BS EN 61587-4:2012

BSI Standards Publication

Mechanical structures for electronic equipment — Tests for IEC 60917 and IEC 60297 series

Part 4: Combination of performance levels for modular cabinets

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(IEC 61587-4:2012)

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Essais pour les séries CEI 60917 et CEI 60297 -
Partie 4: Combinaison des niveaux de performance pour les baies modulaires
(CEI 61587-4:2012)

Mechanische Bauweisen für elektronische Einrichtungen -
Prüfungen für die Normenreihen IEC 60917 und IEC 60297 -
Teil 4: Kombination von Anforderungsstufen für modulare Schränke
(IEC 61587-4:2012)

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Foreword

The text of document 48D/514/FDIS, future edition 1 of IEC 61587-4, prepared by SC 48D "Mechanical structures for electronic equipment" of IEC/TC 48 "Electromechanical components and mechanical structures for electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61587-4:2012.

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60297 Series	NOTE	Harmonised as EN 60297 Series (not modified).
IEC 60917 Series	NOTE	Harmonised as EN 60917 Series (not modified).
IEC 60950-1	NOTE	Harmonised as EN 60950-1.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 61587-1	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 series - Part 1: Environmental requirements, test set-up and safety aspects for cabinets, racks, subracks and chassis under indoor conditions	EN 61587-1	-
IEC 61587-2	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 2: Seismic tests for cabinets and racks	EN 61587-2	-
IEC 61587-3	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 3: Electromagnetic shielding performance tests for cabinets, racks and subracks	EN 61587-3	-

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INTRODUCTION

Requirements for application specific cabinet systems vary considerably. Typically, applications such as industrial, power distribution, IT, communications, data centres, multimedia, traffic control, etc., require differing features.

These differing features are hardly common and many range from static load to dynamic load, including seismic test, protection (IP), electromagnetic shielding (EMC) provision, and many other detailed requirements. It is unrealistic and uneconomical to expect from an economical system to offer an all compliant cabinet from multiple sources.

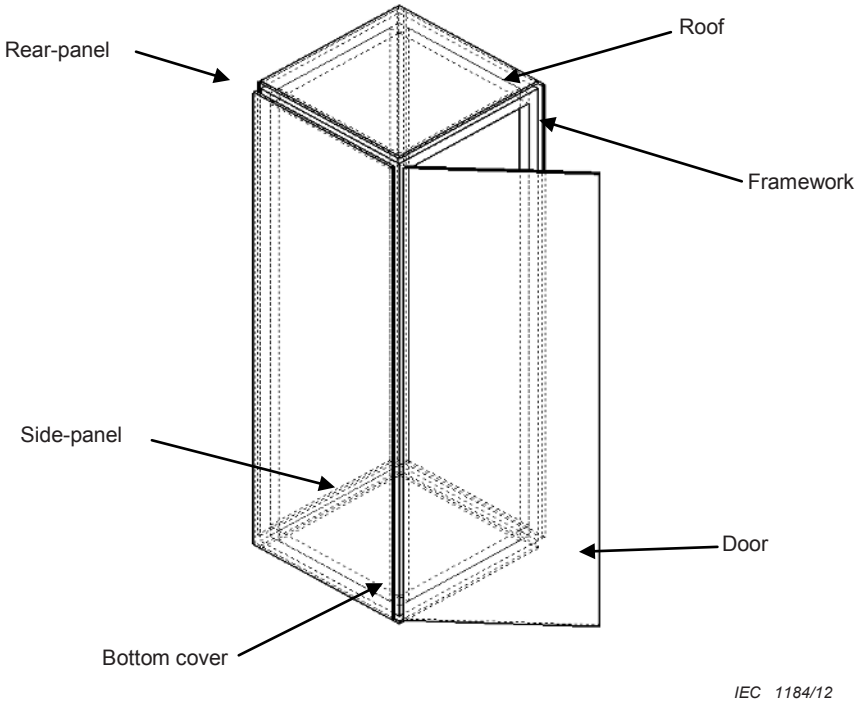

Figure 1 – Arrangement overview of a modular cabinet system

This design guide describes an economically optimal solution for a cabinet system consisting of a modular frame type structure design enhanced by basic cabinet components, such as a door(s), a bottom cover, a roof and side and rear panels. See Figure 1. To fulfil the specific application requirements the user can choose external and/or internal upgrade kits. See Figure 2.

