



# RP24 Rugged Power Pack Testing Results



SYSTEM SOLUTIONS

ENCLOSURES & COMPONENTS

ROTARY SWITCHES

# RUGGED POWER SOLUTION

## FOR MOBILE AND STATIONARY SYSTEMS

### All Test and Inspections

- Status: Done
- Examination of the report : Done

### QS\_001 Test and Inspection Plan

No.	Object	Module / Device	PSU under test	Exam	Norm	Test method	Test method (Proposal Elma)	Remarks
<b>SAFETY REVIEW</b>								
12	Exams & certificates	RP24	M-Series-B	Electrical safety - Qualification	EN61204, -7; EN60950-1	Safety Certification	-	
15			M-Series-B	Electrical safety 115VAC	EN61204, -7; EN60950-1	Report		
<b>ENVIRONMENTAL TESTING</b>								
18	Exams & certificates	RP24	M-Series-B	Environment - Low Pressure (Altitude)	MIL-STD-810G	Method 500.5 or 500.6 Procedure II - Operation / Air Carriage	Measurement Method 500.5 Proc II (Operation / Air Carriage) Altitude Level: 3'500 m, room temperature at half load measurement period about 1 hour (500 W) Internal temperature in the diagnostic program to read	Device number 108
19	Exams & certificates	RP24	M-Series-B	Environment -High Temp	MIL-STD-810G	Method 501.5 or 501.6 Procedure II - Operation - limited to 60 °C	Check according to Method 501.6, Proc II, Operation Climatic category A3 Temp: 60 °C constant / test duration 24 Test under full load - failures in diagnostic system can be seen	Device number 108
20	Exams & certificates	RP24	M-Series-B	Environment - Low Temp	MIL-STD-810G	Method 502.5 or 502.6 Procedure II - Operation	Check according to Method 502.6, Proc II, Operation Climatic category C1 Temp: -35 °C constant / test duration 24 Test under full load - failures in diagnostic system can be seen	Device number 108
21	Exams & certificates	RP24	M-Series-B	Environmental -Temp Shock	MIL-STD-810G	Method 503.5 or 503.6 Procedure IC Multi-cycle shocks from constant extreme temperature	Check according to Method 503.6, proc IC (Multi-Cycle Shocks from Constant Temperature extremes Temperatures: -35 ° / + 60 ° C, beginning of -32 ° C Temperature change: within 10s Testing time: 12h / temperature step, 24 per cycle, a total of 5 cycles Test under full load - failures in diagnostic system can be seen	Device number 108
22	Exams & certificates	RP24	M-Series-A	Environment - Rain	MIL-STD-810G	Method 506.5 or 506.5 Procedure I - Rain and Blowing Rain Configuration: c. In its operational configuration	not rerun the test, as already covered in IP 66/67 test.	The IPX7 requirements according to EN 60529 and according to MIL-STD-810G method 512.5 are similar: Immersing the object 1 meter for 30 minutes If the immersion test is passed, both standards do not support any further test after splash water (IPX4) or according to method 506.5.

