

## Test Report Lithium Ion Battery

**Test Report – No.:** 2226914KAU-001

**Date of issue:** 2016-07-06

**Type:** SB 12V160E-ZC

**Description:** Lithium Ion Battery

**Serialnumber:** 0000028100

**Manufacturer:** Super B b.v.

**Applicant:** Super B b.v.

**Address (Applicant):** Diamantstraat 1e  
7554 TA Hengelo  
Netherlands

**Test Result:** The requirements of the IEC 60092-101, chapter 2.28.2 Flame-retardant test are fulfilled.

For issue dates of the standards please see standard listing in this report.

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This test report consists of 20 pages. All measurement results exclusively refer to the equipment, which was tested.  
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# 1 Measurements and test specifications

## Lithium Ion battery Requirements according to

- |                                     |                                                |                                                                                       |
|-------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | IEC 60092-101, from the 2002-08<br>Edition 4.1 | Electrical installations in ships –<br>Part 101: Definitions and general requirements |
|-------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------|

## Tests

- |                                     |                                                       |                                                                                                                                                                           |
|-------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | Flame-retardant test<br>IEC 60092-101, chapter 2.28.2 | The test specimen shall be introduced into a specified flame at<br>specified intervals and the flame retardance assessed from the<br>amount of burnt or damaged material. |
|-------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 2 Size and type of the DUT

Definition of a battery according to UN 38.3 Rev.5 Amend.2:

Battery means two or more cells which are electrically connected together fitted with devices necessary for use, for example, case, terminals, marking and protective devices. A single cell battery is considered a “cell”.

### 2.1 Size

- ☐ Small battery with protective device  
(*Small battery* means a lithium metal battery or lithium ion battery with a gross mass of less than 12 kg.)
- ☐ Small battery without protective device  
(*Small battery* means a lithium metal battery or lithium ion battery with a gross mass of less than 12 kg.)
- ☒ Large battery with protective device  
(*Large battery* means a lithium metal battery or lithium ion battery with a gross mass of more than 12 kg.)
- ☐ Large battery without protective device  
(*Large battery* means a lithium metal battery or lithium ion battery with a gross mass of more than 12 kg.)

## 2.2 Type

- ☐ Lithium polymer cell
- ☐ Lithium cobalt dioxide cell ( $\text{LiCoO}_2$ )
- ☐ Lithium titanate cell
- ☐ Lithium air cell
- ☐ Lithium manganese cell
- ☒ Lithium iron phosphate cell ( $\text{LiFePO}_4$ )
- ☐ other Lithium ion cell type
- ☐ not given by the manufacturer

### 3 Test result overview

| Lithium Ion Battery  | Applied                             | Date of test | No |
|----------------------|-------------------------------------|--------------|----|
| Flame-retardant test | <input checked="" type="checkbox"/> | 2016-07-01   | 1  |

**Table 1 Test Overview**

The tests have been made in the order of the last column in the “Test Results – Overview” table.

## 4 Description of DUT

### 4.1 Configuration / Operating conditions

For the commissioning of the battery, the manual “Manual\_SB12V160E-ZC\_V3\_Jan\_2016\_ENGELS\_LR” was used.

### 4.2 Technical data Lithium Ion Battery SB 12V160E-ZC

|                 |                   |
|-----------------|-------------------|
| Energy          | 2112 Wh           |
| System capacity | 160 Ah            |
| Voltage range   | 14,6 – 15,4 VDC   |
| Weight          | 26,75 kg          |
| Dimensions XYZ  | 414 x 314 x 226mm |

**Table 2 Technical data Lithium Ion Battery SB 12V160E-ZC**

### 4.3 General pictures Lithium Ion Battery SB 12V160E-ZC



Picture 1 Lithium Ion Battery SB 12V160E-ZC



Picture 2 Lithium Ion Battery SB 12V160E-ZC





**Picture 3 Lithium Ion Battery SB 12V160E-ZC**



**Picture 4 Lithium Ion Battery SB 12V160E-ZC**



Picture 5 Marking plate, sample No. #28100



Picture 6 Marking plate

## 5 Test overview

### 5.1 Flame-retardant test

#### 5.1.1 Normative references

|                                      |                                                                                     |
|--------------------------------------|-------------------------------------------------------------------------------------|
| Methods of Measurement according to: | IEC 60092-101, from the 2002-08 Edition 4.1<br>Flame-retardant test, chapter 2.28.2 |
|--------------------------------------|-------------------------------------------------------------------------------------|

|                  |                                   |
|------------------|-----------------------------------|
| Samples received | 1<br>Serial number:<br>0000028100 |
| Date of test     | 2016-07-01                        |

