

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Power transformers –**  
**Part 22-7: Power transformer and reactor fittings – Accessories and fittings**

**Transformateurs de puissance –**  
**Partie 22-7: Transformateur de puissance et bobines d'inductance – Accessoires et équipements**



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**Power transformers –  
Part 22-7: Power transformer and reactor fittings – Accessories and fittings**

**Transformateurs de puissance –  
Partie 22-7: Transformateur de puissance et bobines d'inductance – Accessoires  
et équipements**

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## POWER TRANSFORMERS –

**Part 22-7: Power transformer and reactor fittings –  
Accessories and fittings**

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International Standard IEC 60076-22-7 has been prepared by IEC technical committee 14: Power transformers.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
14/1044/FDIS	14/1048/RVD

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

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

A list of all parts in the IEC 60076 series, published under the general title *Power transformers*, can be found on the IEC website.



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

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- withdrawn,
- replaced by a revised edition, or
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## POWER TRANSFORMERS –

### Part 22-7: Power transformer and reactor fittings – Accessories and fittings

#### 1 Scope

This part of IEC 60076-22 applies to a selection of accessories and fittings mounted on liquid immersed power transformers according to IEC 60076-1 and reactors according to IEC 60076-6 with or without conservator for indoor or outdoor installation. It outlines the service conditions and the mechanical requirements that are common to all the accessories and fittings.

This document also outlines the operation requirements specific to each device as well as the preferred dimensions relevant for interchangeability and the type and routine test to be performed.

This document covers an exhaustive selection of the accessories and fittings that are currently used on transformers or reactors.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-3-3:2019, *Environmental testing – Part 3-3: Supporting documentation and guidance – Seismic test methods for equipment*

IEC 60068-3-3:1991, *Environmental testing – Part 3-3: Guidance – Seismic test methods for equipments*

IEC 60076-1, *Power transformers – Part 1: General*

IEC 60076-7, *Power transformers – Part 7: Loading guide for mineral-oil-immersed power transformers*

IEC 60296, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

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

IEC 60721-3-4, *Classification of environmental conditions – Part 3-4: Classification of groups of environmental parameters and their severities – Stationary use at non-weatherprotected locations*

IEC 60255-27, *Measuring relays and protection equipment – Part 27: Product safety requirements*

ISO 3601-1, *Fluid power systems – O-rings – Part 1: Inside diameters, cross-sections, tolerances and designation codes*

ISO 7005-1, *Pipe flanges – Part 1: Steel flanges for industrial and general service piping systems*

ISO 12944-6, *Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 6: Laboratory performance test methods*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **thermometer pocket**

facility mounted on the transformer or reactor cover or pipework or any liquid filled compartment, intended to house a thermal sensor to measure the insulating liquid temperature

#### 3.2

##### **earthing terminal**

terminal provided on the transformer or reactor tank or cooler support structure or any other part that needs to be grounded and intended for the electric connection with the earthing network

#### 3.3

##### **draining plug**

facility intended to drain the insulating liquid from liquid filled compartments

#### 3.4

##### **air vent**

facility for venting the air or gas trapped within the transformer tank and pipework

#### 3.5

##### **wheel assembly**

device suitable for movement of the transformer in different directions using rails

#### 3.6

##### **dehydrating breather**

device linking the air space at the top of the tank of a liquid immersed transformer with the outside air to absorb the humidity of the breathed air

#### 3.7

##### **butterfly valve**

device designed to isolate any component or accessory mounted on the transformer liquid system

#### 3.8

##### **junction terminal box**

device designed to make low-voltage, low-current, insulated and liquid-tight electrical connections between the inside and outside of a liquid filled compartment

#### 3.9

##### **sampling valve**

device used to take samples of the insulating liquid

## 4 Service conditions

### 4.1 General

The service conditions set out in IEC 60076-1:2011, 4.2 represent the normal scope of operation of the accessories and fittings specified in this document.

For any unusual service conditions that require special consideration in the design of the devices and equipment, see IEC 60076-1:2011, 5.5. Device specification for operation under such unusual service conditions shall be subject to agreement between the purchaser and manufacturer.

### 4.2 Corrosion protection

The materials used for the construction of the accessories and fittings or the surface treatment shall be resistant to the insulating liquid and suitable to withstand the environmental conditions. Unless otherwise specified, minimum withstand level of the parts exposed to the environment shall be C4 medium durability according to ISO 12944-6.

Parts intended to be welded and earthing pads shall not be painted.

Unless otherwise specified, screws exposed to the environment shall be stainless steel, consistent with the minimum corrosion class C4 medium durability.

