

Assessment report
Fire protection
Antennas
assessment according to
DIN 5510, NF F 16-102, BS 6853,
EN 45545-2

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Rail

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1 Standard basis

In this document the Antennas manufactured by Huber&Suhner will be evaluated in respect of conformity to the generally recognized codes of practice. The assessment is based on the following standards:

- DIN 5510-2:2009: „Preventive fire protection in railway vehicles – Part 2: Fire behaviour and fire side effects of materials and parts“
- Chapter 5.2.2 Electrical products
- NF F 16-102:1992 „Railway rolling stock fire behaviour: Material choosing, applications for rolling stock“ (France)
- BS 6853:1999 “Code of practice for fire precautions in the design and construction of passenger carrying trains” (UK)
- EN 45545-2:2013 “Railway applications – Fire protection on railway vehicles – Part 2: Requirements for fire behaviour of materials and components” (European standard)

2 Description of antennas

2.1 Construction

This document deals with evaluation of following antennas:

Antenna 1: Huber+Suhner Sencity Rail Antenna, Typ 1399.99.0026

Antenna 2: Huber+Suhner Sencity Antenna, Typ 1324.26.0049

The antennas basically consist of: antenna-device, the bottom-plate, the radome, the seal, the connecting cable and the plug. The construction combines elements made of several plastics and metallic parts. The major mass of plastic material is used for the radomes.

A list of materials is shown in the materials table /D5/ provided by the manufacturer.



The radomes are made of plastic material Gelay HRA150 (Antenna 1) and LEXAN EXL9330 (Antenna 2). The vehicle cabling is not considered in this document. The short cable (Pigtail; length 230mm) of the antenna 1399.99.0026 is not regarded as vehicle cabling.

2.2 Installation

The antennas are designed for installation inside vehicles (e.g. inside the drivers cab, technical equipment compartment or passenger compartment) as well as for external applications (e.g. on the roof). The evaluation considers both installation areas.

2.3 Material characteristics

For verification of fire safety according the standards mentioned above an evaluation of materials is required. The evaluation is based on the combustible mass of materials. Therefore all combustible materials (plastic, rubber) will be considered. Metallic materials are not combustible and therefore they will not be taken into account.

Each standard defines different requirements for combustible materials.

According to material table /D5/, the following materials are relevant for evaluation:

Antenna 1 Type 1399.99.0026	
Radome – Geloy HRA150 – mass 282 g	Oxygen index LOI = 20 %
	UL 94 classification: HB (acc. to datasheet /D6/)
Other combustible materials < 17 g	
Total mass of combustible materials 299g (see material table /D5/)	

Antenna 2 Type 1324.26.0049	
Radome – LEXAN EXL9330 – mass 84 g	Classification acc. NF F 16-101: M2 / F2, thus requirements 1, 2 and 3 fulfilled acc. NF F 16-102 (acc. Test reports /D8/ and /D9/)
	Oxygen index LOI = 35 %
	UL 94 classification: V-0 UL File No.: E45329
Other combustible materials < 10 g	
Total mass of combustible materials 86g (see material table /D5/)	

3 Basis of evaluation

The basis for the evaluation of fire safety is the classification of vehicle types where the antennas will be installed.

Following classifications are taken as basis:

- DIN 5510: Fire protection class 1-4
- NF F 16-101: vehicle category B
- BS 6853: Category Ia
- EN 45545: Hazard Level HL3

For further evaluation the exposed main material of radomes will be considered only. Due to the minor mass of the other combustible materials and the not existing fire risk (very low electrical failure power) they will not be regarded subsequently.

4 Evaluation

4.1 Evaluation according to DIN 5510 part 2 (Germany)

In the standard DIN 5510 part 2 the fire safety requirements for materials are defined. The antennas are electrical components in terms of this standard. Non metallic, combustible materials with a distance < 20 cm have to be considered as grouped.

No.	Paragraph	Requirement	Remark
1-1	5.2.2. Electrical products	General	Regards electrical products and enclosures
1-2		Components in sealed enclosure	Not applicable – no metallic enclosure
1-3		Vehicle caballing	Not applicable – no part of the antennas
1-4		Electrical small parts > 50g (accessible for passengers) and > 300g (not accessible for passengers) requirement UL 94 V-1, for smaller masses no verification required	Antenna 2 complies (LEXAN EXL9330 UL94 V-0) antenna 1 complies if not accessible for passengers (Geloy HRA150 UL94 HB)

Table 1: Requirements of DIN 5510-2

Result:

In the case that the Antenna 1 (material Geloy) is not accessible for passengers, the requirements for internal and external installation are met.

The antenna 2 (material LEXAN) complies with the requirements for internal and external installation.

4.2 Evaluation according to NF F 16-102 (France)

In this standard the fire safety requirements for materials of electrical and electronic devices are defined based on the installation location. Non metallic, combustible materials with a horizontal distance < 10 mm and a vertical distance < 20 mm have to be considered as grouped.

