



INSPECTION REPORT

Fire Safety Assessment according to EN 45545-2

safety-related controller HIMax

Report-No.: HB91437T-EN, Version 2.0
Report Date: 2023-07-20, Scope: 18 pages

Customer:

HIMA Paul Hildebrandt GmbH
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Order Date: 2022-09-09
Project No.: 717526230 (717515213)

Inspector:

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Inspection body:

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Revision history

Version	Status	Date	Author	Modified clauses	Modifications
1.0	Withdrawn	2017-07-28	Ulrich Thomas	All	Initial
2.0	Released	2023-07-20	Kangyi Xu	All	Update Reports; new template

1. Client

HIMA Paul Hildebrandt GmbH
 Albert-Bassermann-Straße 28
 68782 Brühl
 Germany

2. General

2.1. Contract

The fire safety assessment for the safety-related controller HIMax were commissioned by the company HIMA to TÜV SÜD Rail GmbH on 2022-09-09.

The assessment was carried out in the period from 2022-09-09 to 2023-07-20 by inspection of the documents provided by the client HIMA or its subcontractors.

The expert involved is an employee of TÜV SÜD Rail GmbH and is not instructed by the preparation of the inspection report.

2.2. Standards

This document deals with the assessment of the safety-related controller HIMax in respect to compliance with the fire safety requirements according to the following acknowledged rules of technology:

Table 1: Standards

No.	Standard	Title
[R01]	DIN EN 45545-1: 2013-08*	Railway applications – Fire protection on rail vehicles – Part 1: General
[R02]	DIN EN 45545-2: 2016-02*	Railway applications – Fire protection on rail vehicles – Part 2: Requirements for fire behaviour of material and components
[R03]	DIN EN 45545-2: 2020-10	Railway applications – Fire protection on rail vehicles – Part 2: Requirements for fire behaviour of material and components

* This standard is part of the accreditation D-IS-11190-01-00

2.3. Abbreviations

Table 2: Abbreviations

Abbreviation	Definition
HL	Hazard Level
max.	Maximum



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Table 2: Abbreviations

Abbreviation	Definition
min.	Minimum
N/A	Not Applicable
OC	Operation category
OI	Oxygen Index
PCB	Printed circuit board

2.4. Management system at the time of inspection

The inspection was executed under application of the valid quality management system [M1] of the inspection body TÜV SÜD Rail GmbH accredited according to DIN EN ISO/IEC 17020:2012 [M2].

Table 3: Management System

Ref.	Designation	Title
[M1]	QMS	Quality management system of TÜV SÜD Rail GmbH
[M2]	D-IS-11190-01-00	Accreditation by the DAkkS according to DIN EN ISO/IEC 17020:2012 as a Type A inspection body. The accreditation is only valid for the scope of accreditation listed in the document annex D-IS-11190-01-00.

3. Documents

Table 4: Documents

ID	Title	Author	Doc./File ID	Date	Rev.
[D1]	Auflistung Kunststoffteile HIMax	HIMA	Auflistung Kunststoffteile HIMax mit COM - TUEV.xlsx	---	---
[D2]	HIMax Sicherheitsgerichtete Steuerung Systemhandbuch	HIMA	HI 801 000 D	---	6.01
[D3]	Test Report PCB - Isola IS400_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4	RST	P60-22-5631	2022-11-17	---
[D4]	Test Report PCB - TECHNOLAM NPG-150N/NPG-150NB_Parylene HR_Elpemer 2467	RST	P60-22-5632	2022-11-17	---
[D5]	Test Report PCB - TECHNOLAM NPG-150N/NPG-150NB_Parylene F_Elpemer 2467	RST	P60-22-5633	2022-11-17	---
[D6]	Test Report PCB - TECHNOLAM NP-140TL/NP-140B_Parylene HR_Elpemer 2467	RST	P60-22-5634	2022-11-17	---
[D7]	Test Report PCB - Panasonic R-1566/R-1551_ImagecureSMART XV501T-4	RST	P60-22-5635	2022-11-17	---
[D8]	Test Report PCB - Isola IS400_ELPEGUARD SL 1306 N-FLZ/23_Imagecure SMART XV501T-4_SD 24	RST	P60-22-5636	2022-11-17	---
[D9]	Test Report PCB - Isola DE 104_ImagecureSMART XV501T-4	RST	P60-22-5637	2022-11-17	1
[D10]	Test Report PCB - Isola DE 104_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4_SD 2444	RST	P60-22-5638	2022-11-17	---
[D11]	Test Report PCB - Isola IS400_ImagecureSMART XV501T-4_SD 2444	RST	P60-22-5639	2022-11-17	---
[D12]	Test Report PCB - Isola DE 104_ImagecureSMART XV501T-4_SD 2444	RST	P60-22-5640	2022-11-17	---
[D13]	Test Report PCB - SUN SMART XV501T-4, ISOLA DE104 Laminate and Prepreg, Parylene HR (SCS)	RST	P60-22-5577	2022-08-29	---
[D14]	Test Report PCB - SUN SMART XV501T-4, ISOLA DE104 Laminate and Prepreg, Parylene C (Heicks)	RST	P60-22-5579	2022-08-29	---

