भारतीय मानक **IS/IEC 60297-3-105 : 2008**

Indian Standard

इलेक्ट्रॉनिक उपकरणों के लिए यांत्रिक संरचनाएं

भाग 3 482.6 मिमी (19 इंच) श्रृंखला की यांत्रिक संरचनाओं के आयाम

अनुभाग 105 1यू उच्च चेसिस के लिए आयाम और डिजाइन पहलू

Mechanical Structures for Electronic Equipment

Part 3 Dimensions of Mechanical Structures of the 482.6 mm (19 in) Series

Section 105 Dimensions and Design Aspects for 1U High Chassis

ICS 31.240

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March 2023 **Price Group 8**

Electromechanical Components and Mechanical Structures for Electronic Equipment Sectional Committee, LITD 03

NATIONAL FOREWORD

This Indian Standard (Part 3/Sec 105) which is identical with IEC 60297-3-105 : 2008 'Mechanical structures for electronic equipment — Dimensions of mechanical structures of the 482,6 mm (19 in) series — Part 3-105: Dimensions and design aspects for 1U high chassis' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Electromechanical Components and Mechanical Structures for Electronic Equipment Sectional Committee and approval of the Electronics and Information Technology Division Council.

The text of IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'.
b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their places, are listed below along with their degree of equivalence for editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 60917-1 Modular order for the development of mechanical structures for electronic equipment practices — Part 1: Generic standard	IS/IEC 60917-1 : 2019 Modular order for the development of mechanical structures for electrical and electronic equipment practices: Part 1 Generic standard	Identical with IEC 60917-1 : 2019
IEC 60297-3-100 Mechanical structures for electronic equipment — Dimensions of mechanical structures of the 482,6 mm (19 in) series — Part 3-100: Basic dimensions of front panels, subracks, chassis, racks and cabinets	IS/IEC 60297-3-100 : 2008 Mechanical structures for electronic equipment: Part 3 Dimensions of mechanical structures of the 482.6 mm (19 in) series, Section 100 Basic dimensions of front panels, subracks, chassis, racks and cabinets	Identical with IEC 60297-3-100 : 2008

The technical committee has reviewed the provisions of the following International Standards referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard:

International Standard	*Title*
IEC 60050-581	International electrotechnical vocabulary — Part 581: Electromechanical components for electronic equipment
IEC 61587-1	Mechanical structures for electronic equipment — Tests for IEC 60917 and IEC 60297 — Part 1: Climatic, mechanical tests and safety aspects for cabinets, racks, subracks and chassis

(*Continued on third cover*)

CONTENTS

INTRODUCTION

Electronic systems based on 1U chassis design have become one of the most important platforms used for servers, industrial electronics, information technology (IT) and telecommunication equipment. 1U chassis are sometimes referred to as “Pizza Boxes”.

Applications for 1U chassis designs are wide spread and solutions are found in every segment of the electronics industry.

IEC 60297-3-100 defines the dimensional rack/cabinet details such as the available aperture and the front panel mounting dimensions. However, IEC 60297-3-100 falls short of providing guidance or dimensional requirements for assembling 1U chassis designs into these IEC 60297 conforming racks/cabinets either in singles or in multiples (stacked in $n \times$ 1U).

This part of IEC 60297 will give guidance and provide for dimensional requirements for 1U chassis based on weight loading, physical size and service accessibility.

In this standard, various chassis types are identified according to application needs.

The defined interface dimensions of the various chassis types permit the development of common mounting accessories. Due to this clarification and the application specific chassis type choice, the serviceability and airflow aspects of the chosen 1U chassis can be addressed by the designer.

Similar attributes for multiple unit high equipment may be derived from this standard. The economical value of this standard lies in the predefined interface dimensions of chassis for which suitable accessories may be developed. In addition, as a consequence of the chosen mounting support, the cooling possibilities are indicated.

Indian Standard

MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT

PART 3 DIMENSIONS OF MECHANICAL STRUCTURES OF THE 482.6 MM (19 IN) SERIES

SECTION 105 DIMENSIONS AND DESIGN ASPECTS FOR 1U HIGH CHASSIS

1 Scope

This part of IEC 60297 specifies the dimensions for 1U chassis mounted into IEC 60297-3-100 compliant racks/cabinets where dimensions, loaded weight and accessibility require differing assembly methods.