Based on this optimal economical solution for a cabinet system, this guide helps the user to select a cabinet matching the performance level of the application.

Based on this economical optimal solution for a cabinet system, this guide helps to provide for a modular cabinet economical system supported by multiple vendors.

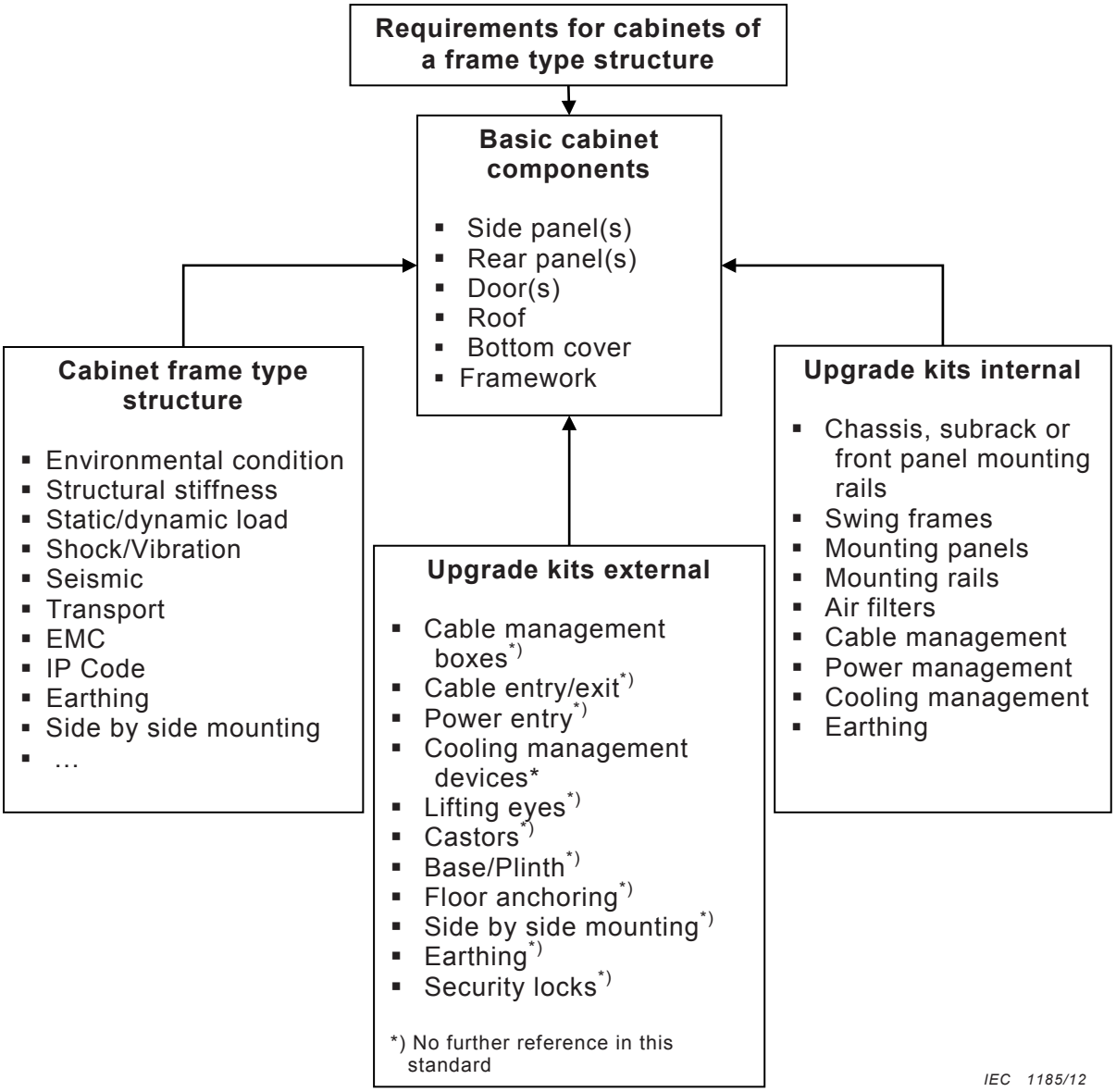

Figure 2 – Basic modular cabinet

MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT – TESTS FOR IEC 60917 AND IEC 60297 SERIES –

