Smart Products Service Co.,Ltd
1622 Deying Mansion, No.118 Middle Jiangdong Rd
Nanjing, Jiangsu Province, China
☎ +86-25-86583475 firetest
✉ info@fire-test.com www.fire-test.com

Applicant: EASCO ELECTRICAL (JIANGSU) CO.,LTD.

Address: No. 88 Chaoyang Road, Huiping Town, Qidong City, Jiangsu Province

Testing Sample: Low Smoke Halogen Free Wiring Ducts Product, Trade: EASCO, Material: PC+ABS, Color: All color

Standard: EN 45545-2:2020 R22 & R23

Testing Lab: TUV (the lab is accredited by ilac-MRA and ISO 17025:2017, CNAS L6069)

Date of Issue: 2024-09-27

Test Data:

Test Items	Certificate & Customer ID code	Results	EN 45545-2 R22 HL3 Requirements	EN 45545-2 R23 HL3 Requirements
EN ISO 4589-2 Oxygen index test	TC.24.09.004261 (Customer ID code: 3976)	OI = 35.3%	OI ≥ 32%	OI ≥ 32%
EN ISO 5659-2 Smoke density test		D_S max = 46.0	D_S max≤150	D_S max≤300
EN 17084 Method 2 Toxicity test		CIT_{NLP} = 0.33	CIT_{NLP}≤0.75	CIT_{NLP}≤1.5

Conclusion: the above test results indicate to meet with the requirements of EN 45545-2:2020 R22 & R23 HL1, HL2 and HL3.

Certificate search:

1. Click www.fire-test.com (English)
2. Select “Search for Certification”
   a. Fill the Certificate ID Code (TC.24.09.004261) and Customer ID Code (3976)
   b. Fill the Certificate ID Code (TC.24.09.004261) and applicant name (EASCO ELECTRICAL (JIANGSU) CO.,LTD.)
3. Submit with confirmation, you may get the search information.

Scan for information
TC.24.09.004261

Value-added services:

WeChat Official Accounts

You can scan the QR code below to follow our WeChat Official/Public Accounts to learn more about the relevant standards and regulations for fire retardant testing of rail transit vehicles or building materials, moreover, and you can also ask for supporting, search for report or certificate information, standards sharing and downloads on the WeChat Official/Public Accounts. Join us!

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EN 45545-2:2020 R22&R23

EN 45545-2:2020 Test Standard Brief

EN 45545-2:2020 Railway applications-Fire protection on railway vehicles Part 2: Requirements for fire behaviour of materials and component

EN 45545-2:2020 has been prepared by Technical Committee CEN/TS 256 “Railway applications” This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2021, and conflicting national standards shall be withdrawn at the latest by February 2021. EN 45545-2:2020 supersedes EN 45545-2:2013+A1:2015.

BS EN 45545-2:2020

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 45545-2

August 2020

ICS 13.220.20; 45.060.01

Supersedes EN 45545-2:2013+A1:2015

English Version

Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components

Applications ferroviaires - Protection contre les incendies dans les véhicules ferroviaires - Partie 2: Exigences du comportement au feu des matériaux et des composants

Bahnanwendungen - Brandschutz in Schienenfahrzeugen - Teil 2: Anforderungen an das Brandverhalten von Materialien und Komponenten

This European Standard was approved by CEN on 22 June 2020.

EN 45545-2:2020 Classification: R1~R28

EN 45545-2:2020 supersedes EN 45545-2:2013+A1:2015, and the latest standard of EN 45545-2:2020 will be divided into **28 categories** (**R1-R28**) according to the final use of vehicle materials, and R27 and R28 are added. The details are as follows:
R27 light diffuser and display cover and R28 floor composite (including floor substrate and floor covering).

According to the EN 45545-2:2013+A1:2015 standard, the test is divided into **26 categories (R1-R26)** according to the end use of vehicle materials.

