Product Service

Mehr Sicherheit.
Mehr Wert.

Technical Assessment Report
Nr. 028-713155957-102

Date of assessment:	2019-10-10
Customer:	AIB KUNSTMANN Reserve GmbH Herr Martin Kunstmann Zur Lohmühle 5 D-86874 Tussenhausen
Manufacturing site:	AIB KUNSTMANN Reserve GmbH Zur Lohmühle 5 D-86874 Tussenhausen
Subject of the assessment report:	Kind: Racks and Cabinets Types: see chapters 2.1.1, 2.1.2, 3.1.1 and 3.1.2
Task of the assessment report:	Part I: Determination, whether the racks and cabinets manufactured and put into circulation by AIB KUNSTMANN Reserve GmbH fall under the scope of Machinery directive 2006/42/EC or not. Part II: Determination, if the racks and cabinets, brought into circulation by AIB KUNSTMANN Reserve GmbH, fulfill the requirements of EN 50272-2:2001 and EN IEC 62485-2:2019-04 regarding indirect contact, or not.
Result	see result chapter of Part I (2.4) and II (3.5)

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

Authors

Part I – Applicability of Machinery directive	Part II – Evaluation of the safety concept against indirect contact
	
Peter Reifferscheid Product Specialist PS-COM-I-MAC	Norman Thein Senior Product Specialist ELVH PS-COM-I-ESY

Reviewers

Part I – Applicability of Machinery directive	Part II – Evaluation of the safety concept against indirect contact
	
Tobias Pfeiffer Business Line Manager PS-COM-IEP	Bernd Kreitmeier Head of Department PS-COM-I-ESY

Order information

Date of order File reference of client	19.03.2019 TB19-99991
Test sample	none, Technical Assessment Report without testing
Date of testing	01.04.2019, 15.04.2019
Testing site	none, Technical Assessment Report without testing
Teilnehmer	N/A

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

Table of contents

Authors 2
Reviewers 2
Order information 2
1 Baseline situation 5
1.1 Description of the baseline situation 5
1.2 Task definition for Part I 5
1.3 Task definition for Part II 5
2 Part I – Applicability of Machinery directive 2006/42/EC 6
2.1 Part I – Evaluated Models 6
2.1.1 Racks 6
2.1.2 Cabinets 6
2.2 Part I – Test specification 6
2.2.1 Machinery directive 2006/42/EC 6
2.2.2 EN ISO 12100:2010 – Safety of machinery – General principles for design – Risk assessment and risk reduction 6
2.3 Part I – Basis for evaluation 7
2.3.1 Machinery directive 2006/42/EC 7
2.3.2 EN ISO 12100:2010 Safety of machinery 7
2.4 Part I – Determination / Result 8
2.4.1 Items out of scope of Machinery directive 2006/42/EC 8
2.4.2 Separate deployment and designation of the components 9
3 Part II – Evaluation of the safety concept against indirect contact 10
3.1 Part II – Evaluated models 10
3.1.1 Racks 10
3.1.2 Cabinets 10
3.2 Part II – Test specification 10
3.2.1 EN 50272-2:2001 – Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries 10
3.2.2 EN IEC 62485-2:2019-04 Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries 10

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

3.3 Teil II – Basis for evaluation 11
3.3.1 Evaluation of the standards 11
3.4 Part II – Determination 11
3.4.1 Suitability of the coating as insulation material 11
3.4.2 Safety concept battery cabinets 12
3.4.3 Safety concept battery racks 13
3.4.4 Combination of battery racks and cabinets 14
3.5 Part II - Result 15
Annex A – Bibliography 16

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

1 Baseline situation

1.1 Description of the baseline situation

The racks and cabinets brought into circulation by AIB Kunstmann Reserve are usually delivered in parts and erected by the end customer or a system supplier. They are mounted with batteries of various kinds and used as universal power supplies or back up power systems. The racks are made of steel or wood, cabinets are steel type.

1.2 Task definition for Part I

The task of part I of this technical assessment report is to evaluate whether the racks and cabinets fall under Machinery directive 2006/42/EC or not.

