CERTIFICATE

Product Certificate
K-0212290/01

Issued *1-7-2023*

Replaces *n/a*

Specific Certification Program 05 for Fire Protection of Lithium-ion batteries storage

STATEMENT BY KIWA
With this product certificate, issued in accordance with the Kiwa Regulations for Certification, Kiwa declares that legitimate confidence exists that the products supplied by

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as specified in this product certificate and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with the international Kiwa TIC - scheme **BRL-K21045** "Fire protection Systems" dated 30-03-2021.
inclusive Specific Certification Program 05 for Fire Protection of Lithium-ion batteries storage dated 22-09-2022.

Ron Scheepers
Kiwa

Publication of this certificate is allowed.
Advice: consult www.kiwa.nl in order to ensure that this certificate is still valid.

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Certification process consists of initial and regular assessment of:
- **quality system**
- **product**

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PRODUCT SPECIFICATION WITH LIMITED SCOPE
The International Kiwa Testing, Inspection and Certification Scheme K21045/02 for “Fire Protection Systems” dated [30-03-2021] and Specific Certification Program 05 for Fire Protection of Lithium-ion batteries storage dated [22-09-2022].

This scheme and program have several scopes fire protection systems.
Is in application of this Specific Certification Program has the scope – E - been applied for Aeresol systems.

Field of application / scope for this specific certification program
The performance of the fire protection system is determined for a typical lithium-ion batterie(s) fire(s). The performance of the fire protection system depends heavily on the typical situation. This certification program requires an test protocol per typical situation motivated on the safety chain consists of five phases, namely pro-action, prevention, preparation, repression and aftercare of the process end-to-end.
The situational performance of the fire protection system shall be declared based on:
- The type of batteries with the maximum level of electrical energy and the typical containment / casing;
- How high the batteries are / can be electrically loaded;
- How the batteries are stored / moved / used.

The type of mitigation performance (ToMP) of the fire protection system shall be declared based on the type of protection such as:
- Fire Control;
- Fire Prevention;
- Fire Repression;
- Fire Suppression.

The effective mitigation performance time (EMPT) of the fire protection system shall be declared based on the time of the of protection is effective. For example are these hold time for total flooding systems or the time fire protection media is supplied by surface protection systems.
Based on the results of this test program in this specific certification program is additional listing possible.

Application and use
It is important that the fire protection of a building or plant be considered as a whole. Fire protection systems form only a part, though an important part, of the available facilities, but it should not be assumed that their adoption necessarily removes the need to consider supplementary measures, such as the provision of portable fire extinguishers or other mobile appliances for first aid or emergency use, or to deal with special hazards.

Advice on these matters can be obtained from the approved supplier of this manufacturer of the fire protection system according to scheme K21045. Information may also be sought from the appropriate fire authority, the health and safety authorities and insurers. In addition, reference should be made as necessary to other national standards and statutory regulations of the particular country.

It is essential that firefighting equipment be carefully maintained to ensure instant readiness when required. Routine maintenance is liable to be overlooked or given insufficient attention by the owner of the system. It is, however, neglected at peril to the lives of occupants of the premises and at the risk of crippling financial loss. The importance of maintenance cannot be too highly emphasized. Installation and maintenance should only be carried out by qualified personnel according to scheme K21045.

Inspection should include an evaluation that the fire protection system continues to provide adequate protection for the risk (protected zones as well as state of the art can change over time).

Where fire protection systems are used in a potentially explosive application, the suitability of the generator to the atmosphere for the determined life shall be assessed.

Conditions for application
The detail engineering and installation of the extinguishing system shall to be determined in conformity with the guidelines and calculation methods of the manufacturer.
The user of the extinguishing system is instructed by an instructor for this system authorized by the supplier on behalf of the manufacturer.
The detail engineering, installation and maintenance of the fire extinguishing components have to take place according to the specifications of the manufacturer and certification scheme K21045.

Point of interest during use
The fire protection systems and components should not be used on fires involving the following unless relevant testing by approved testing laboratories has been carried out to the satisfaction of the Authority.

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Design, Installation and Operation Manual

At delivery the product should be accompanied by an operation manual in the English language, known and authorized by Kiwa.
Following minimum items shall be described:

- Type of media and the fire protection generators;
- Design application density in relation to Fire Class according to EN2;
- Description of occupancies and hazards to be protected against;
- Specification of the fire protection generators;
- Equipment schedule or list of materials for each piece of equipment or device, showing device name; supplier, model or part number and description;
- System calculation;
- Enclosure pressurization and venting calculations;
- Description of fire detection, actuation and control systems.
- Requirements for inspection, maintenance and testing of an fire protection system and for the training of inspection and maintenance personnel.