Table 4: Documents

ID	Title	Author	Doc./File ID	Date	Rev.
[D15]	Test Report PCB - SUN SMART XV501T-4, ISOLA DE104 Laminate and Prepreg, SL 1306 N-FLZ/23	RST	P60-22-5580	2022-08-29	---
[D16]	Test Report PCB - Elpemer 2469 SM-HF, ISOLA DE104 Laminate and Prepreg, Parylene HR (SCS)	RST	P60-22-5585	2022-08-29	---
[D17]	Test Report PCB - Elpemer 2469 SM-HF, ISOLA DE104 Laminate and Prepreg, Parylene C (Heicks)	RST	P60-22-5587	2022-08-29	---
[D18]	Test Report PCB - Elpemer 2469 SM-HF, ISOLA DE104 Laminate and Prepreg, SL 1306 N-FLZ/23	RST	P60-22-5588	2022-08-29	---
[D19]	Test Report PCB - Elpemer 2467, ISOLA DE104 Laminate and Prepreg, Parylene HR (SCS)	RST	P60-22-5581	2022-08-29	---
[D20]	Test Report PCB - Elpemer 2467, ISOLA DE104 Laminate and Prepreg, Parylene C (Heicks)	RST	P60-22-5583	2022-08-29	---
[D21]	Test Report PCB - Elpemer 2467, ISOLA DE104 Laminate and Prepreg, SL 1306 N-FLZ/23	RST	P60-22-5584	2022-08-29	---
[D22]	Test Report PCB - Elpemer 2467, TECHNOLAM NP-140TL/NP-140B, Parylene C (Heicks)	RST	P60-22-5592	2022-08-29	---
[D23]	Test Report PCB - Elpemer 2467, TECHNOLAM NP-140TL/NP-140B, SL 1306 N-FLZ/23	RST	P60-22-5593	2022-08-29	---
[D24]	Test Report PCB - ShengYi S1000/S1000B_Parylene HR_ImagecureSMART XV501T-4	RST	P60-22-5594	2022-08-22	---
[D25]	Test Report PCB - ShengYi S1000/S1000B_Parylene C_ImagecureSMART XV501T-4	RST	P60-22-5595	2022-08-22	---
[D26]	Test Report PCB - ShengYi S1000/S1000B_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4	RST	P60-22-5596	2022-08-22	---
[D27]	Test Report PCB - ShengYi S1000-H_TAIYO PSR-2000CE880E CA/25 CE96	RST	P60-22-5597	2022-08-22	---
[D28]	Test Report PCB - ShengYi S1000-2M_TAIYO PSR-2000 ME8-160PS/CA-25E	RST	P60-22-5598	2022-08-22	---



