INSPECTION REPORT

Fire Safety Inspection according to DIN EN 45545-2

Safety switch STP3D

Report-No.: EL99431G, Version 3.0

Scope: 13 pages

Customer:

Euchner GmbH + Co. KG

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Germany

Order Date: 2025-03-13

Project No.: 717526088 / 717531931

Inspector:

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Content Page

Revision history

Version	Date	Author	Amended sections	Amendment and reason for amendment
1.0	2022-09-27	Kangyi Xu	All	Initial
2.0	2022-11-21	Kangyi Xu	3.1; 4.2.2.; 5	description modification; grouped combustible mass
3.0	See release date	Kangyi Xu	All	New Template; update test reports; 2 small cables added in grouping

Version 3.0 replaces all previous versions.

Assessors involved in this report

Name	Activity
Kangyi Xu	Execution of inspection Preparation of inspection report
Christian Dettlaff	Review of inspection report

1. Client

Euchner GmbH + Co. KG

Kohlhammerstraße 16

70771 Leinfelden-Echterdingen

Germany

2. General

2.1. Contract

The fire safety assessment for the Euchner Safety switch STP3D was commissioned by the company Euchner GmbH + Co. KG to TÜV SÜD Rail GmbH on 2025-03-13.

The assessment was carried out in the period from 2025-03-13 to the release of this inspection report by inspection of the documents provided by the client Euchner or its subcontractors.

2.2. Regulations

This document deals with the assessment of the Euchner Safety switch STP3D in respect to compliance with the fire safety requirements according to the following acknowledged rules of technology:

Table 1: Regulations

No.	Regulations	Title
[R1]	DIN EN 45545-1: 2013-08*	Bahnanwendungen – Brandschutz in Schienenfahrzeugen – Teil 1: Allgemeine Regeln (Railway applications – Fire protection on rail vehicles – Part 1: General)
[R2]	DIN EN 45545-2: 2016-02*	Bahnanwendungen – Brandschutz in Schienenfahrzeugen – Teil 2: Anforderungen an das Brandverhalten von Materialien und Komponenten (Railway applications – Fire protection on rail vehicles – Part 2: Requirements for fire behaviour of material and components)
[R3]	DIN EN 45545-2: 2020-10*	Bahnanwendungen – Brandschutz in Schienenfahrzeugen – Teil 2: Anforderungen an das Brandverhalten von Materialien und Komponenten (Railway applications – Fire protection on rail vehicles – Part 2: Requirements for fire behaviour of material and components)
[R4]	DIN EN 45545-2: 2023-12	Bahnanwendungen – Brandschutz in Schienenfahrzeugen – Teil 2: Anforderungen an das Brandverhalten von Materialien und Komponenten (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
min.	Minimum
N/A	Not Applicable
OC	Operation category
OI	Oxygen Index

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]	Material list Type 2305	Euchner	109523	2025-05-05	–
[D2]	Device list STP3D	Euchner	20220803 Liste STP Geräte EN 45545_2.xlsx	2022-08-03	–
[D3]	Data sheet STP3D-2131B072MC2305 /C2393 /C2412	Euchner	119718	2013-09-30	4
[D4]	Classification report Wellamid 6600-PA66-GV 25 HWV0CP	Currenta	R24-0197D	2024-04-03	–
[D5]	Classification report Durethan BKV 30 FN04	Currenta	19/0872	2019-06-07	–
	Herstellererklärung	Envalior	R000028776	2024-06-14	–
[D6]	Test report cable TENUIS-TW (EN50306-4 1P) 600V 2X0.5 MM	MPA Dresden	20240135/10	2024-03-25	–
		MPA Dresden	20240135/11	2024-03-25	–
		MPA Dresden	20240135/12	2024-03-25	–
		LAPI	1510.1CI0165/20	2020-09-29	–
		LAPI	411.1CI0110/22	2022-03-15	–
		LAPI	024.1CI0110/25	2025-02-20	–
	Manufacturer declaration	H+S	20250428	2025-04-28	–
[D7]	Test report cable TENUIS-TW (EN50306-4 1P) 600V 46X2.5 MM	RISE	O100744-1246301-3	2024-03-18	–
		RISE	O100744-1246301-1	2024-03-18	–
		RISE	O100744-1246301-5	2024-03-18	–
		LAPI	1510.1CI0165/20	2020-09-29	–
		LAPI	411.1CI0110/22	2022-03-15	–
		LAPI	609.1CI0165/20	2025-02-20	–
	Manufacturer declaration	H+S	20250428	2025-04-28	–

4. Equipment under inspection

4.1. Description of equipment

The Safety switch STP3D was developed for application in rolling stock.

