

BS EN 50181:2010



BSI Standards Publication

Plug-in type bushings above 1 kV up to 52 kV and from 250 A to 2,50 kA for equipment other than liquid filled transformers

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The UK participation in its preparation was entrusted to Technical Committee PEL/36, Insulators for power systems.

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50181

July 2010

ICS 29.080.20

Supersedes EN 50181:1997

English version

Plug-in type bushings above 1 kV up to 52 kV and from 250 A to 2,50 kA for equipment other than liquid filled transformers

Traversées embrochables de tensions
supérieures à 1 kV jusqu'à 52 kV
et de 250 A à 2,50 kA pour équipements
autres que transformateurs à remplissage
de liquide

Steckbare Durchführungen über 1 kV
bis 52 kV und von 250 A bis 2,50 kA
für Anlagen anders als flüssigkeitsgefüllte
Transformatoren

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 36A, Insulated bushings.

It was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50181 on 2010-07-01.

This document supersedes EN 50181:1997.

The main technical changes on the Plug-in type bushings are:

- Enlarge the scope of the voltage class from the plug-in bushings from 36 kV to 52 kV;
- Upgrading the current capacity of the existing defined bushings;
- Introduce a new bushing interface for 52 kV.

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The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement | (dop) | 2011-07-01 |
| – latest date by which the national standards conflicting
with the EN have to be withdrawn | (dow) | 2013-07-01 |
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Contents

Introduction.....	4
1 Scope.....	4
2 Normative references.....	4
3 Definitions	4
4 Requirements.....	5
4.1 Application.....	5
4.2 Standard values of maximum voltage (U_m).....	5
4.3 Standard values of rated current (I_r).....	5
4.4 Compliance	5
4.5 Bushing mounting distance.....	5
4.6 Detail dimensions of plug-in type bushings.....	5
Figures	
Figure 1 - Interface dimensions of outside cone plug-in type bushings	6
Figure 2 - Bushing details of outside cone plug-in type bushings.....	7
Figure 3 - Outer dimensions of inside cone plug-in type bushings	9
Figure 4 - Interface details of inside cone plug-in type bushings	10
Tables	
Table 1 - Interface dimensions	6
Table 2 - Bushing dimensions	8
Table 3 - Bushing dimensions	9
Table 4 - Interface dimensions	11

Introduction

The object of this European Standard is to specify the requirements to ensure interchangeability of bushings for maximum voltages above 1 kV up to 52 kV and rated currents from 250 A to 2 500 A for equipment other than insulating liquid filled transformers.

1 Scope

This European Standard is applicable to insulated bushings for maximum voltages above 1 kV up to 52 kV, rated currents from 250 A up to 2 500 A and frequencies from 15 Hz up to 60 Hz for equipment other than liquid filled transformers.

This European Standard establishes essential dimensions, to ensure adequate mounting and interchangeability of mating plug-in separable connectors of equivalent ratings.

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.

EN 60137, *Insulated bushings for alternating voltages above 1 000 V*

IEC Guide 109 and Cenelec TC 111X document ¹⁾, *Environmental aspects – Inclusion in electrotechnical product standards*

NOTE It is highly recommended to minimize the impact of bushings on the environment during all phases of their life (including manufacturing, operation during service life, dismantling after their end of life and disposal or recycling).

IEC Guide 109 and document by CENELEC TC 111X, *Environmental standardization for electrical and electronic products and systems* after finalization can be used as helpful reference.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

plug in type bushing

bushing one end of which is immersed in an insulating medium which has customized dimensions according to insulation requirements for the specific application and the other end designed to receive a separable insulated cable connector without which the bushing cannot function

3.2

separable connector

fully insulated termination permitting the connection and disconnection of the cable to and from the mating plug-in type bushing

3.3

interface type

bushing dimensions that insure mechanical and electrical interchangeability of bushing and separable connector of similar rating and type

NOTE Each interface type is designed by a letter or a number.

