

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V –  
Part 1: Standard strength classes and end fittings**

**Éléments de chaîne d'isolateurs composites pour lignes aériennes de tension nominale supérieure à 1 000 V –  
Partie 1: Classes mécaniques et armatures d'extrémité normalisées**



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**COMPOSITE STRING INSULATOR UNITS FOR OVERHEAD LINES  
WITH A NOMINAL VOLTAGE GREATER THAN 1 000 V –****Part 1: Standard strength classes and end fittings**

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International Standard IEC 61466-1 has been prepared by IEC technical committee 36: Insulators.

This second edition cancels and replaces the first edition published in 1997. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Addition of strength classes reflecting UHV practice;
- b) Inclusion of Corrigendum 1:2008 for Y fitting hole dimensions.

The text of this standard is based on the following documents:

FDIS	Report on voting
36/378/FDIS	36/381/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61466 series, published under the general title *Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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# COMPOSITE STRING INSULATOR UNITS FOR OVERHEAD LINES WITH A NOMINAL VOLTAGE GREATER THAN 1 000 V –

## Part 1: Standard strength classes and end fittings

### 1 Scope

This part of IEC 61466 is applicable to composite string insulator units for a.c. overhead lines with a nominal voltage greater than 1 000 V and a frequency not greater than 100 Hz.

It also applies to insulators of similar design used in substations or on electric traction lines.

This standard applies to string insulator units of composite type with ball, socket, tongue, clevis, Y-clevis or eye couplings, or a combination thereof.

The object of this standard is to prescribe specified values for the mechanical characteristics of the composite string insulator units and define the main dimensions of the couplings to be used on the composite string insulator units in order to permit the assembly of insulators or fittings supplied by different manufacturers and to allow, whenever practical, interchangeability with existing installations.

It also defines a standard designation system for composite string insulator units.

NOTE 1 General definitions and methods of testing are given in IEC 61109.

NOTE 2 Only the dimensions necessary for assembly of the couplings are dealt with in this International Standard. Properties of material and working loads are not specified. The coordination of dimensions of the end-fittings with the strength classes is specified in Clause 7.

### 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 60120:1984, *Dimensions of ball and socket couplings of string insulator units*

IEC 60471:1977, *Dimensions of clevis and tongue couplings of string insulator units*

### 3 Mechanical and dimensional characteristics

Composite string insulator units are standardized by the following specified characteristics:

- specified mechanical load (SML);
- standard couplings.

All dimensions are expressed in millimetres.

The dimensions apply to the finished product after any surface treatment.



## 4 Plan of the standard

This standard includes eleven standard SML classes designated for use together with 10 different series of couplings as follows.

- Two different standard series of ball couplings, one according to IEC 60120 and one, type N, as shown in Annex A of this standard.
- Two different standard series of socket couplings, one according to IEC 60120 and one, type N, as shown in Annex A of this standard.
- Two different standard series of tongue couplings, one, type L, according to IEC 60471 and one, type N, as shown in Annex B of this standard.
- Two different standard series of clevis couplings, one, type L, according to IEC 60471, and one, type N, as shown in Annex B of this standard
- One standard series of Y clevis couplings, as shown in Annex C of this standard.
- One standard series of eye couplings as shown in Annex D of this standard.

## 5 Insulator designation

Insulators are designated in Table 1 by letter CS followed by a number indicating the specified mechanical load (SML) in kilonewtons. The letter B, S, T, C, Y or E or a combination thereof which follows specifies a ball, socket, tongue, clevis, Y-clevis or eye coupling, see Figure 1. The following figures specify the size of the coupling. When a combination of couplings are used, the first letter shall always express the coupling on the upper end of the insulator. The upper end of the insulator is defined in relation to the slope of the sheds. In the case of symmetrical profile of the sheds any order of the letters is acceptable.

As examples, possible designations could be:

CS 120 S/B16 indicates a composite insulator having a SML equal to 120 kN, a socket coupling according to IEC 60120, size 16, at the upper end and a ball coupling according to IEC 60120, size 16, at the other end.

CS 120 C/T19N indicates a composite insulator having a SML equal to 120 kN, a clevis coupling according to Annex B, size 19N, at the upper end and a tongue coupling according to Annex B, size 19N, at the other end.

Fittings of the same series conforming to different standards (e.g. IEC 60120 and Annex A of this part of IEC 61466) should be avoided on the same insulator.

## 6 Marking

Each insulator shall be clearly and indelibly marked with the name or trademark of the manufacturer, the year of manufacture, the specified mechanical load (SML) and a means permitting identification of each of the component parts.

## 7 Composite insulator units

The values of the specified mechanical loads (SML) for composite string insulators together with corresponding coupling sizes are given in Table 1.

The designation letters of the different designs of couplings which may be used in any combination are shown in Figure 1.

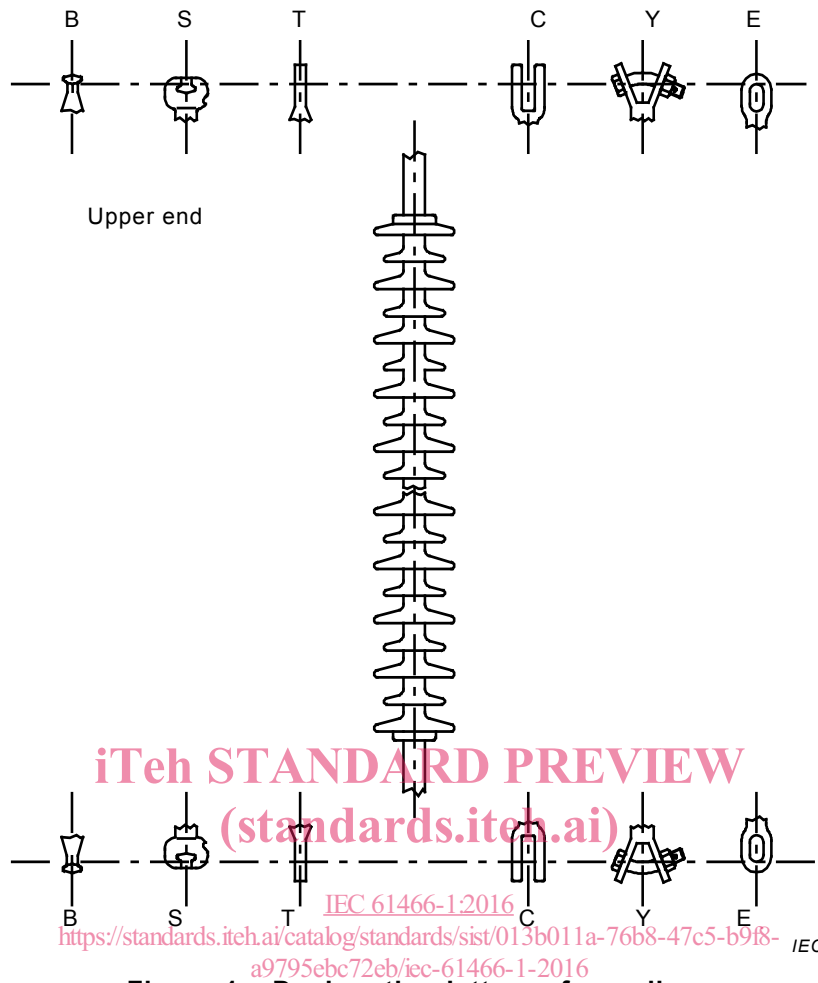


Figure 1 – Designation letters of couplings

Table 1 – Insulator designation

Designation	Specified mechanical load (SML)	Ball and socket		Clevis and tongue		Y-clevis	Eye
		IEC 60120 size	Annex A size	IEC 60471 size	Annex B size	Annex C size	Annex D size
CS 40	40	11	–	–	–	–	–
CS 70	70	16	16N	13L	16N	16 (19)	17 (24)
CS 100	100	16	16N	16L	16N (19N)	19	24
CS 120	120	16	18N	16L	16N (19N)	19	24
CS 160	160	20	22N	19L	19N (22N)	22	25
CS 210	210	20	22N	(19L) 22L	22N	22	25
CS 300	300	24	–	(22L) 25L	–	–	–
CS 400	400	28	–	28L	–	–	–
CS 420	420	28	–	28L	–	–	–
CS 530	530	32	–	32L	–	–	–
CS 550	550	32	–	32L	–	–	–
CS 600	600	–	–	36L	–	–	–

NOTE 1 Non-preferred coupling sizes in brackets.  
NOTE 2 Coupling size 36L is not defined in IEC 60471.

## Annex A (normative)

### Ball and socket couplings, N series

#### A.1 General

This annex applies to the couplings of composite string insulator units.

This annex defines the dimensions of a standardized series of ball and socket couplings, which permit the replacement of existing insulator sets in accordance with North American practice, and permits the assembly of composite insulator units and fittings supplied by different manufacturers.

#### A.2 Dimensions

The dimensions for the ball and socket couplings are expressed by dimensions for the GO and NOT GO gauges (see Figures A.1 to A.7).

All dimensions indicated in Tables A.1 to A.6 are given in millimetres and refer to the finished product after surface treatment such as, for instance, hot dip galvanizing.

The outside dimensions of the socket have not been fixed, since they depend on the mechanical characteristics of the material used. Only the dimensions necessary for assembly of the couplings are dealt with in this standard.

In general, the ball is made of forged steel and the socket is made of malleable or ductile cast iron or forged steel. However, other materials may be used if they have mechanical characteristics corresponding to those given in Table 1 of this part of IEC 61466.

NOTE Dimensions are converted from inches.

#### A.3 Constructional features of the gauges

The choice of material, the hardness, the surface finish, the surface treatment and the method of manufacture are liable to vary from one country to another. Therefore, the following recommendations are given only for general guidance:

- the material shall be non-shrinking, oil-hardening steel;
- the Rockwell hardness number shall be 62 to 63 HRC in order to reduce deformation and wear;
- the surface roughness shall be less than 4  $\mu\text{m}$ ;
- hard chromium plating can, in certain cases, increase resistance to wear.

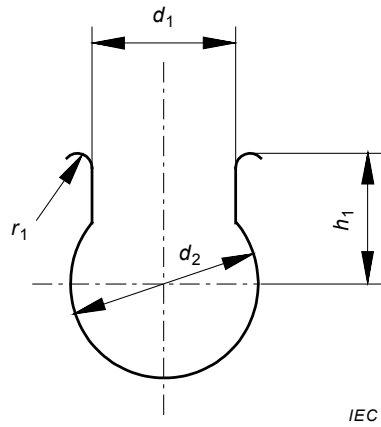
#### A.4 Plan of the annex

This annex includes three standard sizes of ball and socket couplings, followed by the letter N, which reflect the North American practice.

#### A.5 Designation

The ball and socket couplings are designated by the shank diameter, expressed in millimetres, of the ball coupling, followed by the letter N.

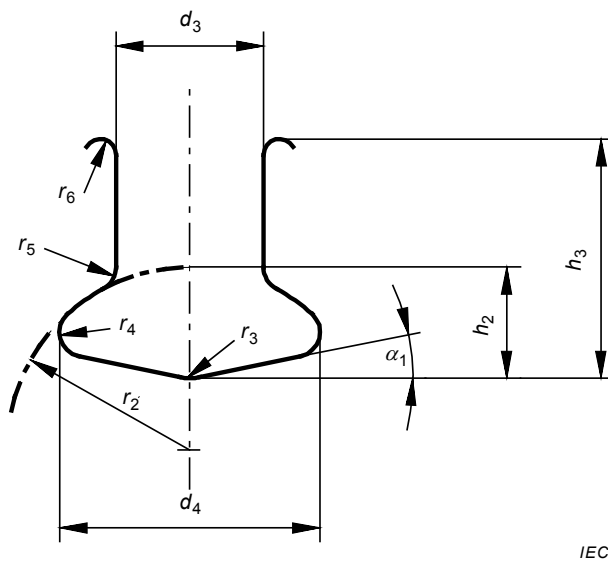
**A.6 Gauges for ball couplings**



**Figure A.1 – Dimensions of NOT GO gauges for ball couplings**

**Table A.1 – Dimensions of NOT GO gauges for ball couplings**

Designated size of ball couplings	Gauge contour	Dimensions according to figure A.1			
		$d_1$	$d_2$	$h_1$	$r_1$
16N	Min.	15,748	-	-	-
	Nom.	15,748	20,638	14,288	1,588
	Max.	15,753	-	-	-
18N	Min.	17,399	-	-	-
	Nom.	17,399	20,638	14,288	1,588
	Max.	17,404	-	-	-
22N	Min.	21,565	28,448	-	1,473
	Nom.	21,590	28,575	19,050	1,600
	Max.	21,615	28,702	-	1,727

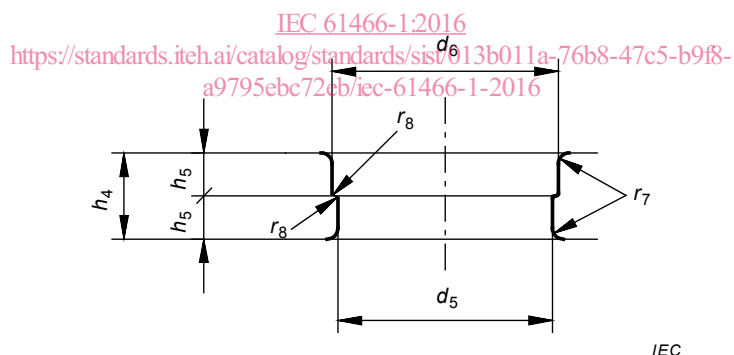


**Figure A.2 – Dimensions of GO gauges for ball couplings**

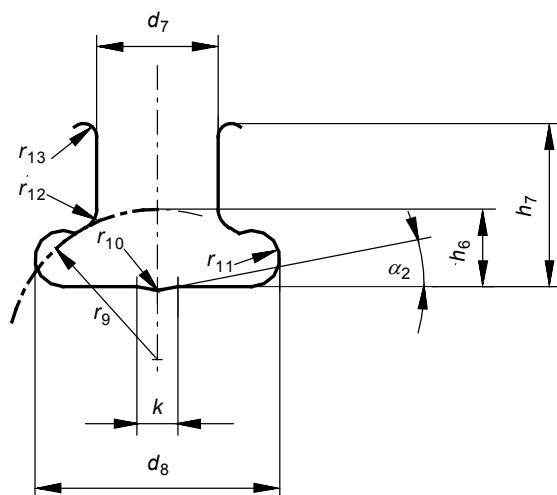
**Table A.2 – Dimensions of GO gauges for ball couplings**

Designated size of ball couplings	Gauge contour	Dimensions according to figure A.2									
		$d_3$	$d_4$	$h_2$	$h_3$	$r_2$	$r_3$	$r_4$	$r_5$	$r_6$	$\alpha_1$
16N	Min.	18,867	33,325	14,122	30,607	23,241	6,223	2,997	3,048	1,905	–
	Nom.	18,872	33,376	14,224	30,607	23,368	6,350	3,124	3,175	2,032	11,5
	Max.	18,872	33,376	14,224	30,734	23,368	6,477	3,124	3,175	2,159	–
18N	Min.	18,867	33,325	14,122	30,607	23,241	6,223	2,997	3,048	1,905	–
	Nom.	18,872	33,376	14,224	30,607	23,368	6,350	3,124	3,175	2,032	11,5
	Max.	18,872	33,376	14,224	30,734	23,368	6,477	3,124	3,175	2,159	–
22N	Min.	23,647	43,078	18,440	36,525	32,055	3,963	5,004	–	1,905	–
	Nom.	23,673	43,104	18,491	36,576	32,106	4,089	5,055	3,962	2,032	9,5
	Max.	23,698	43,129	18,542	36,627	32,156	4,216	5,105	–	2,159	–

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**Figure A.3 – Dimensions of GO and NOT GO gauges for ball couplings****Table A.3 – Dimensions of GO and NOT GO gauges for ball couplings**

Designated size of ball couplings	Gauge contour	Dimensions according to figure A.3					
		$d_5$	$d_6$	$r_7$	$r_8$	$h_4$	$h_5$
16N	Min.	31,598	33,350	–	–	–	–
	Nom.	31,598	33,376	1,588	0,397	12,700	6,350
	Max.	31,623	33,376	–	–	–	–
18N	Min.	31,598	33,350	–	–	–	–
	Nom.	31,598	33,376	1,588	0,397	12,700	6,350
	Max.	31,623	33,376	–	–	–	–
22N	Min.	40,843	43,104	–	–	–	–
	Nom.	40,869	43,129	0,397	0,397	12,700	6,350
	Max.	40,894	43,155	–	–	–	–



