Prüfzusammenfassung/
Test Summary

KION GROUP Battery Systems

Revision

Grund der Änderung	Index	Datum	Bearbeitung
Erstellung der Prüfzusam-menfassung nach UN38.3	1.0	06.04.2020	T. Kowalski/C.Wendt/ A.Wittke
Update der KION-Baugruppen (BG2.0, BGs mit 120Ah)	1.1	30.07.2021	A.Wittke
Update der KION-Baugruppen BG10.6/10.7	1.2	16.04.2022	A. Wittke

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

KION Battery Systems GmbH

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

Zeche Gustav 1, Unit 3
D-63791 Karlstein am Main
Germany
Phone: +49 (0)6188 9929-0

Email: info@kion-batterysystems.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
Phone: +49 6188 - 99410-0
Email: mail@bu-lab.eu

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

The requirements of UN38.3 Rev. 5 Amend2 (T1) conducted by Test Laboratory:
Intertek Deutschland GmbH
Innovapark 20
87600 Kaufbeuren
Phone: +49 8341 9556 0
Email: germany@intertek.com

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
Phone: +49 6021 42060
Email: info@th-ab.de

Test Engineer: M. Mund, J. Katschner
Approved by: Lead Engineer T. Kowalski, J. Büdel

The requirements of UN38.3 Rev. 5 Amend1 conducted by Test Laboratory:
Samsung SDI(Ulsan) : 689-701, Samnam-myeon, Ulju-gun, Ulsan, Korea
Phone: +82-55-380-2334
Email: sdimaster@samsung.com

Samsung SDI(Giheung): 428-5 Gongse-dong, Giheung-gu, Yongin-si, Gyeonggi-do, Korea
Phone: +82-31-8006-3100
Email: sdimaster@samsung.com

Eindeutige Prüfberichtsidentifikationsnummer
unique test report identification number

Module tests for 48,75V batteries: T1-T7
Test Samples:25078
No. BU.2015-03365-0-UN
Test Report-No Intertek Deutschland GmbH: 2223777KAU-001

Module tests for 90V batteries: T1-T5; T8
Test Samples: 32318
No. BU-2017-04942-1-B1
No. BU-201800236-B1

Module tests for 90V batteries: T1-T5;
Test Samples: 609729 (same for 609737)
No. BU-202000226-B1

Battery assembly tests for 48,75V batteries: T5; T7-T8
Test Sample: KAU1508041024-001
No. 2226501KAU-001

Test Sample: 02C02211L02
No. 2016/0507

Battery assembly tests for 90V batteries: T2; T5
Test Sample: 03B04872L01
No. Bu-2018-09036-0-B1

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

Cell tests for 60 Ah cells: T1-T6; T8
Test Sample: CE0600R0001D
Test Report-No Samsung SDI: UN38_3 Certification 60Ah

Cell tests for 94 Ah cells: T1-T6; T8
Test Sample: CS0940R0001A
Test Report-No Samsung SDI: UN38_3 Certification 94Ah

Cell tests for 120 Ah cells: T1-T6; T8
Name of Test Sample: CS1200R 3.66V 120Ah 439Wh
Test Sample No.: 1116120459
Test Report-No Samsung SDI: UN38_3 Certification 120Ah