3.4

bail holder

fixture which facilitates anchoring of an externally mounted device (called the bail) designed to prevent undesirable separation of a separable connector and a bushing

¹⁾ Under development.

NOTE A bail holder may or may not be an integral part of a bushing and is an optional feature.

4 Requirements

4.1 Application

Bushings covered by this European Standard shall be suitable for operation with one end connected to a separable connector and the other end having customized dimensions according to the insulation requirements for the specific application.

4.2 Standard values of maximum voltage (U_m)

The value of U_m of a bushing shall be chosen from the standard values of the highest voltage for equipment, defined in IEC 60038 as given below in kilovolt:

12 – 24 – 36 – 52

4.3 Standard values of rated current (I_r)

The value I_r of a bushing shall be chosen from the standard values given below in ampere:

250 - 400 - 630 - 800 - 1 250 - 1 600 - 2 000 - 2 500

4.4 Compliance

Bushings which are supplied separately shall meet the requirements of EN 60137.

Customized bushings which are integrated directly in the equipment shall comply with the test requirements specified in the standard(s) relevant to that type of equipment.

4.5 Bushing mounting distance

The minimum distance between bushings shall take into account the outer dimensions of separable connectors and the optional bail holders.

4.6 Detail dimensions of plug-in type bushings

4.6.1 General

The dimensions necessary to ensure adequate mounting and interchangeability of mating plug-in separable connectors shall be as specified in the following Figures and Tables.

4.6.2 Outside cone type

The dimensions necessary for outside cone plug-in type bushings are specified in Figures 1 and 2 and in Tables 1 and 2.

