

Prüfbericht-Nr.: Test report no.:	CN2543RS 001	Auftrags-Nr.: Order no.:	326066110 P01730804	Seite 1 von 22 Page 1 of 22
Kunden-Referenz-Nr.: Client reference no.:	2028101	Auftragsdatum: Order date:	2024-11-29	
Auftraggeber: Client:	GoodWe Technologies Co., Ltd. No.90 Zijin Rd., New District, 215011 Suzhou, P.R. China			
Prüfgegenstand: Test item:	Rechargeable Li-ion Battery System			
Bezeichnung / Typ-Nr.: Identification / Type no.:	GW61.4-BAT-AC-G10, GW71.6-BAT-AC-G10, GW81.9-BAT-AC-G10, GW92.1-BAT-AC-G10, GW102.4-BAT-AC-G10, GW112.6-BAT-AC-G10, GW61.4-BAT-AC-JP-G10, GW71.6-BAT-AC-JP-G10, GW81.9-BAT-AC-JP-G10, GW92.1-BAT-AC-JP-G10, GW102.4-BAT-AC-JP-G10.			
Auftrags-Inhalt: Order content:	Test Report			
Prüfgrundlage: Test specification:	Regulation (EU) 2023/1542 Article 12 - Safety of stationary battery energy storage systems			
Wareneingangsdatum: Date of sample receipt:	2024-12-20			
Prüfmuster-Nr.: Test sample no:	20241220-001~003, Cell- 20241220-001~010			
Prüfzeitraum: Testing period:	2024-12-20 - 2025-02-20			
Ort der Prüfung: Place of testing:	See page 4 for details			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by: Depeng Cao	genehmigt von: authorized by: Feng Xu			
Datum: Date: 2025-03-25	Ausstellungsdatum: Issue date: 2025-03-25			
Stellung / Position:	Sachverständige(r)/Expert	Stellung / Position:	Sachverständige(r)/Expert	
Sonstiges / Other:	This report does not evidence compliance of the provided sample with the relevant standards but only with the referred tests. This test report documents the findings of examination conducted on the delivered product mentioned above only. This report does not entitle the applicant to carry any safety mark on this or similar product.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

Prüfbericht-Nr.: CN2543RS 001
Test report no.:

Seite 2 von 22
Page 2 of 22

Anmerkungen
Remarks

Mail: service-gc@tuv.com · Web: www.tuv.com

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature <i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i>
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>



TEST REPORT Regulation (EU) 2023/1542 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 July 2023	
Report Number..... :	CN2543RS 001
Date of issue..... :	See cover page
Total number of pages	See cover page
Name of Testing Laboratory preparing the Report	TÜV Rheinland (Shanghai) Co., Ltd. No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China
Applicant's name	GoodWe Technologies Co., Ltd.
Address..... :	No.90 Zijin Rd., New District, 215011 Suzhou, P.R. China
Test specification:	
Standard	Regulation (EU) 2023/1542
Test procedure	Test report
Non-standard test method	N/A
TRF template used..... :	Regulation (EU) 2023/1542 - Article 12, Ed 1.0
Test Report Form No. :	(EU) 2023/1542_A
Test Report Form(s) Originator :	TÜV Rheinland (Shanghai) Co., Ltd.
Master TRF	Dated 2024-05-28
General disclaimer:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of TÜV Rheinland. The authenticity of this Test Report and its contents can be verified by contacting TÜV Rheinland.	

Test item description..... : Trade Mark..... : Manufacturer Model/Type reference Ratings	Rechargeable Li-ion Battery System GOODWE Same as applicant See cover page See copy of marking label and model list.																								
List of Attachments (including a total number of pages in each attachment): N/A																									
Summary of testing:																									
Tests performed: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr style="background-color: #d3d3d3;"> <th style="width: 20%;">Clause(s)</th> <th style="width: 80%;">Test(s)</th> </tr> </thead> <tbody> <tr><td>ANNEX V-1</td><td>Thermal shock and cycling</td></tr> <tr><td>ANNEX V-2</td><td>External short circuit protection</td></tr> <tr><td>ANNEX V-3</td><td>Overcharge protection</td></tr> <tr><td>ANNEX V-4</td><td>Over-discharge protection</td></tr> <tr><td>ANNEX V-5</td><td>Over-temperature protection</td></tr> <tr><td>ANNEX V-6</td><td>Thermal propagation protection</td></tr> <tr><td>ANNEX V-7</td><td>Mechanical damage by external forces</td></tr> <tr><td>ANNEX V-8</td><td>Internal short circuit</td></tr> <tr><td>ANNEX V-9</td><td>Thermal abuse</td></tr> <tr><td>ANNEX V-10</td><td>Fire test</td></tr> <tr><td>ANNEX V-11</td><td>Emission of gases</td></tr> </tbody> </table>	Clause(s)	Test(s)	ANNEX V-1	Thermal shock and cycling	ANNEX V-2	External short circuit protection	ANNEX V-3	Overcharge protection	ANNEX V-4	Over-discharge protection	ANNEX V-5	Over-temperature protection	ANNEX V-6	Thermal propagation protection	ANNEX V-7	Mechanical damage by external forces	ANNEX V-8	Internal short circuit	ANNEX V-9	Thermal abuse	ANNEX V-10	Fire test	ANNEX V-11	Emission of gases	Testing location: For tests ANNEX V -1~5 and 7~10: SRF (Changzhou) Testing Technology Co., Ltd. No.27, Chuangzhi Road, Kunlun Street, Liyang, Jiangsu 213000, P. R. China For tests ANNEX V -6 and 11: Shanghai Testing & Inspection Institute for Electrical Equipment Co., Ltd. Area A, 1F, Building 1, No.988, Shangxue Road, Malu Town, Jiading District, Shanghai, P.R. China
Clause(s)	Test(s)																								
ANNEX V-1	Thermal shock and cycling																								
ANNEX V-2	External short circuit protection																								
ANNEX V-3	Overcharge protection																								
ANNEX V-4	Over-discharge protection																								
ANNEX V-5	Over-temperature protection																								
ANNEX V-6	Thermal propagation protection																								
ANNEX V-7	Mechanical damage by external forces																								
ANNEX V-8	Internal short circuit																								
ANNEX V-9	Thermal abuse																								
ANNEX V-10	Fire test																								
ANNEX V-11	Emission of gases																								