Guidance for cooling and reference for EMC, seismic and for the climatic and mechanical requirements and tests are provided, as defined in the IEC 61587 series.

The drawings used in this standard are not intended to indicate product design, only the specific dimensions shall be used.

The terminology used complies with IEC 60917-1.

2 Normative references

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

IEC 60050-581, *International electrotechnical vocabulary – Part 581: Electromechanical components for electronic equipment*

IEC 60917-1, *Modular order for the development of mechanical structures for electronic equipment practices – Part 1: Generic standard*

IEC 60297-3-100, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-100: Basic dimensions of front panels, subracks, chassis, racks and cabinets*

IEC 61587-1, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Part 1: Climatic, mechanical tests and safety aspects for cabinets, racks, subracks and chassis*

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 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60917-1 and IEC 60050-581 apply, as well as the following.

3.1
19 in cabinet
cabinet in accordance with IEC 60297-3-100

3.2
19 in vertical members
parts of a cabinet with the mounting holes for front panels, chassis and subracks

3.3
chassis slides
angled parts mounted in the cabinet to support heavy or deep chassis (see also IEC 60917-1)

3.4
telescopic slide
extendable mounting support for heavy or deep chassis within a cabinet, providing easy access to rear parts in extended position of the chassis

3.5
aperture of a cabinet
horizontal opening dimension between two 19 in uprights

3.6
height pitch line
theoretical line between any increment of U (1U = 44,45 mm)

3.7
cable management
cable routing within a cabinet to the equipment

3.8
chassis mounting flanges
may be an integrated part of the chassis or separate brackets attached to the chassis

3.9
cable pull factor
summary of cable weight, linked to the chassis

4 Arrangement overview

The arrangement overview in Figure 1 illustrates the chassis mounting methods into a typical 19 in cabinet.

The 1U chassis dimensions differ pending on the choice of the chassis type and resulting mounting dimensions. There are three types of chassis, determined by the principal methods of mounting into a cabinet. The definitions of the three types of chassis are:

- **Chassis type A**: This type of chassis is mounted into racks/cabinets without chassis supports (light weight, shallow equipment with low cable pull factor, IEC 61587-1 DL 1 shock/vibration environment). For the assembly into cabinets only, the chassis mounting flanges are bolted to the 19 in uprights. This type of chassis provides the maximum use of the available width and heights within a 1U section. See Figure 1.

- **Chassis type B**: This type of chassis is designated for equipment with higher load (high rear cabling pull factor, IEC 61587-1 DL 1 shock/vibration environment). Therefore, chassis slides shall be used. The chassis design shall provide recessed areas as a space for the cabinet mounted chassis slides. See Figure 2.

● **Chassis type C**: This type of chassis is designated for extendable equipment mounted on telescopic slides (top cover and/or rear I/O access via rear cable management, IEC 61587-1 DL 1 environment). Telescopic slides may be of two or three parts, dependent on the extension requirement. The chassis design shall provide on both sides recessed areas dependent on the required space for the telescopic slides.

NOTE There is no standard for telescopic slides, mounting dimensions should be defined by the equipment design. See Figure 3.