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Table 4: Documents

ID	Title	Author	Doc./File ID	Date	Rev.
[D29]	Test Report PCB - ShengYi S1000H_Nanya LP-4G/K-65	RST	P60-22-5599	2022-08-22	---
[D30]	Test Report PCB - TECHNOLAM NP-140TL/NP-140B_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4	RST	P60-22-5600	2022-08-22	---
[D31]	Test Report PCB - Panasonic R-1755C/R-1650C_SD 2444_ImagecureSMART XV501T-4	RST	P60-22-5601	2022-08-22	---
[D32]	Test Report PCB - TECHNOLAM NPG-150N/NPG-150NB_Parylene HR_Elpemer 2469 SM-HF	RST	P60-22-5602	2022-08-22	---
[D33]	Test Report PCB - TECHNOLAM NPG-150N/NPG-150NB_Parylene C_Elpemer 2469 SM-HF	RST	P60-22-5603	2022-08-25	---
[D34]	Test Report PCB - TECHNOLAM NPG-150N/NPG-150NB_ELPEGUARD SL 1306 NFLZ/23_Elpemer 2469 SM-H	RST	P60-22-5604	2022-08-25	---
[D35]	Test Report PCB - ShengYi S1141/S0401_Tayio PSR-2000MT	RST	P60-22-5605	2022-08-25	---
[D36]	Test report Xantar G4F 22	Currenta	20/0556	2020-03-30	---
[D37]	Test report Vampamid PA6 2026 V0 DF	RST	P60-23-5534	2023-05-24	---
[D38]	UL Certificate Lexan 945 AU	UL	E45329	2022-04-14	---
[D39]	UL Certificate PU 552 FL	UL	E108835	2022-01-01	---
[D40]	UL Certificate Hgw2372.1 (EPGC202)	UL	E146321	2022-01-01	---
[D41]	UL Certificate LC70 FR HF(m)	UL	E189230	2022-07-13	---
	UL Certificate Ultramid C3U	UL	E41871	2023-01-01	---
	UL Certificate WELLAMID 6600-PA66-HWV0CP	UL	E63957	2023-01-01	---
[D42]	UL Certificate Xantar G4F 22 R	UL	E41179	2023-01-01	---
[D43]	Test report PocanB4225	UL	LXRWC04047	2020-08-05	---
[D44]	Test report A3X2G5	UL	14941 / 54921	2022-11-11	---

4. Equipment under inspection

4.1. Description of equipment

The safety-related controller HIMax was developed for application in rolling stock.

It consists of a metal housing with different slots populated electrotechnical equipment inside and connection plugs. The device is actively ventilated.



Fig. 1 safety-related controller HIMax – source: HIMA

Connection cables of the vehicle wiring or brackets for mounting are not part of this assessment.

In accordance with the assignment, this fire safety assessment deals with the following assemblies:

Table 5: safety-related controller HIMax – equipment

No	Assembly	Description
1	Modules	X-SB 01; X-CPU 01; X-COM 01; X-DI 32 01; X-DI 32 02; X-DI 32 03; X-DI 64 01; X-DO 12 01; X-DO 24 02; X-DO 32 01; X-CPU 31; X-BLK 01; X-BLK 02; X-BLK 03; X-COM 01E
2	Connector Boards	X-CB 003 01; X-CB 002 01; X-CB 002 03; X-CB 002 05; X-CB 002 02; X-CB 002 04; X-CB 002 06; X-CB 001 01; X-CB 001 02; X-CB 015 03; X-CB 005 03; X-CB 006 03; X-CB 011 03; X-CB 010 03; X-CB 009 03; X-CB 002 07; X-CB 002 08; X-CB 002 09; X-CB 001 04; X-CB 015 04; X-CB 005 04; X-CB 006 04; X-CB 011 04; X-CB 010 04; X-CB 009 04; X-CB 015 01; X-CB 015 02; X-CB 005 01; X-CB 005 02; X-CB 006 01; X-CB 006 02; X-CB 011 01; X-CB 011 02; X-CB 010 01; X-CB 010 02; X-CB 009 01; X-CB 009 02
3	Base Plates	X-BASE PLATE 10 01; X-BASE PLATE 10 31; X-BASE PLATE 15 01; X-BASE PLATE 15 31; X-BASE PLATE 18 01; X-BASE PLATE 18 31; X-Filter 01; X-FRONT COVER 15 02; X-FRONT COVER 10 01; X-FRONT COVER 15 01; X-FRONT COVER 18 01
4	System Fans	X-FAN 10 01; X-FAN 10 03; X-FAN 15 01; X-FAN 15 02; X-FAN 15 03; X-FAN 15 04; X-FAN 18 01; X-FAN 18 03
5	Communication Modules	Communication options for the X-COM 01 / X-COM 01E: <ul style="list-style-type: none"> - PROFIBUS DP Master - PROFIBUS DP Slave - RS232 for CUT - RS422 for CUT - RS485 for Modbus (M&S), COM User Task (CUT) - CAN for CUT - PROFINET V2.4