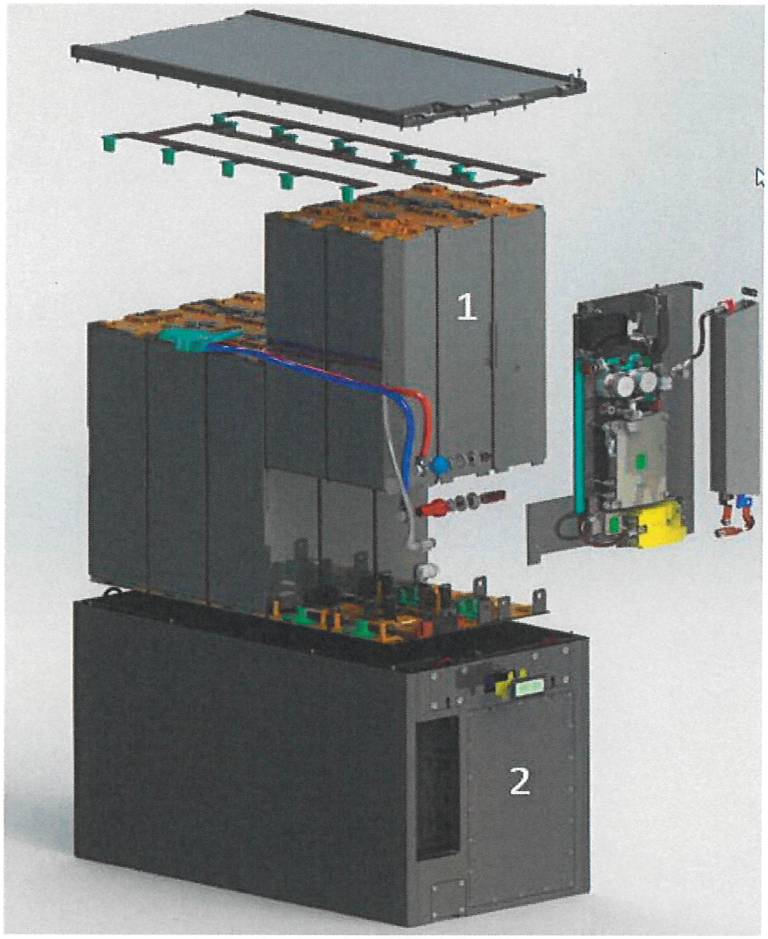
Datum des Prüfberichts
Date of the test report
Date of Issue of BU.2015-03365-0-UN: 18.Aug.2015
Date of issue of #2223777KAU-001 : 21.May 2015
Date of issue of BU-201800236-B1: 13.Sep.2019
Date of issue of #2226501KAU-001:31.May2016
Date of issue of #Bu-2018-09036-0-B1:29.Jan.2018

Date of issue of #2016/0507: 28.Jan.2016
Date of issue of #2018/05/BMZ_001: 11.May.2018
Date of issue of BU-202000226-B1: 21. Oct. 2020
Date of issue of BU-202000080-B1: 14. Apr. 2020
Date of Issue of UN38_3 Certification 60Ah : 24. June 2011
Date of Issue of UN38_3 Certification 94Ah : 23. Feb. 2015
Date of Issue of UN38_3 Certification 12S 120Ah : 21. October 2020
Date of Issue of UN38_3 Certification 13S 120Ah : 14. April 2020

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 connsists of the battery moduls (numbered 1),
which are connected electrically to a battery assembly (numbered 2)
in the picture below. The drawing is only a example of one battery type.



