

## 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 Prüflabors, 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: Domik 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

BMZ GMBH  
Geschäftsführer: Sven Bauer ·  
HRB 5890 Aschaffenburg ·  
Steuer-Nr.: 122/50444 ·  
USt.-Id-Nr.: DE 81 1770 243  
Zeche Gustav 1 ·  
D-63791 Karlstein am Main · Tel:  
+ 49 61 88/99 56 – 0 ·  
Fax: + 49 61 88 /99 56 – 9 00 ·  
mail@bmz-group.com ·  
www.bmz-group.com

Deutsche Bank BIC:DEUTDEFF508  
IBAN:DE85508700050010501500  
BLZ 50870005 Kto. 010501500  
HSBC BIC:TUBDDE33  
IBAN:DE0330030880060849018  
BLZ 30030880 Kto. 600849018  
Commerzbank BIC:COBADE33  
IBAN:DE35795400490105770200  
BLZ 79540049 Kto. 1057702

**Eindeutige Prüfberichtsidentifikationsnummer**  
*unique test report identification number*

**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: 03B04872L01  
No. Bu-2018-09036-0-B1

Test Sample: 04C08672L01  
No. 2018/05/BMZ\_001

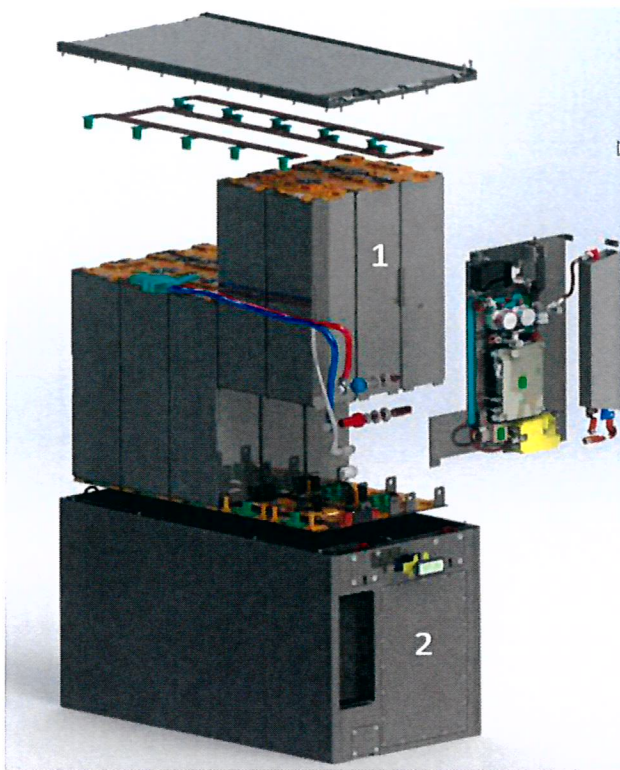
**Datum des Prüfberichts**  
*Date of the test report*

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.May2016  
Date of issue of #Bu-2018-09036-0-B1:29.Jan.2018  
Date of issue of #2016/0507: 28.Jan.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 moduls (numbered 1), which are connected electricly to a battery assembly (numbered 2) in the picture below. The drawing is only a 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**

B-P-N Number (battery label)	Nominal voltage	Nominal capacity	Nominal energy	Number of modules	Module type	Weight +/- 5%	Connection
xxxxxx11xxx	48,75 V	268,0 Ah	13065 Wh	4 modules	25078	708 kg	13S4P
xxxxxx12xxx	48,75 V	804,0 Ah	39195 Wh	12 modules	25078	708 kg	13S12P
xxxxxx13xxx	48,75 V	536,0 Ah	26130 Wh	8 modules	25078	708 kg	13S8P