4.2. Electrical Data

No	Part name	Voltage	Fuse	Max. failure power
1	HIMax	24 V	63 A (external fuse required) for the whole system, each insertion separately fused with 25 A maximum.	600 W

4.3. Installation Conditions

The safety-related controller HIMax is intended for installation in technical compartments. It is not regularly accessible for passengers or staff during operation.

5. Conformity assessment acc. to EN 45545

5.1. Classification according to EN 45545-1

The safety-related controller HIMax is to be used in vehicles of all design categories and for operation in all environments corresponding to operation categories 1 to 4.

The safety objectives according to EN 45545-1, Section 4.2 “Fire resulting from accidental ignition or arson”, Section 4.3 “Fires caused by technical defects” as well as Section 4.4 “Fire resulting from larger ignition models than those described in 4.2 and 4.3” have been incorporated in the assessment in a risk-oriented approach.

Section 4.2 refers to typical ignition models involving newspaper, matches, cigarettes and gas lighters. Those will be taken into consideration for any areas that are freely accessible to passengers and staff (ignition models 1 and 2 in accordance with Annex A, EN 45545-1). According to the intended installation conditions in 4.3 of this report, the access for passengers is regularly not intended. Hence this ignition model has not been considered in the following assessment.

Section 4.3 refers to ignition models comparable to electrical arcing or overheating and the spread of fire by any potentially flammable gases and liquids present (ignition models 3 and 4 in accordance with Annex A, EN 45545-1).

Section 4.4 refers to larger ignition models (model 5 in accordance with Annex A, EN 45545-1) than those defined in sections 4.2 and 4.3 of EN 45545-1. The assessment of this ignition model was made with focus on the material selection and the intended installation conditions.

According to chapter 8, the proof of conformity must be provided for the defined fire protection requirements. Proof of conformity for the fire behaviour of materials and/or components can be provided in the form of test reports or certificates.

- Test reports must be issued by testing laboratories that are accredited for the respective tests according to EN ISO/IEC 17025.
- Certificates must be issued by certification bodies, which are accredited for the respective testing or classification standards according to EN ISO/IEC 17065.

Annex ZA presents the correlation between EN 45545-2 and Interoperability Directive (EU)2016/797 as well as the TSI LOC&PAS (Regulation EU 1302/2014). For a vehicle approval according to the TSI LOC&PAS, test reports or certificates, with a maximum validity of 5 years from the date of issue, must be submitted.

For test reports or certificates with an issue date older than 5 years, the verification can alternatively be issued by a corresponding manufacturer's declaration according to chapter 4.2.10.2.1, paragraph 3 in connection with the application guideline for the TSI LOC&PAS (GUI/LOC&PAS TSI/2021) in addition to the present test report or certificate.

5.2. Assessment according to EN 45545-2

5.2.1. Requirements

Based on the classification according to EN 45545-1, the materials / components shall meet the requirements of Hazard Level 3 (HL3). The components are to be regarded as Electrotechnical equipment covered by the EN 45545-2 standard. Generally, the requirement sets are listed in section 4.4 “Listed products”. The applicable requirements are the following:

Table 6: Requirement sets

No.	Name	Details	Requirement
EL9	Printed circuit boards	Printed circuit boards with all applied coatings but without any attached technical equipment	R26 [R03] EN 60695-11-10 Classification = V0 or R25 EN 60695-2-11 Glow Wire 850 °C or R24 ISO 4589-2 OI ≥ 32%
EL10	Small electrotechnical products	All electrotechnical equipment, including protection against contact and similar	R26 EN 60695-11-10 Classification = V0
EL1A	Cables for interior	Cables not compliant with one of the standards referenced in 4.2 c)	R15 EN 60332-1-2 burned part ≤ 540 mm and unburned part > 50 mm EN 50305 burned part ≤ 1.5 m EN 61034-2 Transmission ≥ 70% EN 50305 ITC ≤ 6

In addition to the requirements of listed products, the grouping rules according to section 4.3 for components with low combustible mass and/ or surfaces are applicable.