For specific details regarding the owner's manual, see scheme K21045 and the Specific Certification Program 05.

Marking

The products should be marked with the Kiwa®-mark.

Place of the mark:

- On Fire Protection System

Required specifications:

- Name of the product and supplier
- Supplier's type designation
- Production date and serial number
- Fire protection media and generators
- Temperature range
- Storage humidity range
- Service life
- Safety distances as specified in certification
- Reference to the application instructions
- Certification mark
- Specific certification Program 05

Method of marking

- Non-erasable and non-detachable;
- Non-flammable;
- Permanent an legible

RECOMMENDATIONS FOR CUSTOMERS

Check at the time of delivery whether:

- the supplier has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc.

If you should reject a product on the basis of the above, please contact:

- LOXXER Belgium

and, if necessary,

- Kiwa Nederland B.V.

Consult the supplier's processing guidelines for the proper storage and transport methods.

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Product specifications / configuration

S	Situational	Information
1	Type of batterie(s)	Specification(s) Plastic: LiPo4 Battery Fix LiFeP04 LIR/108.050.001 10,8V – 50,4 Ah – 500Wh Metal:Robert Bosch GmbH Li-Ion 10INR19/66-4 36V – 13,4 Ah – 500 Wh
2	Maximum level of electrical energy of the batteries	100% charged
3	Casing material of the batteries	Plastic and Metal
4	Containment of the batteries in a compartment.	Storage cabinet for batteries. 4 metal zinc wire mesh plates, interconnecting airflow/ fire suppressant.
4a	The maximum compartment volume and height.	Dimension outside: See drawing . 20230426 Final Drawing Magoxx Lo 20230523 Final drawing Metal Boar
4b	The physical characteristic of the compartment with a view on the escalation process.	Cabinet constructed of Magoxx Magnesium Oxide plates 18 mm. Fire Class A1 according to EN13501-1 and REI 60 minutes according to EN13501-2. ETA15/0643 of 2019 by Kiwa & Certificate of constancy of performance 0063-CPR-92425/02 by Kiwa based on EAD 350142-00-1106 of 2017.
4c	Resistance to fire penetration and/or fire spread compartment. This with a view on the escalation process. EN13501-2 classifications.	60 REI minutes based on the plates. 90 minutes based on the compartment of the storage system with an active fire protection system to control the fire for minimal 90 minutes.
4d	The packages of the batteries for examples in pallet arrangements with for example with carton or plastic.	Non.
4e	The storage arrangements of the batteries in maximum height and distance. This with a view on the escalation process.	Minimal 10 cm separation between the batteries.
4f	The batteries are stored / loaded / repaired in the compartment.	Stored and loaded.
ToMP	**Type of Mitigation Performance**	
	a. Fire Control b. Fire Prevention c. Fire Repression d. Fire Suppression This with a view on the escalation process.	Fire suppression following fire control and if possible fire repression.
EMPT	**Effective Mitigation Performance Time**	
	a. Hold time total flooding systems required based of the fire protection media or;	90 minutes based on the plates of the cabinet and the fire protection system.

