BRITISH STANDARD

BS EN
50112:1996

Measurement, control, regulation — Electrical temperature sensors — Metal protecting tubes for TC assemblies

The European Standard EN 50112:1994 has the status of a British Standard

ICS 17.200.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/65, Measurement and control, upon which the following bodies were represented:

British Coal Corporation
British Gas plc
British Nuclear Fuels plc
Electrical Contractors' Association
Electricity Association
Energy Industries Council
GAMBICA (BEAMA Ltd.)
Health and Safety Executive
Institution of Gas Engineers

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Cable Makers Confederation
British Pressure Gauge Manufacturers' Association
Department of Trade and Industry (National Physical Laboratory)
Engineering Industries Association
Institute of Materials
Society of Environmental Engineers
Society of Glass Technology

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on
15 November 1996

The following BSI references relate to the work on this standard:
Committee reference GEL/65
Draft for comment 93/202007 DC

ISBN 0 580 25744 4

Amendments issued since publication

Amd. No.	Date	Comments

Contents

National foreword

This British Standard has been prepared by Technical Committee GEL/65 and is the English language version of EN 50112: *Measurement, control, regulation — Electrical temperature sensors — Metal protecting tubes for TC assemblies,* published by the European Committee for Electrotechnical Standardization (CENELEC).

Cross-references

Publication referred to	Corresponding British Standard
EN 10027	BS EN 10027 *Designation systems for steel*
EN 10088-1	BS EN 10088 *Stainless steels* Part 1:1995 *List of stainless steels*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 50112

September 1994

UDC 536.532:621.362-213

Descriptors: Industrial-process, temperature measurement, electrical temperature sensors, thermocouples, metal protection tubes for thermocouples

English version

Measurement, control, regulation
Electrical temperature sensors
Metal protecting tubes for TC assemblies

Mesure, commande, régulation
Capteurs électriques de température
Tubes protecteurs métalliques pour assemblages de couples thermoélectriques

Messen, Steuern, Regeln
Elektrische Temperaturaufnehmer
Metall-Schutzrohre für Thermoelemente

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CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Ref. No. EN 50112:1994 E

Foreword

This European Standard was prepared by the CENELEC Technical Board Working Group BTWG 68-2.

The text of the draft, based on BT (DE/Notification) 160, was submitted to the formal vote in August 1993 and was approved by CENELEC as EN 50112 on 1994-03-08.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1995-03-15
- latest date of withdrawal of conflicting national standards (dow) 1995-03-15

1 Scope

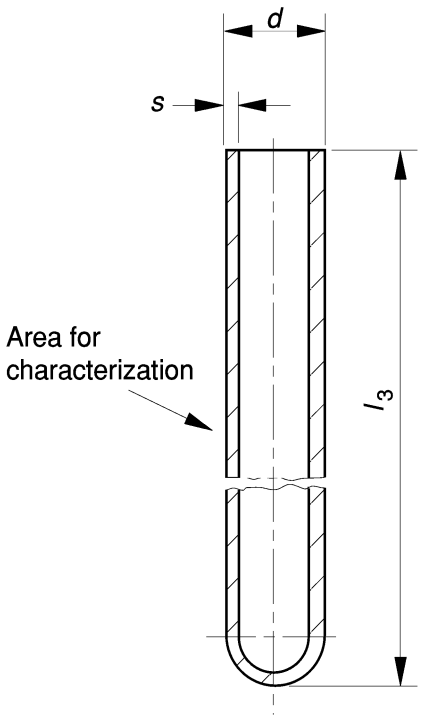
This standard applies to metal protecting tubes, used for straight thermocouple (t/c) assemblies, where the components parts are exposed to internal or external pressures, (ISO 7268), and where the working conditions have to be taken into consideration for the materials used.