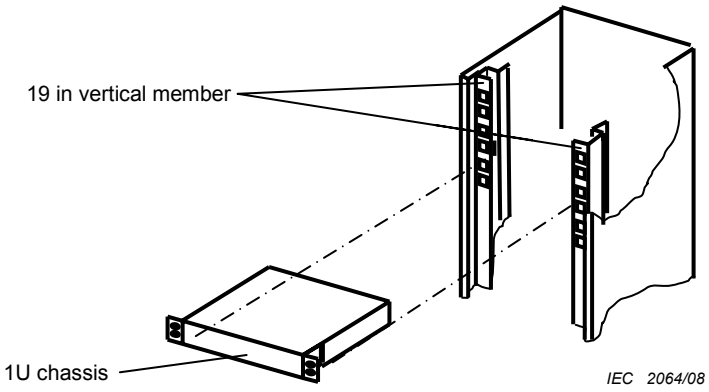


Figure 1 – Chassis type A

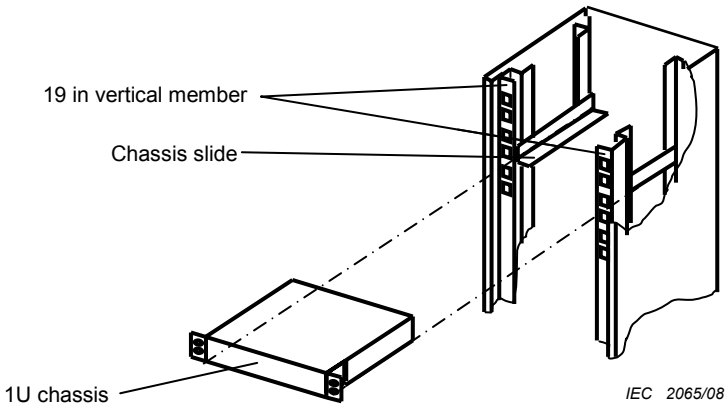


Figure 2 – Chassis type B

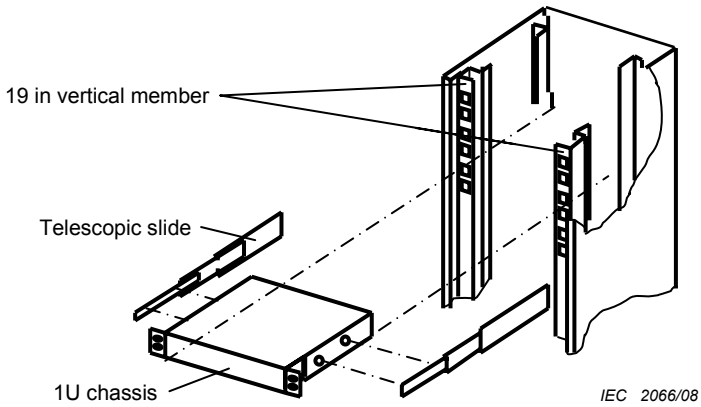


Figure 3 – Chassis type C

5 Dimensions of the 1U chassis

IEC 60297-3-100 defines the front panel dimensions and the aperture of the rack/cabinet.

5.1 Chassis type A

This type of chassis is typically of either light weight, limited depth and/or has a very low cable pull factor. Therefore, the centre of gravity is relatively close to the chassis front panel where the chassis mounting screws to the rack/cabinet uprights are located. Figure 4 illustrates the recommended chassis dimensions utilizing the maximum available cabinet aperture dimension for a 1U chassis. The maximum cable pull factor is to be considered in addition to the maximum weight. The mounted chassis vertical deflection shall not pass over the theoretical rack/cabinet height pitch line.

The maximum width as shown in Figure 4 includes any attached mounting flanges as well as mounting screws.