1.3 Task definition for Part II

The second part of this technical assessment report checks whether the safety concept used by AIB Kunstmann for the racks and cabinets regarding protection against indirect contact is compliant to the relevant paragraphs of EN 50272-2:2001 and EN IEC 62485-2:2019-04.

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

2 Part I – Applicability of Machinery directive 2006/42/EC

2.1 Part I – Evaluated Models

2.1.1 Racks

Following product lines of racks were evaluated:

- BASIC Racks
- CLASSIC Racks
- UPS Racks
- SPECIAL Racks
- SEISMIC Racks
- NUCLEAR Racks
- OFFSHORE Racks
- COMPACT Racks
- CONTAINER Racks
- EPOXY Racks
- HORIZONTAL Racks
- WOODEN Racks
- SHOCK Racks
- SOLAR Racks

2.1.2 Cabinets

The following product lines of cabinets were evaluated:

- STANDARD Cabinet
- STEPPED Cabinet
- DRAWER Cabinet
- SEISMIC Cabinet
- CLIMATE Cabinet[1]
- SPECIAL Cabinet

[1]=CLIMATE Cabinets consist of a Cabinet and an additional cooling fan or A/C unit, which needs to be installed by the final assembler at the construction site. Mounting of the cooling fan or the A/C unit doesn't take place at AIB Kunstmann Reserve. The units are invoiced separately.

2.2 Part I – Test specification

This chapter lists the standards and directives evaluated in this part of the report.

2.2.1 Machinery directive 2006/42/EC

Following two paragraphs out of Machinery directive 2006/42/EC were used:

- Article 1: Scope
- Article 2: Definitions

2.2.2 EN ISO 12100:2010 – Safety of machinery – General principles for design – Risk assessment and risk reduction

Regarding EN ISO 12100:2010 the following chapters were used for evaluation:

- Chapter 3.1: Terms and definitions – machinery, machine

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

2.3 Part I – Basis for evaluation

2.3.1 Machinery directive 2006/42/EC

Regarding 2006/42/EC, "Machinery" is defined in Article 2a as follows [001]:"[...]

- an assembly, fitted with or intended to be fitted with a drive system other than directly applied human or animal effort, consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application,
- an assembly referred to in the first indent, missing only the components to connect it on site or to sources of energy and motion,
- an assembly referred to in the first and second indents, ready to be installed and able to function as it stands only if mounted on a means of transport, or installed in a building or a structure,
- assemblies of machinery referred to in the first, second and third indents or partly completed machinery referred to in point (g) which, in order to achieve the same end, are arranged and controlled so that they function as an integral whole,
- an assembly of linked parts or components, at least one of which moves and which are joined together, intended for lifting loads and whose only power source is directly applied human effort."

2.3.2 EN ISO 12100:2010 Safety of machinery

Regarding EN ISO 12100:2010, chapter 3.1 defines the term "machine" as follows [002]:

- "**machinery**
  machine
  assembly, fitted with or intended to be fitted with a drive system consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application
  NOTE 1 The term "machinery" also covers an assembly of machines which, in order to achieve the same end, are arranged and controlled so that they function as an integral whole."

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH
Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

2.4 Part I – Determination / Result

2.4.1 Items out of scope of Machinery directive 2006/42/EC

Regarding the test specifications named in chapter 2.2.1 and 2.2.2, the following products do not fall under the scope of Machinery directive 2006/42/EC:

Racks:

- BASIC Racks
- CLASSIC Racks
- UPS Racks
- SPECIAL Racks
- SEISMIC Racks
- NUCLEAR Racks
- OFFSHORE Racks
- COMPACT Racks
- CONTAINER Racks
- EPOXY Racks
- HORIZONTAL Racks
- WOODEN Racks
- SHOCK Racks
- SOLAR Racks

Cabinets:

- STANDARD Cabinet
- STEPPED Cabinet
- DRAWER Cabinet
- SEISMIC Cabinet
- SPECIAL Cabinet