### 4.3 Resistance to ambient conditions

The materials used for the construction of the accessories and fittings shall be UV resistant; windows and sight glasses shall not become opaque over the life of the accessory.

### 4.4 Insulating liquid characteristics

This Subclause 4.4 concerns only the accessories and fittings that are in contact with the insulating liquid.

If not otherwise specified, the insulating liquid is a mineral liquid according to IEC 60296 and the operating temperature shall be in accordance with IEC 60076-7.

If the insulating liquid is not a mineral liquid then the purchaser shall indicate the operating temperature.

## 5 General requirements for routine and type test

Unless otherwise specified, tests shall be made at an ambient temperature between 10 °C and 40 °C.

All measuring instruments used for the tests shall have traceable accuracy and be subject to periodic calibration.

## 6 Accessories and fittings

### 6.1 Thermometer pockets

#### 6.1.1 General

The thermometer pocket shall provide at all times a separation between the insulating liquid and the sensor; the thermometer pocket shall be designed to withstand the vacuum and pressure tests defined by IEC 60076-1:2011, 11.8, 11.9, 11.10 and 11.11, for transformer tanks.

When the thermometer pocket is not in use, the opening shall be plugged to avoid contamination by moisture, dust and any other undesired particles.

The thermometer pocket shall be designed to avoid damage to the thermometer pocket or to the temperature sensing equipment due to the thermal expansion of the heat transfer medium.

There shall be good thermal transfer of the thermometer pocket material and the filling medium.

### 6.1.2 Identification and nameplate

No requirement.

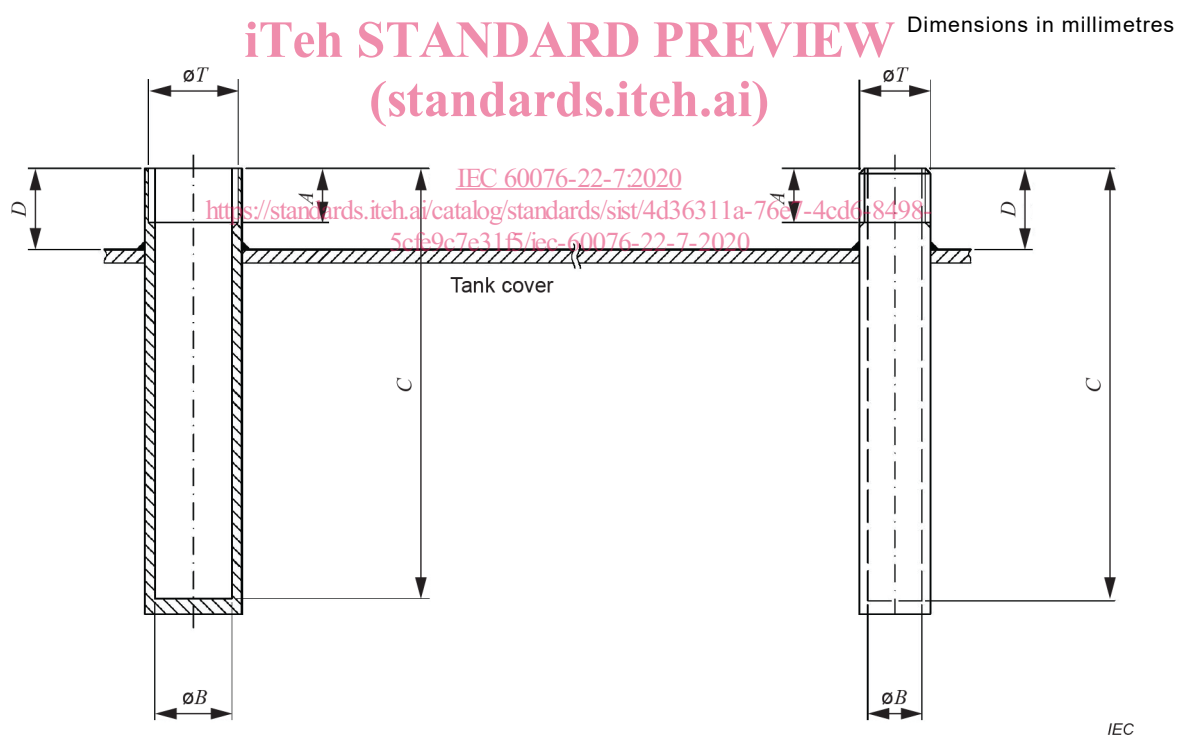
### 6.1.3 Test

The thermometer pocket is not tested individually, but as a component of the transformer or reactor during type or routine testing.

### 6.1.4 Dimensions of thermometer pockets

Figure 1 and Table 1 give the preferred solutions for thermometer pockets.