EN 45545-2 R22 contain material

1. Interior seals
2. Cable containment (linear product)
3. Supply line system and high power devices - Interior
4. Choke and coils - Interior
5. Hoses - Interior
6. **Exposed area ≤0.20m^2, interior**

EN 45545-2 R23 contain material:

1. Exterior seals
2. Cable containment (linear product)
3. Supply line system devices - Exterior
4. Supply line system and high power devices - Exterior
5. Choke and coils - Exterior
6. Hoses-exterior
7. **Exposed area ≤0.20m^2, exterior**

EN45545-2 R22/R23 Test item

EN ISO 4589-2: Oxygen index testing

EN ISO 5659-2: Smoke density testing

EN 17084: Toxicity testing

EN 45545-2 R22 for test method and requirement

requirement set (used for)	Test method ref.	Parameter and unit	Maximum or Minimum	HL1	HL2	HL3
EN45545-2 R22 (IN16;EL2; EL6A;EL7A;M2)	T01 EN ISO 4589-2 OI	Oxygen content %	Minimum	28	28	32
	T10.03 EN ISO 5659-2 25KW/M^2	Ds max. Dimensionless	Maximum	600	300	150
	T12 EN 17084 Method 2 600℃ or T11.02 EN 17084 Method 1 25 kw/m^2	CIT_{NLP} dimensionless or CIT_G dimensionless	Maximum	1.2	0.9	0.75

EN 45545-2 R23 for test method and requirement

requirement set (used for)	Test method ref.	Parameter and unit	Maximum or Minimum	HL1	HL2	HL3
EN45545-2 R23 (IN12;EL2; EL5;EL6B; EL7B;M3)	T01 EN ISO 4589-2 OI	Oxygen content %	Minimum	28	28	32
	T10.03 EN ISO 5659-2 25KW/M^2	Ds max. Dimensionless	Maximum	-	600	300
	T12 EN 17084 Method 2 600℃ or T11.02 EN 17084 Method 1 25 kw/m^2	CIT_{NLP} dimensionless or CIT_G dimensionless	Maximum	-	1.8	1.5

(1) EN ISO 4589-2 Oxygen index testing

EN ISO 4589-2:2006 Plastics-Determination of burning behaviour by oxygen index-Part 2: Ambient-temperature test

Oxygen index

The minimum concentration of oxygen, by volume percentage, in a mixture of oxygen and nitrogen introduced at (23±2)℃ that will just support combustion of material under specified test conditions.

EN ISO 4589-2 test principle:

A small test specimen is supported vertically in a mixture of oxygen and nitrogen flowing upwards through a transparent chimney. The upper end of the specimen is ignited and the subsequent burning behaviour of the specimen is observed to compare the period for which burning continues, or the length of specimen burnt which specified limits for such burning. By testing a series of specimens in different oxygen concentrations, the minimum oxygen concentration is estimated.

Alternatively, for comparison with a specified minimum oxygen index value, three test specimens are tested using the relevant oxygen concentration, at least two of which are required to extinguish before any relevant burning criterion is exceeded.

EN45545-2 R22&R23 Oxygen index test data requirements:

According oxygen index test to evaluate the smoke density value (different risk levels on the data requirements will be different)

(2)EN ISO 5659-2 smoke density test

Conditioning

Before preparing the specimens for test, they shall be conditioned to constant mass at 23℃±2℃ and (50±10)% RH,24h.

Test Methods

Smoke density (Ds) test method in accordance with EN ISO 5659-2 standards. Sample in a sealed furnace test, samples were carried out smoke density at **25kw/m^2**. Record the first 1.5 minutes, the first four minutes of smoke density data and the entire test period maximum smoke density data. The test time is 20 minutes.

EN45545-2 R22/R23 smoke density test data requirements:

According Ds (max) to evaluate the smoke density value (different risk levels on the data requirements will be different)

(3) EN 17084 Method 2 &NFX70-100-1/-2 toxicity testing

Conditioning

Before preparing the specimens for test, they shall be conditioned to constant mass at 23℃±2℃ and (50±10)% RH,24h.

The test is conducted within a tube furnace where the temperature is **600°C**. The collection / measurement of toxic fumes takes place throughout the 40 minute test duration. The testing for each gas is carried out in triplicate. Through the CO_2, CO, HF, HCl, HCN, NO_2, SO_2, HBr gas collection to analyze the eight toxicity.