2 Normative references

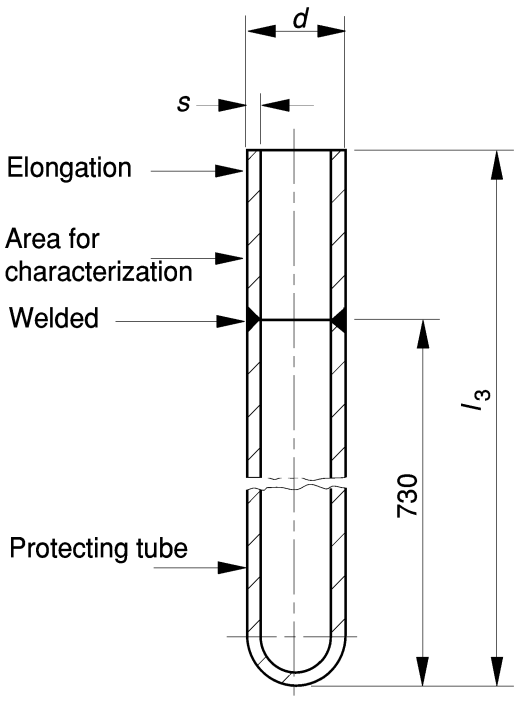
This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10027	Series	*Designation systems for steel*
EN 10088-1 (under consideration)	—	*Stainless steels — Part 1: List of stainless steels*
EN 10216-2 (under consideration)	—	*Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 2: Unalloyed and alloyed steels with specified elevated temperature properties*
ISO 7268	1983	*Pipe components — Definition of nominal pressure*

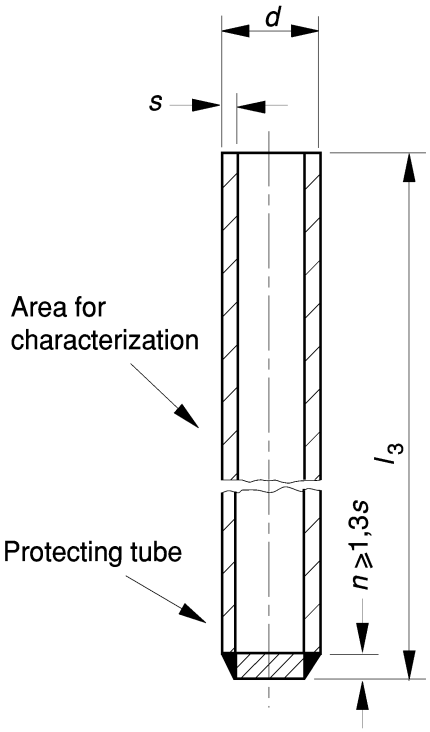
3 Configurations for protecting tubes: dimensions and descriptions



Configuration type A: swaged end



Configuration type B: elongated protecting tube, swaged end



Configuration type C: bottom plugged and welded in

All dimensions are in millimetres.

Figure 1

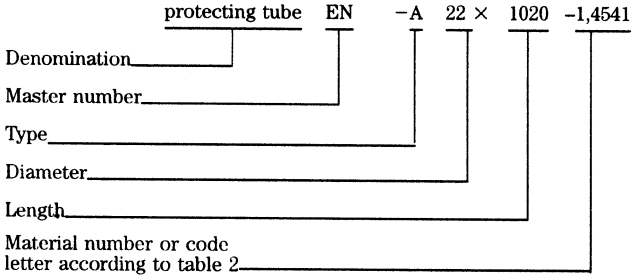


Table 1 — Dimensions and tolerances

Dimensions are in millimetres

Type	d +0,2 −0,1	s ±0,5	For straight t/c assemblies without interchangeable measuring probe having a nominal length l[a]							
			180	250	355	500	710	1000	1400	2000
			Length of protecting tube l_3 tolerance for type A ± 1,5, for type B ± 3, for type C^{+3}_{-1}							
A	15	2	195	265	370	520	—	—	—	—
	22	2	—	—	—	520	730	1020	1420	2020
	24	3	—	—	—	520	730	1020	1420	2020
B	22	2	—	—	—	—	—	1020	1420	2020
C	15	2	195	265	370	520	—	—	—	—
	22	2	—	—	—	520	730	1020	1420	2020
	24	3	—	—	—	520	730	1020	1420	2020

[a] Nominal length l: Dimension from tip of protecting tube to lower edge of connection head with a straight t/c assembly.

4 Material

Table 2 — Definition of code letters for materials for metal protective tube

	Code letters[a]	Material abbreviation EN 10027	Material number	Technical supply conditions
Iron (technically pure)	A		1.0340	SEL[b]
Unalloyed steel	H		1.XXXX	[c]EN 10216-2
Alloyed steel	C	X10CrAl18	1.4742	[d]
	D	X10CrAl24	1.4762	[d]
	F	X18CrN28	1.4749	[d]
	K	X6CrNiMoTi17-12-2	1.4571	[e]EN 10088-1
	N	X6CrNiTi18-10	1.4541	[e]EN 10088-1
	P	X10NiCr32-20	1.4861	SEL[b]
	Q	X15CrNiSi25-20	1.4841	[d]
Ni-alloy	J	NiCr60-15	2.4867	[f]

[a] With configuration type B the code letter is according to the protecting tube material. The elongation is fabricated from unalloyed steel or according to manufacturer.