The protective plug or cap is not specified by this document.



**Figure 1 – Thermometer pocket with female (left) and male (right) thread**

**Table 1 – Preferred dimensions for thermometer pockets**

Dimensions in millimetres

Thermometer pockets with	Type	<i>A</i> min	<i>B</i> min	<i>B</i> max	<i>C</i> min	<i>D</i> max	Thread Ø <i>T</i>
Female thread	<b>A1</b>	20	20		165	30	G1
	<b>F</b>	17	16		155	30	M22 × 1,5
	<b>U</b>	13	12,4	12,5	166	30	M22 × 1,5
Male thread	<b>A2</b>	20	20		120	30	G ¾

## 6.2 Earthing terminal

### 6.2.1 General

Earthing terminals shall be stainless steel grade 304L minimum and positioned clear of ground level. The pad shall be selected to withstand the maximum prospective earth fault currents. Prior to connection to earth, any non-conductive coating shall be removed at threads, contact points, and contact surfaces.

The terminal shall be identified by the letter "E" either on the terminal itself or on its vicinity.

For the calculation of the maximum current of the earthing pads shown in Table 2, the cross section of the earthing element is used; the welding on the tank is considered to have a minimum cross section equivalent to the cross section of the pad. For earth terminal B7, a 5 mm welding seam along the complete circumference is considered. For a stud type earthing element, the core thread is used.

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The terminal shall ensure electrical continuity with the transformer tank.

The welding materials and methods for connecting the pads to the tank shall be capable of withstanding the maximum temperatures indicated in Table A.1 for each type of pad without detriment.

The maximum current values detailed in Table 2 are related only to the earthing pad and its connection to the tank; earthing connections to the pad should be suitably rated to match these values.

Table 2 shows the short-circuit current carrying capacity of the earth terminals. Table 2 is based on an initial temperature of 40 °C and a final temperature of 300 °C and a short circuit duration of 0,5 s, considering that the transformer protections will trip the current earlier than this value.

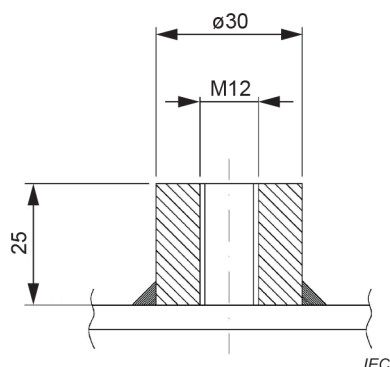
The values in Table 2 have been established considering the material properties as found in literature and an adiabatic temperature rise.

For additional information, see Annex A.

### 6.2.2 Dimensions of different earth terminals

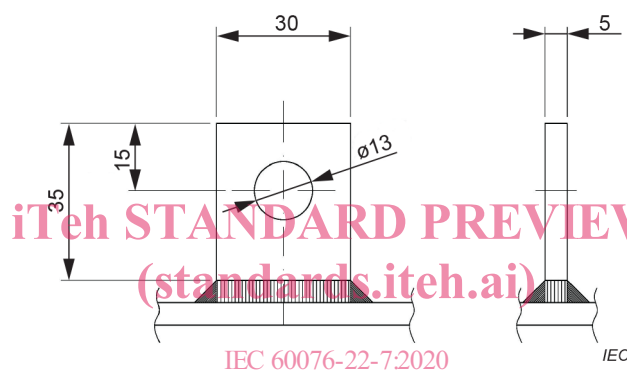
Figure 2 to Figure 8 show the preferred solutions.

Dimensions in millimetres



**Figure 2 – Earth terminal type B1**

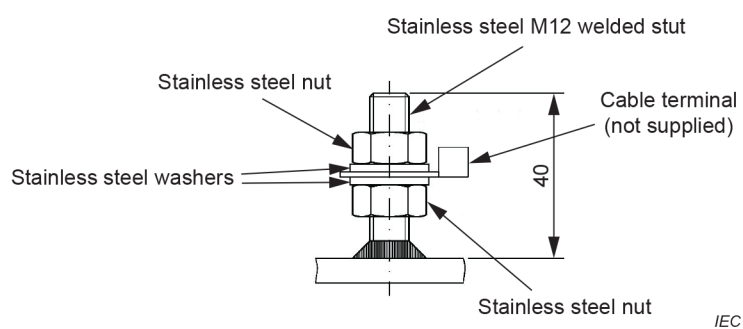
Dimensions in millimetres



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**Figure 3—Earth terminal type B2**

Dimensions in millimetres



**Figure 4 – Earth terminal type B3**