The safety switch is a protective device in connection with door systems. The housing material is glass fibre reinforced thermoplastic. The protection class is IP67.

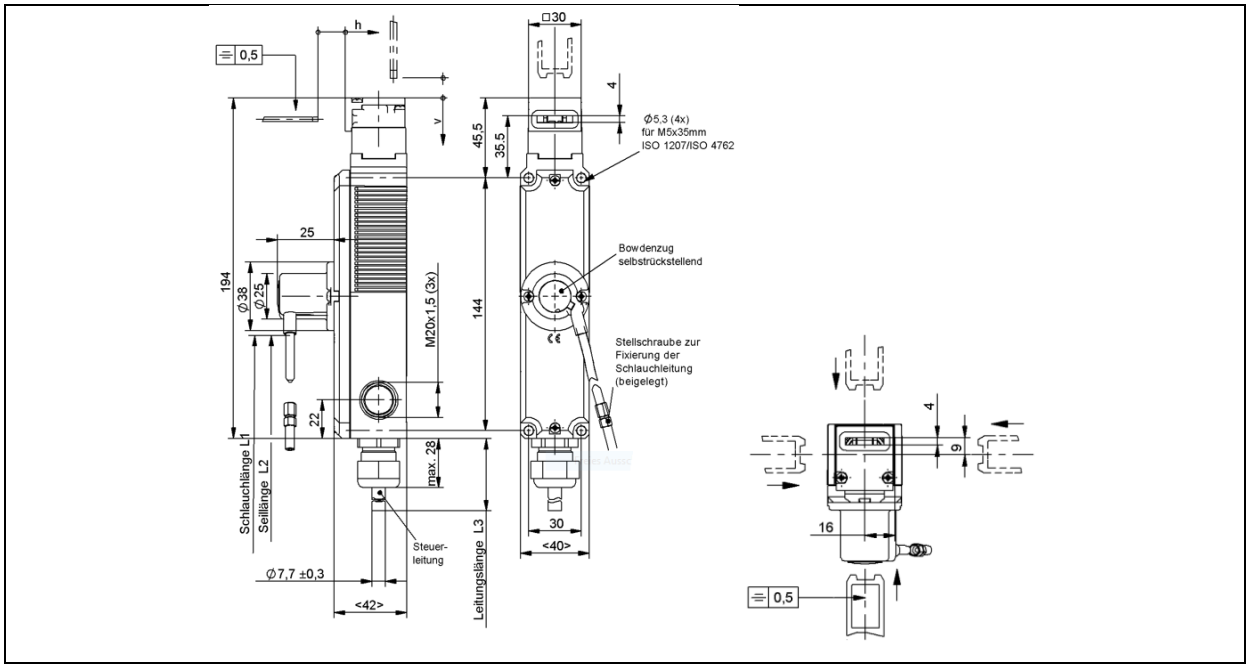

Figure 1 Safety switch STP3D – source: [D3]

The inspected system (see Figure 1) is the maximum equipped version “STP3D-2131B072MC2305” (see Table 5). Any less equipped version of this Safety switch carrying the named equipment is covered by this assessment report.

The assemblies may be retrofitted with the Bowden rope mechanism (Art.-No.: 124769, described as AE-B-A1-03, 0-F-124769). This Bowden rope is part of the maximum equipped version “STP3D-2131B072MC2305” with Art.-No. 109530.

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

Table 5: Safety switch STP3D – equipment

No.	Assembly	Description
1	098361	STP3D-2131B110MC2144
2	098581	STP3D-2131B036MC2153
3	100739	STP3D-2131B024MC2202
4	104582	STP3D-2131B036MC2249
5	104829	STP3D-2131B024MC2254
6	104830	STP3D-2131B024MC2255
7	105768	STP3D-4131C024MC2270

Table 5: Safety switch STP3D – equipment

No.	Assembly	Description
8	109591	STP3D-2131B110MC2306
9	112306	STP3D-2131B072MC2344
10	113225	STP3D-4131A024MC2270
11	115568	STP3D-2131B110MC2371
12	119683	STP3D-2131C024MC2254
13	120016	STP3D-2131B024MC2407
14	120373	STP3D-2131B036MC2411
15	124872	STP3D-2131B072MC2444

4.2. Technical data

Table 6: Safety switch STP3D - Technical data

Parameter	Data
Magnet operating voltage	72 VDC
Short circuit (control fuse)	4 A
Connected power	8.5 W

4.3. Installation Conditions

The Safety switch STP3D is intended for installation in passenger area behind a cover. It is not regularly accessible for passengers during operation.