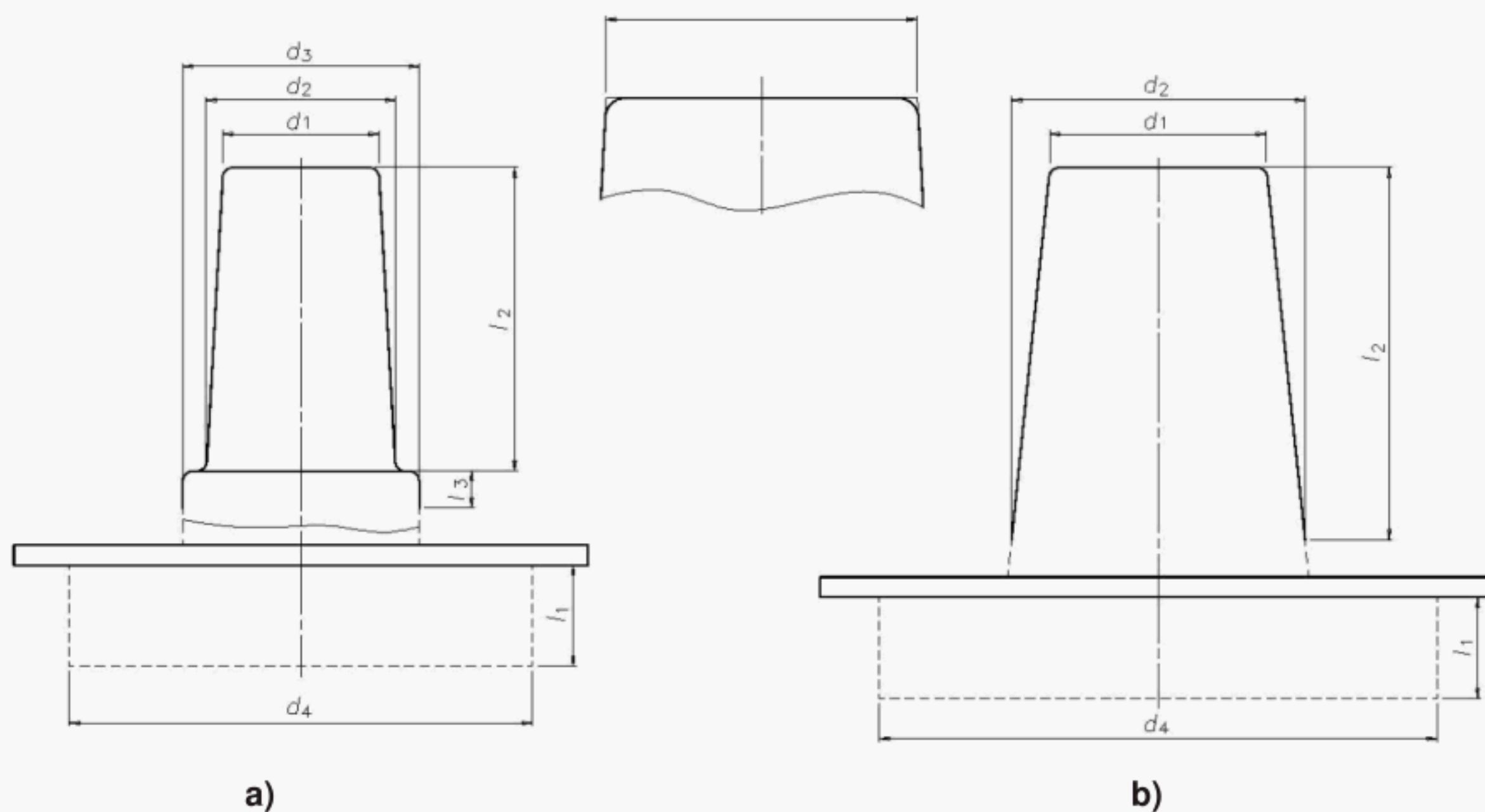


Figure 1 - Interface dimensions of outside cone plug-in type bushings

Table 1 - Interface dimensions

U_m	I_r	d_1	$d_2^{\pm 0,2}$	$d_3^{\pm 0,2}$	d_4 max.	l_1 max.	l_2	l_3 min.	Contact type	Interface type	Figure
kV	A	mm	mm	mm	mm	mm	mm	mm			
12-24	250	31 $_{-0,3}^{+0,1}$	32,5	48,5	132	205	48 $_{-0,2}^{+0,2}$	9	Sliding	A	1a)
12-24-36	250 - 400	46 $\pm 0,2$	56	70	137	205	90 $\pm 0,2$	11	Sliding	B	1a)
12-24-36	630-1 250	46 $\pm 0,2$	56	70	137	205	90 $\pm 0,2$	11	Bolted	C	1a)
12-24	800-1 250	39,9 $\pm 0,2$	52,1	76,2	137	205	81 $\pm 0,2$	14,8	Bolted	D	1a)
36		39,9 $\pm 0,2$	61,5	76,2	165	240	103,7 $\pm 0,2$	21	Bolted	E	1a)
12-24-36	630-1 250 2 500	64 $\pm 0,2$	86,8		165	240	110,5 $\pm 0,2$		Bolted	F	1b)
12-24-36-52	630-1 250										

NOTE The envelope $l_1 \times d_4$ represents the section of the plug-in type bushing inside the equipment.

When bushings are an integral functional part of an equipment, the values l_1 and d_4 may differ from the table and shall be defined by the equipment manufacturer.