Calculate the Index of Toxic Fume CIT_{NLP}

$$CIT_{NLP} = \sum_{i=1}^{i=8} \frac{Y_i}{C_i}$$

Where:

Yi is the yield of the i^{th} gas in mgg^{-1} in the tube furnace;

Ci is the reference concentration of the i^{th} gas in mg/m^3

Gas	Reference concentration; mg/m^3
Carbon Dioxide (CO_2)	72000
Carbon Monoxide (CO)	1380
Hydrogen Fluoride (HF)	25
Hydrogen Chloride (HCl)	75
Hydrogen Bromide (HBr)	99
Hydrogen Cyanide (HCN)	55
Nitrogen Oxides (NO_2)	38
Sulphur Dioxide (SO_2)	262

EN45545-2 R22/R23 toxicity test data requirements:

According to CIT toxicity index to assess (on the data requirements of different risk levels will vary)

Hazard level classification

Fire hazard levels (HL1 to HL3) have been determined using a product of the relation between operation categories and design categories defined in EN 45545-1.

Hazard level classification

	Design category			
Operation category	N: Standard Vehicles	A: Vehicles forming part of an automatic train having no emergency trained staff on board	D: Double decked vehicle	S: Sleeping and couchette vehicles
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

Design categories

All vehicles are classified due to their design as follows:

-A: Vehicles forming part of an automatic train having no emergency trained staff on board;

-D: double decked vehicles;

-S: Sleeping and couchette vehicles;

-N: Standard Vehicles

Operation category

Operation category 1:

Vehicles for operation on infrastructure where railway vehicles may be stopped with minimum delay, and where a safe area can always be reached immediately.

Operation category 2:

Vehicles for operation on underground sections, tunnels and/or elevated structures, with side evacuation available and where there are stations or rescue stations that offer a place of safely to passengers, reachable within a short running time.

Operation category 3:

Vehicles for operation on underground sections, tunnels and/or elevated structures, with side evacuation available and where there are stations or rescue stations that offer a place of safely to passengers, reachable within a long running time.

Operation category 4:

Vehicles for operation on underground sections, tunnels and/or elevated structures, without side evacuation available and where there are stations or rescue stations that offer a place of safely to passengers, reachable within a short running time.

Test Report

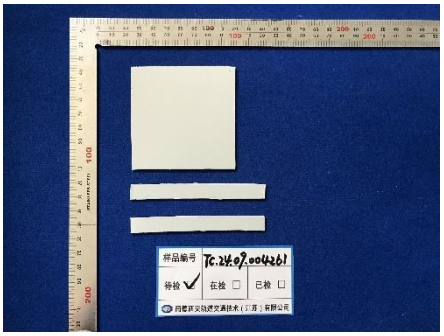
Report No. TC.24.09.004261

Date of Issue 09/27/2024

Applicant: **EASCO ELECTRICAL (JIANGSU) CO.,LTD.**

Applicant address: **No. 88 Chaoyang Road, Huiping Town, Qidong City, Jiangsu Province**

Description of the test subject:

Sample	Description	Photo
001	Sample Description: Low Smoke Halogen Free Wiring Ducts Product Color: All color Trade: EASCO Material: PC+ABS	

Receipt Date of Sample: **09/19/2024**

Date of Testing: **From 09/19/2024 to 09/25/2024**

Sample Submitted: **The sample(s) was (were) submitted by applicant and identified.**

Conclusion:

Test Items			R22			R23		
No.	Items	Standard	HL1	HL2	HL3	HL1	HL2	HL3
1	Oxygen index	EN 45545-2:2020 EN ISO 4589-2:2017	Pass	Pass	Pass	Pass	Pass	Pass
2	Density of smoke	EN 45545-2:2020 EN ISO 5659-2:2017	Pass	Pass	Pass	*	Pass	Pass
3	Toxicity index	EN 45545-2:2020 EN 17084:2018	Pass	Pass	Pass	*	Pass	Pass

Remark: *=Standards are not required.

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Test Report

Report No. TC.24.09.004261

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Test Results

EN 45545-2:2020 Railway applications-Fire protection on railway vehicles Part 2: Requirements for fire behaviour of materials and components

1. EN ISO 4589-2:2017 Plastics—determination of burning behavior by oxygen index Part 2: Ambient temperature test

1.1 Sample details

Specimen size	95mm×10mm
Thickness	About 2.0 mm

Precondition	Temperature	Relative humidity	Duration
	(23±2)°C	(50±5)%R.H.	≥24h

1.2 Test result

Section 1： Determination of oxygen concentration for one pair of "X" and "O" responses at ≤ 1 % (V/V) O_2 concentration interval