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	b. Supply time fire protection media for surface protection. This with a view on the escalation process.	
FPM	**Fire Protection Media**	
	Speciation, classification and initial approval and certification of the FPM.	Aerosol according to scheme Product certification scheme K23001 from -AF-X Fireblocker with Kiwa product certificate number K101072 1 Datasheet NANO CS.pdf
FPS	**Fire Protection System**	
	Configuration of the FPS This with a view on the escalation process. *Configuration used during the test whit motivation for the engineering choices.*	AF-X Fireblocker Aerosol generator CS Kiwa product certificate number K101072 in the top of the compartment. In the top of the compartment is an overpressure relieve installed of a diameter of 16 cm with setting of 15 pascal +/-10% for fine tuning. **Bei Raumtemperatur** 6.1.1 Total leakage Q_t S_x For S_x 50 Pa overpressure is not required so the test results are indicative. Für S_x werden 50 Pa Überdruck nicht benötigt, die Ergebnisse sind daher indikativ. Test S_x / Prüfung S_x — Type of membranes / Membranart — Specifications / Beschreibung — Leakage (Q_t = m³/h) at a pressure of: / Undichtigkeit (Q_t=m³/h) bei einem Druck von: 1 — System leakage / Anlagen Undichtigkeit — N/a — 25 Pa: < 1 — 50 Pa: < 1 2 — Ø 200 mm — Metal stud plasterboard V / Metallständerwand V — 25 Pa: < 1 — 50 Pa: 0.2 3 — Ø 200 mm — Aerated concrete H / Porenbeton H — 25 Pa: 0.2 — 50 Pa: 0.3 4 — Ø 80 mm — Aerated concrete H / Porenbeton H — 25 Pa: 0.3 — 50 Pa: 0.5 5 — Ø 80 mm — Metal stud plasterboard V / Metallständerwand V — 25 Pa: 0.2 — 50 Pa: 0.5 **Bei 200°C** 6.1.2 Total leakage Q_t S_{200} Test S_{200} / Prüfung S_{200} — Type of membranes / Membranart — Specifications / Beschreibung — Leakage (Q_t = m³/h) at a pressure of: / Undichtigkeit (Q_t=m³/h) bei einem Druck von: 1 — Ø 200 mm — Metal stud plasterboard V / Metallständerwand V — 25 Pa: 0.5 — 50 Pa: < 1 2 — Ø 200 mm — Aerated concrete H / Porenbeton H — 25 Pa: 0.6 — 50 Pa: < 1 3 — Ø 80 mm — Aerated concrete H / Porenbeton H — 25 Pa: 0.4 — 50 Pa: < 1 4 — Ø 80 mm — Metal stud plasterboard V / Metallständerwand V — 25 Pa: 0.3 — 50 Pa: < 1 5 — System leakage / Anlagen Undichtigkeit — N/A — 25 Pa: < 1 — 50 Pa: < 1 * < 1 means the leakage was close to or equal to zero. < 1 bedeutet die Undichtigkeit war fast Null oder gleich Null
FDS	**Fire Detection System**	
	Configuration of the FDS based on 2 depend detector independence with a minimal of 2 fire phenomena. This with a view on the escalation process. *Configuration used during the test whit motivation for the engineering choices.*	Two smoke detectors in the top of the compartment. The detectors are Conventional Photoelectric Smoke Detector type SOC-E3N with approval from LPCB based on EN54-7. The electrical automatic control and delay devices is a standard EN12094-1. FP9000E_EN_IM-1PCB_R12072019.pdf DECLARATION-OF-PERFORMANCE-FP90 DECLARATION-OF-CONFORMITY-FP90 FP9000E_1922-CPR-1803_FY_EN (1).pdf
IM	**Initiation Method** of a cell in the batteries	
	a. Electrical overload creating shortcut between cathode and anode of the cell in the batteries. b. External heating (element) damaging the isolation creating	b. This method proof to be sufficient for this test to activate cells in the batterie to have a thermal runaway. And

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	shortcut between cathode and anode of the cell in the batteries. c. Blunt external mechanical force (axe or nail) damaging the isolation creating shortcut between cathode and anode of the cell in the batteries. d. Other method applicable for the typical situation. *Initiation method used during the test whit motivation for the engineering choices.*	c. Blunt external mechanical force (axe or nail) damaging the isolation creating shortcut between cathode and anode of the cell in the batteries.
C	**Closing of the compartment after activation**	
	Procedure of closing the compartment. Focal points in this procedure are: a. having sufficient oxygen in the compartment when the batteries are activated; b. the function and performance of the fire protection system (for example self-closing); c. the follow mitigation process.	The doors were closed just before heating the cells with the thermal element. The compartment was ventilated during the heating of the cells with the thermal element. The doors are equipped with door closers according to EN1154 – Controlled door closing devices. The ventilation is switched off during the first fire / smoke detection.
FMP	**Follow-up Mitigation Process**	
	The method used after the test used to finally mitigate the risk of fire of the batterie(s).	After fire detection, the electrical automatic control and delay devices (EN12094-1) will activate an alarm system that can be relayed to the responsible person or fire department. The 90 min fire suppression buys a window for the Fire services to arrive and prepare the battery extraction. All locker can be opened from an emergency release lever and the battery can be cooled (CO2 extinguisher) and submerged in a metal container filled with salt water. This until the chemical reaction inside the battery stops and all energy is dispersed. (up to 4 weeks). The alarm transmission to the 24-hour receiving station goes either through a stand-alone alarm transmission or the fire alarm control panel must be connected to the main fire alarm center of the building with an alarm transmission. Datasheet overseiningsmodule Certificaat EN54-21.pdf

Table 1 – configuration setup based on Kiwa report A0115043 28 march 2023 v3.