ExTAG/520A/CD
October 2018

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC) SYSTEM FOR CERTIFICATION TO STANDARDS RELATING TO EQUIPMENT FOR USE IN EXPLOSIVE ATMOSPHERES (IECEx SYSTEM)

TITLE: Draft ExTAG Decision Sheet – Cell or Battery testing for type of protection "ib"

Circulated to: ExTAG – IECEx Testing and Assessment Group

INTRODUCTION

This document ExTAG/520A/CD replaces ExTAG/520/CD and is now issued for comment according to IECEx OD 035 taking into account the following decision from the 2018 ExTAG meeting

ExTAG DECSION 2018/16

a) to request TC31 WG37 to consider the preparation of an Interpretation Sheet,
b) that Testsafe be given an opportunity to continue development of a draft IECEx Decision Sheet for consideration as per IECEx OD 035, and
c) that a summary of the BKI position / methodology be provided to ExTAG members for additional consideration over a six week period. (*issued as ExTAG(Cannes/BKI)05)*

Therefore, please consider ExTAG/520A/CD, prepared by TestSafe, in light of the BKI remarks, ExTAG(Cannes/BKI)05, presented during the ExTAG September 2018 meeting (included as an attachment).

In accordance with OD 035 ExTAG/520A/CD is issued for a six week comment period

Please submit comments using the comments table, Word format, a separate document, by –

2018 11 23 to
Christine Kane

Christine Kane for

Julien Gauthier
Julien Gauthier
ExTAG Secretary

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COLLECTION OF IECEx / ExTAG DECISION

Standard: IEC 60079-11:2006 (Edition 5.0) IEC 60079-11:2011 (Edition 6.0)	**Clause:** 10.5.3 b)	
Subject: Cell or Battery testing for type of protection "ib" **Status of document:** Draft	**Key words:** - Cell or battery testing - Internal current-limiting devices - Temperature measurement	**Date: 2018 07 26** **Originator of original proposals:** TestSafe **Date: 2018 07 26** **Originator of this text** TestSafe **TC/SC involved:**

Background

IEC 60079-11:2006 Clauses 10.5.3 b).

b) The maximum surface temperature shall be determined as follows. All current-limiting devices external to the cell or battery shall be short-circuited for the test. Any external sheath (of paper or metal, etc.) not forming part of the actual cell enclosure shall be removed for the test. The temperature shall be determined on the outer enclosure of each cell or battery and the maximum figure taken. The test shall be carried out both with internal current-limiting devices in circuit and with the devices short-circuited using 10 cells in each case. The 10 samples having the internal current-limiting devices short-circuited shall be obtained from the cell/battery manufacturer together with any special instructions or precautions necessary for safe use and testing of the samples.

NOTE 2 - When determining the surface temperature of most batteries/cells, the effect of built-in protective devices, for example fuses or PTC resistors, is not taken into account because this is an assessment of a possible internal fault, for example failure of a separator.

As mention above in note 2, the purpose of this short circuit test is for the assessment of the internal short inside the battery/cell.

IEC 60079-11:2011 Clauses 10.5.3 b).

b) Cells shall be tested at any temperature between laboratory ambient and the specified maximum ambient that gives the most onerous conditions and the values obtained shall be used directly in the temperature class assessment. The cells shall be arranged in a way as to simulate the thermal effects of their intended position in the complete apparatus. The temperature shall be determined on the hottest surface of the cell that may be exposed to the explosive atmosphere and the maximum figure taken. If an external sheath is fitted then the temperature shall be measured at the interface of the sheath and the metal surface of the cell or battery.

The maximum surface temperature shall be determined as follows:

For 'ia' and 'ib' all current-limiting devices external to the cell or battery shall be short-circuited for the test. The test shall be carried out both with internal current-limiting devices in circuit and with the devices short-circuited using 10 cells in each case. The 10 samples having the internal current-limiting devices short-circuited shall be obtained from the cell/battery manufacturer together with any special instructions or precautions necessary for safe use and testing of the samples. If the internal current limiting devices protect against internal shorts then these devices need not be removed. However, such devices shall only be considered for Level of Protection 'ib'.

As mentioned above for level of protection ‘ib’, the current limiting devices is permitted not to be removed if it protects against internal shorts of the cell/battery.

Question:
If the current-limiting devices (a PCB assembly with components) is mounted on the battery body forming a battery pack, should this type of current-limiting devices considered as an internal current-limiting device to protect against internal short and not to be removed for level of protection ‘ib’?