For market deployment, article 3(2) of the German product safety law (Produktsicherheitsgesetz – ProdSG) must be observed [003]:
"[...](2) A product, as long as paragraph 1 is not applicable, may only be put into circulation if it does not, in all foreseeable or intended use cases, imperils the safety or health of persons. During the evaluation, if a product fulfills the requirements of paragraph 1, the following two items must especially be taken into consideration:
1. the characteristics of the product, including its composition, its packaging, the manuals for construction, installation, maintenance and its service life,
2. the impact of the product on other products, as long as the use of the product together with other products can be implied,
3. the presentation of the product, its markings, warning signs, the usermanual, instructions regarding its disposal and all other product-related information,
4. the expected group of users which will be more endangered during the use of the product than others. [...]"

A CE-marking based on Machinery directive 2006/42/EG can not be applied.

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH
Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

2.4.2 Separate deployment and designation of the components

The CLIMATE cabinets consist of two parts: the cabinets manufactured by AIB Kunstmann and fans or A/C units manufactured and labeled by 3rd party manufacturers.

If these parts are shipped as single components and invoiced separately, only the 3rd party parts need a CE-marking (as these will definitely be part of an assembly of machinery) which is already applied by the 3rd party manufacturer.

The single unit cabinet of the CLIMATE Cabinet bundle does not require a CE-marking by AIB Kunstmann Reserve. It would need a CE-marking by the manufacturer if the climate components were already equipped during production or not invoiced separately.

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH
Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

3 Part II – Evaluation of the safety concept against indirect contact

3.1 Part II – Evaluated models

3.1.1 Racks

The following product lines of racks were evaluated:

- BASIC Racks
- CLASSIC Racks
- UPS Racks
- SEISMIC Racks
- NUCLEAR Racks
- OFFSHORE Racks
- COMPACT Racks
- HORIZONTAL Racks
- SOLAR Racks

3.1.2 Cabinets

The following product families of cabinets were evaluated:

- STANDARD Cabinet
- STEPPED Cabinet
- DRAWER Cabinet
- SEISMIC Cabinet
- CLIMATE Cabinet

3.2 Part II – Test specification

The following standards were used for the evaluation of the safety concept.

3.2.1 EN 50272-2:2001 – Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries

The following chapter of EN 50272-2:2001 was used for evaluation:

- Chapter 5.2 "Protection against indirect contact "

3.2.2 EN IEC 62485-2:2019-04 Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries

The following chapter of EN IEC 62485-2:2019-04 was used for evaluation:

- Chapter 4.3 "Protection against indirect contact"

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

3.3 Teil II – Basis for evaluation

3.3.1 Evaluation of the standards

Evaluation for the two standards can be done simultaneously, as the reading of the relevant paragraph is exactly the same, only the referenced standards were adopted to the new international naming restrictions.:

EN 50272-2:2001	DIN EN IEC 62485-2:2019-04
Chapter 5.2, Paragraph 5 [004]:	Kapitel 4.3, Abschnitt 5 [005]:
"Battery stands or battery cabinets made from metal shall either be connected to the protective conductor or insulated from the battery and the place of installation. This insulation shall correspond to the conditions for protection by insulation according to HD 384.4.41, subclause 413.2. Other simultaneously accessible conductive parts, i.e. metal ducts, shall be out of reach. For requirements on creepage distances and clearances, see HD 625.1, using a value of 4000 V for the high-voltage impulse test."	"Battery stands or battery cabinets made from metal shall either be connected to the protective conductor or insulated from the battery and the place of installation. This insulation shall correspond to the conditions for protection by insulation according to IEC 60364-4-41. Other simultaneously accessible conductive parts, i.e. metal ducts, shall be out of reach. For requirements on creepage distances and clearances, see IEC 60664-1, using a value of 4000 V for the high-voltage impulse test."

3.4 Part II – Determination

3.4.1 Suitability of the coating as insulation material

The cabinets, racks and parts of the cabinets and racks are coated using a whirl sintering process and thermo plastic powders based on polyolefin.