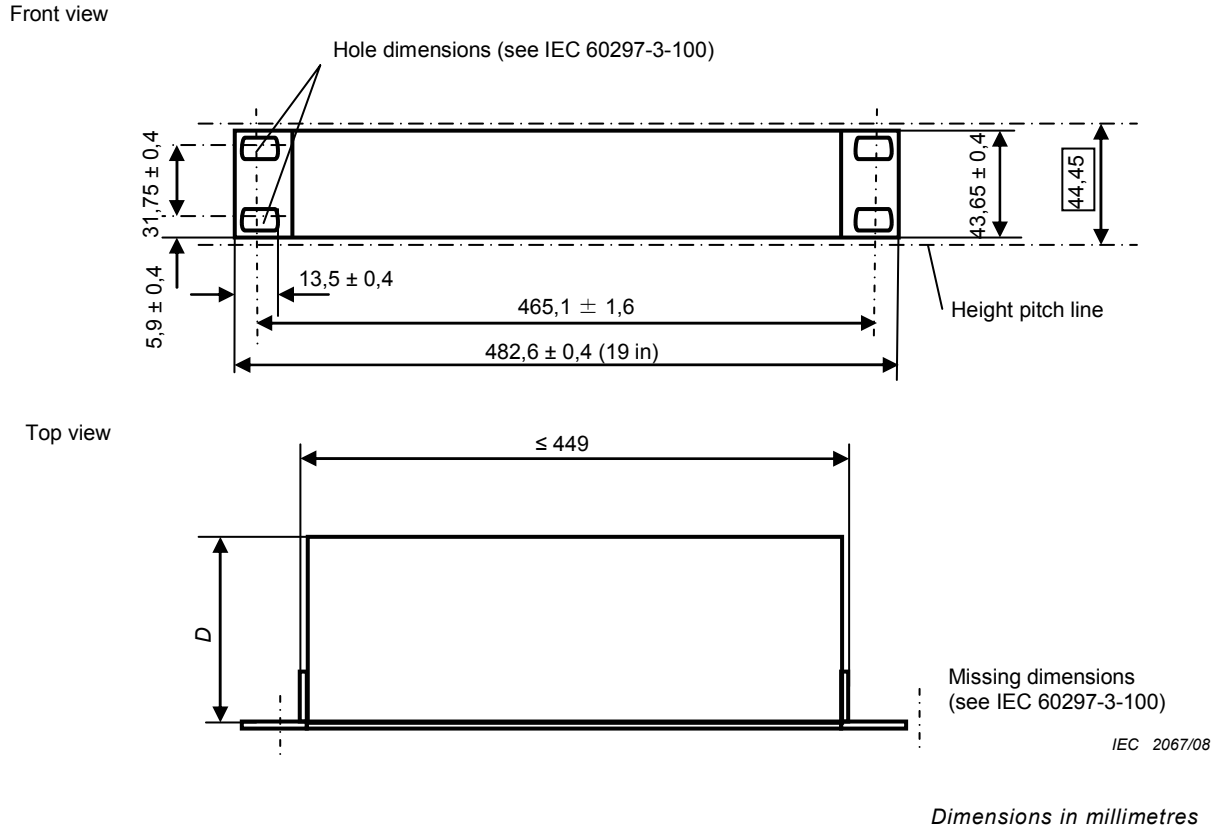


Figure 4 – Dimensions of chassis type A

5.2 Chassis type B

For the type B chassis as shown in Figure 5 the chassis height dimension shall be reduced in order to provide for chassis support space. For the purposes of this standard, the chassis height is reduced by 2 mm at the bottom of the chassis height. This provides for an interference free modular mounting approach of multiple and/or different chassis or subracks in a rack/cabinet.

Where maximum available chassis height is required, only the chassis to mounting support interfaces have to be observed.

For safety reasons and for the load bearing calculation of the chassis slides, the total weight shall not exceed 25 kg.

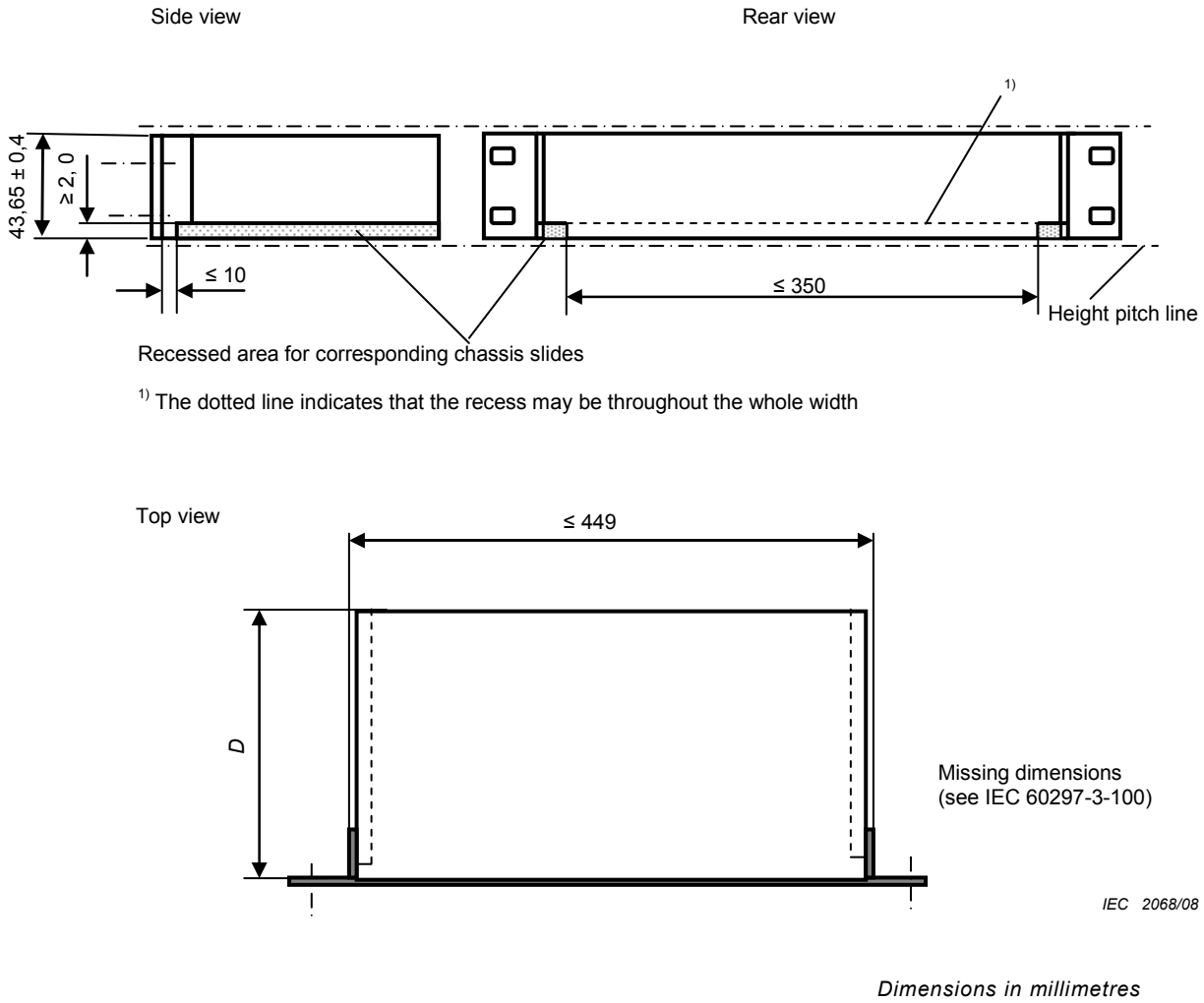


Figure 5 – Dimensions of chassis type B

5.3 Chassis type C

For the type C chassis as shown in Figure 6, the chassis width dimension is reduced to provide space for single, double or triple extension telescopic slides.

The type C chassis may require cable management between the rear of the chassis and the rack/cabinet interface.

The type C chassis dimensions are based on the triple extension telescopic design and the telescopic slides are within the 1U chassis dimension.

The type C chassis load, when fully extended out of the rack/cabinet, must be observed in means of the possible dangerous tilt effect of a free standing rack/cabinet. The recommended chassis width of maximum 425 mm leaves 2 × 12 mm space for the extendable parts of the telescopic slides (see Clause A.2). There is no standard for telescopic slides, but the recommended dimension of 12 mm complies with the most common products in the electronics market and in relation to the maximum load.

NOTE For safety reasons (tilt effect of a cabinet by fully extended chassis) and for the load bearing calculation of telescopic slides the chassis shall not exceed 25 kg.

