

Declaration of Compliance with EN 45545-2 for Model “TRM-410S” and “TRM-810S”

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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 storage devices designated **“TRM-410S”** and **“TRM-810S”**. This product is made by **HANWHA TECHWIN CO., LTD.**

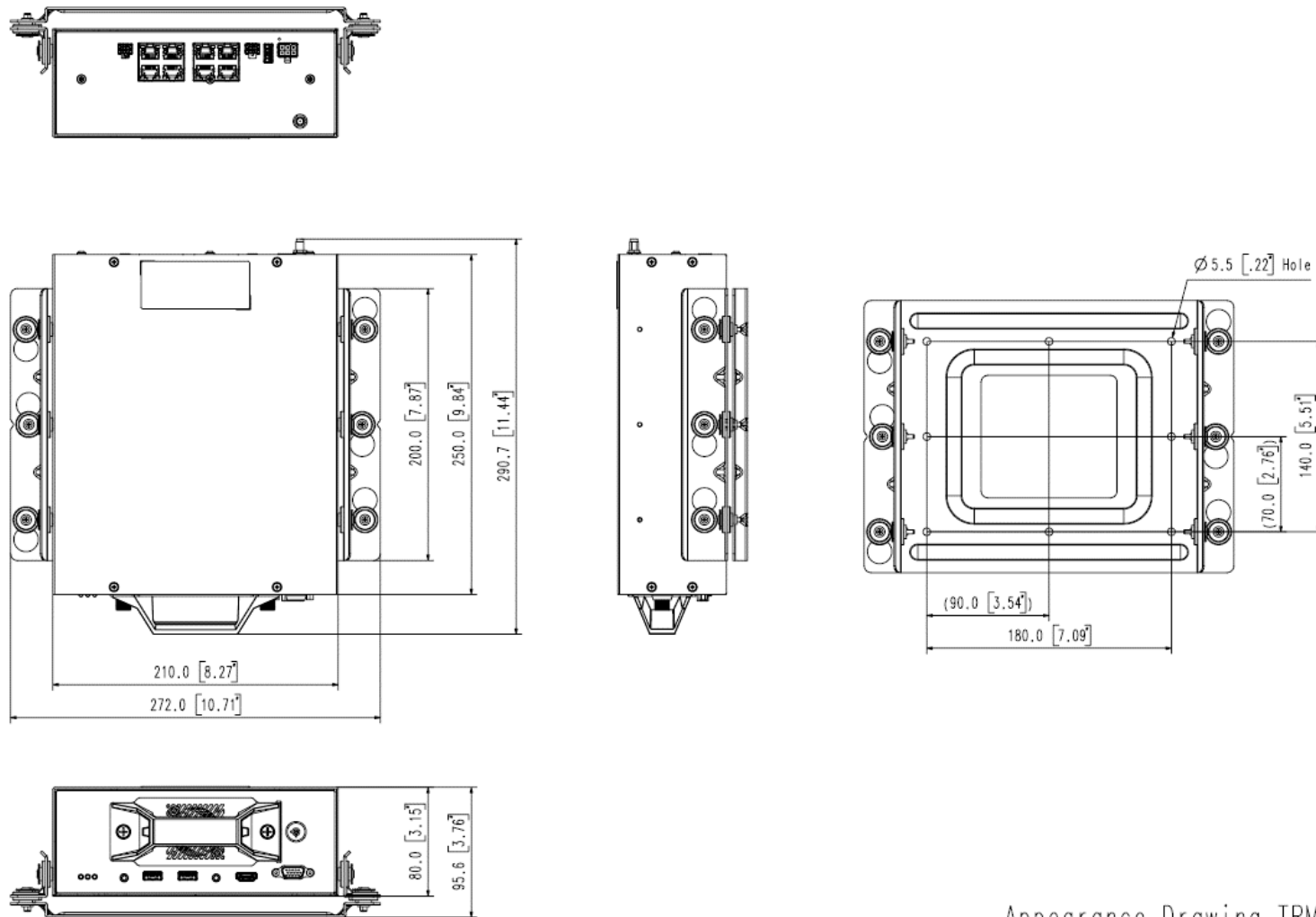
These products are developed and designed for application in rolling stock. The enclosure (top and bottom cover) is made of steel (SECC) parts with 1.2mm thickness. The products contain the functional components including printed circuit boards, and other miscellaneous materials inside the enclosure.

The overall dimension of the products is **290.7 x 272.0mm with 95.6mm height**. The total mass of **“TRM-410S”** and **“TRM-810S”** is **3382.99g** and **3407.27g** 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.