Oxygen concentration, % (V/V)	25.0	35.0	45.0	40.0	37.0	36.0			
Length burn, mm	<50	<50	>50	>50	>50	>50			
Response ("X" or "O")	O	O	X	X	X	X			

Oxygen concentration of the "O" response for the pair = 35.0 % (V/V)

(This is the concentration to be used again for the first measurement in section 2)

Section 2: Determination of oxygen index：Step size to be used for successive changes d in oxygen concentration = 0.2 % (V/V)

	N_T series measurements									
	N_L series measurements									c_f
Oxygen concentration, % (V/V)	35.0	35.2	35.4			35.4	35.2	35.4	35.6	35.4
Length burn, mm	<50	<50	>50			>50	<50	<50	>50	>50
Response ("X" or "O")	O	O	X			X	O	O	X	X
k value	k=-0.14									

OI= c_f + kd ：

OI= c_f + kd = 35.3 %

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k of oxygen index as following table

1	2	3	4	5	6
Responses for the last five measurements	Previous measurement of k				
	O	O O	O O O	O O O O	
X O O O O	-0.55	-0.55	-0.55	-0.55	O X X X X
X O O O X	-1.25	-1.25	-1.25	-1.25	O X X X O
X O O X O	0.37	0.38	0.38	0.38	O X X O X
X O O X X	-0.17	-0.14	-0.14	-0.14	O X X O O
X O X O O	0.02	0.04	0.04	0.04	O X O X X
X O X O X	-0.50	-0.46	-0.45	-0.45	O X O X O
X O X X O	1.17	1.24	1.25	1.25	O X O O X
X O X X X	0.61	0.73	0.76	0.76	O X O O O
X X O O O	-0.30	-0.27	-0.26	-0.26	O O X X X
X X O O X	-0.83	-0.76	-0.75	-0.75	O O X X O
X X O X O	0.83	0.94	0.95	0.95	O O X O X
X X O X X	0.30	0.46	0.50	0.50	O O X O O
X X X O O	0.50	0.65	0.68	0.68	O O O X X
X X X O X	-0.04	0.19	0.24	0.25	O O O X O
X X X X O	1.60	1.92	2.00	2.01	O O O O X
X X X X X	0.89	1.33	1.47	1.50	O O O O O
	Previous measurement of k				
	X	X X	X X X	X X X X	Responses for the last five measurements
	k of column 6 in above table, the symbol instead, mean OI=c_f-kd (see 9.1)				

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Test Report

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Date of Issue 09/27/2024

2. EN ISO 5659-2:2017 Plastics — Smoke generation —Part 2: Determination of optical density by a single-chamber test

2.1 Sample details

Specimen size	75 mm×75 mm
Thickness	About 2.0 mm

Precondition	Temperature	Humidity	Duration
	(23±2)°C	(50±5)%R.H.	≥24h

2.2 Test results

Test mode	The heat flux was 25 kW/m^2 with pilot flame

Parameter	Specimens			Average
	1	2	3	
Ds(1.5)	1.8	2.3	1.9	2.0
Ds(4)	15.9	14.0	10.8	13.6
Ds(10)	57.0	40.7	40.4	46.0
Ds(max)	57.0	40.7	40.4	46.0
VOF4	21.9	21.2	16.0	19.7
T(Ds max), s	600	600	600	600

Note:

Ds(n): Specific optical density of smoke where n is the elapsed time since the start of testing in minutes.

VOF4: VOF4 = $[Ds(1) + Ds(2) + Ds(3) + \frac{Ds(4)}{2}] \times 1min$

Ds(max): For each specimen, produce a graph of light transmission against time and determine the minimum percentage transmission T_{min}. Covert T_{min} to the maximum specific density D_{smax} by calculation to two significant figures using the following equation. $Dsmax = 132\log 10\frac{100}{Tmin}$ Test duration is 10min.

T (Ds max): The time of the start of test at which the Ds(max) was made.