Answer:
No, the current limiting device should be shorted/removed for testing. This type of current limiting device (a PCB with components) has no means to protect the internal shorts of the cell/battery. Therefore, it shall be tested both, with the current limiting device and with the devices short-circuited/removed. Internal short is for example failure of an internal cell/battery separator.

ExTAG(Cannes/BKI)05

INTERNATIONAL ELECTROTECHNICAL COMMISSION SYSTEM FOR CERTIFICATION TO STANDARDS RELATING TO EQUIPMENT FOR USE IN EXPLOSIVE ATMOSPHERES (IECEx SYSTEM)

Title: BKI presentation during Agenda item 6.6 of Agenda document ExTAG/517C/DA -

Circulation to: Members of the ExTAG

Introduction

This document contains the ppt presentation from BKI as presented during the 2018 Cannes ExTAG Meeting.

This document is circulated according to the Decision ExTAG 2018/15 of the ExTAG 2018 meeting, for the information and consideration of ExTAG Members.

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Battery Surface Temperature Assessment

for Equipment Protection Level ‘ib’

According to 60079-11; 10.5.3; b)

Exception for ‘ib’ – part 1

10.5.3 Spark ignition and surface temperature of cells and batteries

[…]

b) Cells shall be tested […]

For ‘ia’ and ‘ib’ all current-limiting devices external to the cell or battery shall be short-circuited for the test. The test shall be carried out both with internal current-limiting devices in circuit and with the devices short-circuited using 10 cells in each case. The 10 samples having the internal current-limiting devices short-circuited shall be obtained from the cell/battery manufacturer together with any special instructions or precautions necessary for safe use and testing of the samples. **If the internal current limiting devices protect against internal shorts then these devices need not be removed.** However, such devices shall only be considered for Level of Protection ‘ib’.

Exception for ‘ib’ – part 2

If the internal current limiting devices protect against internal shorts then these devices need not be removed.

Internal to the battery or internal to the cell?

Definitions in 60079-0:

- **3.5.1 battery:** assembly of two or more cells electrically connected to each other to increase the voltage or capacity.
- **3.5.3 cell:** assembly of electrodes and electrolyte which constitutes the smallest electrical unit of a battery.

Interpretation 1: “internal to the cell”

- If a current limiting device is internal to the cell, it need not be removed for testing in case of ‘ib’, however in case of ‘ia’ all current limiting devices need to be removed for testing.

  This creates contradictions:

  - If the current limiting device is a functional part of the cell (e.g. melting separator), then testing for the case of ‘ia’ would be impossible, as the removal of this part would make the cell inoperable/untestable.

  - If the current limiting device is an additional part to the cell (e.g. internal fuse), then circuit-wise it would be the same as a fuse on the external protective PCB, thus this would not be considered internal to the cell, as the cell “constitutes the smallest electrical unit” of the battery.

Interpretation 2: “internal to the battery”

- Current limiting devices are added to the protective circuit board which must comply with requirements of protection level ‘ib’. These devices are internal to the battery and with the ‘ib’ protection level they protect against internal shorts on the protective PCB. For this reason they need not be removed for assessment of ‘ib’ equipment. However these would still need to be removed for assessment of ‘ia’ equipment.
- This interpretation does not create contradiction.

Interpretation 2 is also supported by Annex E in 60079-1 (flameproof enclosures d):

E.4.1 Prevention of excessive temperature and cell damage

E.4.1.1 Under short-circuit discharge conditions, batteries shall either meet both conditions below, or be fitted with a safety device, as described in E.4.1.2:

a) the external surface temperature of the cell or battery shall not exceed the continuous operating temperature specified by the cell or battery manufacturer taking into account the local ambient temperature within the enclosure; and

b) the maximum discharge current shall not exceed that specified by the cell or battery manufacturer.

E.4.1.2 Where the two conditions in E.4.1.1 above cannot be achieved, a safety device is required which shall comply with the requirements for infallible components in level of protection “ib” as defined in IEC 60079-11, and be located as close to the cell or battery terminals as is reasonably practicable, and be either:

- a resistor or current-limiting device, which limits the current to the maximum continuous withdrawal current specified by the battery manufacturer; or
- a fuse conforming with the IEC 60127 series, selected so that the fusing characteristic prevents the maximum withdrawal current and allowable duration specified by the battery manufacturer from being exceeded. Where the fuse is of the replaceable type, a label shall be provided adjacent to the fuse holder, specifying the type of fuse to be used.

The rating of the resistor or current-limiting device shall be based on the voltage of the cell or battery.

Interpretation 2 was applied by BKI: