

# **Declaration of Compliance with EN 45545-2 for Model “TRM-1610M” and “TRM-1610S”**

**Document Number: 200327**

**Date Issued: 2020-06-17**

**Reported by**

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## 1. Objective

To declare the compliance with EN 45545-2 for a product designed by **HANWHA TECHWIN CO., LTD.**

## 2. Reference Standard

**EN 45545-1** – Railway applications. Fire protection on railway vehicles. General

**EN 45545-2** – Railway applications. Fire protection on railway vehicles. Requirements for fire behaviour of materials and components

**EN 60695-2-11** – Fire hazard testing. Glowing/hot-wire based test methods. Glow-wire flammability test method for end-products (GWEPT)

**ISO 5658-2** – Reaction to fire tests — Spread of flame — Part 2: Lateral spread on building and transport products in vertical configuration

**ISO 5660-1** – Reaction-to-fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (cone calorimeter method) and smoke production rate (dynamic measurement)

**ISO 5659-2** – Plastics — Smoke generation — Part 2: Determination of optical density by a single-chamber test

**ISO 4589-2** – Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test

## 3. Product Information

The products under assessment are Network Video Recorders designated **“TRM-1610M”** and **“TRM-1610S”**. This product is made by **HANWHA TECHWIN CO., LTD.**

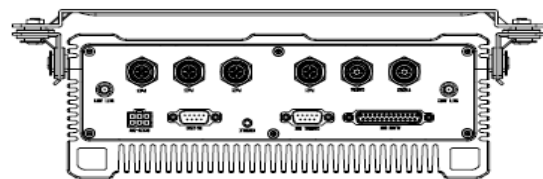
These products are developed and designed for application in rolling stock. The enclosure (top and bottom cover) is made of aluminum parts. The products contain the functional components including printed circuit boards, and other miscellaneous materials inside the enclosure.

The overall dimension of the products is **325.83 x 315.2mm with 115.7mm height**. The total mass of **“TRM-1610M”** and **“TRM-1610S”** is **8,456.5g** and **8,514.5g** respectively.

These products will be installed inside rolling stocks. The outer face will be exposed to a passenger area. While multiple number of the products can be used in one vehicle, each product will be installed separately.

The diagram of **“TRM-1610M”** and **“TRM-1610S”** is shown in **Figure 1-1** and **Figure 1-2** respectively. The breakdown structure of the products with the part list is shown in **Figure 2-1** and **Figure 2-2** respectively. The part list with the information of each mass is shown in **Table 1-1** and **Table 1-2** respectively. The difference between each model name is the connector type on the rear part.

In addition, **“TRM-1610M”** and **“TRM-1610S”** may be used with a controller designated **“TRM CONTROL BOX”** as an option. The overall dimension of the products is **118 x 75.1mm with 29.2mm height**. The total mass is **212g**. The diagram, breakdown structure and part list are shown in **Figure 3**, **Figure 4** and **Table 2** respectively.



TRM-1610M  
UNIT : mm[inch]

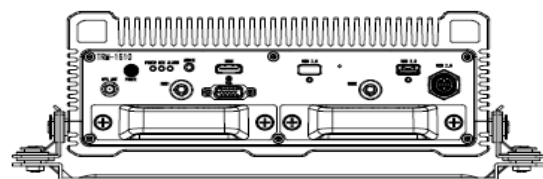
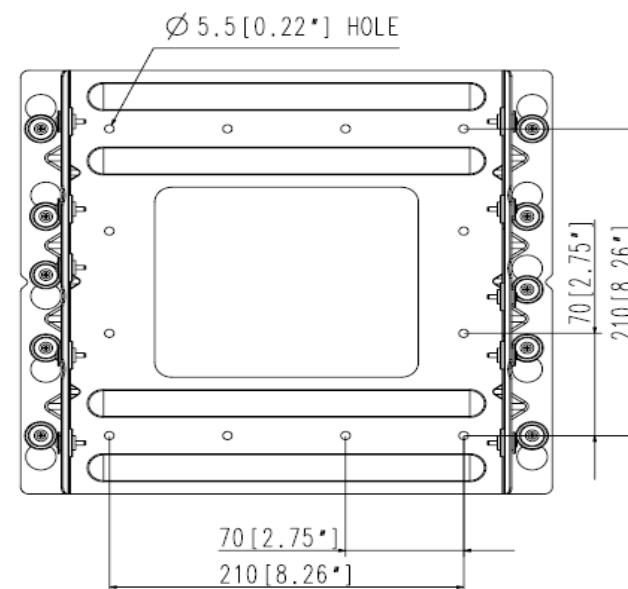
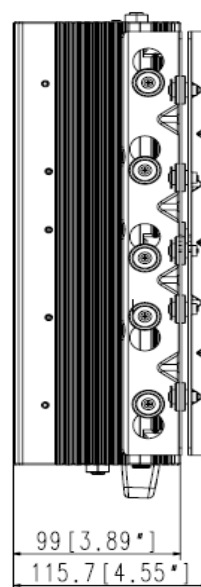
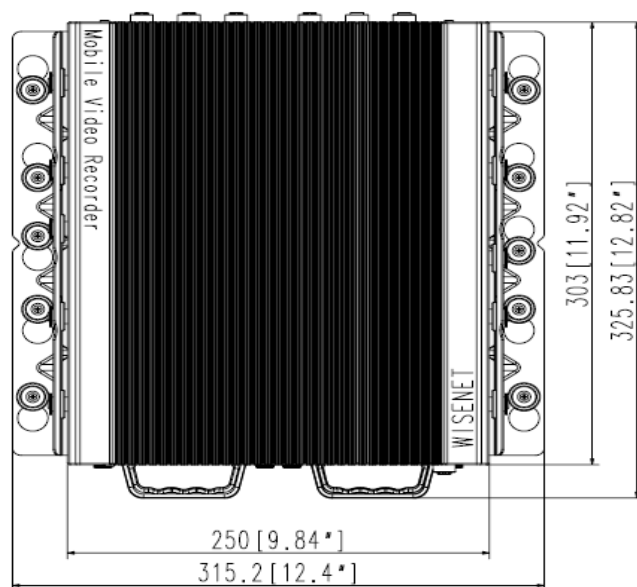
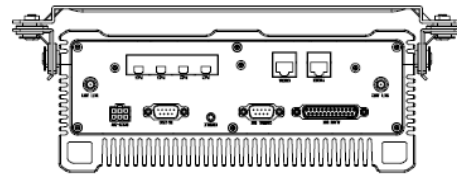


Figure 1-1: Diagram of "TRM-1610M"



TRM-1610S  
UNIT : mm[inch]

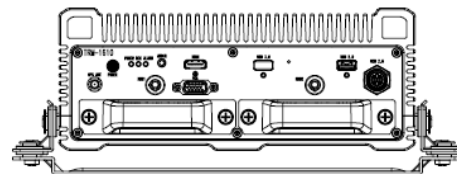
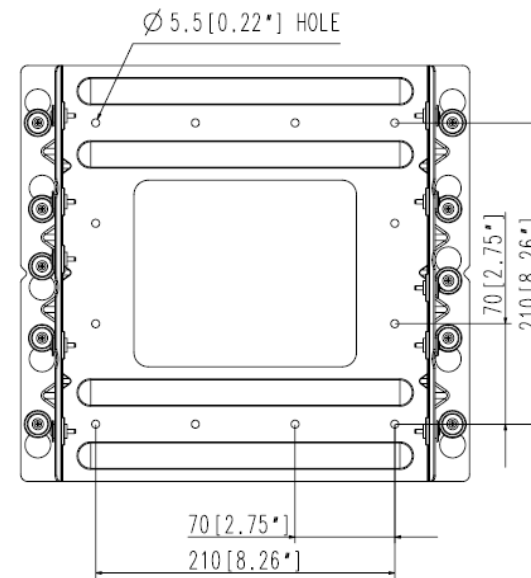
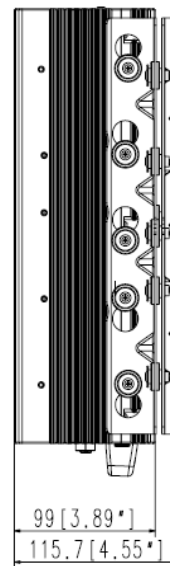
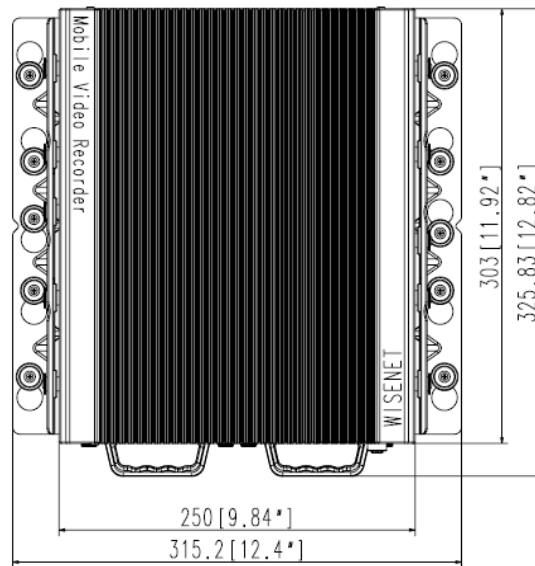


Figure 1-2: Diagram of "TRM-1610S"

1	AM07-010698A	ASSY-SET-BRKT
2	FC29-009490A	CASE--BOTTOM_1610S;AL
3	FC09-008542A	BRACKET--HEATER-HDD_1610S;SECC
4	FC28-0000556A	PAD-THERMAL,W30,D45,T2;GP1500,2
5	AM06-007409A	ASSY,PCB-TRM-1610S SATA PBA
6	AM07-010666A	ASSY,CASE-HDD_TRM-1610S
7	FC15-005838A	COVER--FRONT_1610S;SECC,-
8	FC09-008543A	BRACKET--HEATER-MAIN_1610S;SECC
9	AM07-010646A	ASSY,REAR-TRM-1610M
10	FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2
11	AM06-007406A	ASSY,PCB-TRM-1610S MAIN PBA
12	FC29-009489A	CASE--TOP_1610S;AL
13	EP07-001232A	+HEATER,ELECTRIC-TRM-1610S;F,12V,18W
14	EP07-001233A	+HEATER,ELECTRIC-TRM-1610S;F,12V,36W
15	FC29-003338A	LOCK-SRN-4000
S2	FC18-001331A	SCREW MACHINE
C1	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM
C2	EP02-001146	HARNESS-TRM-1610S;WIRE,30PIN,130MM
C3	EP02-001151	HARNESS-TRM-1610S;WIRE,19P,205MM
C4	EP02-003655A	CABLE-SATA DATA;SRD-1685;1
*C5	EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA
*C6	EP17-001008	ANTENNA,RADAR-ACA-0120-6G0C1-A13-FM;SMA
*C7	EP17-001009	ANTENNA,RADAR-ACA-0100-6G0C1-A31-FM;CODE
*C8	EP02-001147	HARNESS-TRM-1610S;WIRE,4P,50MM

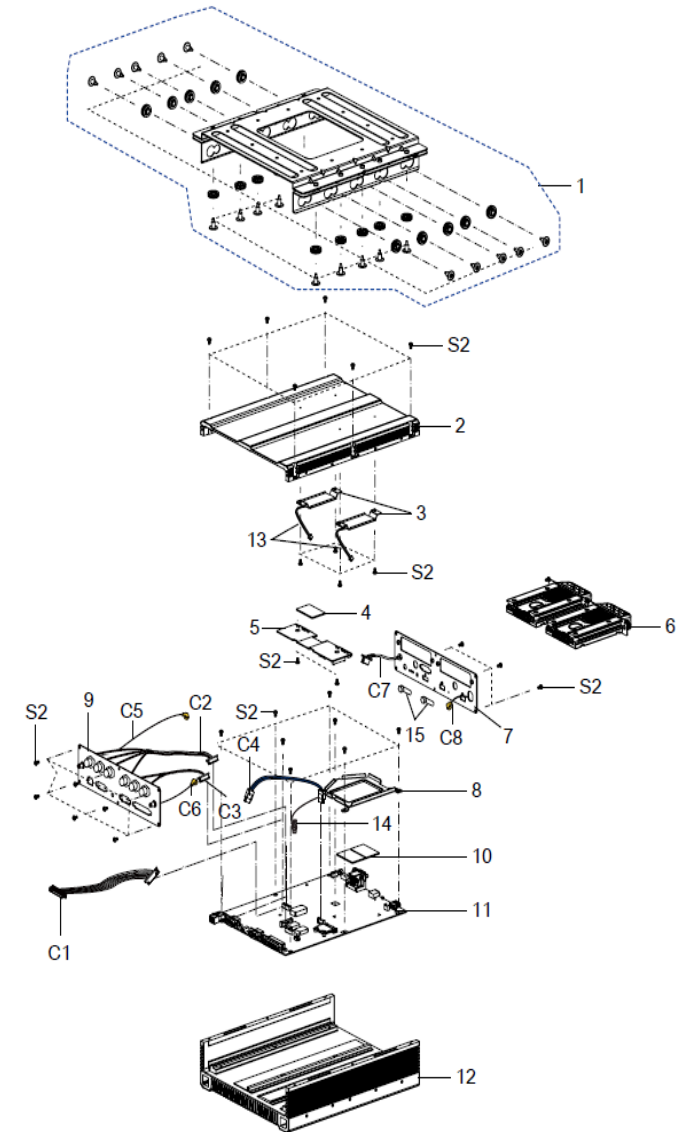


Figure 2-1: Breakdown Structure of “TRM-1610M” with Part List

1	AM07-010698A	ASSY-SET-BRKT
2	삭제	
3	FC29-009490A	CASE--BOTTOM_1610S;AL
4	FC09-008542A	BRACKET--HEATER-HDD_1610S;SECC
5	FC28-0000556A	PAD-THERMAL,W30,D45,T2;GP1500,2
6	AM06-007409A	ASSY,PCB-TRM-1610S SATA PBA
7	AM07-010666A	ASSY,CASE-HDD_TRM-1610S
8	FC15-005838A	COVER--FRONT_1610S;SECC,-
9	FC09-008543A	BRACKET--HEATER-MAIN_1610S;SECC
10	AM06-007407A	ASSY,PCB-TRM-1610S REAR PBA
11	FC15-005839A	COVER--REAR-RJ45-1610S;SECC,-
12	FC28-0000556A	PAD-THERMAL,W30,D45,T2;GP1500,2
13	AM06-007406A	AM06-007406A
14	FC29-009489A	CASE--TOP_1610S;AL
15	FC10-001110A	DAMPER_1610S
16	EP07-001232A	+HEATER,ELECTRIC-TRM-1610S;F,12V,18W
17	EP07-001233A	+HEATER,ELECTRIC-TRM-1610S;F,12V,36W
S1	FC18-004411A	STUD-DAMPER_1610S
S2	삭제	
S3	FC18-001331A	SCREW MACHINE
S4	FC18-001331A	SCREW MACHINE
S5	FC18-001331A	SCREW MACHINE
S6	FC18-001331A	SCREW MACHINE
S7	FC18-001331A	SCREW MACHINE
S8	FC18-001331A	SCREW MACHINE
C1	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM
C2	EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM
C3	EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM
C4	EP02-003655A	CABLE-SATA DATA;SRD-1685;1
*C5	EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA
*C6	EP17-001008	ANTENNA,RADAR-ACA-0120-6G0C1-A13-FM;SMA
*C7	EP17-001009	ANTENNA,RADAR-ACA-0100-6G0C1-A31-FM;CODE

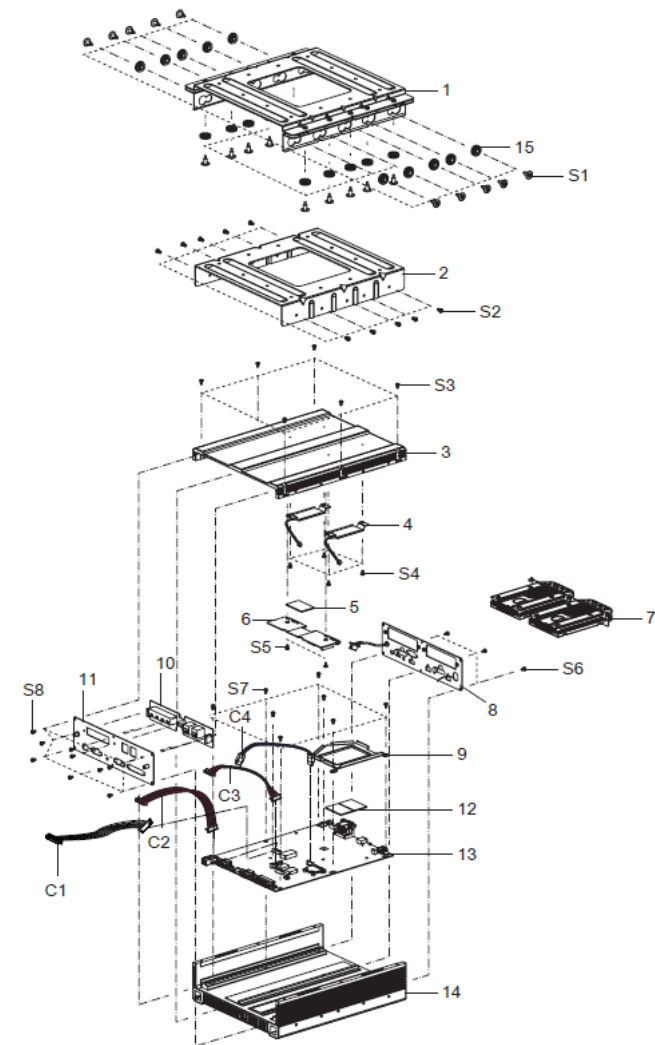


Figure 2-2: Breakdown Structure of “TRM-1610S” with Part List

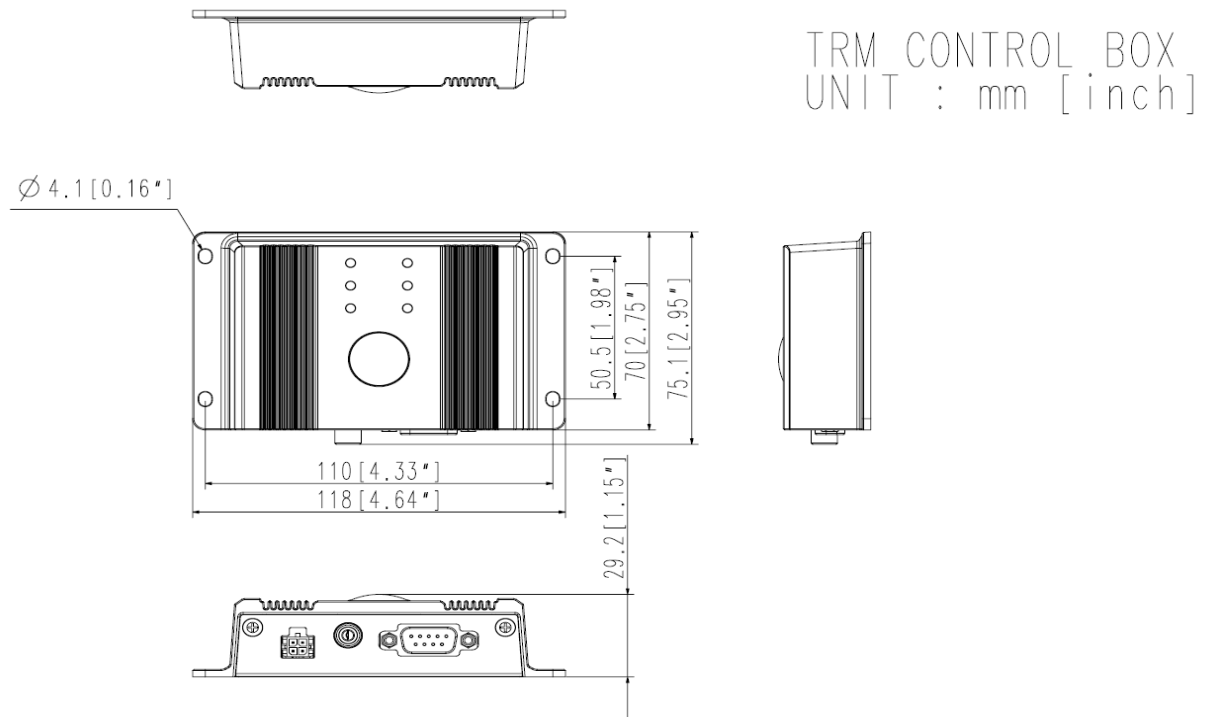
Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
					Type	Details
AM07-010650A	ASSY,FINAL-TRM-1610M				-	ASSY
EP02-003655A	CABLE-SATA DATA;SRD-1685;1	1	6	6	Cable	Cable
EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	8	8	Cable	Cable
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	40	2	80	Metal	SCREW
AM07-010647A	ASSY,TOP-TRM-1610M				Complex	ASSY
AM06-007406A	ASSY,PCB-TRM-1610S MAIN PBA	1	378	378	PCB	PCB
FC29-009489A	CASE--TOP_1610S;AL	1	3423	3423	Metal	AL
FC09-008543A	BRACKET--HEATER-MAIN_1610S;SECC	1	50	50	Metal	SUS
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	3	10	30	RUBBER	RUBBER
EP07-001233A	HEATER,ELECTRIC-TRM-1610S;F,12V,36W	1	5	5	Complex	-
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	8	2	16	Metal	SCREW
AM07-010648A	ASSY,BOTTOM-TRM-1610S				Complex	ASSY
AM06-007409A	ASSY,PCB-TRM-1610S SATA PBA	1	33	33	PCB	PCB
EP07-001232A	HEATER,ELECTRIC-TRM-1610S;F,12V,18W	2	5	10	Complex	-
FC09-008542A	BRACKET--HEATER-HDD_1610S;SECC	2	15	30	Metal	SUS
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	6	2	12	Metal	SCREW
FC29-009490A	CASE--BOTTOM_1610S;AL	1	1908	1908	Metal	AL
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	1	10	10	RUBBER	RUBBER
FC36-001305A	SHEET-HEATER_TRM-1610S;PC	2	5	10	Complex	-
AM07-010643A	ASSY-FRONT-TRM-1610S				Complex	ASSY
EP17-001009	ANTENNA,RADAR-ACA-0100-6G0C1-A31-FM;CODE	1	4	4	Complex	-
EP02-001147	HARNESS-TRM-1610S;WIRE,4P,50MM	1	10	10	Cable	-
FC15-005838A	COVER--FRONT_1610S;SECC,-	1	136	136	Metal	SUS
FC29-003338A	PAD,LOCK-SRN-4000	2	10	20	Metal	SUS
AM07-010646A	ASSY,REAR-TRM-1610M				Complex	ASSY
FC15-005840A	COVER--REAR-M12_1610S;SECC,-	1	145	145	Metal	SUS
EP02-001146	HARNESS-TRM-1610S;WIRE,30PIN,130MM	1	4	4	Cable	Cable
EP02-001151	HARNESS-TRM-1610S;WIRE,19PIN,205MM	1	4	4	Cable	Cable
EP17-001008	ANTENNA,RADAR-ACA-0120-6G0C1-A13-FM;SMA	1	4	4	Complex	-
EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA	1	5	5	Complex	-
AM07-010666A	ASSY,CASE-HDD_TRM-1610S				Complex	ASSY
FC29-009486A	HANDLE-HDD_1610S	2	30	60	Metal	AL
FC15-005841A	COVER-HDD_1610S	2	30	60	Metal	SUS
FC29-009487A	CASE-HDD-TOP_1610S	2	120	240	Metal	AL
FC29-009488A	CASE-HDD-BOTTOM_1610S	2	120	240	Metal	AL
EP10-003754	MODULE,ELECTRONIC-EW-7822MAC;WIFI 11AC D	1	3.5	3.5	PCB	-
Z6001055101A	SCREW-MACHINE;6001-001707,BH,+,M2,L4,ZP	2	1	2	Metal	SCREW
AM07-010698A	ASSY-SET-BRKT	1	1510	1510	Metal	ASSY
			TOTAL	8456.5		

**Table 1-1: Part List of “TRM-1610M” with Information of Each Mass**

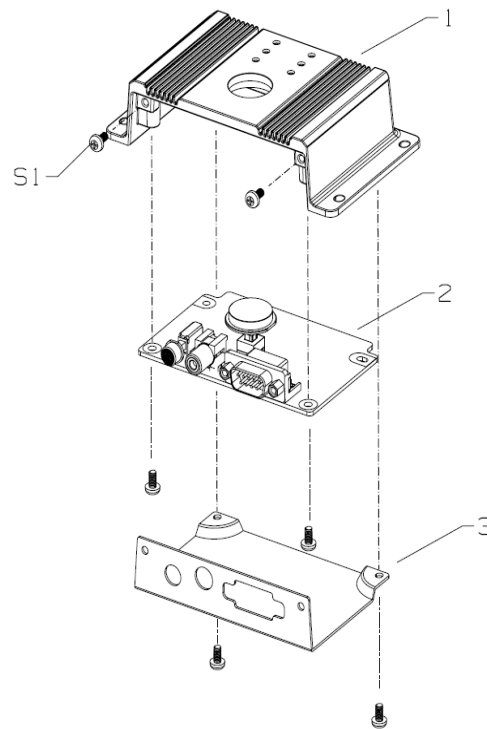
Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
					Type 	Details
AM07-010043A	ASSY,FINAL-TRM-1610S/US				-	ASSY
EP02-003655A	CABLE-SATA DATA;SRD-1685;1	1	6	6	Cable	Cable
EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	8	8	Cable	Cable
EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM	1	4	4	Cable	Cable
EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM	1	4	4	Cable	Cable
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	40	2	80	Metal	SCREW
AM07-010647A	ASSY,TOP-TRM-1610M				Complex	ASSY
AM06-007406A	ASSY,PCB-TRM-1610S MAIN PBA	1	378	378	Complex	PCB
FC29-009489A	CASE--TOP_1610S;AL	1	3423	3423	Metal	AL
FC09-008543A	BRACKET--HEATER-MAIN_1610S;SECC	1	50	50	Metal	SUS
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	3	10	30	RUBBER	RUBBER
EP07-001233A	HEATER,ELECTRIC-TRM-1610S;F,12V,36W	1	5	5	Complex	-
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	8	2	16	Metal	SCREW
AM07-010648A	ASSY,BOTTOM-TRM-1610S				Complex	ASSY
AM06-007409A	ASSY,PCB-TRM-1610S SATA PBA	1	33	33	Complex	PCB
EP07-001232A	HEATER,ELECTRIC-TRM-1610S;F,12V,18W	2	5	10	Complex	-
FC09-008542A	BRACKET--HEATER-HDD_1610S;SECC	2	15	30	Metal	SUS
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	6	2	12	Metal	SCREW
FC29-009490A	CASE--BOTTOM_1610S;AL	1	1908	1908	Metal	AL
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	1	10	10	RUBBER	RUBBER
FC36-001305A	SHEET-HEATER_TRM-1610S;PC	2	5	10	Complex	-
AM07-010643A	ASSY-FRONT-TRM-1610S				Complex	ASSY
EP17-001009	ANTENNA,RADAR-ACA-0100-6G0C1-A31-FM;CODE	1	4	4	Complex	-
EP02-001147	HARNESS-TRM-1610S;WIRE,4P,50MM	1	10	10	Cable	-
FC15-005838A	COVER--FRONT_1610S;SECC,-	1	136	136	Metal	SUS
FC29-003338A	PAD,LOCK-SRN-4000	2	10	20	Metal	SUS
AM07-010649A	ASSY,REAR-TRM-1610S				Complex	ASSY
FC15-005839A	COVER--REAR-RJ45_1610S;SECC,-	1	145	145	Metal	SUS
FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,STEEL	3	2	6	Metal	SCREW
AM06-007407A	ASSY,PCB-TRM-1610S REAR PBA	1	52	52	Complex	PCB
EP17-001008	ANTENNA,RADAR-ACA-0120-6G0C1-A13-FM;SMA	1	4	4	Complex	-
EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA	1	5	5	Complex	-
AM07-010666A	ASSY,CASE-HDD_TRM-1610S	2	300	600	Complex	ASSY
EP10-003754	MODULE,ELECTRONIC-EW-7822MAC;WIFI 11AC D	1	3.5	3.5	Complex	-
Z6001055101A	SCREW-MACHINE;6001-001707,BH,+,M2,L4,ZP	2	1	2	Metal	SCREW
AM07-010698A	ASSY-SET-BRKT	1	1510	1510	Complex	ASSY
			TOTAL	8514.5		

**Table 1-2: Part List of “TRM-1610S” with Information of Each Mass**





**Figure 3: Diagram of optional "TRM CONTROL BOX"**



1	FC29-009491A	CASE-BODY-CTRL_1610S
2	FC15-005837A	COVER-BTM-CTRL_1610S
3	AM06-007411A	ASSY,PCB-TRM-1610S CONTRIL PBA
S1	FC18-001331A	SCREW MACHINE

**Figure 4: Breakdown Structure of optional "TRM CONTROL BOX" with Part List**

Part Code	Part name	ea	Unit weight	Total weight	Material type	
					Type	Details
AM07-010122A	ASSY,CONTROL-TRM-1610S/US				-	ASSY
FC29-009491A	CASE-BODY-CTRL_1610S	1	120	120	Metal	AL
FC15-005837A	COVER-BTM-CTRL_1610S	1	50	50	Metal	SUS
AM06-007411A	ASSY,PCB-TRM-1610S CONTRIL PBA	1	36	36	Complex	PCB
FC18-001331A	SCREW MACHINE	6	1	6	Metal	SCREW
			TOTAL	212		

**Table 2: Part List of optional “TRM CONTROL BOX” with Information of Each Mass**

#### 4. Assessment

##### 4.1 Specifying Target Hazard Level

The product “**TRM-1610M, TRM-1610S**” is to be used in vehicles of all design categories and for operations corresponding to operation categories 1 to 4 specified in Section 5 of EN 45545-1. According to Clause 4.1 of EN 45545-2, the targeted Hazard Level will be “**HL3**”.

##### 4.2 Evaluation of Each Material

###### 1) Printed Circuit Board (PCB)

In accordance with Table 2 and Table 5 of EN 45545-2, PCBs are classified as “**EL9**” in Listed Products, then required to comply with either of Requirement Set “**R24**” or “**R25**”. In this project, “**R25**” was selected.

The test results are summarized in **Table 2**, which demonstrated the compliance with the requirement of **R25/HL3**. For more detail, refer to the test report (**200327**) issued by **Chemitox** which is ISO 17025 accredited for the relevant testing (**Appendix 1**).

**Table 2: Test result of EN 60695-2-11 for PCB**

Part name	Test Parameter	Results
ASSY, PCB-TRM-1610S MAIN PBA	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant
ASSY, PCB-TRM-1610S SATA PBA	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant
ASSY, PCB-TRM-1610S REAR PBA	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant
ASSY, PCB-TRM-1610S CONTROL PBA*	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant

\*: Part of optional “**TRM CONTROL BOX**”.

###### 2) Coating of Aluminum Enclosure:

The outer enclosure parts are coated with certain organic painting. The exposed area is approx. 322,859.3mm<sup>2</sup>, which exceeds 0.2m<sup>2</sup>.

In accordance with Table 2 and Table 5 of EN 45545-2, external surfaces of enclosures containing technical equipment are classified as “**IN1E**” in Listed Products, then required to comply with either of Requirement Set “**R1**”.

The test results are summarized in **Table 3**, which demonstrated the compliance with the requirement of **R1/HL3**. For more detail, refer to the test report (**200349**) issued by **Chemitox**, and those (**12436, 12437 and 12438**) issued by **Interscience Communications**, both of which are ISO 17025 accredited for the relevant testing (**Appendix 2**).


**Table 3: Test result for painting of enclosure**

Test Item	Test Parameter	Result	Determination
ISO 5658-2	CFE (kW/m <sup>2</sup> )	50.0 kW/m <sup>2</sup>	R1/HL3 Compliant
ISO 5660-1	MARHE (kW/m <sup>2</sup> )	3.6 kW/m <sup>2</sup>	
ISO 5659-2	Ds (4) (dimensionless)	3.72	
	VOF4 (min.)	4.19 min.	
	CIT <sub>6</sub> (dimensionless)	0.006 in 4 min. 0.009 in 8 min.	


### 3) Other miscellaneous combustible materials:

There are other miscellaneous materials, part of which are combustible. While all those materials are very small (i.e. exposed area less than 0.2m<sup>2</sup>), total mass of those exceeds 100g. See the below extract from **Table 1** for the relevant materials;

**<For TRM-1610M>**

Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
					Type 	Details
EP02-003655A	CABLE-SATA DATA;SRD-1685;1	1	6	6	Cable	Cable
EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	8	8	Cable	Cable
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	3	10	30	RUBBER	RUBBER
EP07-001233A	HEATER,ELECTRIC-TRM-1610S;F,12V,36W	1	5	5	Complex	-
EP07-001232A	HEATER,ELECTRIC-TRM-1610S;F,12V,18W	2	5	10	Complex	-
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	1	10	10	RUBBER	RUBBER
FC36-001305A	SHEET-HEATER_TRM-1610S;PC	2	5	10	Complex	-
EP17-001009	ANTENNA,RADAR-ACA-0100-6G0C1-A31-FM;CODE	1	4	4	Complex	-
EP02-001147	HARNESS-TRM-1610S;WIRE,4P,50MM	1	10	10	Cable	-
EP02-001146	HARNESS-TRM-1610S;WIRE,30PIN,130MM	1	4	4	Cable	Cable
EP02-001151	HARNESS-TRM-1610S;WIRE,19PIN,205MM	1	4	4	Cable	Cable
EP17-001008	ANTENNA,RADAR-ACA-0120-6G0C1-A13-FM;SMA	1	4	4	Complex	-
EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA	1	5	5	Complex	-
EP10-003754	MODULE,ELECTRONIC-EW-7822MAC;WIFI 11AC D	1	3.5	3.5	PCB	-

**<For TRM-1610S>**

Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
					Type 	Details
EP02-003655A	CABLE-SATA DATA;SRD-1685;1	1	6	6	Cable	Cable
EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	8	8	Cable	Cable
EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM	1	4	4	Cable	Cable
EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM	1	4	4	Cable	Cable
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	3	10	30	RUBBER	RUBBER
EP07-001233A	HEATER,ELECTRIC-TRM-1610S;F,12V,36W	1	5	5	Complex	-
EP07-001232A	HEATER,ELECTRIC-TRM-1610S;F,12V,18W	2	5	10	Complex	-
FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,2	1	10	10	RUBBER	RUBBER
FC36-001305A	SHEET-HEATER_TRM-1610S;PC	2	5	10	Complex	-
EP17-001009	ANTENNA,RADAR-ACA-0100-6G0C1-A31-FM;CODE	1	4	4	Complex	-
EP02-001147	HARNESS-TRM-1610S;WIRE,4P,50MM	1	10	10	Cable	-
EP17-001008	ANTENNA,RADAR-ACA-0120-6G0C1-A13-FM;SMA	1	4	4	Complex	-
EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA	1	5	5	Complex	-
EP10-003754	MODULE,ELECTRONIC-EW-7822MAC;WIFI 11AC D	1	3.5	3.5	Complex	-

In accordance with EN 45545-2 Clause 4.3.3 (Grouping Rule 2), the following material was selected and subject to testing for “R24”;

- **Part Code FC28-000556A, PAD-THERMAL,W30,D45,T2;GP1500,2**

The test results are summarized in **Table 4**, which demonstrated the compliance with the requirement of **R24/HL3**. For more detail, refer to the test report (**200329**) issued by **Chemitox** which is ISO 17025 accredited for the relevant testing (**Appendix 3**).

**Table 2: Test result of ISO 4589-2 for PAD-THERMAL**

Part name	Test Parameter	Results
PAD-THERMAL,W30,D45,T2;GP1500,2	OI (%)	>95% R24/HL3 Compliant

The total mass of the rest of the combustible materials is less than 100g. Based on the requirement specified in Clause 4.3.2 (Grouping Rule 1), those materials are considered as unclassified, and no additional testing will be required.

Regarding optional "TRM CONTROL BOX", there is no other combustible materials than that already tested.

## 5. Verification of compliance with EN 45545-2

The assessment result detailed in Section 5 has demonstrated that the products “**TRM-1610M**” and “**TRM-1610S**” including optional part “**TRM CONTROL BOX**” meet the requirements of the following classification;

### **EN 45545-2 Hazard Levels HL1 to HL 3**

**IMPORTANT NOTE:** The assessment result in this document is based on the assumption that no other non-compliant products are adjacent to the product (i.e. within 20mm horizontally, and 200mm vertically) in the end use application of railway vehicles. Depending on installation condition, additional testing may be required according to Grouping Rules specified in Clause 4.3 and Figure 1 of EN 45545-2.

# **Supplemental information:**

## **Extracts from the relevant parts of EN 45545-1 and EN 45545-2**

### **EN 45545-1 Clause 5.2.1: Operation Category**

Vehicles shall be classified according to the following Operation Categories:

- 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 safety 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 safety 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 safety to passengers, reachable within a short running time.

### **EN 45545-1 Clause 5.3: Design Category**

Railway vehicles are additionally classified under the following Design Categories:

- 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: all other vehicles (standard vehicles).

**EN 45545-2 Table 1: Hazard level classification**

Operation category	Design 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

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## **EN 45545-2 Clause 4.3.1, 4.3.2 and Figure 1: Grouping rules**

### **4.3.1 General**

No requirements apply to products with a combustible mass of < 10 g not in touching contact with another unclassified product. To assess products the following parameters have to be considered. Products shall be considered as grouped if:

- the exposed area of each product is < 0,2 m<sup>2</sup>; and
- they are not compliant to the applicable requirements of Table 2; and
- the combustible mass of each product is > 10 g or they are in touching contact to another combustible product; and
- 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; and
- they are not fully separated by a product compliant with the fire integrity requirement of 5.3.6.

The combustible masses of the products in this group shall be summed.

The assessment process described in 4.3.2 to 4.3.4 is visualized in the flow chart in Figure 1.

### **4.3.2 Rule 1**

If the total combustible mass of the grouped products is

- < 100 g for interior grouped products;

or

- < 400 g for exterior grouped products;

no requirements apply to the products of this group.

### **4.3.3 Rule 2**

If the combustible mass of the grouped products exceeds the limits stated in Rule 1, but is

