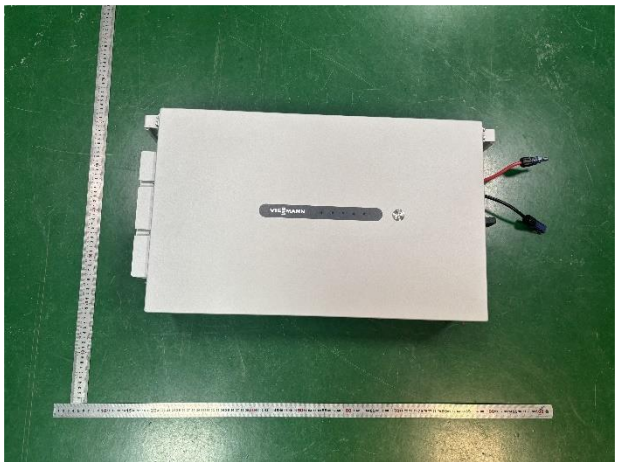
Prüfbericht-Nr.: *Test report no.:*	**CN24WTPB 002**	**Auftrags-Nr.:** *Order no.*:	326099352 P01845930	
Kunden-Referenz-Nr.: *Client reference no.*:	2322559	**Auftragsdatum:** *Order date:*	2025-03-04	
Auftraggeber: *Client*:	Viessmann Climate Solutions SE Viessmannstr. 1 /35108 Allendorf (Eder) Deutschland			
Prüfgegenstand: *Test item*:	Rechargeable Li-ion Battery System			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	Viessmann Battery HV5-A			
Auftrags-Inhalt: *Order content*:	Test Report			
Prüfgrundlage: *Test specification*:	Regulation (EU) 2023/1542 Article 10 - Performance and durability requirements for rechargeable industrial batteries, LMT batteries and electric vehicle batteries.			
Wareneingangsdatum: *Date of sample receipt*:	2025-03-04			
Prüfmuster-Nr.: *Test sample no:*	HV5-20250304-001			
Prüfzeitraum: *Testing period*:	2025-03-04 - 2025-03-25			
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	Depeng Cao	**genehmigt von:** *authorized by*: Feng Xu	Feng Xu
Datum: *Date:* 2025-03-30		**Ausstellungsdatum:** *Issue date:* 2025-03-30	
Stellung / Position:	Sachverständige(r)/Expert	**Stellung** / Position:	Sachverständige(r)/Expert

Sonstiges / *Other*:	The product has been evaluated with Regulation (EU) 2023/1542 Article 10 refer to TUV Rhineland test report No. CN24WTPB 001. The mentioned models listed on above are identical to the original models in the previous report CN24WTPB 001, except for license holder and model name. 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*

Prüfbericht-Nr.: CN24WTPB 002
Test report no.:

Anmerkungen
Remarks

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. *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.*
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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. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen 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 bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *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.*

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
Regulation (EU) 2023/1542
OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 12 July 2023

Report Number. ..... :	**CN24WTPB 002**
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 ..... :	Viessmann Climate Solutions SE
Address ..... :	Viessmannstr. 1 /35108 Allendorf (Eder) Deutschland
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 10, Ed 1.0
Test Report Form No. ..... :	(EU) 2023/1542_B
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..... :	Rechargeable Li-ion Battery System
Trade Mark..... :	VIESMANN
Manufacturer ..... :	Same as applicant
Model/Type reference..... :	See cover page
Ratings..... :	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:

Clause(s)	Test(s)
ANNEX IV-1	Rated capacity and capacity fade
ANNEX IV-2	Power and power fade
ANNEX IV-3	Internal resistance and internal resistance increase
ANNEX IV-4	Energy round trip efficiency and its fade
ANNEX IV-5	The expected life-time of the battery

Testing location:

GoodWe Technologies Co., Ltd.
No.90 Zijin Rd., New District, 215011 Suzhou, P.R. China