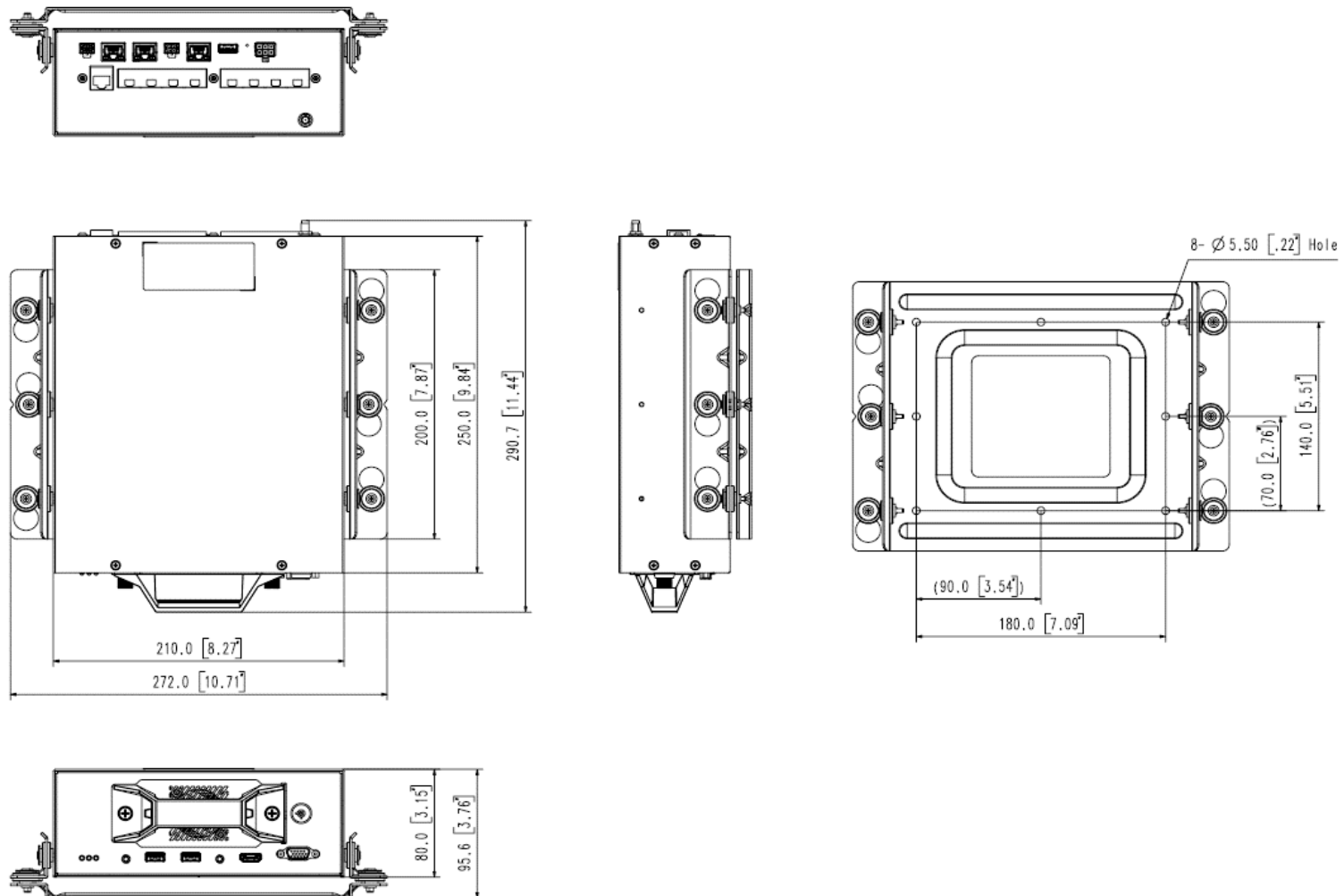
The diagram of **“TRM-410S”** and **“TRM-810S”** is shown in **Figure 1-1** and **Figure 1-2** respectively. The breakdown structure of the products with the part list is shown in **Figure 2-1** and **Figure 2-2** respectively. The part list with the information of each mass is shown in **Table 1-1** and **Table 1-2** respectively.

The difference between each model name is the number of PoE channels on the rear side (TRM-410S: 4ch, TRM-810S: 8ch). Due to this difference, the main PCB is different between the two models, and the rear PCB has been added to TRM-810S.