|                                |
|--------------------------------|
| Description of test sample     |
| One (1) Super B, SB 12V160E-ZC |

|                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Purpose of test                                                                                                                                                     |
| The test specimen shall be introduced into a specified flame at specified intervals and the flame retardance assessed from the amount of burnt or damaged material. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description of test equipment                                                                                                                                                                                                                                                                                                                                                                                                     |
| A burner (conventional Bunsen burner) fed with town gas shall be used, the flame of which, when adjusted in still air and in the vertical position, is approximately 125 mm long, the blue part of the flame being about 35 mm long.<br>The test specimen shall be fastened to a thin metal wire so that its longitudinal axis is inclined at an angle approximately 45° to the horizontal and its transverse axis is horizontal. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test specimen                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The test specimen consists of a bar or strip at least 120 mm long, 10 mm wide and 3 mm thick. Test specimens of other sizes may also be accepted. An increase in the length beyond 120 mm is unimportant. In the case of tubes or sections, the straight section of which is not notably larger than a rectangle of 10 mm × 3 mm in size and area, the test may be carried out on a 120 mm length of the object. The thickness of the sample can attain 10 mm without disadvantage. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test procedure                                                                                                                                                                                                                                                                                                                                                                                                                          |
| The test shall be carried out at normal ambient temperature and away from draughts. The Bunsen burner axis shall be set vertically in such a position that the tip of the blue part of the flame just touches the lower end of the specimen. The flame shall be applied five times for 15 s at a time, with an interval of 15 s between each application. After the last application, the specimen shall be allowed to burn itself out. |



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|                     |
|---------------------|
| Acceptance Criteria |
|---------------------|

|                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------|
| The material is deemed to be flame-retardant if the burnt or damaged part of the specimen is not more than 60 mm long. |
|------------------------------------------------------------------------------------------------------------------------|

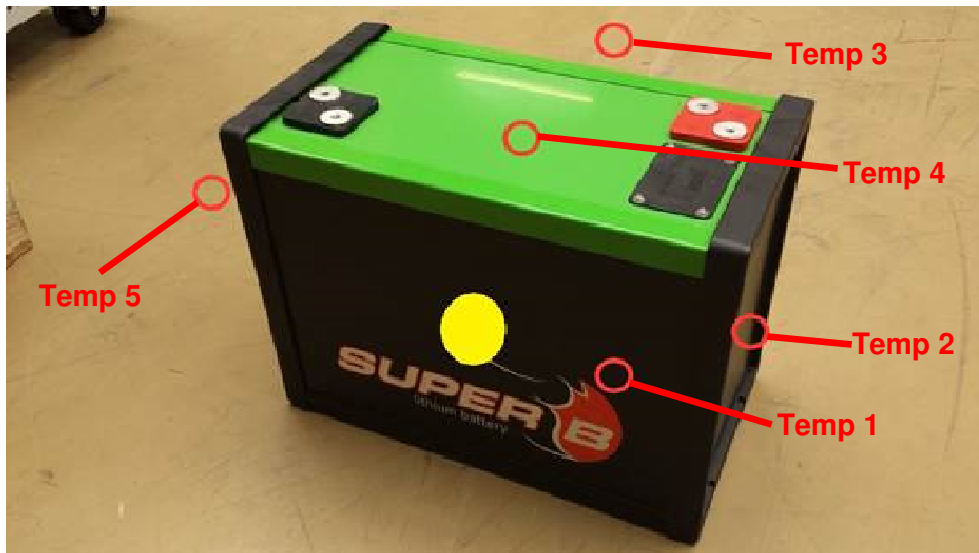
**Place of test**

☒ EV lab Intertek Deutschland GmbH, Kaufbeuren

### 5.1.2 Picture of the test setup



Picture 7 Test setup flame-retardant test



Picture 8 Position of the thermocouples and the site for the flame of the burner (yellow point)