Conclusion:

Ds(max)	46.0

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Date of Issue 09/27/2024

3. EN 17084:2018 Railway applications- Fire protection in railway vehicles- Toxicity test of materials and components-Method 2

3.1 Sample details

Weight	S1: 1.0029 g; S2: 1.0041 g; S3: 1.0015 g

Precondition	Temperature	Humidity	Duration
	(23±2)°C	(50±5)%R.H.	≥24h

3.2 Test results

Gas	Unit	MDL	S 1	S 2	S 3	Average
Carbon Dioxide (CO_2)	%	0.004	1.68	1.75	1.71	1.71
Carbon Monoxide (CO)	ppm	5	7309.0	7012.0	6955.0	7092.0
Hydrogen Fluoride (HF)	ppm	0.05	0.3	0.3	0.3	0.3
Hydrogen Chloride (HCl)	ppm	0.05	1.8	1.9	1.9	1.9
Hydrogen Bromide (HBr)	ppm	0.1	ND	ND	ND	ND
Hydrogen Cyanide (HCN)	ppm	0.3	1.8	1.7	1.7	1.7
Nitrogen Dioxide (NO_2)	ppm	0.5	4.0	5.0	5.0	4.7
Sulphur Dioxide (SO_2)	ppm	0.1	0.6	0.6	0.6	0.6

Note: Where ND indicates Non-detected.
Where MDL indicates Method Detection Limit.

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Calculate the Index of Toxic Fume CIT_{NLP}

$$CIT_{NLP} = \sum_{i=1}^{i=8} \frac{Y_i}{C_i}$$

Where:

Yi is the yield of the i^{th} gas in mgg^{-1} in the tube furnace;

Ci is the reference concentration of the i^{th} gas in mg/m^3,see table 2

Table 2

Gas	Reference concentration; mg/m^3
Carbon Dioxide (CO_2)	72000
Carbon Monoxide (CO)	1380
Hydrogen Fluoride (HF)	25
Hydrogen Chloride (HCl)	75
Hydrogen Bromide (HBr)	99
Hydrogen Cyanide (HCN)	55
Nitrogen Oxides (NO_2)	38
Sulphur Dioxide (SO_2)	262

Result:

CIT_{NLP}	0.33

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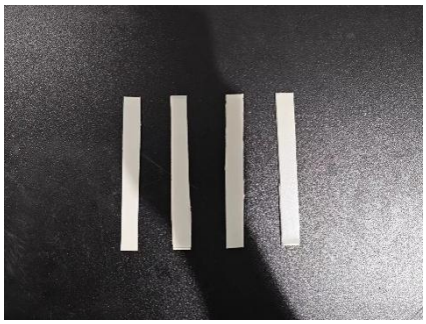
Requirement of EN 45545-2:2020 R22 & R23:

Items	Vehicle category(R22)			Vehicle category(R23)		
	HL1	HL2	HL3	HL1	HL2	HL3
OI%(min)	28	28	32	28	28	32
Ds max(max)	600	300	150	*	600	300
CIT_{NLP} (max)	1.2	0.9	0.75	*	1.8	1.5

Conclusion:

Items	Record	Vehicle category(R22)			Vehicle category(R23)		
		HL1	HL2	HL3	HL1	HL2	HL3
OI%	35.3	Pass	Pass	Pass	Pass	Pass	Pass
Ds(max)	46.0	Pass	Pass	Pass	*	Pass	Pass
CIT_{NLP}	0.33	Pass	Pass	Pass	*	Pass	Pass

Test photos:



Before test- EN ISO 4589-2

During test- EN ISO 4589-2

After test- EN ISO 4589-2

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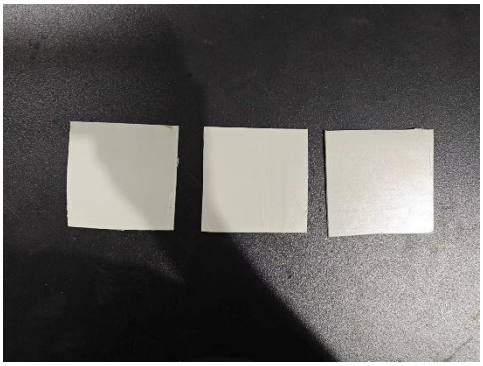
Date of Issue **09/27/2024**

	
Before test- EN ISO 5659-2	After test- EN ISO 5659-2

Statement：The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to the sole criterion for assessing the potential smoke and toxicity hazard of the product in use.

TÜV SÜD SW Rail Transportation Technology (Jiangsu) Co., Ltd.

Prepared by:

Shijun Luan

Approved by:

Wayne Wang

-End of Report-

Laboratory:
TÜV SÜD SW Rail Transportation Technology (Jiangsu) Co., Ltd.

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