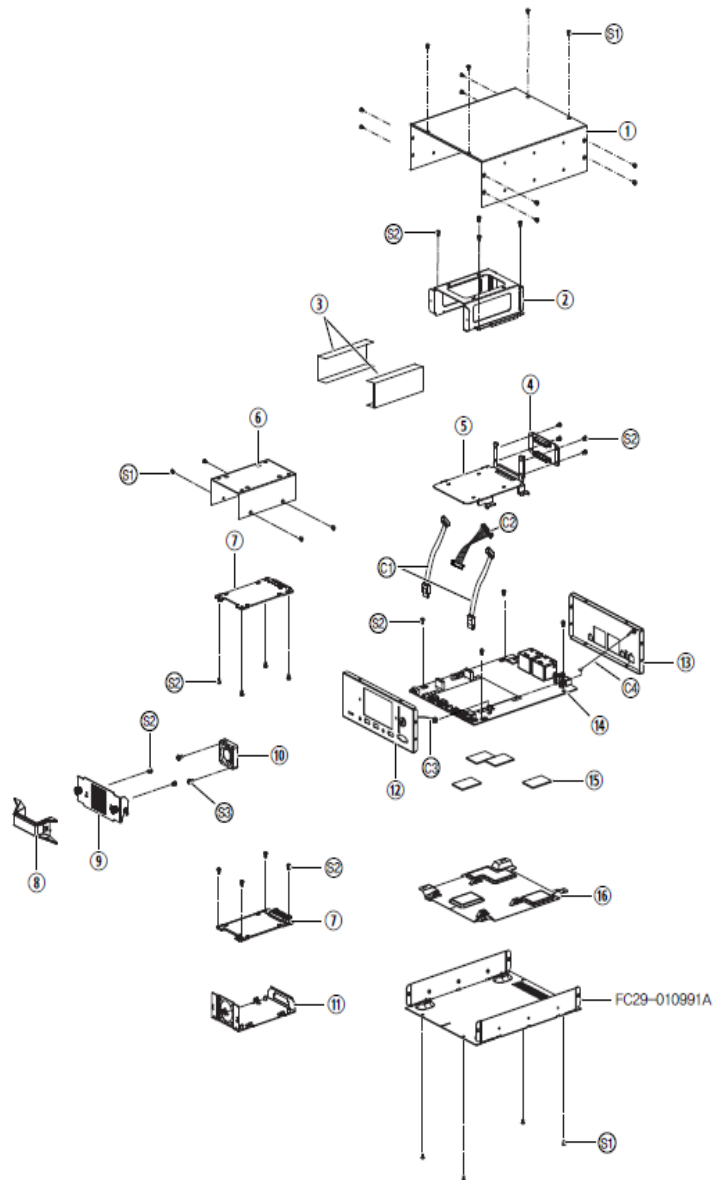
Appearance Drawing TRM-410S
Unit : mm [inches]

Figure 1-1: Diagram of "TRM-410S"



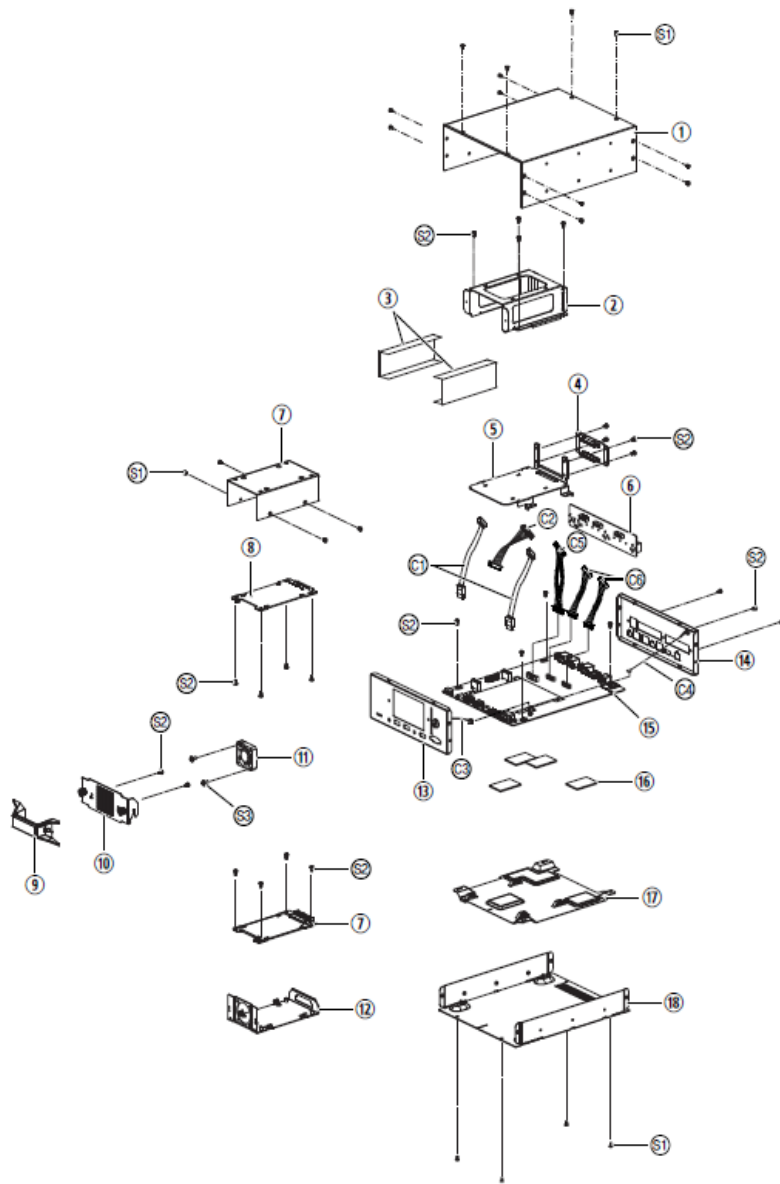
Appearance Drawing TRM-810S
Unit : mm [inches]

Figure 1-2: Diagram of "TRM-810S"



부품위치	부품번호	품명	규격	수량	공급여부	비고
1	FC29-010989A	CASE-TOP_TRM-810S;SECC,BLACK,T		1	SA	
2	FC09-009949A	BRACKET-HDD-TOP_TRM-810S;SECC,		1	SA	
3	AM06-008581A	ASSY,PCB-TRM-810S;BACKPLANE PB		1	SA	
4	FC29-010984A	GUIDE-HDD_TRM-810S;POM		2	SA	
5	FC09-009948A	BRACKET-HDD-BOTTOM_TRM-810S;SE		1	SA	
6	FC29-010990A	TRAY-HDD-TOP_TRM-810S;SECC T1.		1	SA	
7	AM06-008580A	ASSY,PCB-TRM-810S;SATA PBA		2	SA	
8	FC29-010983A	HANDLE-TRAY-HDD_TRM-810S;PC		1	SA	
9	FC15-006785A	COVER-TRAY-HDD_TRM-810S;SECC,T		1	SA	
10	EP07-002692	FAN,ELECTRIC-04010SS-05N,40MM,		1	SA	
11	FC29-010992A	TRAY-HDD-BOTTOM_TRM-810S;SECC		1	SA	
12	FC15-006783B	COVER-FRONT_TRM-410S;SECC,T1.2,		1	SA	
13	FC15-006784C	COVER-REAR_TRM-410S;SECC,T1.2,		1	SA	
14	AM06-008545A	ASSY,PCB-TRM-410S;MAIN PBA		1	SA	
15	FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,		1	SA	
16	FC09-009950A	BRACKET-MAIN-PCB_TRM-810S;SECC		1	SA	
17	FC29-010991A	CASE-BOTTOM_TRM-810S;SECC,BLAC		1	SA	
C1	EP02-003655A	CABLE-SATA DATA;SRD-1685;1		2	SA	
C2	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130		1	SA	
C3	EP02-001254	HARNESS-TRM-810S/410S;WIRE,2P,		1	SA	
C4	EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A		1	SA	
S1	FC18-001254A	SCREW-FLAT HEAD ,M3L8;M3,0.5,L		20	SA	
S2	FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,MI		22	SA	
S3	Z6003019101A	SCREW-TAPTYPE;6003-001321,BH,+		2	SA	