xxxxxx21xxx	48,75 V	268,0 Ah	13065 Wh	4 modules	25078	855 kg	13S4P
xxxxxx22xxx	48,75 V	1005,0 Ah	48993 Wh	15 modules	25078	855 kg	13S15P
xxxxxx23xxx	48,75 V	536,0 Ah	26130 Wh	8 modules	25078	855 kg	13S8P
xxxxxx31xxx	48,75 V	335,0 Ah	16331 Wh	5 modules	25078	856 kg	13S5P
xxxxxx32xxx	48,75 V	938,0 Ah	45727 Wh	14 modules	25078	856 kg	13S14P
xxxxxx33xxx	48,75 V	536,0 Ah	26130 Wh	8 modules	25078	856 kg	13S8P
xxxxxx41xxx	48,75 V	201,0 Ah	9798 Wh	3 modules	25078	750 kg	13S3P
xxxxxx42xxx	48,75 V	804,0 Ah	39195 Wh	12 modules	25078	939 kg	13S12P
xxxxxx43xxx	48,75 V	804,0 Ah	39195 Wh	12 modules	25078	1119 kg	13S12P
xxxxxx44xxx	48,75 V	536,0 Ah	26130 Wh	8 modules	25078	1119 kg	13S8P
xxxxxx51xxx	90 V	268,0 Ah	24120 Wh	8 modules	25441 29124	1210 kg	12S2S4P
xxxxxx52xxx	90 V	670,0 Ah	60300 Wh	20 modules	25441 29124	1210 kg	12S2S10P
xxxxxx53xxx	90 V	940,0 Ah	84600 Wh	20 modules	32318 32317	1210 kg	12S2S10P
xxxxxx54xxx	90 V	469,0 Ah	42210 Wh	14 modules	25441 29124	1210 kg	12S2S7P
xxxxxx61xxx	90 V	268,0 Ah	24120 Wh	8 modules	25441 29124	1558 kg	12S2S4P
xxxxxx62xxx	90 V	670,0 Ah	60300 Wh	20 modules	25441 29124	1558 kg	12S2S10P
xxxxxx63xxx	90 V	940,0 Ah	84600 Wh	20 modules	32318 32317	1210 kg	12S2S10P
xxxxxx64xxx	90 V	469,0 Ah	42210 Wh	14 modules	25441 29124	1210 kg	12S2S7P
xxxxxx71xxx	90 V	402,0 Ah	36180 Wh	12 modules	25441 29124	2178 kg	12S2S6P
xxxxxx72xxx	90 V	1316,0 Ah	118440 Wh	28 modules	32318 32317	2178 kg	12S2S14P
xxxxxx73xxx	90 V	737,0 Ah	66330 Wh	22 modules	25441 29124	2178 kg	12S2S11P
xxxxxx74xxx	90 V	846,0 Ah	76140 Wh	18 modules	32318 32317	2178 kg	12S2S9P
xxxxxx81xxx	48,75 V	335,0 Ah	16331 Wh	5 modules	25078	856 kg	13S5P
xxxxxx82xxx	48,75 V	938,0 Ah	45727 Wh	14 modules	25078	856 kg	13S14P
xxxxxx83xxx	48,75 V	536,0 Ah	26130 Wh	8 modules	25078	856 kg	13S8P
xxxxxx91xxx	48,75 V	335,0 Ah	16331 Wh	5 modules	25078	1013 kg	13S5P
xxxxxx92xxx	48,75 V	1005,0 Ah	48993 Wh	15 modules	25078	1013 kg	13S15P
xxxxxx93xxx	48,75 V	536,0 Ah	26130 Wh	8 modules	25078	1013 kg	13S8P

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 (Subcontra	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
- b. 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 UN38.3.3 (g) for battery assemblies were performed with the most risky assembly combination for each voltage class:

		<u>48,75V batteries</u>	<u>90V batteries</u>
(i)	Overcharge	passed	passed
(ii)	Short circuit	passed	passed
(iii)	Over discharge	passed	passed

**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)



*Head of Storage & Vehicle Energy Application*

**Unterschrift mit Namen/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*