Three kinds of powders are used:

- Flamulit HTC 144 from Axalta Coating Systems (former DuPont Powder Coatings) [006]
- Fixatti PE 1110 from Fixatti (former Schaetti Coat 1110 of Schaetti Coating Technologies) [007]
- Fixatti PE 1210 from Fixatti (former Schaetti Coat 1210 of Firma Schaetti Coating Technologies) [008]

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

The different kinds of coating powder are comparable in their relevant characteristics regarding coating:

Characteristic	Flamulit HTC 144	Schaetti Coat 1110	Schaetti Coat 1210
Minimum coating thickness	250 µm	250 µm	250 µm
Dielectric strength	>30 kV/mm	>20 kV/mm	>20 kV/mm
Erichsen cupping test according to ISO1520	8 mm	8 mm	8 mm
Tensile stretch	100%	200%	200%
Brittle temperature	-40°C	-40°C	-40°C
Manufacturing process:	whirl sinter process	whirl sinter process	whirl sinter process
Pre-heating temperature object	min. 230-260°C	min. 260°C	min. 260°C
Exposure time	3-6 sec	3-6 sec	3-6 sec

To ensure sufficient insulation, AIB Kunstmann Reserve monitores the minimum coating thickness of 400µm on all metall surfaces via random sample testing each day at the end of the coating process. Furthermore, each coated part is visually inspected on damages and uneven coating.

Another quality measure is the isolation testing at the end of the manufacturing process. Applied test voltage is 5kV AC, 1 min. This is aplied to all cabinets and one percent of all rack parts due to the high number of racks manufactured.

A testing at manufacturers premises on 2004-02-11 conducted by TÜV Süddeutschand (today renamed as TÜV SÜD) showed that Flamulit HTC 144 can be used for the intended purposes and was documented in a technical risk assessment [009].

Because of the high similarity of the three used coating powders it is assumed that Schaetti Coat 1110 and 1210 are acceptable, too.

3.4.2 Safety concept battery cabinets

The battery cabinets consist of coated parts screwed to each other using cutting washers to ensure a conducitve connection to each other. Transfer resistance, when assembled correct, is in the area of a few milli-Ohm.
This is inspected by inspection of each cabinet upon copletion. Doors, hinges and screw heads are measured against the PE connection, the measured values are documented.

Afterwards, the cabinet is connected to PE with a separate earthing connector.

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH
Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

The requirements described in chapter 3.3.1 regarding the protection against indirect contact are fulfilled.

3.4.3 Safety concept battery racks

Battery racks are mounted via plugging or screwing. In contrast to the cabinets, all blank metal parts are covered, for example with cover caps made of centrolen, PE-HD-material of Centroplas, so that no touching is possible anymore. Regarding insulation, Centrolen possesses the following characteristics [010]:

Characteristic	**Centrolen PE-HD**
Specific volume resistance	≥ 10^{13} Ωm
Specific surface resistance	≥ 10^{13} Ω
Dielectric strength	45 kV/mm
CTI-value	600
Operational temperature:	
Minimum temperature	-75°C
Maximum short term temperature	120°C
Maximum long term temperature	80°C

The insulation characteristics of the covers are tested via random sample testing at each delivery batch.

Connection to PE is not intended for racks.
The requirements described in 3.3.1 against indirect contact are fulfilled.

Insulation fulfills the requirements of double or reinforced insulation regarding DIN VDE 0100-410 [011].

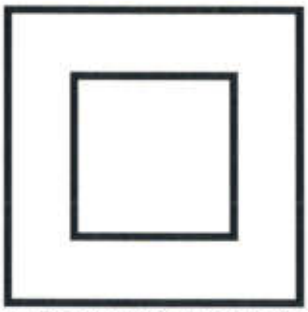

Figure 1: Protective insulation mark

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

The requirement of marking each part of the rack during manufacturing with a Protective insulation mark, see **Figure *1***, is not fulfilled. Instead, stickers with this sign are delivered in conjunction with the parts of the racks and the description in the manual to attach these stickers in the viewable area of the construction in its end-use application.
This way, the goal of the standard requirement, the notification of the user, is achieved.