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

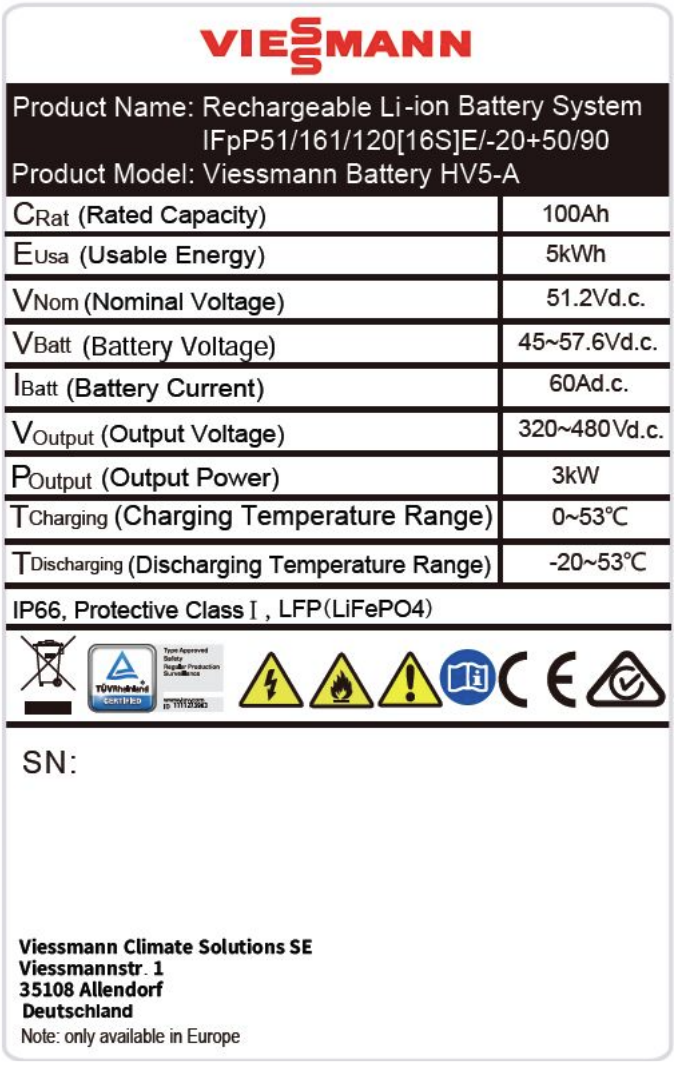
☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known 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 IECEE.
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE 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.



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 rechargeable Li-ion battery System is used for energy storage system, which include 16 cells connected with 16S1P and 1 DC/DC as main power port.

2. The rechargeable Li-ion battery System gets the signal and data information of cell voltage and temperature through the BMS board.

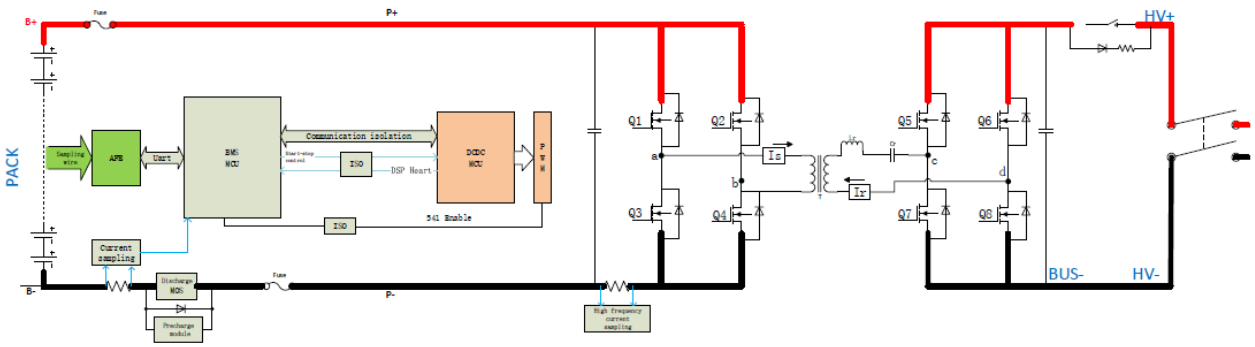
3. The product includes a battery module and a DC-DC power board. Battery charging and discharging are achieved through a DC-DC power board, and the battery module working voltage range is 45V to 57.6V, the DC-DC power board output voltage range is 320Vd.c. to 480Vd.c.