No requirements apply to products with a combustible mass of < 10 g not in touching contact with another unclassified product (EN 45545-2 section 4.3.1).

Table 7: Grouping rule 1

No.	Section	Requirement	Remark
1-1	4.3.2. Grouping rule 1	< 100 g for interior grouped products	No requirements
1-2	Products without requirements	< 400 g for exterior grouped products	No requirements

Table 8: Grouping rule 2

No.	Section	Requirement	Remark
2-1	4.3.3. Grouping rule 2 Products tested according to R24	< 500 g for interior grouped products tested according to R24	Proof R24 Oxygen index
2-2	R24	< 2000 g for exterior grouped products tested according to R24	Proof R24 Oxygen index

The following general rules shall be considered:

Table 9: General requirements

Section	Requirement	Remark
4.2. a) General	Products which comply with the highest level of reaction to fire performance and therefore need no further testing are - products classified as A1 according to EN 13501-1 - all products described in commission decision 96/603/EC (as amended)	---
4.2 m) [R02] 4.2. l) [R03] Size of test specimen	If the end use condition does not allow sizes of test specimen for ISO 5658-2 (if this is part of the requirement set): R6 interior use R9 exterior use	---
4.2. n) [R02] 4.2. m) [R03]	If listed products are used in an application below the mass and area thresholds given in 4.3, they may be treated as non-listed products.	---
4.5 non-listed products	Any product not listed in EN 45545-2 Table 2 shall be considered as a non-listed product or shall be assessed using the grouping rules stipulated in EN 45545-2 section 4.3. The requirements of non-listed products are the following: > 0.2 m ² R1 (interior), R7 (exterior) ≤ 0.2 m ² R22 (interior), R23 (exterior)	This requirement can also be applied to products that cannot be tested according to the requirements for listed products, provided that the exposed area is < 0.2 m ² .
4.7 Products to be approved on functional necessity	If it can be shown that any of the requirements specified above are not technically achievable with functionally suitable products, then existing commercially available products can be used until and unless a suitable product is developed. There shall be no requirement to consider products made available after the date after the date of the contract.	---
5.3.6 [R02] 5.3.7 [R03] Fire integrity test	There shall not be more than one hole after the test T03.01. or T03.02. This hole shall have no dimension in the plane of the test piece greater than 3 mm. Alternatively, the material fulfils the requirements of Conventional Classified Products acc. to EN 45545-3. Those products are considered to meet the integrity requirements.	Materials that are fully separated with those products shall be grouped separately.

5.2.2. Material verification

The combustible materials are listed in the material list [D1].

According to the available documentation the combustible material required to be verified by test are PCBs, small electrotechnical products and some smaller items. The relevant requirements according to EN 45545-2 as well as the test results are listed in Table 10. All other combustible materials can be grouped or have a combustible mass of less than 10 g with no touching contact with any other unclassified material and are therefore not required for verification by test.