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☐ Other: (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:

The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECCE.

IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECCE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

GOODWE	
Product Name: Rechargeable Li-ion Battery System	
IFP51/161/120(2P16S)*n*M/-20+50/90	
☐ GW61.4-BAT-AC-G10	VNom (Nominal Voltage)307.2V
Max. WBatt (Weight) 950kg	EC.R (Nominal Energy) 61.44kWh
☐ GW71.6-BAT-AC-G10	VNom (Nominal Voltage)358.4V
Max. WBatt (Weight) 1040kg	EC.R (Nominal Energy) 71.68kWh
☐ GW81.9-BAT-AC-G10	Vnom (Nominal Voltage)409.6V
Max. WBatt (Weight)1130kg	EC.R (Nominal Energy)81.92kWh
☐ GW92.1-BAT-AC-G10	Vnom (Nominal Voltage)460.8V
Max. WBatt (Weight) 1220kg	EC.R (Nominal Energy) 92.16kWh
☐ GW102.4-BAT-AC-G10	Vnom (Nominal Voltage)512V
Max. WBatt (Weight)1310kg	EC.R (Nominal Energy)102.4kWh
☐ GW112.6-BAT-AC-G10	Vnom (Nominal Voltage)563.2V
Max. WBatt (Weight) 1400kg	EC.R (Nominal Energy) 112.6kWh
n*Number Of Battery Packs(n=6~11)	
CRat (Rated Capacity)	200Ah
INom (Nominal Dis-Charge Current)	100Ad.c.
Max. IBatt (Short Circuit Current@Time)	11kA@2ms
TCharging (Charging Temperature Range)	-20~+55°C
TDischarging (Discharging Temperature Range)	-20~+55°C
Usable Extinguishing Agent	Co ₂ , Novac1230, FM-200
Crucial Material	LiFePO ₄ , C, C ₆ H ₆ O ₂ , C ₆ H ₅ O ₂ , Cu, Al C ₆ H ₁₁ O ₂ , C ₆ H ₅ O ₂ , LiPF ₆ , (C ₆ H ₅) ₃ N
IP55, Protective Class I, LiFePO ₄	
 	
GoodWe Technologies Co., Ltd. E-mail: service@goodwe.com Address: No.90 Zifin Road, Now District, Suzhou, 215011, China	

Label for GW61.4-BAT-AC-G10, GW71.6-BAT-AC-G10, GW81.9-BAT-AC-G10, GW92.1-BAT-AC-G10, GW102.4-BAT-AC-G10, GW112.6-BAT-AC-G10.

GOODWE	
Rechargeable Li-ion Battery System	
リチウムイオン蓄電池システム	
IFpP51/161/120[2P16S]*n¹M/-20+50/90	
☐ GW61.4-BAT-AC-JP-G10 Nominal Voltage	定格電圧: 307.2V
Max.Weight最大重量	1025kg
Nominal Energy定格エネルギー	61.44kWh
☐ GW71.6-BAT-AC-JP-G10 Nominal Voltage	定格電圧: 358.4V
Max.Weight最大重量	1115kg
Nominal Energy定格エネルギー	71.68kWh
☐ GW81.9-BAT-AC-JP-G10 Nominal Voltage	定格電圧: 409.6V
Max.Weight最大重量	1205kg
Nominal Energy定格エネルギー	81.92kWh
☐ GW92.1-BAT-AC-JP-G10 Nominal Voltage	定格電圧: 460.8V
Max.Weight最大重量	1295kg
Nominal Energy定格エネルギー	92.16kWh
☐ GW102.4-BAT-AC-JP-G10 Nominal Voltage	定格電圧: 512V
Max.Weight最大重量	1385kg
Nominal Energy定格エネルギー	102.4kWh
n ¹ : Number Of Battery Packs蓄電池パックの数量 (n=6 - 10)	
Rated Capacity定格容量	200Ah
Nominal Dis-/Charge Current定格充電/放電電流	100Ad.c.
Short Circuit Current @Time短路電流@時間	11kA@2ms
Charging Temperature Range充電温度範囲	-20-+55°C
Discharging Temperature Range放電温度範囲	-20-+55°C
Usable Extinguishing Agent	CO ₂ , Novac1230, FM-200
利用可能な消火剤	
Crucial Material	LiFePO ₄ , C, C ₃ H ₄ O ₃ , C ₄ H ₈ O ₃ , Cu, Al
重要材料	C ₃ H ₁₀ O ₃ , C ₄ H ₈ O ₃ , LiPF ₆ , (C ₂ H ₅) _n
IP55, Protective Class I 保護クラス I, LiFePO ₄	
 	