5. Conformity assessment acc. to DIN EN 45545

5.1. Classification according to DIN EN 45545-1

The Safety switch STP3D 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 DIN 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, DIN 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, DIN EN 45545-1).

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

According to section 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 DIN 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 DIN EN 45545-2

5.2.1. Requirements

Based on the classification according to DIN 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 DIN EN 45545-2 standard. Generally, the requirement sets are listed in section 4.4 “Listed products”. The applicable requirements are the following:

Table 7: Requirement sets

No.	Name	Details	Requirement
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 (DIN EN 45545-2 section 4.3.1).

Table 8: Grouping rule 1

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

Table 9: 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		≤ 2000 g for exterior grouped products tested according to R24	Proof R24 Oxygen index

The following general rules shall be considered:

Table 10: General requirements

Section	Requirement
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) [R2] 4.2. l) [R3] [R4] 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

Table 10: General requirements

Section	Requirement
4.2. n) [R2] 4.2. m) [R3] [R4]	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 DIN EN 45545-2 Table 2 shall be considered as a non-listed product or shall be assessed using the grouping rules stipulated in DIN EN 45545-2 section 4.3. The requirements of non-listed products are the following: > 0.2 m² R1 (interior), R7 (exterior) ≤ 0.2 m² R22 (interior), R23 (exterior)
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 [R2] 5.3.7 [R3] [R4] 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 DIN EN 45545-3. Those products are considered to meet the integrity requirements.

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 housing, cover material and GKW-LW 600V cables. The relevant requirements according to DIN EN 45545-2 as well as the test results are listed in Table 11. All other combustible materials can be grouped or have a combustible mass of not more than 10 g with no touching contact with any other unclassified material and are therefore not required for verification by test.

Table 11: Listing of material testing

Material	Requirement	Result	Certificate	HL
4.3.3. Grouping rules 2 Cover - Wellamid 6600-PA66-GV25 HWV0CP Housing - Durethan BKV 30 FN04	R24	 fulfilled fulfilled	 [D4] [D5]	 HL3 HL3
EL1A – Cable interior TENUIS-TW (EN50306-4 1P) 600V	R15	 fulfilled	 [D6], [D7]	 HL3

Material treated according to the grouping rules > 10 g but ≤ 100 g for interior:

Table 12: Listing of interior groups

No.	Group name	Components / Materials	Total combustible mass
1	STP3D	Bowden rope sheath / PTFE: 10 g Housing parts / Durethan BKV30H2.0 901510: 21.2 g Parts of housing / Pocan BFN 4231 901510: 16.1 g Rest of small parts: 16.6 g Shrink hose: 0.9 g	64.8 g

The grouped combustible mass needs to be considered when integrated into the vehicle.

The combustible materials used for the Safety switch STP3D fulfil the requirements according to DIN EN 45545-2 for HL3.

6. Plausibility check of the ignition sources

6.1. Fire development starting from the component

The power is limited by fuse (4 A) to 8.5 W (see chapter 4.2). 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 and 30 seconds duration in accordance with Annex A, DIN 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 DIN EN 45545-1, Chapter 4.3.

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, DIN EN 45545-1) and additionally with direct flame or arc action (ignition models 1 and 4 according to Annex A, DIN 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 combustible mass of the component is very low, which greatly limits the promotion of fire spread.

7. Summary

As result of this assessment, the Safety switch STP3D meets the requirements of the listed acknowledged codes of practice:

- DIN EN 45545-2:2016 hazard levels HL1 to HL3
- DIN EN 45545-2:2020 hazard levels HL1 to HL3
- DIN EN 45545-2:2023 hazard levels HL1 to HL3

Groupings according to DIN EN 45545-2 section 4.3.2 to be considered for installation in the vehicles, if the distance of the grouped components from a non-qualified component is less than ≤ 20 mm horizontally and ≤ 200 mm vertically (see section 5.2.2):

- Group 1 STP3D of 64.8 g

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 (see section 5.1) is confirmed until 2027-03-15 [D6], [D7].

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