60952-1, 6.4	Qualified to DO-293A and DO-160G. All tests requirements were met.	

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Altitude	DO-293A, 3.5 IEC 60952-1, 6.6	Qualified to 20621m (67654 ft). In accordance with DO-293A.	
Rapid Decompression	DO-293A, 3.5.2 IEC 60952 no reqmt	Qualified from 2300m (8000 ft) to 20621m (67654 ft) in accordance with DO-293A.	
Temperature Shock	DO-293A, 3.6 IEC 60952-1, 6.7	Qualified to testing temperatures +85°C to -55°C per DO-293A.	
Fungus Resistance	DO-293A, 3.7 IEC 60952-1, 6.8	Component test. All components have been tested and qualified to DO-293A and DO-160G Category F.	
Humidity	DO-293A, 3.8 IEC 60952-1, 6.9	Qualified to DO-293A and DO-160G, Category B.	
Fluid Contamination	DO-293A, 3.9 IEC 60952-1, 6.10	<p>Test was performed on representative material samples. All samples successfully met the test requirement.</p> <p>Fluids tested:</p> <p>Fuels.</p> <ul style="list-style-type: none"> Aviation Jet A fuel Aviation piston engine fuel (100LL AVGAS) <p>Hydraulic fluids</p> <ul style="list-style-type: none"> Mineral based (MIL-H-5606) Non-mineral based synthetic (MIL-PRF-83282 and MIL-PRF-87257) <p>Lubricating oils</p> <ul style="list-style-type: none"> Mineral based (MIL-L-6081) Ester based synthetic (MIL-L-23699) Internal combustion engine SAE 15W40 <p>Solvents and cleaning fluids</p> <ul style="list-style-type: none"> Isopropyl alcohol (TT-I-735) Denatured alcohol <p>De-icing fluid</p> <ul style="list-style-type: none"> Ethylene Glycol Propylene Glycol AMS 1424 (SAE AEA Type I) AMS 1428 (SAE AEA Type VI) <p>Insecticides - none</p> <p>Sullage - none</p> <p>Disinfectants (heavy duty phenolics) - none</p> <p>Coolant dielectric fluid - none</p> <p>Fire extinguishants - none</p>	
Salt Spray	DO-293A, 3.10 IEC 60952-1, 6.11	Qualified to DO-293A and DO-160G, Category S.	
Physical Integrity at High Temperature	DO-293A, 3.11 IEC 60952-1, 6.12	Qualified to DO-293A.	