4. The insulation between the DC (Battery) circuits and the metal enclosure is basic insulation (BI) and the one between the DC (Battery) circuits and communication circuit is reinforced insulation (RI). All DC (Battery) circuits are considered as DVC-C circuits.

5. The BMS functional safety was evaluated according to IEC 60730-1 Annex H.

6. Only Article 10 - Performance and durability requirements for rechargeable industrial batteries, LMT batteries and electric vehicle batteries was evaluated in this report.

The system block diagram is outlined as below:



Performance and durability parameters specified by manufacture.

Rechargeable Li-ion Battery System Model: Viessmann Battery HV5-A		
Part A Parameters related to electrochemical performance and durability		Part B Elements to explain the measurements for parameters listed in Part A
Rated Capacity, (Wh)	5kwh	100% DOD (cell 2.87~3.59V voltage range), 1kW charge & discharge at 25±3 ℃ for battery system at beginning life.
Capacity fade, (%)	1: ≤ 20% after 4500 Cycles. 2: ≤ 30% after 6000 Cycles.	1: Based on cell 2.87~3.59V voltage range at 25±2℃ of Cell under constant power 3kW test condition. 2: Based on cell 2.87~3.59V voltage rang at 25±2℃ of Cell under constant power 2.5kW test condition.
Power, (W)	Charge power:3kw Discharge power:3kw	Charge: SOC≤90%, output voltage 435±10V, constant power 3kW (0.6P) charge at 25±3 ℃ for battery system. Discharge: SOC≥10%, output voltage for 380±10V, constant power 3kW (0.6P) discharge at 25±3 ℃ for battery system.
Power fade, (%)	0	No fade of rated power.
Internal resistance, (Ω)	AC Internal resistance: 165mΩ DC Internal resistance: 2500mΩ	SOC ≥ 20% and SOC ≤ 80%, constant power 3kW charge & discharge at 25±3 ℃ for battery system.
Internal resistance increase, (%)	0	No increase of Internal resistance.
Energy round trip efficiency, (%)	86.5%	Based on cell 2.87~3.59V voltage range, constant power 3kW charge & discharge at 25±3 ℃ for battery system at beginning life.
Energy round trip efficiency fade, (%)	0	No fade of Energy round trip efficiency.
The expected life-time	1: 4500 cycles or. 2: 6000 cycles or. 3: ≥ 10 years or total output energy ≥ 15.33MWh	1: Based on 100% DOD (cell 2.87~3.59V voltage range) at 25±2℃ of Cell under constant power 3kW test condition and ≥ 80% SOH. 2: Based on 100% DOD (cell 2.87~3.59V voltage range) at 25±2℃ of Cell under constant power 2.5kW test condition and ≥ 70% SOH. 3. Based on 100% DOD (cell 2.87~3.59V voltage range) at 25±2℃ of Cell under constant power 2.5kW test condition and ≥ 70% SOH.

Note:
All parameters above are specified by the manufacture, only a portion of parameters were verified based on reference standards and methods, see table ANNEX IV - 2.1~2.5 for details.
100% Depth of discharge (DOD) means fully charging cell max voltage =3.59V, fully discharging cell min voltage =2.87V for this battery system.

