

# Deviation Request ETSO-C142a#2 for an ETSO approval for CS-ETSO applicable to NON-RECHARGEABLE LITHIUM CELLS and BATTERIES (ETSO-C142a)

## Consultation Paper

### 1 Introductory Note

The hereby presented deviation requests shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004 as amended by EASA Management Board [Decision No 12-2007](#) products certification procedure dated 11th September 2007, Article 3 (2.) of which states:

“2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.”

### 2 ETSO-C142a#2 NON-RECHARGEABLE LITHIUM CELLS and BATTERIES

#### 2.1 Summary of Deviation

Deviates from ETSO-C142a by using RTCA DO-227A with a corrected testing pattern for battery humidity test instead of DO-227 modified by Appendix 1 of ETSO-C142a.

#### 2.2 Original Requirement

##### ETSO-C142a

##### **3.1.1 - Minimum Performance Standard**

RTCA DO-227 “Minimum Operational Performance Standard for Lithium Batteries” from June 1995 unless otherwise specified by Appendix 1 of this ETSO

##### **3.1.2 - Environmental Standard**

Non-Rechargeable Lithium Cells and Batteries must be tested according to RTCA DO-227 Section 2.3 unless otherwise specified by Appendix 1 of this ETSO

#### **4.2. – Specific**

Each lithium cell or battery must be marked in accordance with RTCA DO-227, Section 1.4.6.

## DO-227A

### 2.4.2.1.7 Battery Humidity Test

(...)

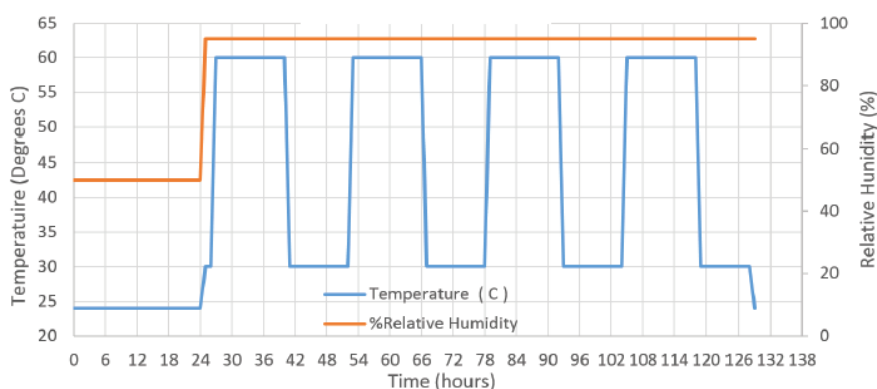
b. At the end of the hold period, (...) and perform a series of 4 temperature cycles between 30°C and 60°C. Each temperature shall be maintained for 12 hours for a total of 96 hours (...). Table 2-2 lists the temperature and relative humidity conditions for the first cycle.

(...)

**Table 2-2: Table of Relative Humidity / Temperature Test Profile Values**

Time (Hours)	Temperature (°C)	% Relative Humidity
0	30	95
2	60	95
4	60	95
6	60	95
8	60	95
10	60	95
12	60	95
14	60	95
16	30	95
18	30	95
20	30	95
22	30	95
24	30	95

(...)



**Figure 2-16: Humidity test profile of temperature and humidity vs time.**

## 2.3 Industry

EASA advertised their intent to recognize the use of RTCA DO-227A in place of the current RTCA DO-227, which should be the MPS for the future ETSO-C142b. Until ETSO-C142b is published, the industry needs to get batteries and end-items approved in accordance with DO-227A. EASA is granting credit for this new version of DO-227A to show compliance to the applicable special conditions at installation level. FAA is following the same approach.

However, DO-227A section 2.4.2.1.7 contains contradictory indications for the pattern to be applied during the battery humidity test. This deviation intends to provide an acceptable interpretation.

According to the text of b., each temperature should be maintained for 12 hours for a total of 96 hours in 4 cycles. This does not account for the time for the progressive change of temperature from one value to the other.

Furthermore, table 2-2 sets a pattern with 7 temperature steps at 60°C and 5 at 30°C.

