Prüfzusammenfassung/
Test Summary

Name des Zellen- Batterie oder Produktherstellers
Name of the cell, battery or product manufacturer

BMZ GmbH

Kontaktinformationen des Zellen-, Batterie- oder Produktherstellers
Contact information of the cell, battery or product manufacturer

Am Sportplatz 28-30
D-63791 Karlstein
Germany
Phone: +49 (0) 6188 / 9956-0
Telefax: +49 (0) 6188 / 9956-900

Email: mail@bmz-group.com

Name des Prüflabor, inkl. Aller Kontaktinformationen
Name of the testing laboratory, including all contact information

Batteryuniversity GmbH
Am Sportplatz 30
D-63791 Karlstein am Main

Test engineer: H.-P. Grimm, T. Emge
Approved by: Dominik Hennefeld, Laboratory Manager

The requirements of UN38.3 Rev. 5 Amend2 (T1) conducted by Test Laboratory:
Intertek Deutschland GmbH
Innovapark 20
87600 Kaufbeuren

Test Engineer: M. Lombardini
Approved by: R. Renecke, Lead Engineer

The requirements of UN38.3.3 (g) conducted by the following Test Laboratory partly:
University of applied sciences Aschaffenburg
Laboratory of power electronics
Wuerzburgerstraße 45
63743 Aschaffenburg

Test Engineer: M. Mund, J. Katschner
Approved by: Lead Engineer T. Kowalski, J. Büdel
Module tests for 48,75V batteries:
Test Samples: 25078
No. BU.2015-03365-0-UN
Test Report-No Intertek Deutschland GmbH: 2223777KAU-001

Module tests for 90V batteries:
Test Samples: 32318
No. BU-2017-04942-1-B1
No. BU-201800236-B1

Battery assembly tests for 48,75V batteries:
Test Sample: KAU1508041024-001
No. 2226501KAU-001

Test Sample: 02C02211L02
No. 2016/0507

Battery assembly tests for 90V batteries:
Test Sample: 03804872L01
No. Bu-2018-09036-0-B1

Test Sample: 04C08672L01
No. 2018/05/BMZ_001

Datum des Prüfberichts
Date of the test report

Date of Issue of BU.2015-03365-0-UN: 18.Aug.2015
Date of issue of #2223777KAU-001: 21.May 2015
Date of issue of BU-201800236-B1: 13.Sep.2019
Date of issue of #2226501KAU-001: 31.May 2016
Date of issue of #2018/05/BMZ_001: 11.May.2018

Detaillierte Beschreibung der Zelle oder Batterie
detailed description of the cell or battery

Identification: Lithium Ion Battery
Chemical System: Lithium NMC/Graphite
Rechargeable: YES

The design of the battery consists of the battery module (numbered 1), which are connected electrically to a battery assembly (numbered 2) in the picture below. The drawing is only an example of one battery type.
Identification: Lithium Ion Battery  
Chemical System: Lithium NMC/Graphite  
Rechargeable: YES

Model designation: 13S1P PHEV (48.75V)  
Reference number: 25078

Model designation: 12S1P PHEV (45V/94Ah)  
Reference number: 32317  
Reference number: 32318

Model designation: 12S1P PHEV (45V/60Ah)  
Reference number: 25441  
Reference number: 29124

**battery assemblies**

<table>
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<tr>
<th>B-P-N Number (battery label)</th>
<th>Nominal voltage</th>
<th>Nominal capacity</th>
<th>Nominal energy</th>
<th>Number of modules</th>
<th>Module type</th>
<th>Weight 5%</th>
<th>+/- 5%</th>
<th>Connection</th>
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<td>268,0 Ah</td>
<td>13065 Wh</td>
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<td>708 kg</td>
<td>+/-</td>
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<td>Voltage</td>
<td>Capacity</td>
<td>Energy</td>
<td>Modules</td>
<td>Weight</td>
<td>Code</td>
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<td>536.0 Ah</td>
<td>26130 Wh</td>
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<td>856 kg</td>
<td>13S9P</td>
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<td>940.0 Ah</td>
<td>84600 Wh</td>
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<td>xxxxxx81xxx</td>
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<td>16331 Wh</td>
<td>5 modules</td>
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<td>45727 Wh</td>
<td>14 modules</td>
<td>25078</td>
<td>856 kg</td>
<td>13S14P</td>
<td></td>
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<tr>
<td>xxxxxx83xxx</td>
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<td>536.0 Ah</td>
<td>26130 Wh</td>
<td>8 modules</td>
<td>25078</td>
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<td>536.0 Ah</td>
<td>26130 Wh</td>
<td>8 modules</td>
<td>25078</td>
<td>1013 kg</td>
<td>13S9P</td>
<td></td>
</tr>
</tbody>
</table>