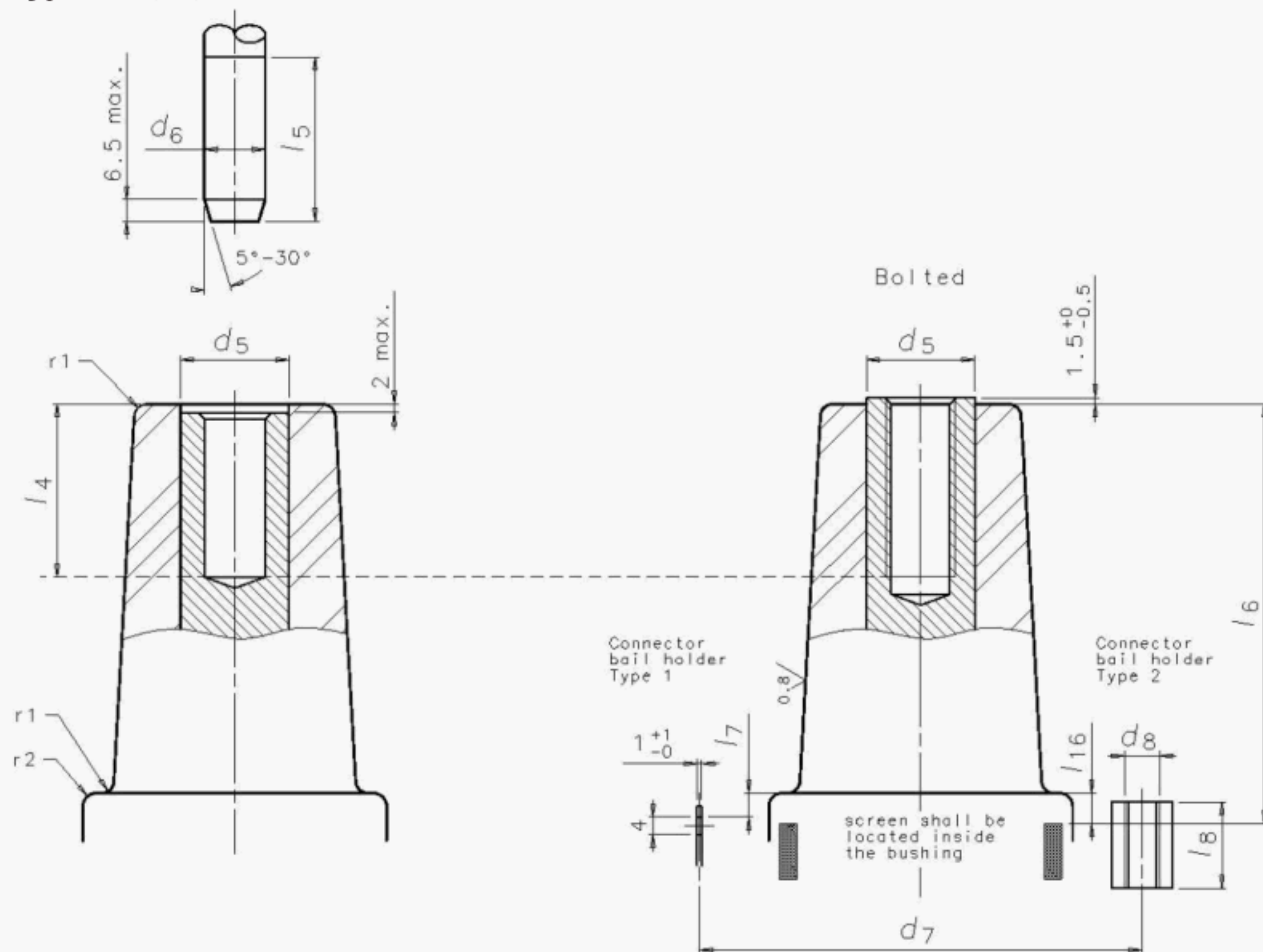
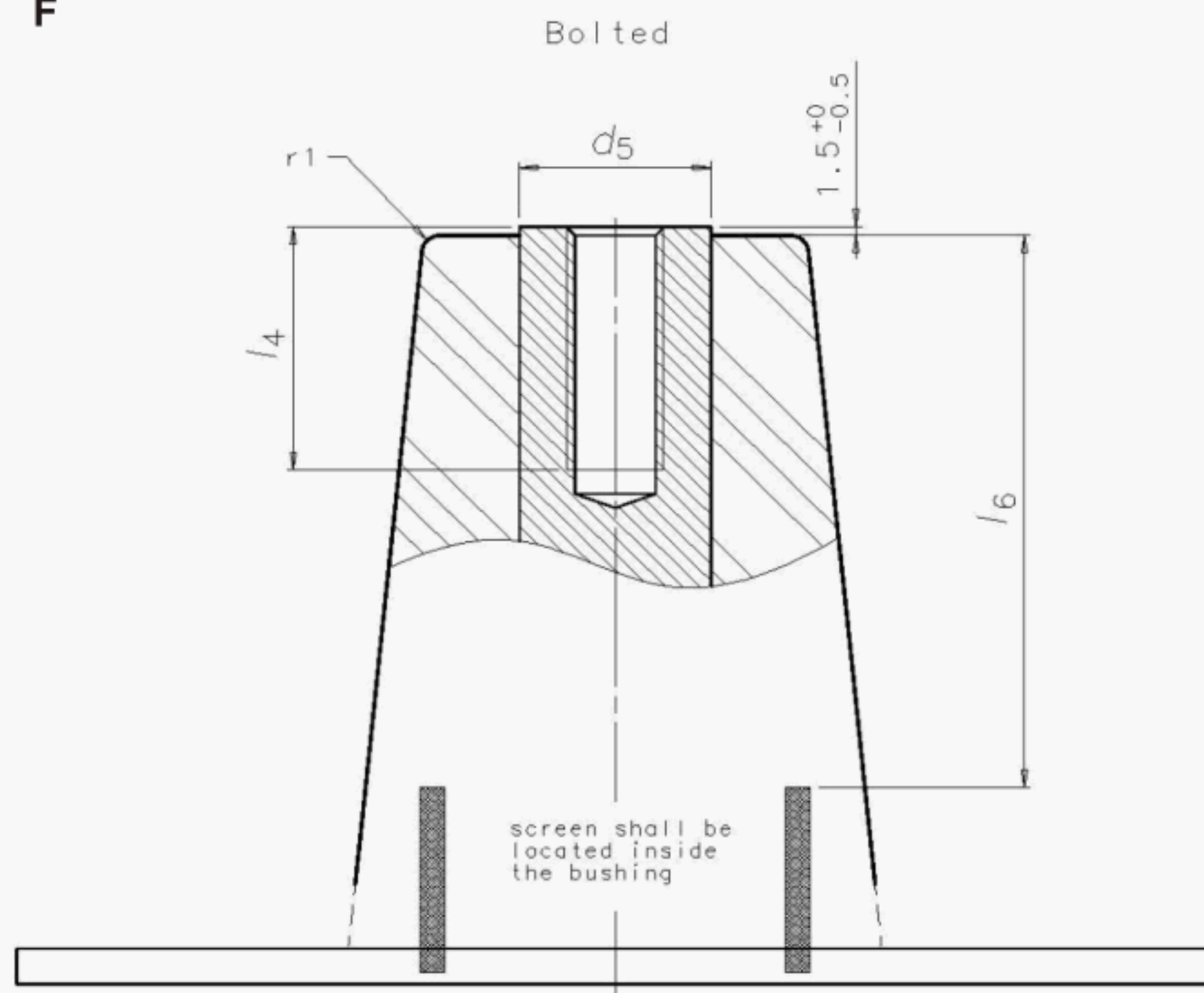
Interface type: A to E**Interface type: F****Figure 2 - Bushing details of outside cone plug-in type bushings**