Battery assemblies

B-P-N Number (battery label)	Nominal voltage	Nominal capacity	Nominal energy	Number of modules	Module type	Weight +/- 5%
xxxxxx11xxx	48,75 V	268,0 Ah	13,1 kWh	4 modules	25078	708 kg
xxxxxx12xxx	48,75 V	804,0 Ah	39,2 kWh	12 modules	25078	708 kg
xxxxxx13xxx	48,75 V	536,0 Ah	26,1 kWh	8 modules	25078	708 kg
xxxxxx14xxx	47,7 V	360,0 Ah	17,2 kWh	3 modules	611415	708 kg
xxxxxx15xxx	47,7 V	600,0 Ah	28,6 kWh	5 modules	611415	708 kg
xxxxxx16xxx	47,7 V	1080,0 Ah	51,5 kWh	9 modules	611415	708 kg
xxxxxx20xxx	48,75 V	268,0 Ah	13,1 kWh	4 modules	25078	856 kg
xxxxxx21xxx	48,75 V	268,0 Ah	13,1 kWh	4 modules	25078	856 kg
xxxxxx22xxx	48,75 V	1005,0 Ah	49,0 kWh	15 modules	25078	856 kg
xxxxxx23xxx	48,75 V	536,0 Ah	26,1 kWh	8 modules	25078	856 kg
xxxxxx24xxx	47,7 V	360,0 Ah	17,2 kWh	3 modules	611415	856 kg
xxxxxx25xxx	47,7 V	600,0 Ah	28,6 kWh	5 modules	611415	856 kg
xxxxxx26xxx	47,7 V	1080,0 Ah	51,5 kWh	9 modules	611415	856 kg
xxxxxx31xxx	48,75 V	335,0 Ah	16,3 kWh	5 modules	25078	856 kg
xxxxxx32xxx	48,75 V	938,0 Ah	45,7 kWh	14 modules	25078	856 kg
xxxxxx33xxx	48,75 V	536,0 Ah	26,1 kWh	8 modules	25078	856 kg
xxxxxx34xxx	47,7 V	360,0 Ah	17,2 kWh	3 modules	611415	856 kg
xxxxxx35xxx	47,7 V	600,0 Ah	28,6 kWh	5 modules	611415	856 kg
xxxxxx36xxx	47,7 V	1080,0 Ah	51,5 kWh	9 modules	611415	856 kg
xxxxxx41xxx	48,75 V	201,0 Ah	9,8 kWh	3 modules	25078	750 kg
xxxxxx42xxx	48,75 V	804,0 Ah	39,2 kWh	12 modules	25078	939 kg
xxxxxx43xxx	48,75 V	804,0 Ah	39,2 kWh	12 modules	25078	1119 kg
xxxxxx44xxx	48,75 V	536,0 Ah	26,1 kWh	8 modules	25078	1119 kg
xxxxxx51xxx	90 V	268,0 Ah	24,1 kWh	8 modules	25441 29124	1210 kg
xxxxxx52xxx	90 V	670,0 Ah	60,3 kWh	20 modules	25441 29124	1210 kg
xxxxxx53xxx	88,3 V	940,0 Ah	83,0 kWh	20 modules	32318 32317	1210 kg
xxxxxx54xxx	90 V	469,0 Ah	42,2 kWh	14 modules	25441 29124	1210 kg
xxxxxx55xxx	88,1 V	360,0 Ah	31,7 kWh	6 modules	609737 609739	1210 kg
xxxxxx56xxx	88,1 V	600,0 Ah	52,8 kWh	10 modules	609737 609739	1210 kg
xxxxxx57xxx	88,1 V	1080,0 Ah	95,1 kWh	18 modules	609737 609739	1210 kg
xxxxxx58xxx	see Update EG 2021/07			18 modules	609737 609739	1210 kg
xxxxxx61xxx	90 V	268,0 Ah	24,1 kWh	8 modules	25441 29124	1558 kg
xxxxxx62xxx	90 V	670,0 Ah	60,3 kWh	20 modules	25441 29124	1558 kg
xxxxxx63xxx	88,3 V	940,0 Ah	83,0 kWh	20 modules	32318 32317	1558 kg
xxxxxx64xxx	90 V	469,0 Ah	42,2 kWh	14 modules	25441 29124	1558 kg
xxxxxx65xxx	88,1 V	360,0 Ah	31,7 kWh	6 modules	609737 609739	1558 kg