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Figure A.4 – Dimensions of NOT GO gauges for ball couplings

Table A.4 – Dimensions of NOT GO gauges for ball couplings

Designated size of ball couplings	Gauge contour	Dimensions according to figure A.4										
		$d_7$	$d_8$	$h_6$	$h_7$	$r_9$	$r_{10}$	$r_{11}$	$r_{12}$	$r_{13}$	$k$	$\alpha_2$
16N	Min.	18,923	–	12,573	25,781	23,368	3,175	–	–	1,905	–	–
	Nom.	18,923	38,100	12,573	25,908	23,368	3,302	4,366	3,175	2,032	6,350	11
	Max.	18,928	–	12,675	26,035	23,495	3,429	–	–	2,159	–	–
18N	Min.	18,923	–	12,573	25,781	23,368	3,175	–	–	1,905	–	–
	Nom.	18,923	38,100	12,573	25,908	23,368	3,302	4,366	3,175	2,032	6,350	11
	Max.	18,928	–	12,675	26,035	23,495	3,429	–	–	2,159	–	–
22N	Min.	23,698	47,498	16,713	36,195	32,055	3,175	4,648	–	1,905	–	–
	Nom.	23,724	47,625	16,764	36,322	32,106	3,302	4,775	4,064	2,032	6,350	9,5
	Max.	23,749	47,752	16,815	36,449	32,156	3,429	4,902	–	2,159	–	–

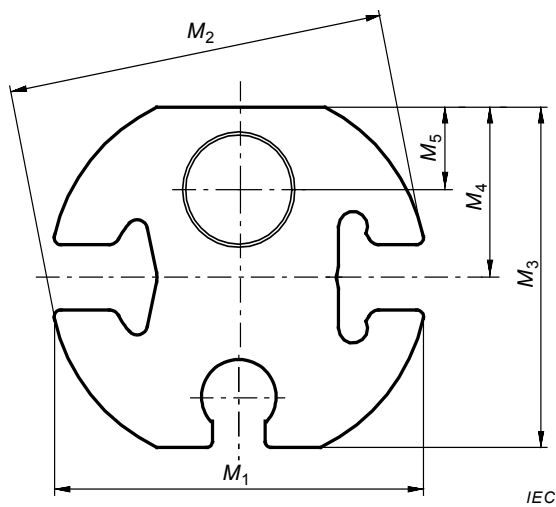


Figure A.5 – Dimensions of gauges for ball coupling size 16N and 18N

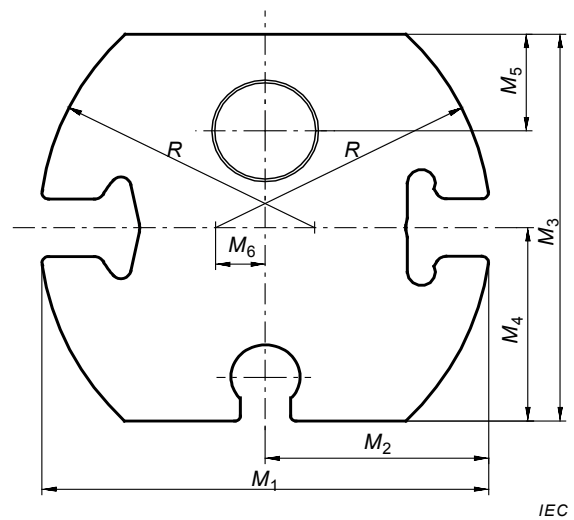


Figure A.6 – Dimensions of gauge for ball coupling size 22N

Table A.5 – Dimensions of gauges for ball couplings

Designated size of ball couplings	Gauge contour	Dimensions according to figures A.5, A.6						
		$M_1$	$M_2$	$M_3$	$M_4$	$M_5$	$M_6$	$R$
16N	Nom.	110	111	98	49	24	–	–
18N	Nom.	110	113	98	49	24	–	–
22N	Nom.	140	70	127	64	32	15	90

NOTE The thickness of each gauge is 12,7 mm.