GoodWe Technologies Co., Ltd. E-mail: service@goodwe.com Address: No.90 Zifin Road, New District, Suzhou, 215011, China	

Label for GW61.4-BAT-AC-JP-G10, GW71.6-BAT-AC-JP-G10, GW81.9-BAT-AC-JP-G10, GW92.1-BAT-AC-JP-G10, GW102.4-BAT-AC-JP-G10.

Note: The "+, -" markings provided on the surface of product, production date provided on SN code.

⚠ DANGER危険	
 Keep away from children 远离儿童	 Do not lift under operation or after connection 请勿在运行时抬起设备
 Never disassemble this battery unit 禁止拆解	 Warning fire 远离火源, 当心火灾
 Warning electric shock 高压电危险	 Warning explosion 当心爆炸
 Warning danger 注意危险	 Warning corrosion 当心腐蚀
 Do not disconnect under operation 请勿在运行时断开连接	
⚠ CAUTION注意	
 Read user manual before operating 阅读产品说明书	 Must wear protective goggles 必须戴防护眼镜
 Dispose of the equipment properly 妥善回收	

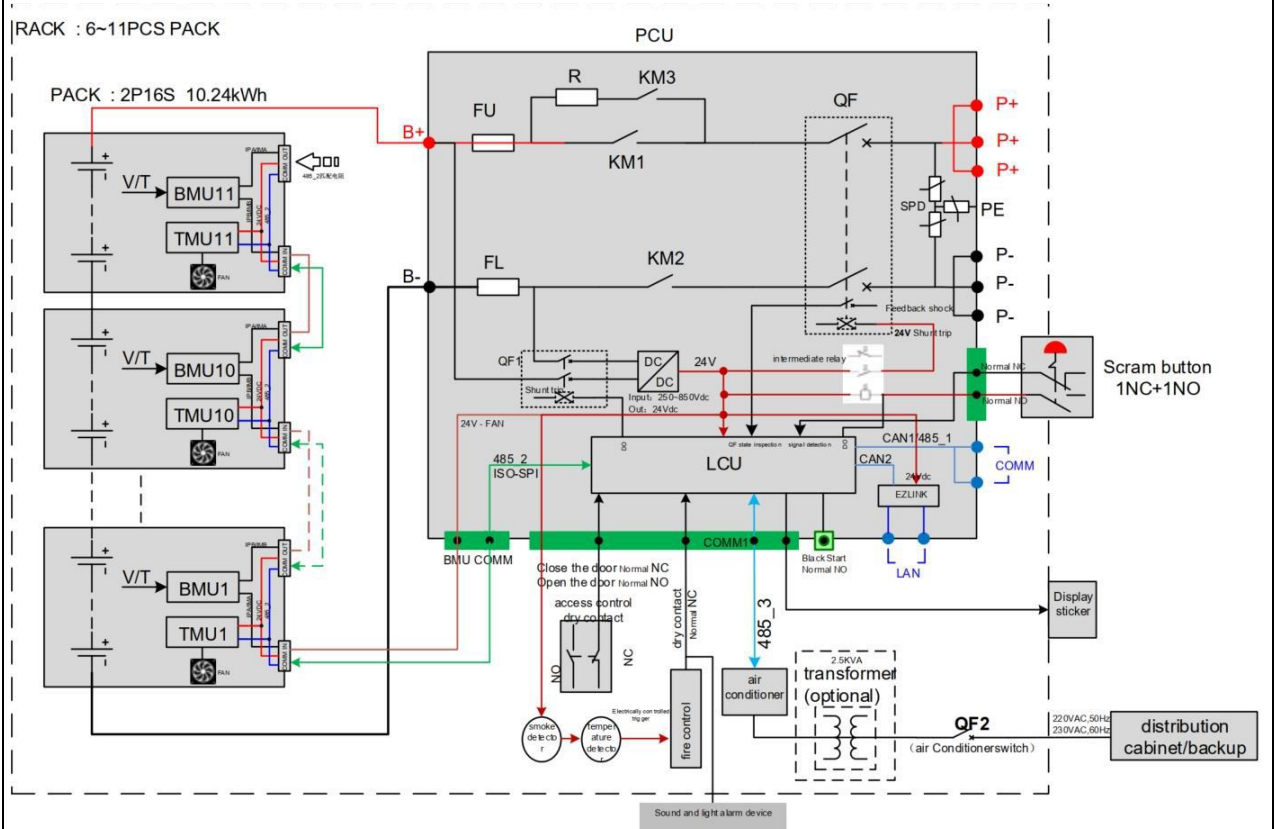
Label for Warning

Test item particulars.....:	
Classification of application.....:	☐ Portable battery ☐ Starting, Lighting and Ignition Battery ☐ Light Means of Transport Battery ☒ Industrial Battery ☐ Electric Vehicle Battery
Classification of installation and use.....:	☐ Ordinary Person ☒ Instructed Person ☒ Skilled Person
Supply Connection	☐ pluggable equipment ☐ type A ☐ type B ☒ permanent connection ☐ detachable power supply cord ☐ non-detachable power supply cord
Environmental category	☒ indoor ☐ unconditional ☒ conditional ☒ outdoor
Over voltage category	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Class of equipment.....	☒ Class I ☐ Class II ☐ Class III
Pollution degree (PD)	☐ PD1 ☒ PD2 (Inside) ☒ PD3 (Outside)
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P (Pass)	
- test object does not meet the requirement..... : F (Fail)	
Testing.....:	
Date of receipt of test item : See cover page	
Date (s) of performance of tests : See cover page	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : GoodWe (GuangDe) Power Supply Technology Co., Ltd. No.8, Dongting Rd., Guangde Economic Development Zone, Anhui, China	

General product information and other remarks:Product Description:

- 1- The battery system mainly consists of 6 to 11 battery packs and 1 control box in series connection. Each battery pack mainly consists of 32 cells structured with 16S2P, 1 slave BMU, 1 air conditioning and related connection parts. The slave BMU used for measuring and collecting the cell parameters of each pack and uploading to LCU in control box. The control box mainly consists of protective device such as relay, fuse, circuit breaker, DC/DC power board and master LCU function as the control unit for the battery system.