B-P-N Number (battery label)	Nominal voltage	Nominal capacity	Nominal energy	Number of modules	Module type	Weight +/- 5%
xxxxxx66xxx	88,1 V	600,0 Ah	52,8 kWh	10 modules	609737 609739	1558 kg
xxxxxx67xxx	88,1 V	1080,0 Ah	95,1 kWh	18 modules	609737 609739	1558 kg
xxxxxx71xxx	90 V	402,0 Ah	36,2 kWh	12 modules	25441 29124	2178 kg
xxxxxx72xxx	88,3 V	1316,0 Ah	116,2 kWh	28 modules	32318 32317	2178 kg
xxxxxx73xxx	90 V	737,0 Ah	66,3 kWh	22 modules	25441 29124	2178 kg
xxxxxx74xxx	88,3 V	846,0 Ah	74,7 kWh	18 modules	32318 32317	2178 kg
xxxxxx75xxx	88,1 V	480,0 Ah	42,3 kWh	8 modules	609737 609739	2178 kg
xxxxxx76xxx	88,1 V	840,0 Ah	74,0 kWh	14 modules	609737 609739	2178 kg
xxxxxx77xxx	88,1 V	1440,0 Ah	126,8 kWh	24 modules	609737 609739	2178 kg
xxxxxx78xxx	88,1 V	960,0 Ah	84,6 kWh	16 modules	609737 609739	2178 kg
xxxxxx79xxx	88,1 V	1440,0 Ah	126,8 kWh	24 modules	609737 609739	2178 kg
xxxxxx81xxx	48,75 V	335,0 Ah	16,3 kWh	5 modules	25078	856 kg
xxxxxx82xxx	48,75 V	938,0 Ah	45,7 kWh	14 modules	25078	856 kg
xxxxxx83xxx	48,75 V	536,0 Ah	26,1 kWh	8 modules	25078	856 kg
xxxxxx91xxx	48,75 V	335,0 Ah	16,3 kWh	5 modules	25078	1013 kg
xxxxxx92xxx	48,75 V	938,0 Ah	49,0 kWh	15 modules	25078	1013 kg
xxxxxx93xxx	48,75 V	536,0 Ah	26,1 kWh	8 modules	25078	1013 kg
xxxxxx94xxx	47,7 V	335,0 Ah	17,2 kWh	3 modules	611415	856 kg
xxxxxx95xxx	47,7 V	938,0 Ah	28,6 kWh	5 modules	611415	856 kg
xxxxxx96xxx	47,7 V	536,0 Ah	51,5 kWh	9 modules	611415	856 kg
xxxxx106xxx	88,1 V	840,0 Ah	74,0 kWh	14 modules	609737 609739	1458 kg
xxxxx107xxx	88,1 V	1440,0 Ah	126,8 kWh	24 modules	609737 609739	1458 kg
xxxxx131xxx	47,7 V	360,0 Ah	17,2 kWh	3 modules	611415	750 kg
xxxxx141xxx	47,7 V	600,0 Ah	28,6 kWh	5 modules	611415	939 kg
xxxxx142xxx	47,7 V	840,0 Ah	40,1 kWh	7 modules	611415	939 kg
xxxxx151xxx	47,7 V	600,0 Ah	28,6 kWh	5 modules	611415	1119 kg
xxxxx152xxx	47,7 V	840,0 Ah	40,1 kWh	7 modules	611415	1119 kg

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)

UN Manual of Tests and Criteria, Part III, Section 38.3 - Lithium batteries (ST/SG/AC.10/11/Rev.7, Amend.1)

Performed Tests: Modul/Battery		Performed Tests: Cell (by cell manufacturer)
T.1 Altitude Simulation (Subcontracto	passed	T.1 Altitude Simulation
T.2 Thermal Test	passed	T.2 Thermal Test
T.3 Vibration	passed	T.3 Vibration
T.4 Shock	passed	T.4 Shock
T.5 External Short Circuit	passed	T.5 External Short Circuit
T.6 Impact/Crush	Not performed	T.6 Impact/Crush
T.7 Overcharge	passed	T.7 Overcharge
T.8 Forced discharge	Not performed	T.8 Forced discharge

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:

a. each cell or battery is of the type proved to meet the requirements of each test of the Manual of Test and Criteria, Part III, sub-section 38.3;

b. each cell and battery incorporates a safety ventig 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;

d. each battery containing cells or series of cells connected in parallel is equipped with effective means as 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 oranizational structure and responsibilities of personnel with regard to design and product
   1. quality
   the relevant inspection and test, quality control, quality assurance , and process operation instruction that will
   2. be used;
   process control that should include relevant activities to prevent and detect internal short circuit failure during
   3. manufacture of cells;
   quality records, such as inspection reports, test data, calibration data and certificates. Test data shall be kept
   4. 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;

   7. a means of control of cells or batteries that are not conforming to the type tested as 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.

All requirements for the admittance of Lithium cells and batteries for Transportation are fullfiled

Assembly combination for each voltage class:

		48,75V batteries	90V batteries
(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 Crtiteria, Part III, Section 38.3 - Lithium batteries (UN ST/SG/AC10/11/Rev.6, Amend.1)

UN Transportation Test 12S1P PHEV-1 #609737 and #609729

UN Manual of Tests and Crtiteria, Part III, Section 38.3 - Lithium batteries (UN ST/SG/AC10/11/Rev.7, Amend.1)

UN Transportation Test 13S1P PHEV-1 #41543-00 and #41544-00
UN Manual of Tests and Crtiteria, Part III, Section 38.3 - Lithium batteries (UN ST/SG/AC10/11/Rev.6, Amend.1)

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

/ Geschäftsführer KBS