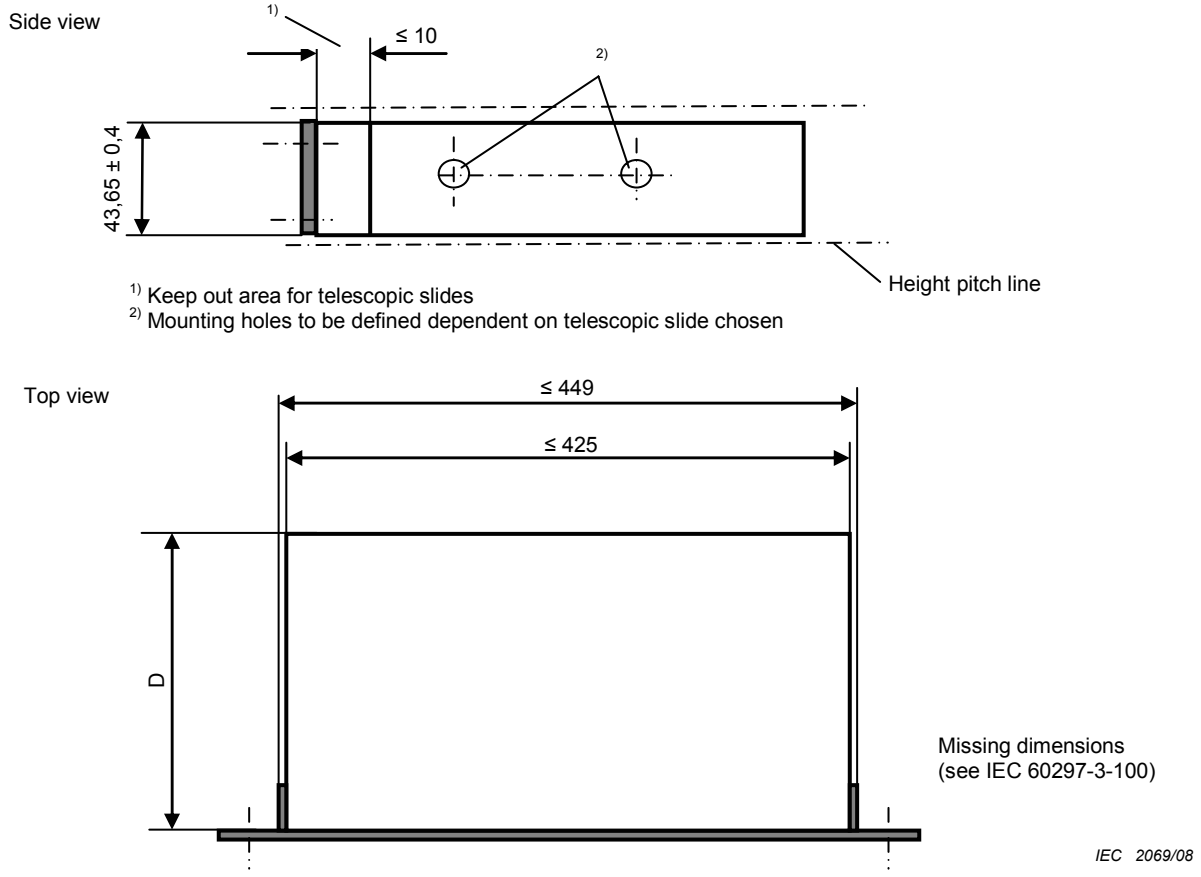


Figure 6 – Dimensions of chassis type C