Figure 2-1: Breakdown Structure of “TRM-410S” with Part List



부품위치	부품번호	품명	규격	수량	공급여부	비고
1	FC29-010989A	CASE-TOP_TRM-810S;SECC,BLACK,T		1	SA	
2	FC09-009949A	BRACKET-HDD-TOP_TRM-810S;SECC,		1	SA	
3	AM06-008581A	ASSY,PCB-TRM-810S;BACKPLANE PB		1	SA	
4	FC29-010984A	GUIDE-HDD_TRM-810S;POM		2	SA	
5	FC09-009948A	BRACKET-HDD-BOTTOM_TRM-810S;SE		1	SA	
6	AM06-008579A	ASSY,PCB-TRM-810S;REAR PBA		1	SA	
7	FC29-010990A	TRAY-HDD-TOP_TRM-810S;SECC T1.		1	SA	
8	AM06-008580A	ASSY,PCB-TRM-810S;SATA PBA		2	SA	
9	FC29-010983A	HANDLE-TRAY-HDD_TRM-810S;PC		1	SA	
10	FC15-006785A	COVER-TRAY-HDD_TRM-810S;SECC,T		1	SA	
11	EP07-002692	FAN,ELECTRIC-04010SS-05N,40MM,		1	SA	
12	FC29-010992A	TRAY-HDD-BOTTOM_TRM-810S;SECC		1	SA	
13	FC15-006783A	COVER-FRONT_TRM-810S;SECC,T1.2		1	SA	
14	FC15-006784A	COVER-REAR_TRM-810S;SECC,T1.2,		1	SA	TRM-810S
	FC15-006784B	COVER-REAR_TRM-810S;SECC,T1.2,		1	SA	TRM-810M
15	AM06-008544A	ASSY,PCB-TRM-810S;MAIN PBA		1	SA	
16	FC28-000556A	PAD-THERMAL,W30,D45,T2;GP1500,		1	SA	
17	FC09-009950A	BRACKET-MAIN-PCB_TRM-810S;SECC		1	SA	
18	FC29-010991A	CASE-BOTTOM_TRM-810S;SECC,BLAC		1	SA	
C1	EP02-003655A	CABLE-SATA DATA;SRD-1685;1		2	SA	
C2	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130		1	SA	
C3	EP02-001254	HARNESS-TRM-810S/410S;WIRE,2P,		1	SA	
C4	EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A		1	SA	
C5	EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-		1	SA	
C6	EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-		2	SA	
S1	FC18-001254A	SCREW-FLAT HEAD ,M3L8;M3,0.5,L		20	SA	
S2	FC18-001331A	SCREW-SPECIAL;+,TH,M3,0.5,6,MI		25	SA	
S3	Z6003019101A	SCREW-TAPTYPE;6003-001321,BH,+		2	SA	

Figure 2-2: Breakdown Structure of “TRM-810S” with Part List

Table 1-1: Part List of “TRM-410S” with Information of Each Mass

No.	Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
						Type	Details
1	AM07-012322A	ASSY,FINAL-TRM-410S				-	ASSY
2	FC15-006783A	COVER-FRONT_TRM-810S	1	147	147.00	Metal	Steel
3	FC15-006784A	COVER-REAR_TRM-810S	1	161	161.00	Metal	Steel
4	FC29-010989A	CASE-TOP_TRM-810S	1	862	862.00	Metal	Steel
5	FC29-010991A	CASE-BOTTOM_TRM-810S	1	648	648.00	Metal	Steel
6	FC09-009950A	BRACKET-MAIN-PCB_TRM-810S	1	231	231.00	Metal	Steel
7	FC09-009949A	BRACKET-HDD-TOP_TRM-810S	1	158	158.00	Metal	Steel
8	FC09-009948A	BRACKET-HDD-BOTTOM_TRM-810S	1	162	162.00	Metal	Steel
9	FC29-010984A	GUIDE-HDD_TRM-810S	1	21	21.00	Plastic	POM
10	FC29-010983A	HANDLE-TRAY-HDD_TRM-810S	1	17	17.00	Plastic	PC
11	FC15-005841A	COVER-TRAY-HDD_TRM-810S	1	54	54.00	Metal	Steel
12	FC29-010990A	TRAY-HDD-TOP_TRM-810S	1	220	220.00	Metal	Steel
13	FC29-010992A	TRAY-HDD-BOTTOM_TRM-810S	1	133	133.00	Metal	Steel
14	FC28-000556A	PAD-THERMAL	4	4	16.00	RUBBER	RUBBER
15	Z6003019101A	SCREW-TAPTITE	2	2	4.00	Metal	SCREW
16	FC18-001254A	SCREW-TAPTITE	20	1	20.00	Metal	SCREW
17	FC15-001331A	SCREW-SPECIAL	23	1	23.00	Metal	SCREW
18	AM06-008545A	ASSY,PCB-TRM-410S;MAIN PBA	1	345.22	345.22	PCB	-
19	EP02-001254	HARNESS-TRM-810S/410S;WIRE,2P,70MM	1	16.4	16.40	Cable	-
20	EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA	1	3.94	3.94	Metal	-
21	AM06-008580A	ASSY,PCB-TRM-810S;SATA PBA	2	38	76.00	PCB	-
22	EP07-002692	FAN,ELECTRIC-04010SS-05N,40MM,7500	1	15.23	15.23	Complex	ASSY
23	AM06-008581A	ASSY,PCB-TRM-810S;BACKPLANE PBA	1	17.1	17.10	PCB	-
24	EP02-003655A	CABLE-SATA DATA;SRD-1685;1	2	6.08	12.16	Cable	-
25	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	7.53	7.53	Cable	-
26	EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM	2	3.9	7.80	Cable	-
27	EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM	1	4.61	4.61	Cable	-
				TOTAL	3382.99		