Part 4: Combination of performance levels for modular cabinets

1 Scope

This part of IEC 61587 provides the combinations of different degrees of protection for cabinet systems regarding IP code, climate levels, static and dynamics load tests, electromagnetic shielding and seismic requirements. Optimal economical solution can be ensured by ordering a cabinet with specific properties for which this design guide provides the easy selection of defined performance levels.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61587-1, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 series – Part 1: Environmental requirements, test set-up and safety aspects for cabinets, racks, subracks and chassis under indoor conditions*

IEC 61587-2, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Part 2: Seismic tests for cabinets and racks*

IEC 61587-3, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Part 3: Electromagnetic shielding performance tests for cabinets, racks and subracks*

3 Selection of performance levels

The environmental and test requirements for cabinets are defined in existing standards.

According to IEC 60529 enclosure systems can be classified by their IP code. The IP code is a 2 digit number where the first digit (0 – 6) indicates the level of protection that the enclosure provides against access to hazardous parts and the entry of solid foreign objects. The second digit (0-8) indicates the protection against harmful entry of water.

As in IEC 61587-1 a cabinet system can meet the standards of climatic levels C1, C2, C3, the levels of industrial atmosphere A1(E), A2(E), A3(E), levels of static loading SL5, SL6, SL7, levels of dynamic loading DL4, DL5, DL6 and levels of impact loading K1, K2 and K3.

A cabinet system can also meet the seismic requirements as defined in IEC 61587-2 and/or the EMC (Electro Magnetic Compatibility) performance tests as defined in IEC 61587-3 and shown in Table 1.

Table 1 – List of requirements used to specify a cabinet

	Performance levels	Standard
IP code	IP [0-6][0-8]	IEC 60529
Climatic levels	C1, C2, C3	IEC 61587-1
Industrial atmosphere	A1(E), A2(E), A3(E)	IEC 61587-1
Static load test	SL4, SL5, SL6	IEC 61587-1
Dynamic load test	DL4, DL5, DL6	IEC 61587-1
Impact load test	K1, K2, K3	IEC 61587-1
Seismic load test	Waveform A, Waveform B	IEC 61587-2
Electromagnetic shielding	Frequency range (E0,E1,E2,E3, see Table 9) 30 MHz to 230 MHz, 230 MHz to 1 000 MHz, 1 GHz to 3 GHz	IEC 61587-3

NOTE It is obvious that there are requirements and definitions that are closely related and that there are requirements that are independent of each other. For individual configurations of a cabinet the different performance levels shall be chosen as shown in Tables 2 to 9. Table 10 shows the selection of some combined performance levels as the most common examples.

Table 2 – Protection against dust and water

Levels PX: Protection against dust (ingress of solid foreign objects)and water ingress of water with harmful effects)		Typical field of application
Level P0	IP00	No protection by enclosure
Level P1	IP20 – IP22	Office environment
Level P2	IP23 – IP33	Office environment, enhanced protection
Level P3	IP34 – IP44	Industrial environment
Level P4	IP54 – IP55	Industrial environment, enhanced protection

Table 3 – Climatic conditions

Level CX: Climatic properties		Typical field of application
Level C0	-	No protection against climatic impacts
Level C1	C1	Office, laboratory environment
Level C2	C2	Industrial environment, production halls
Level C3	C3	Industrial, open air, tropical climate

Table 4 – Industrial atmosphere

Level AX: Industrial atmosphere (shock and vibration)		Typical field of application
Level A0	-	No protection against industrial atmosphere
Level A1	A1(E)	Moderate concentration of harmful substances (for example enclosed spaces)
Level A2	A2(E)	Heavy concentration of harmful substances (for example chemical industry)
Level A3	A3(E)	Heavy concentration of harmful substances combined with maritime climate