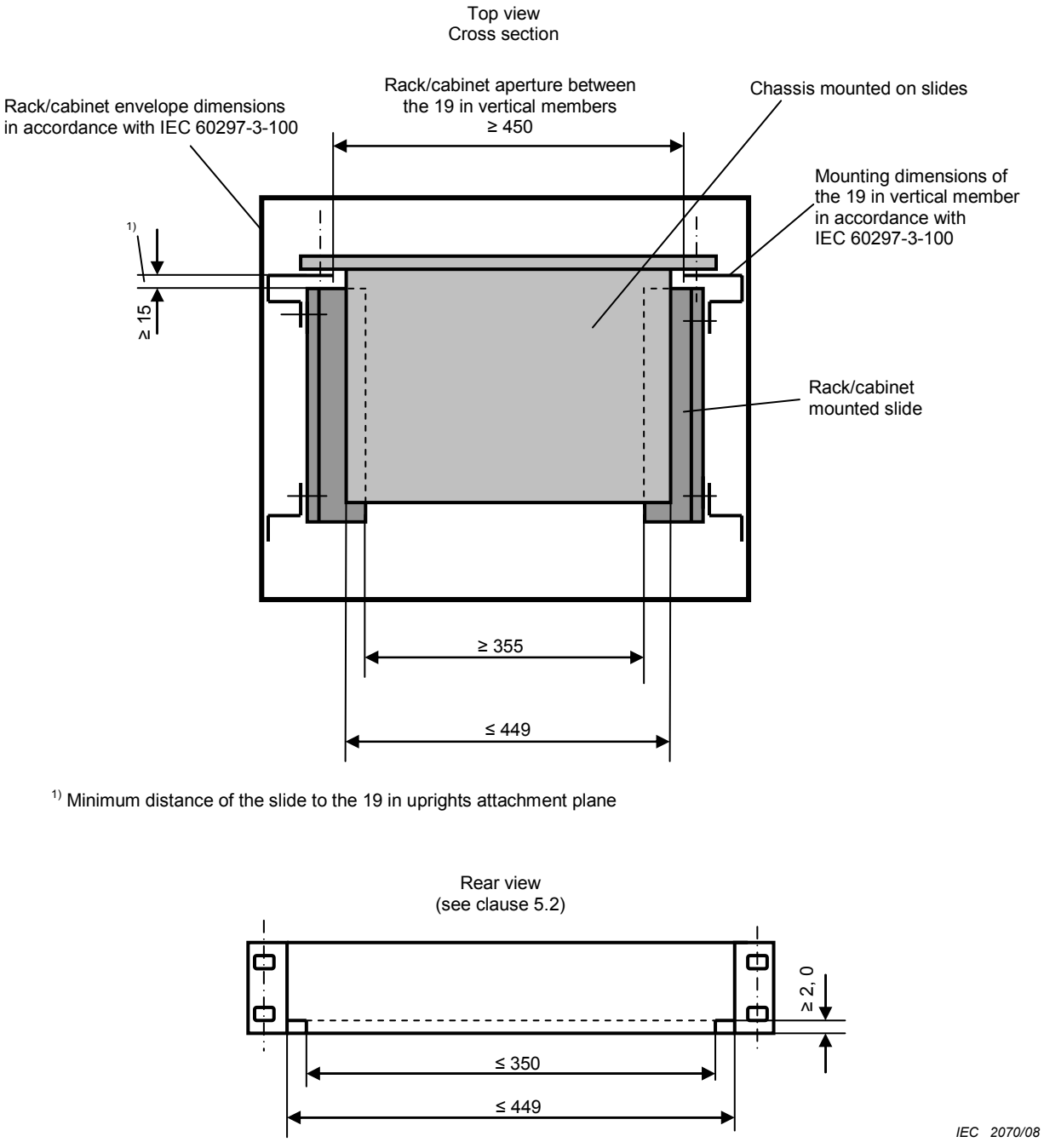
6 Climatic, mechanical tests (safety aspects, EMC, seismic)