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23	Exams & certificates	RP24	M-Series-B	Environment - Humidity	MIL-STD-810G	Method 507.5 or 507.6 Procedure II – Aggravated	Check according to Method 507.6, Proc II Aggravated Temperature: + 30 ° C / + 60 ° C Humidity: 95% RH Residence: 8h / 6h Changing times: 2h / 8h Cycle time 24 Number of cycles 10 Preconditioning: 24 at 23 ° C / 50% RH	Device number 108
24	Exams & certificates	RP24	M-Series-A	Environment - Sand and Dust	MIL-STD-810G or EN 60529	Method 510.5 or 510.6 Procedure I - Blowing Dust. IP6X	The test is not repeated, as there has been no change in the seal.	The IP6X requirement according to EN 60529 has more stringent test conditions: - Larger amount of dust - Wind due to negative pressure - Longer test duration 8 hours This means that the test according to MIL-STD-810G method 510.5 is unnecessary
25	Exams & certificates	RP24	M-Series-B	Environment - Vibration	MIL-STD-810G	Method 514.6 or 514.7 Transportation - Category 4 Composite two-wheeled vehicle vibration exposure	Testing according to method 514.7, Proc I, Cat 4 Fig. 514.7C-3, Tab. 514.7C-III  Test under full load - failures can be seen in the diagnostic system	Device number 108
26	Exams & certificates	RP24	M-Series-B	Environment - Vibration	MIL-STD-810G	Method 514.6 or 514.7 Transportation - Category 9 Helicopter	Testing according to Method 514.7, Proc III, Cat 14, Fig 514.6D-3 according to AECTP400 Helicopter: Super Puma Random Frequency: 10 - 2000Hz Spectrum (ASD): Tab D-2 RMS value Random: 3.61gRMS Test duration: 3h / axis, total 9h Test under full load - failures visible in the diagnostic system	Device number 108
27	Exams & certificates	RP24	M-Series-B	Environment - Vibration	MIL-STD-810G	Method 514.6 or 514.7 Transportation - Category 4 composite wheeled vehicles exposure	Check according to method 514.7, Proc I, Cat 4 composite wheeled vehicles exposure Fig. 514.7C-4; Tab. 514.7CV test under full load - failures visible in the diagnostic system	Device number 108

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28	Exams & certificates	RP24	M-Series-B	Environment - Vibration	MIL-STD-810G	Method 514.6 or 514.7 Operational - Category 20 Ground vehicles Tracked vehicles	Testing according to Method 514.7, Proc III, Cat 20, Fig 514.6D-8, according to AECTP400, Edit 3, Meth 401, Fig B-3 - Heavy Vehicle Frequency range: 5 - 2000 Hz Test duration: 4h / axle, total 12h test under full load - Failures visible in the diagnostic system	Device number 108
29	Exams & certificates	RP24	M-Series-B	Environment - Shock	MIL-STD-810G	Method 516.6 or 516.7 Procedure I – Functional Shock	Testing according to method 516.6, Proc I, Ground Equipment Terminal Saw-Tooth Shock 40g / 11ms Test duration: 3 axis with 3 shocks per axis test under full load - failures visible in the diagnostic system	Device number 108
30	Exams & certificates	RP24	M-Series-B	Environment - Shock	MIL-STD-810G	Method 516.6 or 516.7 Procedure IV - Transit Drop Table 516.6-VI. Transit drop test Table 516.7-VII. Logistic transit drop test Table 516.7-VIII. Tactical transport drop test	Table 516.7-VIII. Tactical transport drop test 1.5 m	Device number 101
31	Exams & certificates	RP24	M-Series-B	Environment - Temp, Humidity and Vibration	MIL-STD-810G	Method 520.3 or 520.4 Procedure III - Qualification References to altitude do not apply	Vibration method according 514.7, Proc I, Cat 4 (line A-25) Temperature according to Method 501.6, Proc II max + 60 ° C (line A-19) Temperature according to Method 502.6, Proc II min -35 ° C (line A-20)	Device number 108
32	Exams & certificates	RP24	M-Series-A	M-Series-A	EN60529	Dust-proof: IP6X	-	The test is not repeated, there was no change in the instrument seal.
33	Exams & certificates	RP24	M-Series-B	Environmental - protection provided by housing (IP code)	EN60529	Sealed against strong water jets: IPX6 jet nozzle Nozzle: 12.5 mm Distance: 2.5 m to 3 m Water volume: 100 l / min ± 5% Test duration: 3 min	-	Device number 108

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34	Exams & certificates	RP24	M-Series-A	Environmental - protection provided by housing (IP code)	EN60529	Temporary immersion: IPX7 The water level above the housing: - 1 m from the lower edge / 0.15 m from the upper edge The test duration is 30 minutes	-	We have passed this test with the M series according to test report No. 17-0996 Rev5. We propose to not repeat this test with version 2 but perform the IPx6 test (water jets) instead.