- 2- The differences between GW61.4-BAT-AC-G10, GW71.6-BAT-AC-G10, GW81.9-BAT-AC-G10, GW92.1-BAT-AC-G10, GW102.4-BAT-AC-G10, GW112.6-BAT-AC-G10 are only the quantities of battery packs and corresponding parameters, and the size of the rack used for mounting. Refer to model list for details.
- 3- The differences between GW61.4-BAT-AC-JP-G10, GW71.6-BAT-AC-JP-G10, GW81.9-BAT-AC-JP-G10, GW92.1-BAT-AC-JP-G10, GW102.4-BAT-AC-JP-G10 are only the quantities of battery packs and corresponding parameters, and the size of the rack used for mounting. Refer to model list for details.
- 4- The insulation between the hazardous voltage circuit and the grounded metal enclosure is basic insulation. And the insulation between the hazardous voltage circuit and communication circuit is reinforced insulation.
- 5- The battery system has overcharge, over-discharge, over current and short-circuits proof circuit. The electronic circuits and software controls for the battery system relied upon protective functions of the battery management system have been evaluated in accordance with IEC 60730-1 Annex H.
- 6- The IP degree of the battery system is IP55.
- 7- Overvoltage Category II was evaluated for the battery system, the battery system should isolate from an Overvoltage category III supply source to prevents transient overvoltage conditions in end-installation.
- 8- The difference between GW61.4-BAT-AC-JP-G10, GW71.6-BAT-AC-JP-G10, GW81.9-BAT-AC-JP-G10, GW92.1-BAT-AC-JP-G10, GW102.4-BAT-AC-JP-G10 and GW61.4-BAT-AC-G10, GW71.6-BAT-AC-G10, GW81.9-BAT-AC-G10, GW92.1-BAT-AC-G10, GW102.4-BAT-AC-G10, GW112.6-BAT-AC-G10 is the weight difference caused by the inconsistent thickness of the shell, see the parameter table for details.

The system block diagram is outlined as below:



Operating parameters:

Model list for battery cell and pack:

	Rechargeable Lithium-ion Cell	Rechargeable Li-ion battery pack
Type/model	LF100LA	GW10.2-PACK-ACI-G10
Battery type	LiFePO4	LiFePO4
Structure	-	16S2P
Nominal Voltage [V]	3.2	51.2
Rated Capacity [Ah]	102	200
Rated Energy [kWh]	0.3264	10.24
Upper limit charging voltage [V]	3.9	57.76
Discharging cut-off voltage [V]	2.0	45.92
Maximum charge current [A]	100	180
Maximum discharge current [A]	250	220
Charge range of ambient temperature [°C]	-20 to 65	0 to 55
Discharge range of ambient temperature	-30 to 65	-20 to 55