Table 1-2: Part List of “TRM-810S” with Information of Each Mass

No.	Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
						Type	Details
1		ASSY,FINAL-TRM-810S				-	ASSY
2	FC15-006783A	COVER-FRONT_TRM-810S	1	147	147.00	Metal	Steel
3	FC15-006784A	COVER-REAR_TRM-810S	1	161	161.00	Metal	Steel
4	FC29-010989A	CASE-TOP_TRM-810S	1	862	862.00	Metal	Steel
5	FC29-010991A	CASE-BOTTOM_TRM-810S	1	648	648.00	Metal	Steel
6	FC09-009950A	BRACKET-MAIN-PCB_TRM-810S	1	231	231.00	Metal	Steel
7	FC09-009949A	BRACKET-HDD-TOP_TRM-810S	1	158	158.00	Metal	Steel
8	FC09-009948A	BRACKET-HDD-BOTTOM_TRM-810S	1	162	162.00	Metal	Steel
9	FC29-010984A	GUIDE-HDD_TRM-810S	1	21	21.00	Plastic	POM
10	FC29-010983A	HANDLE-TRAY-HDD_TRM-810S	1	17	17.00	Plastic	PC
11	FC15-005841A	COVER-TRAY-HDD_TRM-810S	1	54	54.00	Metal	Steel
12	FC29-010990A	TRAY-HDD-TOP_TRM-810S	1	220	220.00	Metal	Steel
13	FC29-010992A	TRAY-HDD-BOTTOM_TRM-810S	1	133	133.00	Metal	Steel
14	FC28-000556A	PAD-THERMAL	4	4	16.00	RUBBER	RUBBER
15	Z6003019101A	SCREW-TAPTITE	2	2	4.00	Metal	SCREW
16	FC18-001254A	SCREW-TAPTITE	20	1	20.00	Metal	SCREW
17	FC18-001331A	SCREW-SPECIAL	26	1	26.00	Metal	SCREW
18	EP02-001254	HARNESS-TRM-810S/410S;WIRE,2P,70MM	1	16.4	16.40	Cable	-
19	AM06-008579A	ASSY,PCB-TRM-810S;REAR PBA	1	52.5	52.50	PCB	-
20	EP17-001010A	ANTENNA,RADAR-ACA-0220-6G0C1-A7-FM;SMA	1	3.94	3.94	Metal	-
21	AM06-008580A	ASSY,PCB-TRM-810S;SATA PBA	2	38	76.00	PCB	-
22	EP07-002692	FAN,ELECTRIC-04010SS-05N,40MM,7500	1	15.23	15.23	Complex	ASSY
23	AM06-008544A	ASSY,PCB-TRM-810S;MAIN PBA	1	314	314.00	PCB	-
24	AM06-008581A	ASSY,PCB-TRM-810S;BACKPLANE PBA	1	17.1	17.10	PCB	-
25	EP02-003655A	CABLE-SATA DATA;SRD-1685;1	2	6.08	12.16	Cable	-
26	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	7.53	7.53	Cable	-
27	EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM	2	3.9	7.80	Cable	-
28	EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM	1	4.61	4.61	Cable	-
				TOTAL	3407.27		

4. Assessment

4.1 Specifying Target Hazard Level

The product “**TRM-410S, TRM-810S**” 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 “**HL2**”.

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 (**200941**) 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	Report Number
ASSY,PCB-TRM-410S;MAIN PBA*	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant	200941
ASSY,PCB-TRM-810S;REAR PBA**	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant	200328
ASSY,PCB-TRM-810S;SATA PBA**	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant	200328
ASSY,PCB-TRM-810S;MAIN PBA	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant	200941
ASSY,PCB-TRM-810S;BACKPLANE PBA**	Glow Wire Temperature	GWEPT:850C R25/HL3 Compliant	200328

*: It was confirmed that the material construction of “**ASSY,PCB-TRM-410S;MAIN PBA**” is identical to that of “**ASSY,PCB-TRM-810S;MAIN PBA**” tested in the relevant report.

** : It was confirmed that the material construction of “**ASSY,PCB-TRM-810S;REAR PBA**”, “**ASSY,PCB-TRM-810S;SATA PBA**” and “**ASSY,PCB-TRM-810S;BACKPLANE PBA**” is identical to that of “**ASSY, FRONT SUBRJ45_SPN-10080P**” tested in the relevant report.