### EMC TESTING

39	Exams & certificates	RP24	M-Series-B	EMC Immunity for industrial environments	EN61000-6-2	Immunity industry	Test under full load, 1 DC output without battery, Class II
40	Exams & certificates	RP24	M-Series-B	EMC Emission standard for residential	EN61000-6-3	Emitted interference in living areas	Test under full load, 1 DC output without battery, Class II
41	Exams & certificates	RP24	M-Series-B	EMC type test - power supply	EN61204-3	Power supply for DC output	Test under full load, 1 DC output without battery, Class II
42	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement CE102	Test under full load, 1 DC output without battery, Class II
43	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement RE102	Test under full load, 1 DC output without battery, Class II
44	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement CS101	Test under full load, 1 DC output without battery, Class II
45	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement CS114	Test under full load, 1 DC output without battery, Class II
46	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement CS115	Test under full load, 1 DC output without battery, Class II
47	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement CS116	Test under full load, 1 DC output without battery, Class II
48	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement CS118	Test under full load, 1 DC output without battery, Class II
49	Exams & certificates	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement RS103	Test under full load, 1 DC output without battery, Class II

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<b>HPE TESTING</b>								
<b>51</b>	common test	RP24	M-Series-B	EMC military standard	MIL-STD-461G	Requirement RE102	Test under full load, 1 DC output without battery, Class II	
<b>52</b>	exams	RP24	M-Series-B	115VAC - MIL	MIL-STD-461G	Requirement RE102	Test under full load, 1 DC output without battery, class II, 115VAC / 60Hz	
<b>53</b>	exams	RP24	M-Series-B	115VAC - MIL	MIL-STD-461G	Requirement CE102	Test under full load, 1 DC output without battery, class II, 115VAC / 60Hz	
<b>54</b>	Exams & certificates	RP24	M-Series-B	HPE Tests - HEMP	MIL-STD-461G	Requirement RS105		Passed. Review from V+T (Science and technology department) to follow
<b>55</b>	Exams & certificates	RP24	M-Series-B	HPE Tests - HEMP	MIL-STD-188-125-1 / 2	Pulse Current Injection (PCI) Short Pulse		Passed. Review from V+T (Science and technology department) to follow
<b>56</b>	Exams & certificates	RP24	M-Series-A	HPE Tests - Lightning	MIL-STD-464C	Lightning		
<b>57</b>	Exams & certificates	RP24	M-Series-B	HPE Tests - External RF EME	MIL-STD-464C	According Table 4 - Maximum external EME for ground systems		
<b>58</b>	Exams & certificates	RP24	M-Series-B	HPE Tests - Lightning	IEC61000-4-5			
<b>TESTING OF CASCADE PERFORMANCE</b>								
<b>62</b>	Exams & certificates	RP24	M-Series-B	Cascading up to 3 Devices		Test duration: 24 h / room temperature / power 2.6kW	Performance Power Supply 860W	
<b>63</b>	Exams & certificates	RP24	M-Series-B	Cascading up to 3 Devices - EMC	EN61000-6-2	Immunity industry	Performance Power Supply 860W	
<b>64</b>	Exams & certificates	RP24	M-Series-B	Cascading up to 3 Devices - EMC	EN61000-6-3	Emitted interference in living areas	Performance Power Supply 860W	
<b>65</b>	Exams & certificates	RP24	M-Series-B	Cascading up to 5 Devices		Endurance test: 6 hours / room temperature / power > 4KW	Performance Power Supply 860W	



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66	Exams & certificates	RP24	M-Series-B	Cascading up to 5 Devices - EMC	MIL-STD-461G	Requirement CE102	Performance Power Supply 860W	
67	Exams & certificates	RP24	M-Series-B	Cascading up to 5 Devices - EMC	MIL-STD-461G	Requirement RE102	Performance Power Supply 860W	

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