Table 10: Listing of material testing

Material	Requirement	Result	Certificate	HL
<i>EL9 - PCB</i>				
Isola IS400_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4	R24	fulfilled	[D3]	HL3
TECHNOLAM NPG-150N/NPG-150NB_Parylene HR_Elpemer 2467	R24	fulfilled	[D4]	HL3
TECHNOLAM NPG-150N/NPG-150NB_Parylene F_Elpemer 2467	R24	fulfilled	[D5]	HL3
TECHNOLAM NP-140TL/NP-140B_Parylene HR_Elpemer 2467	R24	fulfilled	[D6]	HL3
Panasonic R-1566/R-1551_ImagecureSMART XV501T-4	R24	fulfilled	[D7]	HL3
Isola IS400_ELPEGUARD SL 1306 N-FLZ/23_Imagecure SMART XV501T-4_SD 24	R24	fulfilled	[D8]	HL3
Isola DE 104_ImagecureSMART XV501T-4	R24	fulfilled	[D9]	HL3
Isola DE 104_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4_SD 2444	R24	fulfilled	[D10]	HL3
Isola IS400_ImagecureSMART XV501T-4_SD 2444	R24	fulfilled	[D11]	HL3
Isola DE 104_ImagecureSMART XV501T-4_SD 2444	R24	fulfilled	[D12]	HL3
SUN SMART XV501T-4, ISOLA DE104 Laminate and Prepreg, Parylene HR (SCS)	R24	fulfilled	[D13]	HL3
SUN SMART XV501T-4, ISOLA DE104 Laminate and Prepreg, Parylene C (Heicks)	R24	fulfilled	[D14]	HL3
SUN SMART XV501T-4, ISOLA DE104 Laminate and Prepreg, SL 1306 N-FLZ/23	R24	fulfilled	[D15]	HL3
Elpemer 2469 SM-HF, ISOLA DE104 Laminate and Prepreg, Parylene HR (SCS)	R24	fulfilled	[D16]	HL3
Elpemer 2469 SM-HF, ISOLA DE104 Laminate and Prepreg, Parylene C (Heicks)	R24	fulfilled	[D17]	HL3
Elpemer 2469 SM-HF, ISOLA DE104 Laminate and Prepreg, SL 1306 N-FLZ/23	R24	fulfilled	[D18]	HL3
Elpemer 2467, ISOLA DE104 Laminate and Prepreg, Parylene HR (SCS)	R24	fulfilled	[D19]	HL3
Elpemer 2467, ISOLA DE104 Laminate and Prepreg, Parylene C (Heicks)	R24	fulfilled	[D20]	HL3
Elpemer 2467, ISOLA DE104 Laminate and	R24	fulfilled	[D21]	HL3



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Prepreg, SL 1306 N-FLZ/23				
Elpemer 2467, TECHNOLAM NP-140TL/NP-140B, Parylene C (Heicks)	R24	fulfilled	[D22]	HL3
Elpemer 2467, TECHNOLAM NP-140TL/NP-140B, SL 1306 N-FLZ/23	R24	fulfilled	[D23]	HL3
ShengYi S1000/S1000B_Parylene HR_ImagecureSMART XV501T-4	R24	fulfilled	[D24]	HL3
ShengYi S1000/S1000B_Parylene C_ImagecureSMART XV501T-4	R24	fulfilled	[D25]	HL3
ShengYi S1000/S1000B_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4	R24	fulfilled	[D26]	HL3
ShengYi S1000-H_TAIYO PSR-2000CE880E CA/25 CE96	R24	fulfilled	[D27]	HL3
ShengYi S1000-2M_TAIYO PSR-2000 ME8-160PS/CA-25E	R24	fulfilled	[D28]	HL3
ShengYi S1000H_Nanya LP-4G/K-65	R24	fulfilled	[D29]	HL3
TECHNOLAM NP-140TL/NP-140B_ELPEGUARD SL 1306 N-FLZ/23_ImagecureSMART XV501T-4	R24	fulfilled	[D30]	HL3
Panasonic R-1755C/R-1650C_SD 2444_ImagecureSMART XV501T-4	R24	fulfilled	[D31]	HL3
TECHNOLAM NPG-150N/NPG-150NB_Parylene HR_Elpemer 2469 SM-HF	R24	fulfilled	[D32]	HL3
TECHNOLAM NPG-150N/NPG-150NB_Parylene C_Elpemer 2469 SM-HF	R24	fulfilled	[D33]	HL3
TECHNOLAM NPG-150N/NPG-150NB_ELPEGUARD SL 1306 NFLZ/23_Elpemer 2469 SM-H	R24	fulfilled	[D34]	HL3
ShengYi S1141/S0401_Tayio PSR-2000MT	R24	fulfilled	[D35]	HL3
<i>EL 10 - Small electrotechnical product</i>				
Lexan 945 AU	R26	fulfilled	[D38]	HL3
PU 552 FL	R26	fulfilled	[D39]	HL3
Hgw2372.1 (EPGC202)	R26	fulfilled	[D40]	HL3
PA6/66, Badamid; Ultramid C3U	R26	fulfilled	[D41]	HL3
Xantar G4F 22 R	R26	fulfilled	[D42]	HL3
<i>4.3.3. Grouping rule 2</i>				
Xantar G4F 22 R	R24	fulfilled	[D36]	HL3
Vampamid PA6 2026 V0 DF	R24	fulfilled	[D37]	HL2
Fan housing PocanB4225	R24	fulfilled	[D43]	HL2
Fan A3X2G5	R24	fulfilled	[D44]	HL2