	[°C]		
	Weight [kg]	1.98±0.1	<90
	Overall size: (W*H*D) [mm]:	160±1.0*118.5±1.0*49.9±1.0	894*135.3*595
	Enclosure Protection (IP)	-	IP20
	Cooling Type	-	Air cooling
	Altitude [m]	-	Below 4000

Model list for battery system:

	Rechargeable Li-ion Battery System					
Type/model	GW61.4-BAT-AC-G10	GW71.6-BAT-AC-G10	GW81.9-BAT-AC-G10	GW92.1-BAT-AC-G10	GW102.4-BAT-AC-G10	GW112.6-BAT-AC-G10
Composition	n*battery pack' GW10.2-PACK-ACI-G10'+1 control box					
	n=6	n=7	n=8	n=9	n=10	n=11
Structure	(2P16S)6S	(2P16S)7S	(2P16S)8S	(2P16S)9S	(2P16S)10S	(2P16S)11S
Weight [kg]	<950	<1040	<1130	<1220	<1310	<1400
Overall size: (W*H*D) [mm]:	1055*2000*1055					
Battery type	LiFePO4					
Nominal Voltage [V]	51.2*n					
Rated Capacity [Ah]	200					
Rated Energy [kWh]	10.24*n					
Upper limit charging voltage [V]	57.76*n					
Discharging cut-off voltage [V]	45.92*n					
Maximum charge current [A]	180					
Maximum discharge current [A]	220					
Charge range of ambient temperature [°C]	-20 to 55*					
Discharge range of ambient temperature [°C]	-20 to 55					
Enclosure Protection (IP)	IP55					
Cooling Type	Air cooling					
Altitude [m]	Below 4000					
Protective class	I					

*When the pack minimum temperature is lower than 7° C (charge and discharge) or 3 ° C (standing), the air conditioner will turn on the heating mode; When the minimum pack temperature is higher than 12 ° C (charge/discharge) or 10 ° C (stand), the air conditioner turns off the heating mode.

	Rechargeable Li-ion Battery System				
Type/model	GW61.4-BAT-AC-JP-G10	GW71.6-BAT-AC-JP-G10	GW81.9-BAT-AC-JP-G10	GW92.1-BAT-AC-JP-G10	GW102.4-BAT-AC-JP-G10
Composition	n*battery pack' GW10.2-PACK-ACI-G10'+1 control box				
	n=6	n=7	n=8	n=9	n=10
Structure	(2P16S)6S	(2P16S)7S	(2P16S)8S	(2P16S)9S	(2P16S)10S
Weight [kg]	1025	1115	1205	1295	1385
Overall size: (W*H*D) [mm]:	1055*2000*1055				
Battery type	LiFePO4				
Nominal Voltage [V]	51.2*n				
Rated Capacity [Ah]	200				
Rated Energy [kWh]	10.24*n				
Upper limit charging voltage [V]	57.76*n				
Discharging cut-off voltage [V]	45.92*n				
Maximum charge current [A]	180				
Maximum discharge current [A]	220				
Charge range of ambient temperature [°C]	-20 to 55*				
Discharge range of ambient temperature [°C]	-20 to 55				
Enclosure Protection (IP)	IP55				
Cooling Type	Air cooling				
Altitude [m]	Below 4000				
Protective class	I				

*When the pack minimum temperature is lower than 7° C (charge and discharge) or 3 ° C (standing), the air conditioner will turn on the heating mode; When the minimum pack temperature is higher than 12 ° C (charge/discharge) or 10 ° C (stand), the air conditioner turns off the heating mode.

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

Chapter I	General provisions		N/A
Chapter II	Sustainability and safety requirements		--
Article 12	Safety of stationary battery energy storage systems		P
1.	Stationary battery energy storage systems placed on the market or put into service shall be safe during their normal operation and use.		P
2.	By 18 August 2024, the technical documentation referred to in Annex VIII shall:		P
	(a) demonstrate that the stationary battery energy storage systems are compliant with paragraph 1 and include evidence that they have been successfully tested for the safety parameters set out in Annex V, for which state-of-the-art testing methodologies shall be used. The safety parameters shall only apply in so far as a corresponding hazard exists for the stationary battery energy storage system in question when it is used under the conditions envisaged by the manufacturer;		P
	(b) include an assessment of possible safety hazards of the stationary battery energy storage system that are not addressed in Annex V;		P
	(c) include evidence that the hazards referred to in point (b) have been successfully mitigated and tested; state-of-the-art testing methodologies shall be used for such testing;		P
	(d) include mitigation instructions in case the identified hazards could occur, for example a fire or explosion.		P
	The technical documentation shall be reviewed if a battery is prepared for re-use, prepared for repurposing, remanufactured or repurposed.		N/A
3.	The Commission is empowered to adopt delegated acts in accordance with Article 89 to amend the safety parameters set out in Annex V in view of technical and scientific progress.		—
CHAPTER III	Labelling, marking and information requirements		N/A
CHAPTER IV	Conformity of batteries		N/A
CHAPTER V	Notification of conformity assessment bodies		N/A
CHAPTER VI	Obligations of economic operators other than the obligations in Chapters VII and VIII		N/A
CHAPTER VII	Obligations of economic operators as regards battery due diligence policies		N/A
CHAPTER VIII	Management of waste batteries		N/A
CHAPTER IX	Digital battery passport		N/A
CHAPTER X	Union market surveillance and Union safeguard procedures		N/A