**Picture 9 Test setup flame-retardant test**



**Picture 10 Test setup flame-retardant test**



**Picture 11 Test setup flame-retardant test**

### 5.1.3 Test results

Test requirements

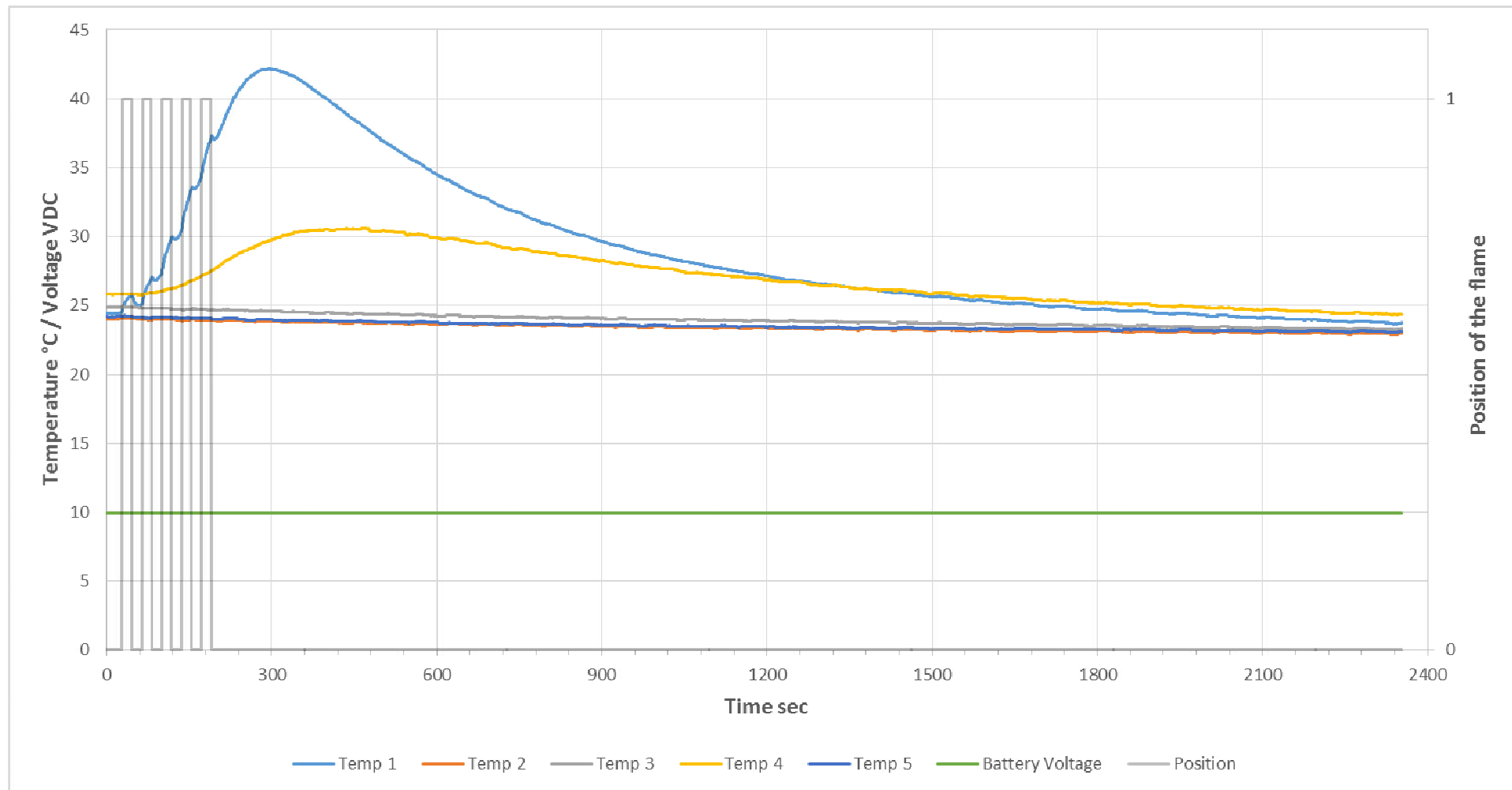
☒ fulfilled

☐ fail

Comment

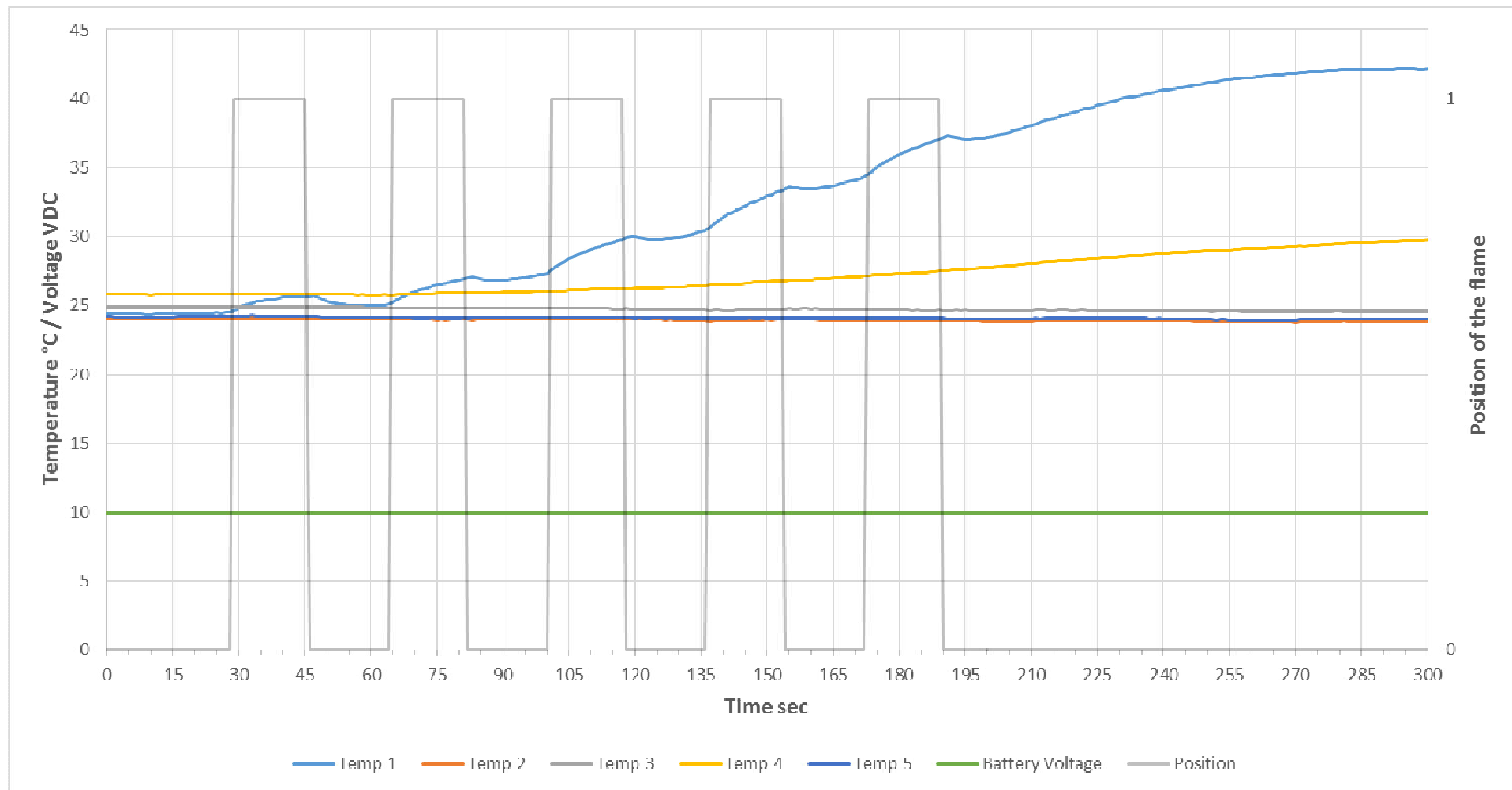
During the test, there were no abnormalities.

Once the plastic began to burn, but after the gas burner was removed from the test sample the flame at the test sample distinguished itself out after a few seconds.



**Picture 12 Temperature and voltage profile during the flame-retardant test**





**Picture 13 Temperature and voltage profile during the flame-retardant test (zoom picture 12)**



**Picture 14 After the flame-retardant test**



**Picture 15 After the flame-retardant test**

## 5.2 Environmental conditions

| Ambient Temperature<br>°C | Ambient Humidity<br>r.H. % | Ambient Air – pressure<br>mBar |
|---------------------------|----------------------------|--------------------------------|
| 24,2                      | 56                         | 945                            |

**Table 3 General lab conditions**



## 6 Attachment

### 6.1 Test devices

#### 6.1.1 Flame-retardant test

| Equipment                                                   | Type   | Manufacturer | Ser. No.   | Inventory-No. |
|-------------------------------------------------------------|--------|--------------|------------|---------------|
| <input checked="" type="checkbox"/> Flame tube              | 125mm  | -/-          | -/-        | PM KF 1685    |
| <input checked="" type="checkbox"/> Thermocouples           | Type-J | Omega        | -/-        | PM KF 2836    |
| <input checked="" type="checkbox"/> Data Acquisition System | 34972A | Agilent      | MY49017533 | PM KF 2692    |

#### 6.1.1 Ambient conditions

| Equipment                                                       | Type        | Manufacturer | Ser. No. | Inventory-No. |
|-----------------------------------------------------------------|-------------|--------------|----------|---------------|
| <input checked="" type="checkbox"/> Data logger almemo          | MA259045    | Ahlborn      | H1320177 | PM KF 2338    |
| <input checked="" type="checkbox"/> Temperature/humidity sensor | FHAD46-2L00 | Ahlborn      | 13020002 | PM KF 2339    |
| <input checked="" type="checkbox"/> Air pressure sensor         | FDA612 SA   | Ahlborn      | 12080383 | PM KF 2349    |

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