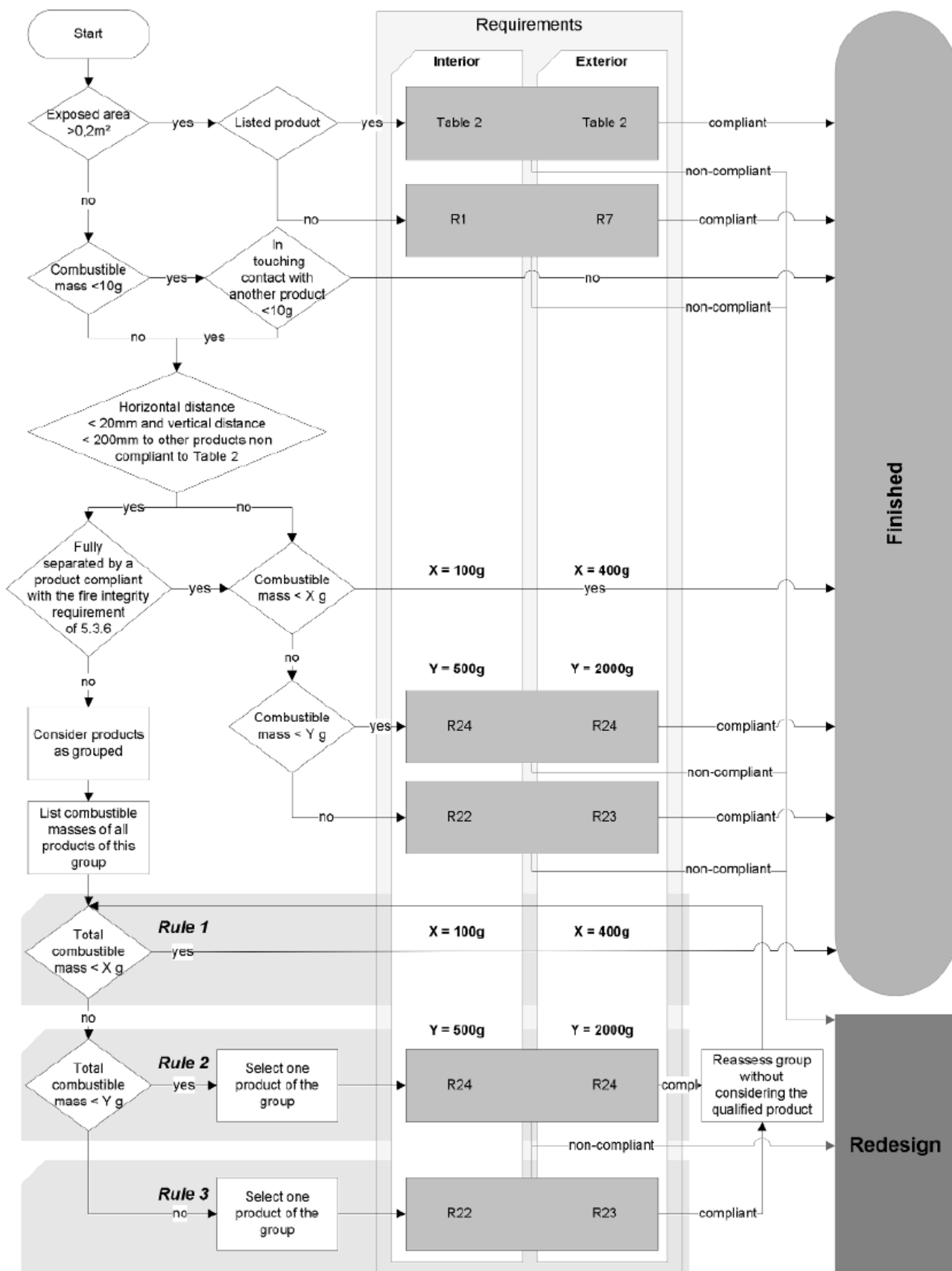
- < 500 g for interior grouped products;

or

- < 2 000 g for exterior grouped products;

one combustible product of this group has to be tested according to R24.

If this product is compliant to R24 it shall not be considered for further assessment of this group. The remaining products in this group shall be assessed starting with Rule 1, 4.3.2, again.



**EN 45545-2 Table 2: Requirement for printed circuits boards**

<b>A1</b> EL9	Printed circuit boards	Printed circuit boards with all varnishes applied but without any attached technical equipment	R24 or R25 <b>A1</b>
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**EN 45545-2 Table 5: Test requirement and criteria for R24 and R25**

<b>A1</b> Requirement set (used for) <b>A1</b>	Test method reference	Parameter and unit	Maximum or Minimum	HL1	HL2	HL3
	T10.03 EN ISO 5659-2: 25 kWm <sup>-2</sup>	$D_5$ max. dimensionless	Maximum	600	300	150
	T12 NF X 70-100-1 and - 2 600 °C	$CIT_{NLP}$ dimensionless	Maximum	1,2	0,9	0,75
R23 (EX12; EL2; EL5 EL6B; EL7B; M3)	T01 EN ISO 4589-2: OI	Oxygen content %	Minimum	28	28	32
	T10.03 EN ISO 5659-2: 25 kWm <sup>-2</sup>	$D_5$ max. dimensionless	Maximum	–	600	300
	T12 NF X 70-100-1 and NF X 70-100-2 600 °C	$CIT_{NLP}$ dimensionless	Maximum	–	1,8	1,5
R24	T01 EN ISO 4589-2: OI	Oxygen content %	Minimum	28	28	32
R25 (EL9)	T16 EN 60695-2-11	Glow Wire Temperature °C	Minimum	850	850	850
R26 (EL10)	T17 EN 60695-11-10	Vertical small flame test	Minimum	V0	V0	V0

**EN 45545-2 Table 2: Requirement for external surfaces of enclosures containing technical equipment**

IN1E	External surfaces of enclosures containing technical equipment	Enclosures which are located inside the body shell  NOTE Fire resistance requirements may apply to enclosures containing technical equipment – see 4.2 and EN 45545-3.	R1
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**EN 45545-2 Table 5: Test requirement and criteria for R1**

Requirement set (used for)	Test method reference	Parameter and unit	Maximum or Minimum	HL1	HL2	HL3
R1 (IN1A; IN1B; IN1D; IN1E; IN4; IN5; IN6A; IN7; IN8; IN9B; IN11; IN12A; IN12B; IN14; F5)	T02 ISO 5658-2	$CFE$ $\text{kWm}^{-2}$	Minimum	20 a	20 a	20 a
	T03.01 ISO 5660-1: 50 $\text{kWm}^{-2}$	$MARHE$ $\text{kWm}^{-2}$	Maximum	a -	90	60
	T10.01 EN ISO 5659-2: 50 $\text{kWm}^{-2}$	$D_s(4)$ dimensionless	Maximum	600	300	150
	T10.02 EN ISO 5659-2: 50 $\text{kWm}^{-2}$	$VOF_4$ min	Maximum	1 200	600	300
	T11.01 EN ISO 5659-2: 50 $\text{kWm}^{-2}$	$CIT_c$ dimensionless	Maximum	1,2	0,9	0,75

## Appendix 1

### Test Report for Printed Circuit Board

## Appendix 2

### Test Report for Painting of Enclosure

## Appendix 3

### Test Report for PAD-THERMAL