Table 2 - Bushing dimensions

U_m	I_r	Bushing contact						l_5	l_6	Radius		Bail holder Type 1 or 2			l_7	l_8	l_{16}	Interface and bushing type
		Type	Material ^a	d_5	d_6	Thread	l_4			r_1	r_2	Location	Required number	d				
				nominal								d_7 $\pm 0,5$		Type 2	± 2		± 1	
kV	A						min.	min.	max.	max	max.		min.			min.		
				mm	mm		mm	mm	mm	mm	mm	mm			mm	mm	mm	
12-24	250	Sliding	Cu	-	$7,9^{+0,02}_{-0,05}$	-	32	30	54	1	2x 45°	90	2	M6	3,5	8	2	A1
12-24-36	250	Sliding	Cu	-	$14^{+0}_{-0,04}$	-	40	38	97	3	3	102	2	M8	5,5	10	2	B1
12-24-36	400	Sliding	Cu	-	$14^{+0}_{-0,04}$	-	40	38	97	3	3	102	2	M8	5,5	10	2	B2
12-24-36	630	Bolted	Cu	22 min.	-	M16	29	-	97	3	3	b 102	b 2	b M8	-	10	-	C1
12-24-36	1 250	Bolted	Cu	32	-	M16	29	-	97	3	3	b 102	b 2	b M8	-	10	-	C2
12-24			Cu						88									D1
	800	Bolted		32	-	M16	29					b	b	b				
			or							3	3			M8	-	10	-	
												102	2					
36			Al						111									E1
12-24									88									D2
	1 250	Bolted	Cu	32	-	M16	29	-		3	3	b	b	b				
														M8	-	10	-	
												123	2					
36									111									E2
12-24-36	2 500	Bolted	Cu	50	-	M16	29	-	94	3	-	-	-	-	-	-	-	F1
12-24-																		
36-52	630	Bolted	Cu	32	-	M16	29	-	94	3	-	-	-	-	-	-	-	F2
12-24-																		
36-52	1 250	Bolted	Cu	32	-	M16	29	-	94	3	-	-	-	-	-	-	-	F3

^a In the connection of separable connectors to bushings, care must be taken in the matching of the materials of the cable conductors, the cable lugs and the bushing conductors. Where dissimilar metals are joined, appropriate precautions shall be taken.

Where aluminium bushing conductors are used and screw threads are required, a suitable grade of aluminium or aluminium alloy shall be used.

^b Bail holder is optional.

4.6.3 Inside cone type

The dimensions necessary for inside cone plug-in type bushings are specified in Figures 3 and 4 and in Tables 3 and 4.