Material treated according to the grouping rules > 10 g but < 100 g:

- X-CPU 01: 42 g
- X-CPU 31: 14 g

- X-DI 32 01: 14 g
- X-DI 32 02:
 - Alternative 1 (with X-CB 005 01): 35 g
 - Alternative 2 (with X-CB 005 02): 48 g
 - Alternative 3 (with X-CB 005 03): 35 g
 - Alternative 4 (with X-CB 005 04): 48 g
- X-DI 32 03: 14 g
- X-DI 64 01:
 - Alternative 1 (with X-CB 006 01): 35 g
 - Alternative 2 (with X-CB 006 02): 48 g
 - Alternative 3 (with X-CB 006 03): 35 g
 - Alternative 4 (with X-CB 006 04): 48 g
- X-DO 12 01
 - Alternative 1 (with X-CB 011 01): 35 g
 - Alternative 2 (with X-CB 011 02): 60 g
 - Alternative 3 (with X-CB 011 03): 37 g
 - Alternative 4 (with X-CB 011 04): 57.5 g
- X-BASE PLATE 10 01: 18 g
- X-BASE PLATE 10 31: 18 g
- X-BASE PLATE 15 01: 18 g
- X-BASE PLATE 15 31: 18 g
- X-BASE PLATE 18 01: 18 g
- X-BASE PLATE 18 31: 18 g

The grouped combustible mass needs to be considered when integrated into the vehicle. Due to the distance between the different grouped combustible masses, no more than three connection modules "X-CB 003 01" in succession are allowed to be mounted on the "X-BASE PLATE". A connection module "X-CB 003 01" in slot 3 is not permitted.

The combustible materials used for the safety-related controller HIMax fulfil the requirements according to EN 45545-2 for HL2.

6. Plausibility check of the ignition sources

6.1. Fire development starting from the component

The maximum failure power is limited to 600 W. The theoretical ignition potential in the event of a failure, irrespective of the technical cause, is below the relevant ignition model 4 (max. 1 kW over 30 seconds) in accordance with Annex A, EN 45545-1. Due to the small amount of combustible mass, the predominantly qualified materials and the low electrical power, which is limited in time by the existing fuse, ignition and fire development in the event of an electrical failure are sufficiently prevented from "fire caused by technical defects", in accordance with EN 45545-1, Chapter 4.3. In addition, the metal housing protects against further fire spread in the unlikely event of ignition.

6.2. Fire involvement of the component by external ignition source

An external fire event, starting from a vandalism or technique fire, can affect the materials with thermal radiation (ignition models 2 and 3 according to Annex A, EN 45545-1) and additionally with direct flame or arc action (see ignition models 1 and 4 according to Annex A, EN 45545-1) and involve them in the fire. The materials have been qualified in terms of ignition prevention at low ignition power, which does not completely prevent fire involvement in major fire events. The component housing is made of non-combustible material and the combustible mass of the component is very low, which greatly limits the promotion of fire spread.



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7. Summary

As result of this assessment, the safety-related controller HIMax meets the requirements of the listed acknowledged codes of practice:

- EN 45545-2:2016 hazard levels HL1 to HL2
- EN 45545-2:2020 hazard levels HL1 to HL2

Groupings to be considered for installation in the vehicles:

- Due to the distance between the different grouped combustible masses, no more than three connection modules "X-CB 003 01" in succession are allowed to be mounted on the "X-BASE PLATE". A connection module "X-CB 003 01" in slot 3 is not permitted.
- Other groups see section 5.2.2

For regular intended operation the required level of safety for passengers and staff is ensured.

The assessment was carried out based on the documents provided by the client (see list of documents). At the time of the inspection and based on the test reports provided, the validity of the fire protection technical verification within the framework of EC conformity test procedures is confirmed until 2025-03-29 [D36].

This inspection report was written under the specified accreditation without influence of third party.

TÜV SÜD Rail GmbH, Unit Rolling Stock

Release

Author

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