3.4.4 Combination of battery racks and cabinets

Battery cabinets and racks are combined and sold by AIB KUNSTMANN Reserve.
Racks and inlay grates are mounted into cabinets. Because of that, the safety measures described in 3.4.2 and 3.4.3 are combined. This is feasible, as each part is safe in accordance to EN 50272-2 and EN IEC 62485-2, and a combination of safety measures is allowed.

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

3.5 Part II - Result

The following racks and cabinets as well as combinations of them fulfill the requirements of EN 50272-2:2001 and EN IEC 62485-2:2019-04 regarding the protection against indirect contact:

Racks:

- BASIC Racks
- CLASSIC Racks
- UPS Racks
- SEISMIC Racks
- NUCLEAR Racks
- OFFSHORE Racks
- COMPACT Racks
- HORIZONTAL Racks
- SOLAR Racks

Marking of Protective class II (Protective insulation) is required.

Cabinets:

- STANDARD Cabinet
- STEPPED Cabinet
- DRAWER Cabinet
- SEISMIC Cabinet
- CLIMATE Cabinet

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

Annex A – Bibliography

[001]	Directive 2006/42/EC of the European Parliament and of the council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) The German version of this document was used: https://eur-lex.europa.eu/legal-content/DE/TXT/HTML/?uri=CELEX:32006L0042&from=DE
[002]	DIN EN ISO 12100:2011-03 Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze – Risikobeurteilung und Risikominderung (ISO 12100:2010); Deutsche Fassung EN ISO 12100:2010 Kostenpflichtiger Download: https://www.beuth.de/de/norm/din-en-iso-12100/128264334
[003]	German law regarding the market deployment of products (Produktsicherheitsgesetz – ProdSG) https://www.gesetze-im-internet.de/prodsg_2011/index.html
[004]	DIN EN 50272-2:2001 – Sicherheitsanforderungen an Batterien und Batterieanlagen – Teil 2: Stationäre Batterien Kostenpflichtiger Download: https://www.vde-verlag.de/normen/0510005/din-en-50272-2-vde-0510-2-2001-12.html
[005]	DIN EN IEC 62485-2:2019-04 Sicherheitsanforderungen an Sekundär-Batterien und Batterieanlagen – Teil 2: Stationäre Batterien Kostenpflichtiger Download: https://www.vde-verlag.de/normen/0500138/din-en-iec-62485-2-vde-0510-485-2-2019-04.html
[006]	Data sheet Flamulit HTC 144 Available on request from manufacturer: www.axaltacs.com

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH

Niederlassung München
Ridlerstraße 65
80339 München
Deutschland

[007]	Data sheet Schaetti Coat 1110, renamed to Fixatti PE 1110 Available on request from manufacturer: www.fixatti.com
[008]	Data sheet Schaetti Coat 1210, renamed to Fixatti PE 1210 Available on request from manufacturer: www.fixatti.com
[009]	Experts opinion from TÜV Süddeutschland regarding: "Beurteilung von Batteriegestellen, hinsichtlich deren Isolation gegen die Batterie und den Aufstellort [...]", Autor: Wolfgang Gastl Archived, label: "2004-02-23-AIB-Kunstmann-Tussenhausen-Batteriegestelle" This document was provided by AIB KUNSTMANN Reserve
[010]	Technical data sheet Centrolen / PE-HD Manufacturer: Centroplast Engineering Plastics GmbH https://www.centroplast.de/fileadmin/user_upload/centroplast_datenblatt_td_centrolen_pe_hd.pdf
[011]	DIN VDE 0100-410:2018-10 – Errichten von Niederspannungsanlagen – Teil 4-41: Schutzmaßnahmen – Schutz gegen elektrischen Schlag (IEC 60634-4-41:2005, modifiziert + A1:2017); Deutsche Übernahme HD 60364-4-41:2017 + A11:2017 https://www.vde-verlag.de/normen/0100481/din-vde-0100-410-vde-0100-410-2018-10.html

Dipl.-Ing. Norman Thein
08.10.2019

Mobil: +49 151 73030822
E-Mail: norman.thein@tuev-sued.de
TÜV®

TÜV SÜD Product Service GmbH
Niederlassung München
Ridlerstraße 65
80339 München
Deutschland