2) Coating of Steel Enclosure:

The outer enclosure parts are coated with the organic painting detailed below;

- **Coating grade: EMS BLACK MATT (MNC)-1 made by AKZO Nobel.**
- **Coating thickness: 15 – 20 μm .**

The exposed area is approx. 0.64m^2 , which exceeds 0.2m^2 .

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 (**200940**) issued by **Chemitox**, and those (**12909, 12910 and 12911**) 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	Report Number	Determination
ISO 5658-2	CFE (kW/m^2)	$33.6 \text{ kW}/\text{m}^2$	200940	R1/HL3 Compliant
ISO 5660-1	MARHE (kW/m^2)	$7.3 \text{ kW}/\text{m}^2$	12909	
ISO 5659-2	Ds (4) (dimensionless)	4.55	12910	
	VOF4 (min.)	3.34 min.	12910	
	CIT _G (dimensionless)	0.000 in 4 min. 0.009 in 8 min.	12911	

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^2), total mass of those exceeds 100g. See the below extract from **Table 1** for the relevant materials;

<For TRM-410S>

No.	Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
						Type	Details
9	FC29-010984A	GUIDE-HDD_TRM-810S	1	21	21.00	Plastic	POM
10	FC29-010983A	HANDLE-TRAY-HDD_TRM-810S	1	17	17.00	Plastic	PC
14	FC28-000556A	PAD-THERMAL	4	4	16.00	RUBBER	RUBBER
19	EP02-001254	HARNESS-TRM-810S/410S;WIRE,2P,70MM	1	16.4	16.40	Cable	-
22	EP07-002692	FAN,ELECTRIC-04010SS-05N,40MM,7500	1	15.23	15.23	Complex	ASSY
24	EP02-003655A	CABLE-SATA DATA;SRD-1685;1	2	6.08	12.16	Cable	-
25	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	7.53	7.53	Cable	-
26	EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM	2	3.9	7.80	Cable	-
27	EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM	1	4.61	4.61	Cable	-

<For TRM-810S>

No.	Part Code	Part name	ea	Unit weight (g)	Total weight (g)	Material type	
						Type	Details
9	FC29-010984A	GUIDE-HDD_TRM-810S	1	21	21.00	Plastic	POM
10	FC29-010983A	HANDLE-TRAY-HDD_TRM-810S	1	17	17.00	Plastic	PC
14	FC28-000556A	PAD-THERMAL	4	4	16.00	RUBBER	RUBBER
18	EP02-001254	HARNESS-TRM-810S/410S;WIRE,2P,70MM	1	16.4	16.40	Cable	-
22	EP07-002692	FAN,ELECTRIC-04010SS-05N,40MM,7500	1	15.23	15.23	Complex	ASSY
25	EP02-003655A	CABLE-SATA DATA;SRD-1685;1	2	6.08	12.16	Cable	-
26	EP02-001144	CABLE-TRM-1610S;SATA,11P,-,130MM	1	7.53	7.53	Cable	-
27	EP02-001143	CABLE-TRM-1610S;ETHERNET,19P,-,130MM	2	3.9	7.80	Cable	-
28	EP02-001145	CABLE-TRM-1610S;GIGA ETH,29P,-,100MM	1	4.61	4.61	Cable	-

In accordance with EN 45545-2 Clause 4.3.3 (Grouping Rule 2), the following materials were selected and subject to testing for “R24”. Due to the limited mass of the relevant parts, the requirement “R22” will NOT be applied.

- **Part Code FC28-000556A, PAD-THERMAL**

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 4: 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

- **Part Code FC29-010983A, HANDLE-TRAY-HDD_TRM-810S**

The test results are summarized in **Table 5**, which demonstrated the compliance with the requirement of **R24/HL2**. For more detail, refer to the test report (**201047**) issued by **Chemitox** which is ISO 17025 accredited for the relevant testing (**Appendix 4**).

Table 5: Test result of ISO 4589-2 for HANDLE-TRAY-HDD_TRM-810S

Part name	Material detail	Test Parameter	Results
PAD-THERMAL,W30,D45,T2;GP1500,2	Polycarbonate Designated "NH-1035"	OI (%)	30.3% R24/HL2 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.