No.	Paragraph	Requirement	Remark
2-1	6.1 External installation	Mass < 300 g no requirements regardless of vehicle category	Both antennas comply
		Mass > 300 g requirement 2 for all vehicle categories	For both antennas requirements are not applicable (note: LEXAN complies with requirement 2 M2 / F2 Geloy not complies)
2-2	6.2.1 Internal installation inside technical equipment compartment	Mass < 300 g no requirements regardless of vehicle category	Both antennas comply
		mass > 300 g requirement 2 for all vehicle categories	For both antennas requirements are not applicable (note: LEXAN complies with requirement 2 M2 / F2 Geloy not complies)
2-3	6.2.2 Internal installation inside passengers or staff compartment	Mass < 10 g no requirements regardless of vehicle category	For both antennas not applicable
		Mass between 10 g and 100 g requirement 2 for all vehicle categories	Requirements are not applicable for antenna 1 (Geloy > 100g) Antenna 2 complies (LEXAN → M2 / F2)
		Mass > 100 g requirement 3 for all vehicle categories	Antenna 1 (Geloy) does not comply Requirements are not applicable for antenna 2

Table 2: Requirements acc. to NF F 16-102

Result:

The antenna 1 (material Geloy) complies with the requirements for external installation and internal installation inside of technical equipment compartment. For internal installation inside passengers or staff compartment antenna 1 doesn't comply with the requirements.

The antenna 2 (material LEXAN) complies with the requirements for internal and external installation.

4.3 Evaluation according to BS 6853 (UK)

In this standard the fire safety requirements for materials of electrical and electronic devices are defined based on the installation location.

Non metallic, combustible materials with a horizontal distance < 20 cm and a vertical distance < 50 cm have to be considered as grouped.

No.	Paragraph	Requirement	Remark
3-1	6.1 General – external installation	Mass < 400 g no requirements regardless of vehicle category	Both antennas comply
3-2	6.1 General – internal installation	Mass < 100 g no requirements regardless of vehicle category	Requirements are not applicable for antenna 1 (Geloy > 100g) Antenna 2 complies
		Mass 100 g to 500 g Oxygen index 34 % Smoke density A0 Toxicity R-value	Antenna 1 (Geloy > 100 g) does not comply Requirements are not applicable for antenna 2 (LEXAN < 100g)

Table 3: Requirements acc. to BS 6853

Result:

The antenna 1 (material Geloy) complies with the requirements for external installation. For internal installation antenna 1 doesn't comply with the requirements.

The antenna 2 (material LEXAN) complies with the requirements for internal and external installation.

4.4 Evaluation according to EN 45545-2 (EU)

In this standard the fire safety requirements for materials of electrical and electronic devices are defined based on the installation location.

Based on the classification acc. to EN 45545-1, the materials/components shall meet the requirements of Hazard Level HL3. Considering the low mass of combustible material of the antennas, EN 45545-2 chapter 4.2 f) "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" is applicable.

Therefore the requirements of chapter 4.3 "Grouping rules" will be assessed.

Main applicable grouping rules:

- No requirements apply to products with a combustible mass of < 10 g not in touching contact with another unclassified product.
- the horizontal distance to a product non compliant to Table 2 is < 20 mm or the vertical distance to a product non compliant to Table 2 is < 200 mm.

No.	Clause	Requirement	Remark
4-1	4.3.2. Grouping rule 1 Products without requirements	< 100 g for interior grouped products	Requirements are not applicable for antenna 1 (Geloy > 100g) Antenna 2 complies
4-2		< 400 g for exterior grouped products	Both antennas comply

Table 4: Grouping rule1

No.	Clause	Requirement	Remark
5-1	4.3.3. Grouping rule 2 Products tested acc. to R24 Oxygen Index > 32%	< 500 g for interior grouped products tested acc. to R24	Antenna 1 (Geloy OI 20%) does not comply Antenna 2 (LEXAN → OI 35%) complies
5-2		< 2000 g for exterior grouped products tested acc. to R24	Antenna 1 (Geloy OI 20%) does not comply Antenna 2 (LEXAN → OI 35%) complies

Table 5: Grouping rule2

Alternatively, the requirement set EL10 acc. to clause 4.4 Table 2 “Listed products” is applicable for antennas:

- EL10 Small electro-technical products [Requirement R26: EN 60695-11-10 vertical small flame test V-0 (identical with UL94)] (Antenna 2 complies UL 94 V-0)

Result:

The antenna 1 (material Geloy) complies with the requirements for external installation. For internal installation antenna 1 doesn't comply with the requirements.

The antenna 2 (material LEXAN) complies with the requirements for internal and external installation.

5 Summary

The antenna 1 (Huber+Suhner Sencity Rail Antenna Type 1399.99.0026) is permitted to be installed externally and inside the technical equipment compartment of rolling stock without restrictions (apart from requirements acc. to EN 45545-2: external application is permitted only). In these locations it complies with all requirements of evaluated standards for every vehicle classification.

For fire safety purposes the antenna 2 (Huber+Suhner Sencity Antenna Type 1324.26.0049) is permitted to be installed without restrictions for all internal and external applications in rolling stock.

The antenna 2 meets all relevant requirements of evaluated standards for every vehicle classification.

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6 Documents

Ref.-Nr.	Document	Originator
/D1/	Datasheet description antenna 1399.99.0026	Huber & Suhner
/D2/	Drawing antenna 1399.99.0026	Huber & Suhner
/D3/	Datasheet description antenna 1326.26.0049	Huber & Suhner
/D4/	Drawing antenna 1326.26.0049	Huber & Suhner
/D5/	Table of materials	Huber & Suhner
/D6/	Datasheet Geloy HRA 150	SABIC
/D7/	Datasheet t Lexan EXL9330	SABIC
/D8/	Test report Lexan EXL9330, M-classification	SNPE
/D9/	Test report Lexan EXL9330, F- classification	SNPE

Table 6: document table