According Regulation (EC) No 1907/2006 (REACH) a safety data sheet must be provided for substances and preparations only. Batteries are not affected by the requirements of this regulation.
Liste der durchgeführten Prüfungen und Ergebnisse

List of tests performed and results

Test Specification UN 38.3:
UN Transportation Test:
UN Manual of Tests and Criteria, Part III, Section 38.3 - Lithium batteries (ST/SG/AC.10/11/Rev.5, Amend.2)
UN Manual of Tests and Criteria, Part III, Section 38.3 - Lithium batteries (ST/SG/AC.10/11/Rev.6, Amend.1)

Performed Tests:
T.1 Altitude Simulation (Subconra passed
T.2 Thermal Test passed
T.3 Vibration passed
T.4 Shock passed
T.5 External Short Circuit passed
T.6 Impact/Crush Not performed
T.7 Overcharge passed
T.8 Forced discharge Not performed

Verweis auf Prüfanforderungen für zusammengesetzte Batterien
Reference to test requirements for composite batteries

General requirements for the admittance of Lithium cells and batteries for Transportation:
each cell or battery is of the type proved to meet the requirements of each test of the
a. Manual of Test and Criteria, Part III, sub-section 38.3;
each cell and battery incorporates a safety venting device or is designed to preclude a violent
rupture under normal conditions of carriage;
c. each cell and battery is equipped with an effective means of preventing external short circuits;
each battery containing cells or series of cells connected in parallel is equipped with effective means as
d. necessary to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.)
e. cells and batteries shall be manufactured under a quality management program that includes:
a description of the organizational structure and responsibilities of personnel with regard to
1. design and product quality
the relevant inspection and test, quality control, quality assurance, and process operation
2. instruction that will be used;
process control that should include relevant activities to prevent and detect internal short
3. circuit failure during manufacture of cells;
quality records, such as inspection reports, test data, calibration data and certificates. Test
4. data shall be kept and made available to the competent authority upon request;
5. management reviews to ensure the effective operation of the quality management program;
6. a process for control of documents and their revision;
a means of control of cells or batteries that are not conforming to the type tested as
7. mentioned in (a) above;
8. training programs and qualification procedures for relevant personnel; and
9. procedures to ensure that there is no damage to the final product.
Tests related to UN38.3 (g) for battery assemblies were performed with the most risky assembly combination for each voltage class:

<table>
<thead>
<tr>
<th></th>
<th>48.75V batteries</th>
<th>90V batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Overcharge</td>
<td>passed</td>
<td>passed</td>
</tr>
<tr>
<td>(ii) Short circuit</td>
<td>passed</td>
<td>passed</td>
</tr>
<tr>
<td>(iii) Over discharge</td>
<td>passed</td>
<td>passed</td>
</tr>
</tbody>
</table>

Verweis auf die verwendete überarbeitete Ausgabe des Handbuchs über Prüfungen und Kriterien und etwaige Änderungen dazu

Reference to the revised edition of the Manual of Tests and Criteria used and any amendments thereto

Recommendations of the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Part III, section 38.3, Lithium metal and lithium ion batteries

UN Transportation Test 13S1P PHEV-1 #25078-03
UN Manual of Tests and Criteria, Part III, Section 38.3 - Lithium batteries (ST/SG/AC.10/11/Rev.5, Amend.2)

UN Transportation Test 12S1P PHEV-1 #32318-01
UN Manual of Tests and Criteria, Part III, Section 38.3 - Lithium batteries (UN ST/SG/AC10/11/Rev.6, Amend.1)

Unterschrift mit Näm en/Titel des Unterzeichners als Hinweis auf Gültigkeit der bereitgestellten Informationen

Signature with name and title of the signatory indicating the validity of the information provided