Other operating parameters:

	Product	Li-ion battery Cell	Rechargeable Li-ion Battery System
Battery system	Type/model	LF100LA	Viessmann Battery HV5-A
Battery module parameters inside of product	Nominal voltage [Vdc]	3.2	51.2
	Rated Capacity [Ah]	102	100
	Battery structure	-	16S1P
	Battery Voltage Range [Vdc]	-	45 to 57.6
	Upper limit charging voltage [Vdc]	3.90	57.6
	Discharge cut-off voltage [Vdc]	2.0	45.0
	Maximum charging current [A]	100	60
	Maximum discharge current [A]	250	60
Battery system parameters	Output Voltage range [Vdc] *	-	320 to 480
	Power [kW] *	-	3
	Usable Energy [kWh]	-	5
	Temperature range for charging [°C]	0 to 65	0 to 53
	Temperature range for discharging [°C]	-30 to 65	-20 to 53
	Dimension (height* thickness*width) [mm]	(118.5±1)*(49.9±1)*(160.0±1)	380*170*700
	Weight [kg]	1.98±0.1	52
	Ingress Protection (IP)	-	IP66
	Protective Class	-	I
	Pollution Degree	-	PD3 (PD 2 inside)
	Cooling type	-	Fan cooling
	Altitude (m)	-	4000
Note*: The product used a DC-DC as final power port.			

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

Chapter I	**General provisions**		N/A
Chapter II	**Sustainability and safety requirements**		--
Article 10	Performance and durability requirements for rechargeable industrial batteries, LMT batteries and electric vehicle batteries		P
1.	From 18 August 2024, rechargeable industrial batteries with a capacity greater than 2 kWh, LMT batteries and electric vehicle batteries shall be accompanied by a document containing values for the electrochemical performance and durability parameters set out in Part A of Annex IV.		P
	For batteries referred to in the first subparagraph, the technical documentation referred to in Annex VIII shall contain an explanation of the technical specifications, standards and conditions used to measure, calculate or estimate the values for the electrochemical performance and durability parameters. That explanation shall include, at least, the elements set out in Part B of Annex IV.		P
2.	From either 18 August 2027 or 18 months after the date of entry into force of the delegated act referred to in the first subparagraph of paragraph 5, whichever is the latest, rechargeable industrial batteries with a capacity greater than 2 kWh, except those with exclusively external storage, shall meet the minimum values laid down in the delegated act adopted pursuant to the first subparagraph of paragraph 5 for the electrochemical performance and durability parameters set out in Part A of Annex IV.		—
3.	From either 18 August 2028 or 18 months after the date of entry into force of the delegated act referred to in the second subparagraph of paragraph 5, whichever is the latest, LMT batteries shall meet the minimum values laid down in the delegated act adopted pursuant to the second subparagraph of paragraph 5 for the electrochemical performance and durability parameters set out in Part A of Annex IV.		—
4.	Paragraphs 1, 2 and 3 shall not apply to a battery that has been subject to preparation for re-use, preparation for repurposing, repurposing or remanufacturing, where the economic operator placing that battery on the market or putting it into service demonstrates that the battery, before undergoing such operations, has been placed on the market or put into service before the dates on which those obligations become applicable in accordance with those paragraphs.		P
5.	By 18 February 2026, the Commission shall adopt a delegated act in accordance with Article 89 to supplement this Regulation by establishing minimum values for the electrochemical performance and durability parameters set out in Part A of Annex IV that rechargeable industrial batteries with a capacity greater than 2 kWh, except those with exclusively external storage, shall attain.		—

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict
	By 18 February 2027, the Commission shall adopt a delegated act in accordance with Article 89 to supplement this Regulation by establishing minimum values for the electrochemical performance and durability parameters set out in Part A of Annex IV that LMT batteries shall attain.		—
	In preparing the delegated acts referred to in the first and second subparagraph, the Commission shall consider the need to reduce the life cycle environmental impact of rechargeable industrial batteries with a capacity greater than 2 kWh, except of those with exclusively external storage, and of LMT batteries, and ensure that the requirements laid down therein do not have a significant adverse impact on the functionality of those batteries or the appliances, light means of transport or other vehicles into which those batteries are incorporated, their affordability and industry's competitiveness.		—
6.	The Commission is empowered to adopt delegated acts in accordance with Article 89 to amend the electrochemical performance and durability parameters set out in Annex IV in light of market developments and technical and scientific progress, including, in particular, related to technical specifications of the informal UNECE Working Group on Electric Vehicles and the Environment.		—
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**
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**