For the test of mechanical integrity, dedicated tests are described in the IEC 61587 series. This standard should be referenced in technical specifications as a common base for the design properties of 1U equipment. The 1U chassis are not explicitly described in the above mentioned standard. Therefore, the tests for the chassis should be performed according to the subracks.

Annex A
(informative)

Chassis and rack/cabinet relationship

A.1 Chassis type B and rack/cabinet relationship

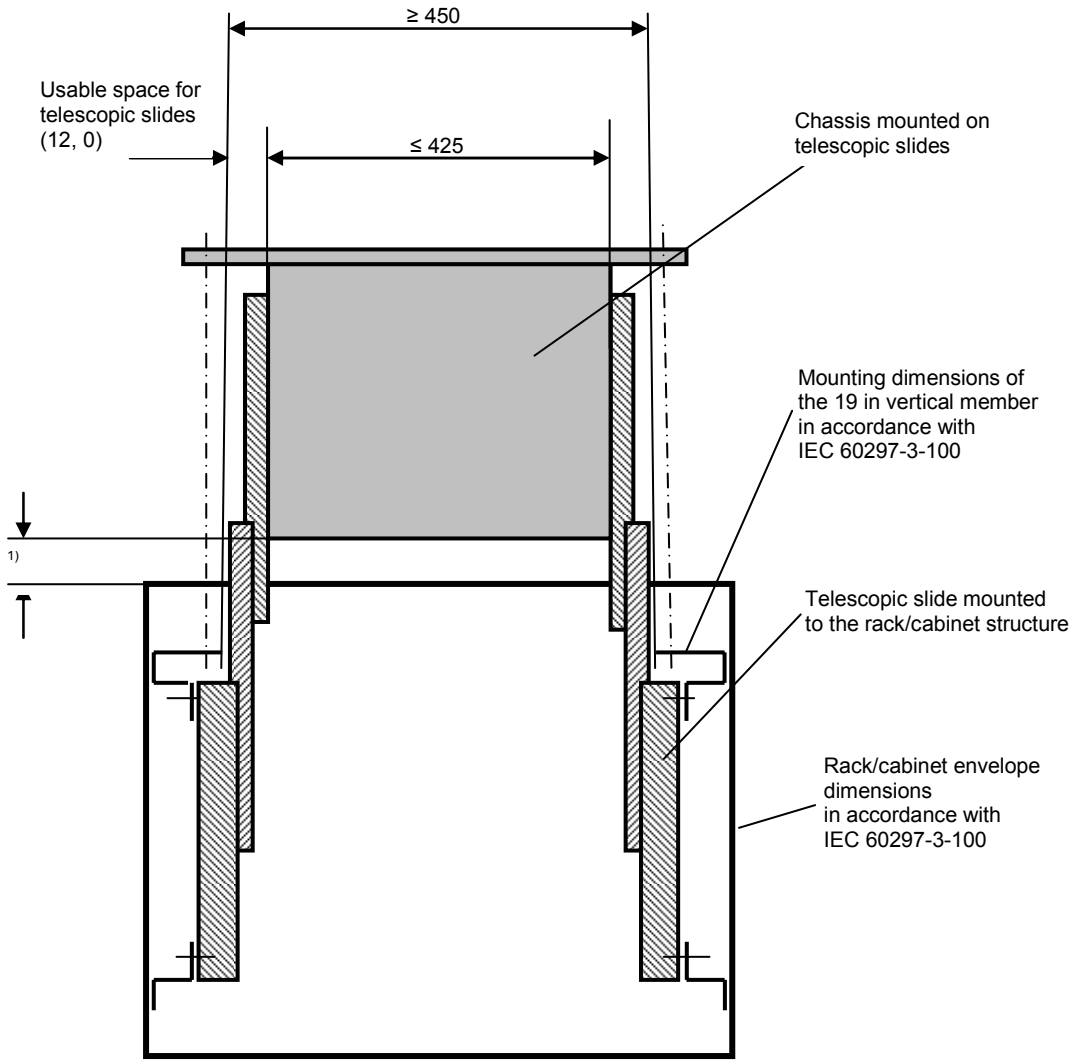


[1] Minimum distance of the slide to the 19 in uprights attachment plane

Dimensions in millimetres

Figure A.1 – Chassis type B and rack/cabinet relationship

A.2 Chassis type C rack/cabinet relationship



[1] Chassis type C top and rear I/O access to be defined by the designer and installer defined cable management

IEC 2071/08

Dimensions in millimetres

Figure A.2 – Chassis type C rack/cabinet relationship

Annex B
(informative)

Cooling air flow

For well-controlled heat management within a cabinet, the air flow through multiple built-in chassis or subracks should be in the same direction. The preferred air flow direction for 1U chassis is from front to rear. As an alternative side to side or side to rear air flow may be considered. These alternative air flow solutions are mainly used for stand-alone equipment. These rules apply for chassis with forced air flow.

In the case of natural convection, some space within the cabinet should be considered for the air inlet and outlet (bottom to top air flow). At convection and forced air cooling, ideally the cooling air enters at the front of the chassis and exits at the rear of the chassis.

Optionally, cooling air may enter the chassis and exit the chassis at any point taking the chassis type (A, B, C) and final application installation into account. Application specific standards, specifications and/or profiles shall define the airflow direction.

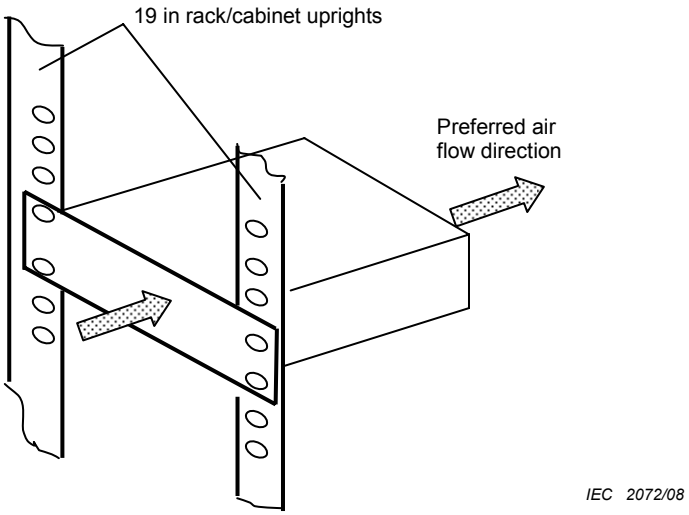


Figure B.1 – Cooling airflow direction

Annex C
(informative)

Chassis depth relationship to the rack/cabinet

Table C.1 – Maximum depth *D* in relation to corresponding cabinet depth

Dimensions in mm

Chassis type A	◎	◎	—	—	—	—
Chassis type B and C	◎	◎	◎	◎	◎	◎
Chassis depth *D* ≤	250	500	600	700	800	1 000
Cabinet depth (See IEC 60297-3-100)	300	600	800	900	1 000	1 200

(*Continued from second cover*)

International Standard	*Title*
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

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.

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Amendments Issued Since Publication

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