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict
CHAPTER XI	Green public procurement and procedure for amending restrictions on substances		N/A
CHAPTER XII	Delegated powers and committee procedure		N/A
CHAPTER XIII	Amendments		N/A
CHAPTER XIV	Final provisions		N/A
ANNEX I	RESTRICTION ON SUBSTANCES		N/A
ANNEX II	CARBON FOOTPRINT		N/A
ANNEX III	ELECTROCHEMICAL PERFORMANCE AND DURABILITY PARAMETERS FOR PORTABLE BATTERIES OF GENERAL USE		N/A
ANNEX IV	ELECTROCHEMICAL PERFORMANCE AND DURABILITY REQUIREMENTS FOR LMT BATTERIES, INDUSTRIAL BATTERIES WITH A CAPACITY GREATER THAN 2 KWH AND ELECTRIC VEHICLE BATTERIES		N/A
ANNEX V	SAFETY PARAMETERS		P
1.	Thermal shock and cycling	Test results refer to table ANNEX V - 1	P
	This test shall be designed to evaluate changes in the integrity of the battery arising from expansion and contraction of cell components upon exposure to extreme and sudden changes in temperature, and potential consequences of such changes. During a thermal shock, the battery shall be exposed to two temperature limits and held at each temperature limit for a specified period.		P
2.	External short circuit protection	Test results refer to table ANNEX V - 2	P
	This test shall evaluate the safety performance of a battery when applying an external short circuit. The test can evaluate the activation of the overcurrent protection device or the ability of cells to withstand the current without reaching a hazardous situation (e.g. thermal runaway, explosion, fire). The main risk factors are heat generation at cell level and electrical arcing, which can damage circuitry or lead to reduced isolation resistance.		P
3.	Overcharge protection	Test results refer to ANNEX V - 3	P

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict
	This test shall evaluate the safety performance of a battery in overcharge situations. The main safety risks during overcharge are the decomposition of the electrolyte, cathode and anode breakdown, exothermic decomposition of the solid electrolyte interphase (SEI) layer, separator degradation, and lithium plating, which can lead to self-heating of the battery and thermal runaway. The factors affecting the outcome of the test shall, as a minimum, include, the charging rate and the finally reached state of charge. The protection can be ensured either by voltage control (interruption after reaching the limit charging voltage) or current control (interruption after exceeding maximum charging current).		P
4.	Over-discharge protection	Test results refer to ANNEX V - 4	P
	This test shall evaluate the safety performance of a battery in over-discharge situations. Safety risks during over-discharge include polarity reversal leading to oxidation of the anode current collector (Copper) and to plating on the cathode side. Even minor over-discharge can cause dendrite formation and ultimately short-circuiting.		P
5.	Over-temperature protection	Test results refer to ANNEX V - 5	P
	This test shall evaluate the effect of temperature control failure or failure of other features for protection against internal overheating during operation.		
6.	Thermal propagation protection	Test results refer to ANNEX V - 6	P
	This test shall evaluate the safety performance of a battery in thermal propagation situations. A thermal runaway in one cell can cause a cascading reaction throughout the entire battery which can be composed of numerous cells. It can lead to severe consequences including a significant gas release. The test shall take into account the tests that are under development for transport applications by ISO and the UN Global Technical Regulation.		P
7.	Mechanical damage by external forces	Test results refer to ANNEX V - 7	P
	These tests shall simulate one or more situations in which a battery is accidentally exposed to mechanical stresses and remains operational for the purpose for which it was designed. The criteria to simulate these situations should reflect real life uses.		P
8.	Internal short circuit	Test results refer to ANNEX V - 8	P