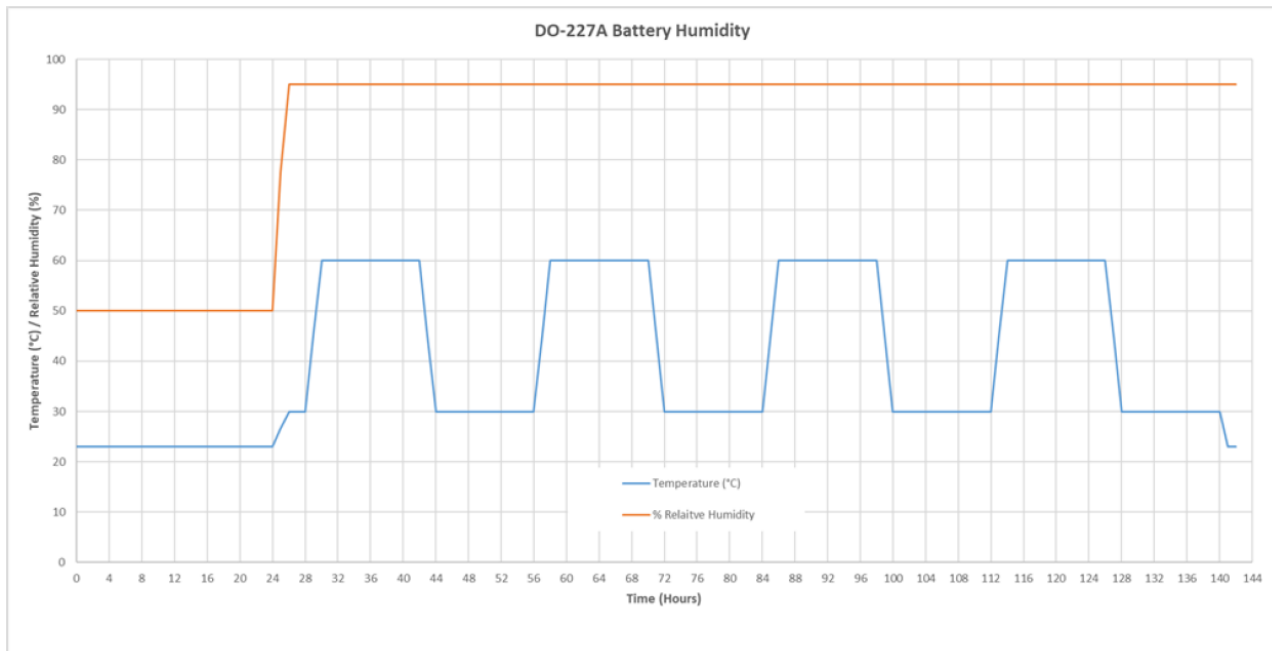
Figure 2-16 also shows a pattern with longer periods at 60°C than at 30°C, with the 30°C period being less than 12 hours.

The objective of this deviation is to resolve this contradiction by proposing the pattern in table 1, which is:

- Composed of 4 cycles,
- Such that each cycle contains 12 hours at 30°C and 12 hours at 60°C.

<i>Time (Hours)</i>	<i>Duration (Hours)</i>	<i>Temperature (°C)</i>	<i>% Relative Humidity</i>
0-24	24	23	50
24-26	2	Ramp to 30	Ramp to 95
26-28	2	Soak 30	95
28-30	2	Ramp to 60	95
30-42	12	Soak 60	95
42-44	2	Ramp to 30	95
44-56	12	Soak 30	95
56-58	2	Ramp to 60	95
58-70	12	Soak 60	95
70-72	2	Ramp to 30	95
72-84	12	Soak 30	95
84-86	2	Ramp to 60	95
86-98	12	Soak 60	95
98-100	2	Ramp to 30	95
100-112	12	Soak 30	95
112-114	2	Ramp to 60	95
114-126	12	Soak 60	95
126-128	2	Ramp to 30	95
128-140	12	Soak 30	95
140-141	1	Ramp to 23	95

**Table 1 – Required Humidity Profile**



It should be noted that the pattern is also more stringent than the DO-227 one, as the equivalent DO-227 test contained in section 2.3.6 contains a pattern of 2 cycles (total 48 hours), with the temperature varying between 38 and 50°C.

## 2.4 Equivalent Level of Safety

An equivalent level of safety is provided by the more stringent testing requirements imposed by DO-227A compared to the requirements of the DO-227 as amended by the appendix 1 of ETSO-C142a, while correcting the RTCA DO-227A inconsistencies in the definition of humidity cycles.

## 2.5 EASA position

We accept the deviation.