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

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**		**P**
1.	For the purposes of this Annex the following definitions apply:		P
	(1) 'Rated capacity' means the total number of ampere-hours (Ah) that can be withdrawn from a fully charged battery under reference conditions.		P
	(2) 'Capacity fade' means the decrease over time and upon usage in the amount of charge that a battery can deliver at the rated voltage, with respect to the original rated capacity.		P
	(3) 'Power' means the amount of energy that a battery is capable of providing over a given period under reference conditions.		P
	(4) 'Power fade' means the decrease over time and upon usage in the amount of power that a battery can deliver at the rated voltage.		P
	(5) 'Internal resistance' means the opposition to the flow of current within a cell or a battery under reference conditions, that is, the sum of electronic resistance and ionic resistance to the contribution to total effective resistance including inductive/capacitive properties.		P
	(6) 'Energy round trip efficiency' means the ratio of the net energy delivered by a battery during a discharge test to the total energy required to restore the initial state of charge by a standard charge.		P
2.	Part A - Parameters related to electrochemical performance and durability	Provided	P
	(1) Rated capacity (in Ah) and capacity fade (in %).	Test results refer to Table ANNEX IV - 2.1	P
	(2) Power (in W) and power fade (in %).	Test results refer to Table ANNEX IV - 2.2	P
	(3) Internal resistance (in Ω) and internal resistance increase (in %).	Test results refer to Table ANNEX IV - 2.3	P
	(4) Where applicable, energy round trip efficiency and its fade (in %).	Test results refer to Table ANNEX IV - 2.4	P
	(5) The expected life-time of the battery under the reference conditions for which it has been designed, in terms of cycles, except for non-cycle applications, and calendar years.	Test results refer to Table ANNEX IV - 2.5	P
	Part B - Elements to explain the measurements for parameters listed in Part A	Provided	P
	(1) Applied discharge rate and charge rate.		P
	(2) Ratio between nominal battery power (W) and battery energy (Wh).		P

Regulation (EU) 2023/1542			
Clause	Requirement + Test	Result - Remark	Verdict
	(3) Depth of discharge in the cycle-life test.		P
	(4) Power capability at 80 % and 20 % state of charge.		P
	(5) Any calculations performed with the measured parameters, if applicable.		P
ANNEX V	**SAFETY PARAMETERS**		**N/A**
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**
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 IV - 1	**Rated capacity (in Ah) and capacity fade (in %)**					**--**
Sample No.	**Fully charged voltage, (V dc)**	**Charge power, (kW)**	**Discharge power, (kW)**	**End-of-discharge voltage, (V dc)**	**Discharge capacity, (kWh)**	**Remark**
At 25°C ambient						
HV5-20250304-001	421.6	1.0	1.0	393.3	5.05	--
Sample No.	**Original capacity (Ah)**	**Operating conditions**	**Remaining capacity (Ah)**	**Capacity fade (%)**		**Remark**
--	--	--	--	--		*

Supplementary information:

Rated capacity test method based on IEC 62620 :2023 clause 6.3.1 except test with charge and discharge constant power 0.2P(1kW). Manufacture specified lower limit discharge voltage: cell min 2.87V, upper limit voltage: cell max 3.59V.

* Not verified for capacity fade, specified value see page 9.