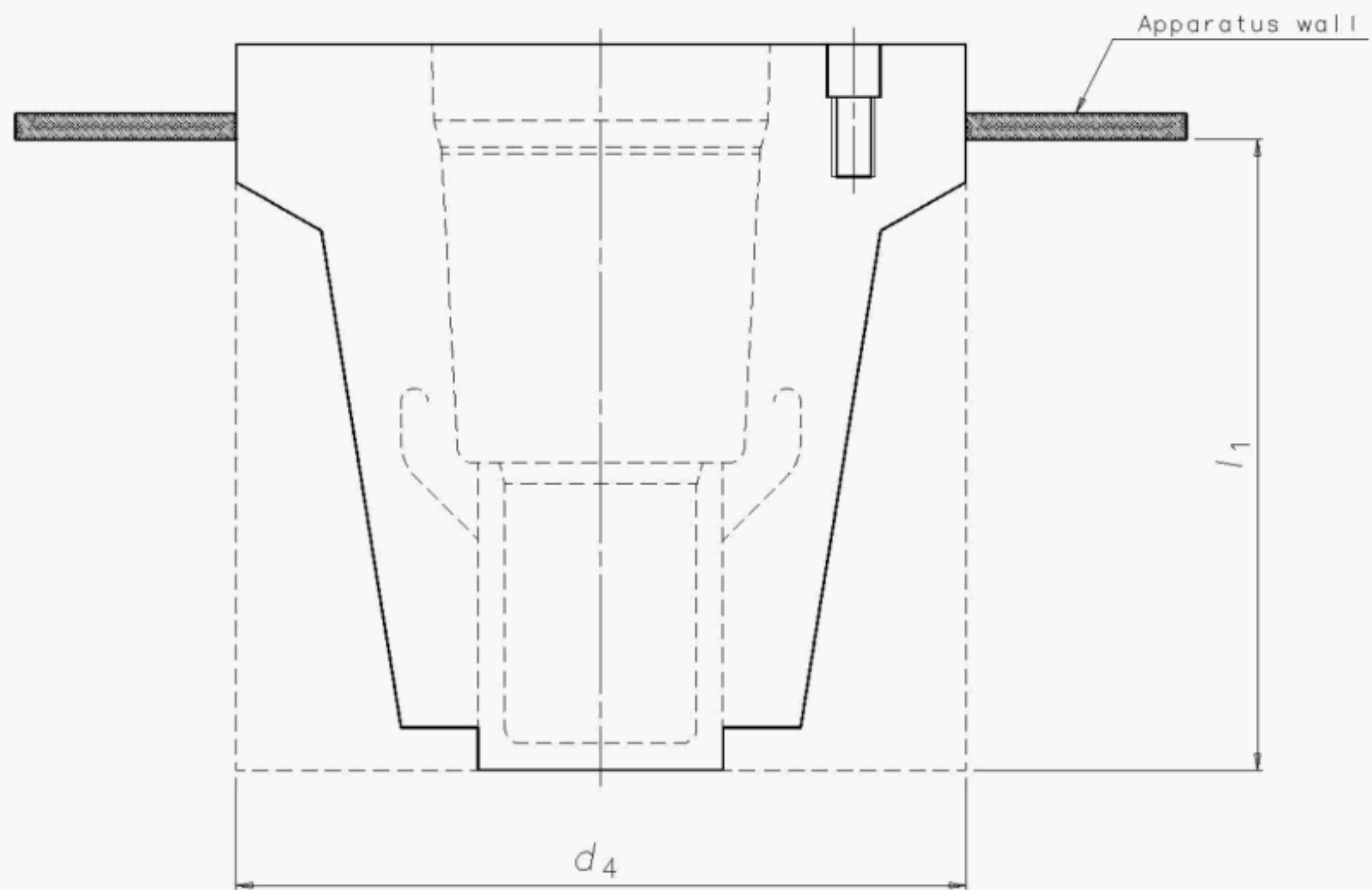


Figure 3 - Outer dimensions of inside cone plug-in type bushings

Table 3 - Bushing dimensions

U_m kV	I_r A	d_4 max. mm	l_1 max. mm	Interface type
12-24	250	132	205	0
12-24-36	400 - 630	137	205	1
12-24-36	800	137	205	2
12-24-36-52	1 250	185	240	3

NOTE The envelope $l_1 \times d_4$ represents the section of the plug-in type bushing inside the equipment.

When bushings are an integral functional part of an equipment, the values l_1 and d_4 may differ from the table and shall be defined by the equipment manufacturer.