Table 5 – Static load test

Level SLX: Static load test (IEC 61587-1)		Nominal load per cabinet
Level SL0	-	No load definition on basic structure
Level SL4	SL4	Up to 200 kg
Level SL5	SL5	Up to 400 kg
Level SL6	SL6	Up to 800 kg

Table 6 – Dynamic load test

Level DLX: Dynamic load test		Typical field of application
Level DL0	-	No definition on basic cabinet structure
Level DL4	DL4	Mainly stationary use, normal handling
Level DL5	DL5	Moderate level of shock and vibration, stationary and mobile use
Level DL6	DL6	High level of shock and vibration, as on commercial ships, low level military requirements

Table 7 – Impact load test

Level KX: Impact test		Typical application
Level K0	-	No definition on basic cabinet structure
Level K1	K1	Equipment, used in laboratories
Level K2	K2	Equipment, used in laboratories and offices
Level K3	K3	Equipment for general industrial electronics, factory, outdoor

Table 8 – Seismic load test

Level SX: Seismic test		Seismic requirements
Level S0	-	-
Level S1	Waveform A or waveform B	Severe

Table 9 – Electromagnetic shielding

Level EX: Electromagnetic shielding		Attenuation requirements
Level E0	–	No shielding
Level E1	Frequency 30 – 230 MHz, 230 MHz to 1 000 MHz, 1 GHz to 3 GHz	20 dB, 10 dB, 0 dB
Level E2	Frequency 30 – 230 MHz, 230 MHz to 1 000 MHz, 1 GHz to 3 GHz	40 dB, 30 dB, 20 dB
Level E3	Frequency 30 – 230 MHz, 230 MHz to 1 000 MHz, 1 GHz to 3 GHz	60 dB, 50 dB, 40 dB

Table 10 – Examples of performance level combinations

Cabinet example 1	P0	C0	A0	SL0	DL0	K0	S0	E0
2	P1	C1	A1	SL4	DL4	K1	S0	E0
3	P3	C2	A2	SL5	DL5	K2	S1	E1
4	P4	C3	A3	SL6	DL6	K3	S1	E2
5	P3	C2	A2	SL5	DL5	K2	S0	E3

NOTE Table 10 contains some examples of possible performance level combinations.

Table 11 – Typical application examples

Description	Level	Case	Case	Case	Case	Case	Case	Case	Case
No protection by enclosure	1	P0	C0	A0	SL0	DL0	K0	S0	E0
Office environment	2	P1							
Laboratory environment			C1						
Office environment, enhanced protection		P2							
Light industry production environment	2		C1						
Moderate concentration of harmful substances				A1					
Industrial environment	3/5	P3							
Industrial, open air, tropical	5		C2	A2					
Industrial environment, enhanced protection	4	P4							
Heavy concentration of harmful substances with maritime climate	4		C3	A3					
Static load up to 200 kg	2				SL4				
400 kg	3/5				SL5				
800 kg	4				SL6				
Dynamic load mainly stationary use, normal handling	2					DL4			
Moderate level shock and vibration, stationary and mobile use	3/5					DL5			
High level of shock and vibration, as on commercial ships, low level military requirements	4					DL6			
Equipment, used in laboratories and offices	2						K1		
Equipment for general industrial electronics, factory	3/5						K2		
Outdoor	4						K3		
Seismic zone 4	3/4							S1	
Electromagnetic shielding 30 MHz to 230 MHz, 20 dB	3								E1
230 MHz to 1 000 MHz, 10 dB									
1 GHz to 3 GHz, 0 dB	4								E2
30 MHz to 230 MHz, 40 dB									
230 MHz to 1 000 MHz, 30 dB									
1 GHz to 3 GHz, 20 dB	5								E3
30 MHz to 230 MHz, 60 dB									
230 MHz to 1 000 MHz, 50 dB									
1 GHz to 3 GHz, 40 dB									

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