Table ANNEX IV - 2	**Power (in W) and power fade (in %)**					--
Sample No.	**Rated energy, (kWh)**	**Charge power, (kW)**	**Charge power ratio**	**Discharge power, (kW)**	**Discharge power ratio**	**Remark**
At 20% SOC						
HV5-20250304-001	5.0	3.0	0.6P	3.0	0.6P	--
At 80% SOC						
HV5-20250304-001	5.0	3.0	0.6P	3.0	0.6P	--
Sample No.	**Original power, (kW)**	**Operating conditions**	**Remaining power, (kW)**	**Power fade, (%)**		**Remark**
HV5-20250304-001	3.0	After 100 charge/discharge cycles	3.0	0		*

Supplementary information:

Power test method based on IEC 62620 :2023 clause 6.6.1 except test with charge and discharge constant power 0.6P(3kW) and total tested for 100 cycles.

Manufacture specified lower limit discharge voltage: cell min 2.87V, upper limit voltage: cell max 3.59V.

* Power fade result only verified within 100 specified charge/discharge cycles.

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

Table ANNEX IV - 3	**Internal resistance (in Ω) and internal resistance increase (in %)**				--
Sample No.	**Applying alternating RMS current, (mA)**	**Applying alternating frequency, (kHz)**	**AC resistance, (mΩ)**		**Remark**
HV5-20250304-001	10.0	1.0	163.1		--
Sample No.	**Original AC resistance, (Ω)**	**Operating conditions**	**Remaining AC resistance, (Ω)**	**AC Resistance increase, (%)**	**Remark**
--	--	--	--	--	*
Sample No.	**Discharge current I_2 (A)- I_1 (A)**	**Discharge voltage U_1 (V dc)- U_2 (V dc)**	**DC resistance, (mΩ)**		**Remark**
HV5-20250304-001	6.8-2.5=4.3	393.3-382.7=10.6	2465.1		--
Sample No.	**Original DC resistance, (Ω)**	**Operating conditions**	**Remaining DC resistance, (Ω)**	**DC Resistance increase, (%)**	**Remark**
--	--	--	--	**--**	*
Supplementary information: Resistance test method based on IEC 62620 :2023 clause 6.5 except DC resistance tested with 3kw charge and discharge power. * Not verified for resistance crease, specified value see page 9.					

Table ANNEX IV - 4	**Energy round trip efficiency and its fade (in %)**					--
Sample No.	**Fully charged voltage, (V dc)**	**Charge Power, (kW) and Energy, (kWh)**	**Discharge Power, (kW) and Energy, (kWh)**	**End-of-discharge voltage, (V dc)**	**Round trip efficiency, (%)**	**Remark**
HV5-20250304-001	437.3	3.0 5.646	3.0 4.897	343.3	86.7	--
Sample No.	**Operating conditions**	**Charge Energy, (kWh)** **Discharge Energy, (kWh)**	**Remaining round trip efficiency, (%)**	**Round trip efficiency fade, (%)**		**Remark**
HV5-20250304-001	After 100 charge/discharge cycles	5.559 4.831	86.9	0		--
Supplementary information: Test method based on IEC 62620 :2023 clause 6.6.1 except test with charge and discharge constant power						

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

0.6P(3kW) and total tested for 100 cycles.
Manufacture specified lower limit discharge voltage: cell min 2.87V, upper limit voltage: cell max 3.59V.
* Round trip efficiency fade result only verified for 100 specified charge/discharge cycles.

Table ANNEX IV - 5	**Expected life-time of the battery**					--
Sample No.	**Fully charged voltage, (V dc)**	**Charge power, (kW)**	**Discharge power, (kW)**	**End-of-discharge voltage, (V dc)**	**Depth of discharge, (%)**	**Remark**
HV5-20250304-001	434.9	3.0	3.0	342.9	100	*
	Cycles ~~or calendars~~	**Remaining energy, (kwh)**	**Remaining Power, (kW)**	**Test Ambient, (°C)**		
	100	4.83	3.0	25.0		

Supplementary information:

Supplementary information:

Test method based on IEC 62620 :2023 clause 6.6.1 except test with charge and discharge constant power 0.6P(3kW) and total tested for 100 cycles.
Manufacture specified lower limit discharge voltage: cell min 2.87V, upper limit voltage: cell max 3.59V.
* Not verified for more cycles, other manufacture specified value see page 9.

- End of report -