5. Verification of compliance with EN 45545-2

The assessment result detailed in Section 5 has demonstrated that the products “**TRM-410S**” and “**TRM-810S**” meet the requirements of the following classification;

EN 45545-2 Hazard Levels HL1 to HL 2

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

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 m²; 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

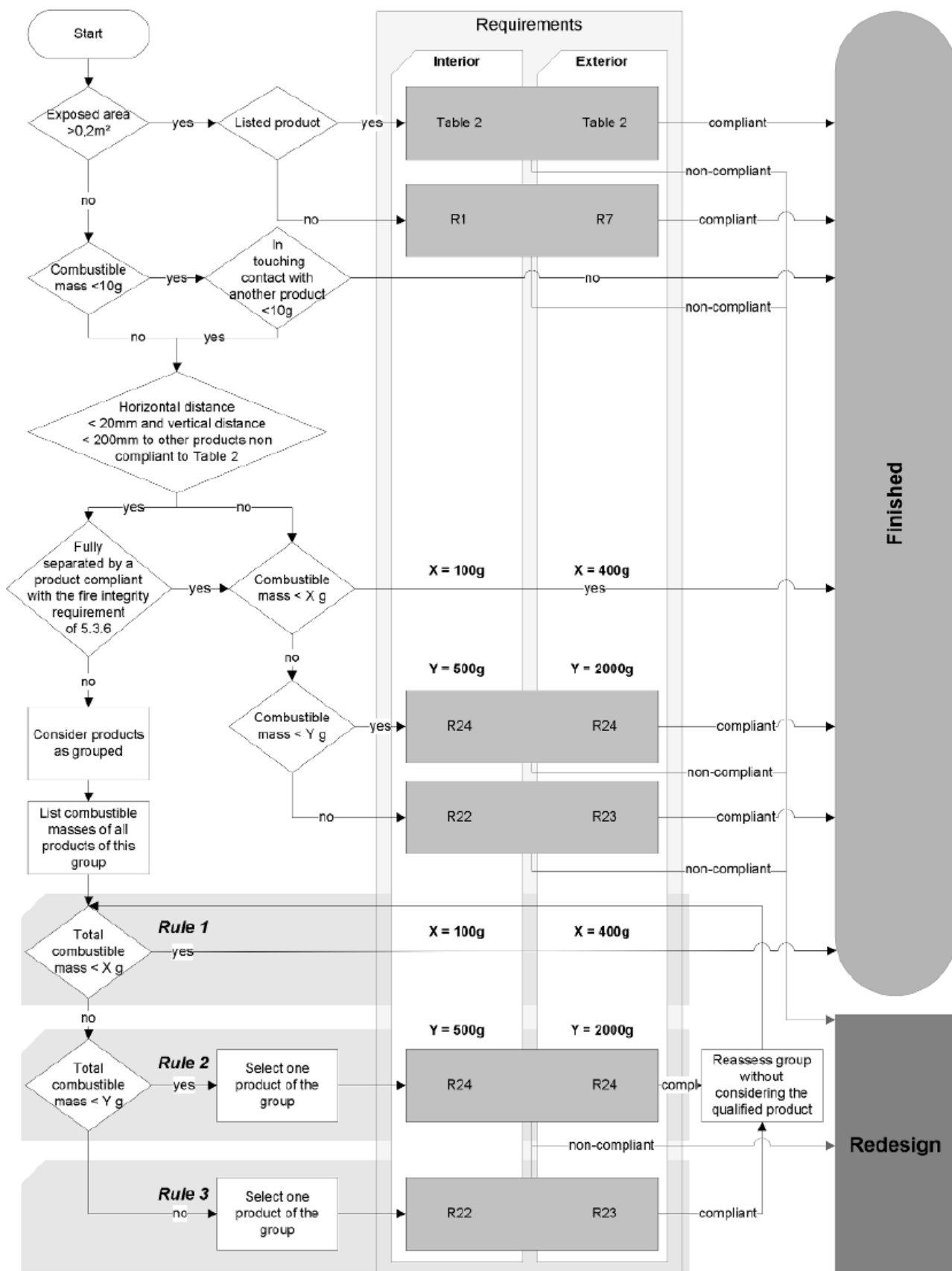
- < 500 g for interior grouped products;

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

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

A1 Requirement set (used for) A1	Test method reference	Parameter and unit	Maximum or Minimum	HL1	HL2	HL3
	T10.03 EN ISO 5659-2: 25 kWm ⁻²	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 ⁻²	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 kWm^{-2}	Minimum	20 a	20 a	20 a
	T03.01 ISO 5660-1: 50 kWm^{-2}	$MARHE$ kWm^{-2}	Maximum	a -	90	60
	T10.01 EN ISO 5659-2: 50 kWm^{-2}	$D_s(4)$ dimensionless	Maximum	600	300	150
	T10.02 EN ISO 5659-2: 50 kWm^{-2}	VOF_4 min	Maximum	1 200	600	300
	T11.01 EN ISO 5659-2: 50 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

Appendix 4

Test Report for NH-1035 (Material used for
HANDLE-TRAY-HDD_TRM-810S)