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict
	This test shall evaluate the safety performance of a battery in internal short-circuit situations. The occurrence of internal short circuits, one of the main concerns for battery manufacturers, potentially leads to venting, thermal runaway, and sparking which can ignite the electrolyte vapours escaping from the cell. The generation of such internal short circuits can be triggered by manufacturing imperfections, the presence of impurities in the cells or dendritic growth of lithium, and is the cause of most in-field safety incidents. Multiple internal short circuit scenarios are possible (e.g. electrical contact of cathode/anode, aluminium current collector/copper current collector, aluminium current collector/anode) each with a different contact resistance.		P
9.	Thermal abuse	Test results refer to ANNEX V - 9	P
	During this test, the battery shall be exposed to elevated temperatures (in IEC 62619 the temperature is 85 °C) which can trigger exothermal decomposition reactions and lead to a thermal runaway in the cell.		P
10.	Fire test	Test results refer to ANNEX V - 10	P
	The risk of explosion shall be assessed by exposing the battery to fire.		P
11.	Emission of gases	Test results refer to ANNEX V - 11	P
	Batteries can contain significant amounts of potentially hazardous materials, for example highly flammable electrolytes, corrosive and toxic components. If exposed to certain conditions, the integrity of the battery could be compromised, resulting in the release of hazardous gases. Therefore, it is important to identify emissions of gases from substances released from the battery during tests: the risk of toxic gases emitted from non-aqueous electrolytes shall be properly taken into account for all safety parameters listed in points 1 to 10.		P
ANNEX VI	LABELLING, MARKING AND INFORMATION REQUIREMENTS		N/A
ANNEX VII	PARAMETERS FOR DETERMINING THE STATE OF HEALTH AND EXPECTED LIFETIME OF BATTERIES		N/A
ANNEX VIII	CONFORMITY ASSESSMENT PROCEDURES		N/A
ANNEX IX	EU DECLARATION OF CONFORMITY No* ... * (identification number of the declaration)		N/A
ANNEX X	LIST OF RAW MATERIALS AND RISK CATEGORIES		N/A
ANNEX XI	CALCULATION OF COLLECTION RATES FOR WASTE PORTABLE BATTERIES AND WASTE LMT BATTERIES		N/A
ANNEX XII	STORAGE AND TREATMENT, INCLUDING RECYCLING, REQUIREMENTS		N/A
ANNEX XIII	INFORMATION TO BE INCLUDED IN THE BATTERY PASSPORT		N/A

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX XIV	MINIMUM REQUIREMENTS FOR SHIPMENTS OF USED BATTERIES		N/A
ANNEX XV	CORRELATION TABLE		N/A

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

Table ANNEX V - 1	Thermal shock and cycling				--
Sample No.	OCV at start of test, (V dc)	Max temperature, (°C)	Min temperature, (°C)	OCV at End test, (V dc)	Remark
20241220-002	53.31	75	-40	53.28	A, B
	Max temperature Storage time, (h)	Min temperature Storage time, (h)	Interval time between max and min Temperature, (h)	Cycles	
	6	6	0.5	10	
Remark: A – No Fire, explosion, venting, leakage or rupture, OCV change ≤ 10%, mass loss ≤ 0.1%. B – Other (Please explain): Test method and requirement based on Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, ST/SG/AC.10/11/Rev.7/Amend.1/Section 38.3.4.2 and UL1973: 2022 Clause 38. Note: Tested on both control box and single battery module.					

Table ANNEX V - 2	External short circuit protection					--
Sample No.	Ambient, (°C)	OCV at start of test, (V dc)	Max discharge current, (A)	Maximum Case Temperature Rise ΔT , (°C)	Test termination	Remark
20241220-003	25.2	587.6	10517	0*	A	C, F
Remark: A - The test was completed after 6 h; B - The test was completed after the cell casing cooled to 20% of the maximum temperature rise Results: C - No fire or Explosion; D - Fire; E - Explosion; F - Other (Please explain): Test method and requirement based on IEC 63056:2020 Clause 7.6. Note*: Test on complete system. No obviously temperature rise due to protection device operating immediately.						

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

Table ANNEX V - 3	Overcharge protection				--
Sample No.	OCV at start of test for Cell, (V dc)	Maximum Charging Current, (A)	Max. Charging Voltage of Battery system, (V dc)	Max. Voltage of Cell, (V dc)	Remark
20241220-002	3.103 to 3.115	180.0	637.9	3.656	A, D, F, H
--			Charge Voltage Applied Battery System		
			Whole		Part
			635.36*1.1=698.896		-
Remark: A – No Fire or Explosion B – Fire C – Explosion D – The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage E – The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage F – All function of battery system did operate as intended during the test. G – All function of battery system did not operate as intended during the test. H – Other (Please explain): Test method and requirement based on IEC 62619:2022 Clause 8.2.3. Note: Test on GW112.6-BAT-AC-G10.					

Table ANNEX V - 4	Over-discharge protection					--
Sample No.	Ambient, (°C)	OCV at start of test, (V dc)	Discharge current		Measured minimum cell voltage, (V dc)	Remark
			0.2 It (A)	Maximum discharge current, (A)		
20241220-002	24.0	579.2	40.0	200.0	2.5821	A, C
Remark: A - The BMS interrupt the over discharging current by an automatic disconnect of the main contactors before the cell voltage dropped below lower limit discharging voltage of the cell. B - Measured minimum cell voltage less than lower limit discharging voltage of the cell. C - Other (Please explain): Test method and requirement based on IEC 63056:2020 Clause 7.8. Note: Test on GW112.6-BAT-AC-G10.						

Table ANNEX V - 5	Over temperature protection			--
Sample No.	OCV at start (SOC 50%) of test, (V dc)	Maximum Charging Current, (A)	Maximum Charging Voltage, (V dc)	
20241220-002	600.4	3.5	611.5	

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

Maximum Specified Temperature of Battery System, °C	Maximum Measured Cell Case Temperature, °C	Remark
55.0	57.0	A, D, F, H
Remark: A – No fire or Explosion B – Fire C – Explosion D – Temperature sensing function of BMU did operate and then charging stopped E – Temperature sensing function of BMU did not operate and then charging stopped F – All function of battery system did operate as intended during the test. G – All function of battery system did not operate as intended during the test. H – Other (Please explain): Test method and requirement based on IEC 62619:2022 Clause 8.2.4 Note: Test on GW112.6-BAT-AC-G10.		