[b] Chemical composition according to iron-steel-list.

[c] Seamless tubes from heat stable steel.

[d] Heat resistant steels for rolling and forging.

[e] Stainless steel.

[f] Ductile nickel alloys with chrome.

5 Protection tubes shall be manufactured from:

a) seamless unalloyed (carbon) steel;

b) seamless or welded alloyed steel;

c) seamless or welded special materials.

The welding shall not result in beads protruding into the bore of the tube.

NOTE Welding may affect the corrosion and/or mechanical properties of the tube.

6 Testing

The tubes shall be leak free when tested at a positive pressure of 2 bar at room temperature.

7 Marking

The material code reference shall be permanently marked on the outside wall of the tube, a minimum of 40 mm from the open end.

Annex A
Indications for the selection and application of the material for protecting tubes

The following remarks are only recommendations for the application of various materials. For sheath selection the specific service conditions should be taken into account as it is possible where different areas of stress are experienced, to combine different tube materials as shown in type B. At elevated temperatures, and in molten metal, the useful life is greatly reduced.

A.1 Resistance of materials of protecting tubes in contact with gases

Table A.1

Material number	Applicable in air °C	Resistance against			
		Sulfur containing gases		Gases containing nitrogen and with low oxygen content	Carbon deposition
		Oxidizing	Reducing		
1.0340	550	low	low	intermediate	low beneath 550 °C
1.4742	1050	very high	intermediate	low	intermediate
1.4762	1200		high		
1.4749	1050	very high	intermediate	intermediate	intermediate
	1200		quite high		
1.4541	800	low	low	intermediate	intermediate
1.4841	1200			quite high	low
2.4867				high	
1.4861					

A.2 Recommended application fields

A.2.1 *Application in gases*

Table A.2

Application field	Material number
Tempering oven	1.0305
Annealing or hardening oven with gases containing sulfur or carbon	1.4742 1.4762 1.4749
Chemically agressive vapours with the exception of combined vapours of hydrochloric acid with sulfur dioxide gas	1.4541
Ovens with gases containing nitrogen but with low oxygen content	1.4861
Nitration ovens with ammonia	—

A.2.2 *Application in molten salts*

Table A.3

Application field		Material number
Nitrate of potassium, saltpetre, nitre	up to 500 °C	1.0305 1.0340
Cyanide	up to 950 °C	1.0305 1.0340 1.4841
Chlorine-containing-melts[a]		1.4742 1.4749 1.4762

[a] In molten salts containing barium chloride all metallic protective tubes are only short living. It is therefore recommended to measure temperature in those molten salts with radiation thermometers (pyrometers).

A.2.3 *Application in metallic melts*

Table A.4

Application field		Material number
Aluminium	up to 700 °C	1.4861[a]
Magnesium containing aluminium	up to 700 °C	1.0340
Bearing metal	up to 600 °C	1.0305[a]
Lead	up to 600 °C	1.0305[ab]
	up to 700 °C	1.0305[abc]
		1.4861 2.4867
Zinc	up to 480 °C	1.0305 1.4749 1.4762
	up to 600 °C	1.0340
Tin	up to 650 °C	1.0305
Copper	up to 1250 °C	1.4762[d]
Copper-zinc-alloys	up to 900 °C	1.4862[d]

[a] Also protecting tubes out of cast iron with lamellas graphite (grey cast iron) with material numbers 0.6020 (GG20) may be used, which however do not have to match the dimensions from Table 1.

[b] The formation of lead oxide on the surface of the melt is to be avoided.

[c] Only with outer layer of hard chrome.

[d] All metallic protecting tubes are more or less attacked by copper melts. In the case of high quality copper alloys it is therefore possible that unacceptable impurities are introduced into the melt in this way.

A.3 Protective measures

It is possible to extend the useful life-time of protecting tubes by a coating of enamel or aluminium bronze or protecting paint. In molten metal the worst attack usually takes place at the metal/air interface. The tubes may be protected by changing the immersion depth repeatedly, or by a sleeve, by a protecting paint, or also by a refractory wrapping.

List of references

See national foreword.

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