

IACS E10, IEC 60945 (Revision 3)

<u>Item</u>	<u>IACS E10</u>	<u>IEC 60945</u>
1) Dry Heat	IEC60068-2-2	IEC60945 Section 8.2.2.2

-Test requirement : The equipment shall be operational and subjected to a temperature of +70°C +/- 2°C for 16 hrs

-Required standard: No degradation of the equipment performance

2) Damp Heat	IEC60068-2-30	IEC60945 Section 8.3
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-Test requirement : The equipment shall be operational and subjected to the following humidity test: +55°C +/-2°C @ 95% +/- 5% Humidity for 12hrs, followed by +20°C +/- 5°C for 6hrs. This complete cycle to be repeated with the equipment non-operational.

-Required standard : No degradation of the equipment performance

3) Low Temperature	IEC60068-2-1	IEC60945 Section 8.4.2.3
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-Test requirement: The equipment shall be operational and subjected to the following cold temperature test: -25°C +/- 2°C for a period not less than 16 hrs

-Required standard: No degradation of the equipment performance

4) High Voltage

-Test requirement: 1500V 50Hz between Live/Neutral & Earth for 1 minute

-Required standard: No insulation breakdown during test and no degradation of the equipment performance after the test is complete

5) Vibration	IEC60068-2-6	IEC60945 Section 8.7.2
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-Test requirement: The equipment shall be operational and tested in three mutually perpendicular axes as follows: for each axis the sweep shall be carried out from 2-13.2Hz at +/-1mm and from 13.2-100Hz at +/-1.0g Units to be vibrated for a period of 2 hrs at each resonant frequency with an amplification factor of 2 or above, or at 30Hz if no resonance is found

-Required standard: No degradation of the equipment performance

6) Power Supply Variation	IEC60092-504	IEC60945 Section 10.7.2
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-Test requirement: The equipment shall be operational and tested for both 230 & 110V
Deviation: +/-10% (voltage) with +/-5% (frequency)

Transient test (2 secs): +/-20% (voltage) with +/-10% (frequency)

Tests to be repeated after dry heat and low temperature tests

-Required standard: No degradation of the equipment performance

7) Power Supply Failure IEC60092-504 IEC60945 Section 10.8.2

-Test requirement: Unit switched on and checked to be operational. Power turned off for 60 seconds. System powered up and retested for 90 seconds to ensure that it is fully operational -this test repeated two more times with no failures being detected

-Required standard: No degradation of the equipment performance

8) Conducted LF IEC60533 IEC60945 Section 10.2.2

-Test requirement: The equipment shall be operational. A signal generator shall be connected, using an isolation transformer (as detailed in Figure 5 of IEC60945), to the mains input of the equipment. The output voltage of the signal generator shall be set initially to 10% of the power supply voltage and the frequency swept from 50Hz to 900Hz. The signal generator output voltage shall be reduced to 1% at 6kHz and then held at that level until 10kHz.

* Note: This test has been deleted within IEC60945 Revision 4 (Draft)

-Required standard: No degradation of the equipment performance

9) Conducted RF IEC61000-4-6 IEC60945 Section 10.3.2

-Test requirement: The equipment shall be operational and the test applied to both power and signal lines. The frequency shall be swept from 10kHz to 80MHz amplitude modulated at 1kHz +/-10% and 400Hz +/-10% to a modulated depth of 30% and 80%, amplitude maintained at 3V rms. The equipment shall also be subjected to the same series of tests at the following spot frequencies: 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22 and 25MHz at 10V rms with 80% +/-10% modulation at 400Hz +/-10%.

* Note: Measurement between 10kHz - 150kHz has been deleted within IEC60945 Revision 4 (Draft)

- Required standard: No degradation of the equipment performance

10) Electromagnetic Field IEC61000-4-3 IEC60945 Section 10.4.2

- Test requirement: The equipment shall be operational. The equipment shall be exposed to an electric field of 10V/m swept from 30kHz-1GHz amplitude modulated at 1kHz +/-10% and 400Hz +/-10% to a modulation depth of 30% and 80% +/-10%

- Required standard: No degradation of the equipment performance

11) Radiated Emmissions IEC60533 IEC60945 Section 9.3.2

CISPR 16-1 & 16-2

-Test requirement: The equipment shall not radiate RF signals greater than:

Frequency	Limits (dBµV/m)	Notes
10kHz - 300kHz	80 - 50	1
300kHz - 30MHz	50 - 34	1

30MHz - 156MHz	54	
156MHz - 165MHz	24	2
165MHz - 2GHz	54	

- *Notes: 1. No longer required in IEC60945 Revision 4 (Draft)
 2. Alternative methods described within IEC60945 Revision 4 (Draft)
 - Required standard: Radiated levels must be below stipulated limits

12) Conducted Emissions IEC60533 IEC60945 Section 9.2.2

Test requirement: The equipment shall not emit conducted levels greater than:

<u>Frequency Limits</u>	<u>(dBμV/m)</u>
10kHz - 150kHz	96 - 50
150kHz - 350kHz	60 - 50
350kHz - 30MHz	50

- Required standard: Radiated levels must be below stipulated limits

13) Electrostatic Discharge IEC61000-4-2 IEC60945 Section 10.9.2

-Test requirement:

- a) Air discharge: The equipment shall be subjected to an electrostatic discharge of 8kV applied to any exposed metal part of the system. This will be repeated 100 times, in a number of different places, for both positive and negative polarity.
- b) Contact discharge: The above process will be repeated for contact discharge at a level of 6kV, for both positive and negative polarity.

- Required standard: No degradation of the equipment performance

14) Insulation Resistance IEC60092-504 IEC60945 Section 8.3 & 8.4

-Test requirement: The equipment shall be tested initially, before and after the humidity and low temperature tests and after the final test. The insulation between live & neutral to earth shall be tested for both polarities and shall not be less than 10Mohms

- Required standard: No degradation of the equipment performance

15) Bursts/Fast Transients IEC61000-4-4 IEC60945 Section 10.5.2

-Test requirement:

With the equipment operational a fast transient pulse will be applied for a period of 10 minutes, as follows:

Power supply line	: 2kV differential at 2.5kHz
Signal and control lines	: 1kV common mode at 5kHz
Pulse rise time	: 5nS (10% and 90%)

Pulse width : 50nS (50% value)
Application : 15mS burst every 300mS

-Required standard: No degradation of the equipment performance

16) Surge Immunity IEC61000-4-5 IEC60945 Section 10.6.2

- Test requirement:

With the equipment operational a 2kV common mode pulse shall be applied to line/earth for a minimum of 10 minutes at a rate of one pulse/minute. With the equipment operational a 1kV differential pulse shall be applied to line/line for a minimum of 10 minutes at a rate of one pulse/minute. These tests shall be repeated for both polarities.

- Required standard: No degradation of the equipment performance

17) Static Inclination IEC60092-504

- Test requirement: With the equipment operational it shall be inclined to a minimum angle of 22.5° either side of horizontal at two mutually perpendicular axes for a period of at least 15 minutes

- Required standard: No degradation of the equipment performance

18) Dynamic Inclination IEC60092-504

-Test requirement: With the equipment operational it shall be rolled to a minimum angle of 45° either side of horizontal at two mutually perpendicular axes for a period of at least 15 minutes

- Required standard: No degradation of the equipment performance

19) Acoustic Noise: IEC60945 Section 11.1.2

Test requirement: With the equipment operational the level of acoustic noise emanating from the equipment shall be recorded

*Note: New definition within IEC60945 Revision 4 (Draft), as below

- Required standard: The detected noise pressure level shall not exceed 60 dB(A) at a distance of 1m from any part of the EUT

20) Compass Safe Distance: IEC60945 Section 11.2.2

-Test requirement: The equipment shall be tested at an accredited Test Laboratory (e.g. DERA, TUV) to determine the Compass Safe Distance. This test will be repeated with the equipment operational and non-operational.

* This test is specialized by Korea Technology Institute, www.emc.re.kr

21) Access to dangerous voltages: IEC60945 Section 12.1

-Test requirement: All Mariner Systems (UK) Ltd. products carry the manufacturers European CE Mark which is the manufacturers declaration that the product is safe for use. Part of this safety requirement is that the "standard finger" safety test be carried out.

-Required standard: Confirm CE Mark is affixed to all products. If this Mark is not present then carry out the "standard finger" safety test.