Table ANNEX V – 6, ANNEX V – 11	Thermal propagation protection					--
Sample No.	OCV of Battery System Before Test, (V dc)	OCV of Target Cell Before Test, (V dc)	Maximum Cell Case Temperature, (°C)	Maximum DUT Enclosure Temperature, (°C)	Remark	
20241220-001	53.5	3.349	504.7	34.1	A, E	
Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m²)		
Overcharge		Middle cell of the battery pack		--		
Flammable gas generation and composition data:						
Measurement Method	Gas Compound	Gas Type	Pre-Flaming (L)	Post-Flaming (L)		
Flame ionization detection	Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	23.039	No flaming		
Fourier-Transform infrared Spectrometer	Carbon Monoxide	Carbon Containing	6.316	No flaming		
	Carbon Dioxide	Carbon Containing	24.058	No flaming		
Solid-state Hydrogen Sensor	Hydrogen	Hydrogen	24.624	No flaming		
Measurement Method	Gas components		Total volume of gas (L)			
			Pre-Flaming	Post-Flaming		
Fourier-Transform infrared Spectrometer	Methane	CH ₄	3.085	No flaming		
	Acetylene	C ₂ H ₂	0.129	No flaming		
	Ethylene	C ₂ H ₄	3.489	No flaming		

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

- 1) Cell can be failed through laser exposure, applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method
- 2) If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.

Remark:

A – No fire external to DUT enclosure or area for fire protection or no battery case rupture

B – Fire external to DUT enclosure or area for fire protection

C – Explosion

D – Battery case rupture

E – Other (Please explain): Test method and requirement based on UL 9540A:2019 and IEC 62619:2022 Clause 7.3.3

Tested on single battery pack.

Table ANNEX V - 7		Mechanical damage by external forces		--
Sample No.	Test item	OCV at start of test, (V dc)	OCV after test, (V dc)	Remark
20241220-002	Steady force test (250N)	51.9	51.9	A, B
	Vibration test	52.0	52.0	A, B
	Impact test (cell)	3.345	3.3465	A, B
	Drop test (battery pack)	52.1	52.1	A, B
Remark: A – Tested with no non-compliant results. B - Other (Please explain): Test method and requirement based on EN 62477-1+A11+A1+A12 Clause 5.2.2.4.2.3 and 5.2.6.4. IEC 62619 Clause 7.2.2, 7.2.3, IEC 63056 Clause 7.9.				

Table ANNEX V - 8		Internal short circuit		--
Sample No.*	OCV at start of test, (V dc)	Particle location ¹⁾	Maximum applied pressure, (N)	Remark
CELL-20241220-001	3.395	1	400	A, E, G
CELL-20241220-002	3.380	1	400	A, E, G
CELL-20241220-003	3.393	1	400	A, E, G
CELL-20241220-004	3.375	1	400	A, E, G

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

CELL-20241220-005	3.376	1	400	A, E, G
-------------------	-------	---	-----	---------

Supplementary information:
¹⁾ Identify one of the following:

1: Nickel particle inserted between positive and negative (active material) coated area.

2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

Remark:

A – No fire or explosion

B – Fire

C – Explosion

D – Test concluded when 50 mV voltage drop occurred prior to reaching force limit

E – Test concluded when 800/400 N pressure was reached and 50 mV voltage drop was not achieved

F – Test was concluded when fire or explosion occurred

G – Other (Please explain): Test method and requirement based on IEC 62619:2022 Clause 7.3.2

Note*: Tested on cells.

Table ANNEX V - 9		Thermal abuse				--
Sample No.*	OCV at start of test, (V dc)	Test temperature, (°C)	Max. DUT Enclosure Temperature, (°C)	Max. Temperature storage time, (h)	Remark	
CELL-20241220-008	3.371	85.0	85.1	3	A, B	
CELL-20241220-009	3.374	85.0	85.2	3	A, B	
CELL-20241220-010	3.381	85.0	85.0	3	A, B	
Remark: A – No fire or no explosion B – Other (Please explain): Test method and requirement based on IEC 62619:2022 Clause 7.2.4 Note*: Tested on cells.						

Table ANNEX V - 10		Fire test		--
Sample No.*	OCV before test, (V dc)	OCV after test, (V dc)	Remark	
CELL-20241220-006	3.377	0	D, E, F	
CELL-20241220-007	3.373	0	D, E, F	
Remark:				

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict

A – Cell did not explode.
B – Cell exploded but no part of the cell casing penetrated the wire screen.
C – Cell exploded such that particles from the casing penetrated the wire screen.
D – Cell vented without exploding.
E – Cell caught on fire without explosion
F – Other. (Please explain): Test method and requirement based on UL 1973:2022 Annex E9.
Note*: Tested on cells.

- End of report -