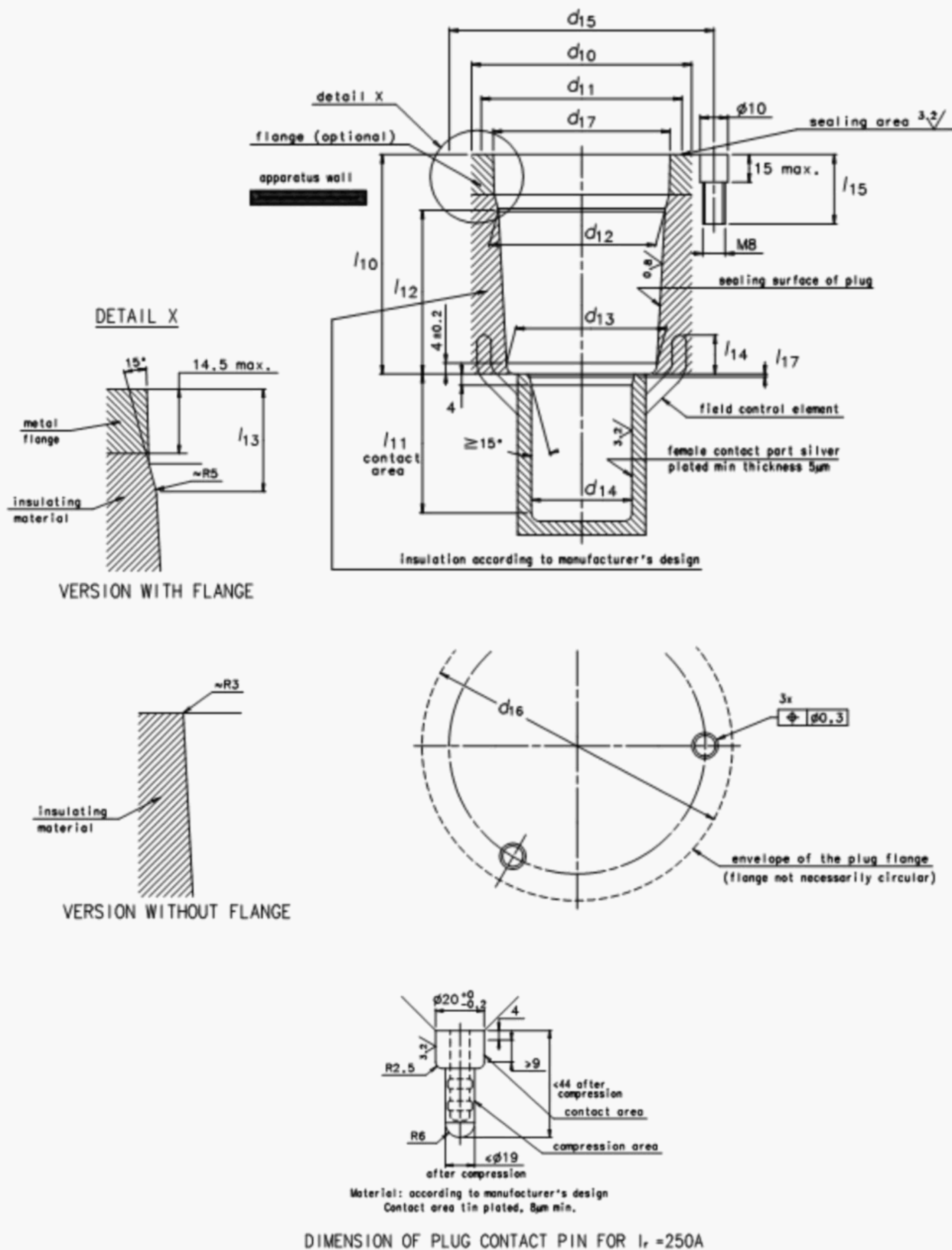


Figure 4 - Interface details of inside cone plug-in type bushings

Table 4 - Interface dimensions																		
U_m	I_r	d_{10}	d_{11}	d_{12} $\pm 0,4$	d_{13} $\pm 0,4$	d_{14} $+0,1$ 0	d_{15}	d_{16}	d_{17}	l_{10} $\pm 1,3$	l_{11}	l_{12} $\pm 0,2$	l_{13}	l_{14} $+2$ -1	l_{15} $+5$ 0	l_{17}	Contact type	Interface Type
kV	A	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		
12-24	250	69 min	62 max	53,2	47,5	a	88	108	59,5	83	44	59	20 ± 1	14	23	1 $\pm 0,15$	Sliding	0
12-24-36	400	min	max															
		79	72	59,8	54	36	95	115	63,5	83	46,5	59	20 0	14	23	0	Sliding	1
12-24-36	800	min	max															
		86	79	65,8	60	39	102	122	69,5	83	46,5	59	20 ± 1	14	23	0	Sliding	2
12-24-36-52	1 250	115 min	95 max	87,8	79,7	55	130	150	92,5	110	82	81	24 $\pm 1,50$	19	32	0	Sliding	3

^a The female part has to be designed according to the requirements of the separable connector contact pin detail.

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