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Compasses —

Part 2:
Requirements, designation and marking

Compas — Partie 2: Prescriptions, désignation et marquage

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 12753-2 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Subcommittee SC 9, *Media and equipment for drawing and related documentation*.

ISO 12753 consists of the following parts, under the general title *Compasses*:

— *Part 1: Nomenclature, illustrations and equivalent terms*

— *Part 2: Requirements, designation and marking*

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Compasses —

Part 2:
Requirements, designation and marking

1 Scope

This part of ISO 12753 defines requirements as well as rules for designation and marking for precision (P) and standard (S) compasses.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12753. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12753 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6508-1:1999, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T).*

ISO 9175-1:1988, *Tubular tips for hand-held technical pens using India ink on tracing paper — Part 1: Definitions, dimensions, designation and marking.*

ISO 9176:1988, *Tubular technical pens — Adaptor for compasses.*

ISO 9177-2:1989, *Mechanical pencils — Part 2: Black leads — Classification and dimensions.*

ISO 12753-1:1999, *Compasses — Part 1: Nomenclature, illustrations and equivalent terms.*

3 Definitions

For the purposes of this part of ISO 12753, the definitions given in ISO 12753-1 apply.

4 Requirements

4.1 Cases and packaging

Cases and packaging shall be dust-proof. Closures shall have ease of movement and shall not open as a result of normally occurring vibrations or handling. Recesses shall be such that when the case or packaging is closed, the compasses, parts and accessories contained within cannot become displaced. Sharp edges and burrs shall be avoided. Inspection shall be in accordance with 5.1.

4.2 Surfaces

Compasses, parts and accessories shall be free of burrs and their surfaces may be high-gloss polished, mat or otherwise finished. Inspection shall be in accordance with 5.1. All parts made of copper-zinc alloy (brass) or steel shall be protected from corrosion. Testing shall be in accordance with 5.3.

4.3 Compasses

Legs, joints and central drives of compasses shall be able to move smoothly and without clearance or spring back (see Table 1).

Table 1 — Compass requirements

Characteristic	Quality requirements		Testing
	Precision (P)	Standard (S)	Precision and standard
Needle offset	0,4 mm max.	1 mm max.	With standard measuring equipment, accurate to 0,01 mm. Both compass legs shall be properly fitted with needles for testing
Alignment	1° max.	5° max.	With measuring equipment accurate to 0,1°
Torque to move the legs in the compass head	14 N·cm to 20 N·cm	14 N·cm to 40 N·cm	With measuring equipment accurate to 1 N·cm
Torque to bend the leg joints	50 N·cm max.[1)]	70 N·cm max.[1)]	Measuring device as selected by the manufacturer. Opening angle 90°
Spring back	0° 10' max.	0° 40' max.	See 5.2
Wear resistance of compass mechanism	2 000 openings at 10/min, opening angle (90 ± 5)°	500 openings at 10/min, opening angle (90 ± 5)°	Mechanical device

1) Joints shall not bend when compass legs are opened or closed. Torque to move joints shall be more than torque to move legs but less than the given values.

Standard compasses shall show alignment (see Table 1). The needles of precision compasses shall be able to be closed all the way until they touch (see Table 1 and ISO 12753-1:1999, Figure 1). The pivot needle of a drop compass shall be movable in the lower position without backlash. Precision drop compasses shall be capable of drawing circles from 0,7 mm to 10 mm diameter and standard drop compasses shall be capable of drawing circles from 1 mm to 6 mm, either by lead (see ISO 9177-2) or by pen point. Inspection shall be in accordance with 5.1.

4.4 Compass inserts

It shall be possible to secure the extremity of the compass inserts into the compass leg socket so that they cannot be turned. Once firmly secured, needles and leads shall not be able to be pushed back under conditions of proper use.

Preferred dimensions for the clamping diameter of the sockets of compass legs for inserts are 3 mm, 3,5 mm and 4 mm with a tolerance of H8 for precision and H9 for standard compasses. Inspection shall be in accordance with 5.1.

4.5 Ruling pens and pen points

The blades of ruling pens for precision compasses and of precision ruling pens shall be ground so as to allow line widths of 0,13 mm to 0,7 mm and shall have a hardness degree of at least 50 HRC (see ISO 6508). Standard ruling pens shall be capable of line widths from 0,25 mm to 0,7 mm. Border pens shall be ground so that they are capable of line widths from 0,25 mm to 1,4 mm and shall have a hardness degree of at least 50 HRC.

The tips of the ruling pens shall not scratch the surface of the drawing media. Inspection shall be in accordance with 5.1.

4.6 Compass attachments for technical pens

Compass attachments for technical pens shall conform to ISO 9176 and the technical pens used therein shall conform to ISO 9175-1[1)].

4.7 Resistance to corrosion

After testing, drawing instruments shall show no visible surface corrosion. Correct functioning shall be assured. Testing shall be in accordance with 5.3.

5 Testing

5.1 Visual inspection

Visual inspection shall be made with the naked eye (normal vision).

5.2 Spring back

Spring back shall be tested as follows. Scratch a 60 mm diameter circle onto a drawing film with the compass using a needle with shoulder point fitted in the compass leg for inserts.

Without detaching the compass from the centre, open the compass wider and then bring the shoulder point back into alignment with the previously drawn circle by means of pressure applied at the lower end of the leg for inserts. After releasing the pressure on the leg, draw a second circle. The radial distance between the two circles, divided by the length of the compass leg, expressed in minutes of arc, is the spring back.

5.3 Corrosion resistance

5.3.1 Test conditions

See Table 2.

In humid climates moisture can condense on the surface of the tested material, the temperature of which is lower than the temperature of the saturated air in the test apparatus.

The temperature of the air in the testing apparatus is 40 °C during the condensation procedure.

The test chamber climate is either a constant atmosphere or a non-constant atmosphere as required.

The effect of the condensed water depends on the amount of water on the surface of the material to be tested, which is affected by the temperature in the test chamber and by the temperature of the material to be tested.

Comparative results can only be achieved under similar test conditions.

1) A standard dealing with tubular tips for hand-held technical pens using non-India ink on tracing paper is not yet available, but is planned.

Table 2 — Test conditions for corrosion-resistance testing

Testing climate		Duration of one cycle			Conditions for the apparatus at equilibrium			
		1st test period	2nd test period	Total	Air temperature		Relative humidity	
					1st test period	2nd test period	1st test period	2nd test period
constant atmosphere		heating up until termination	heating up until termination	—	(40 ± 3) °C	(40 ± 3) °C	≈ 100 %	≈ 100 %
non-constant atmosphere	with alternating humidity and temperature	8 h incl. heating	16 h incl. cooling (testing apparatus opened or ventilated)	24 h	(40 ± 3) °C	18 °C to 28 °C	≈ 100 %	< 100 %
	with alternating temperature	8 h incl. heating	16 h incl. cooling (testing apparatus closed)	24 h	(40 ± 3) °C	18 °C to 28 °C	≈ 100 %	≈ 100 %

5.3.2 Test apparatus

The test apparatus is a steam-tight climatic chamber. The material of the inner walls shall be corrosion-proof and shall have no influence on the material to be tested. In accordance with 5.3.3, the climatic chamber shall have a floor tank to collect the water. The testing apparatus is heated up by heating up the water in the floor tank. An example of a testing chamber is given in Figure 1.

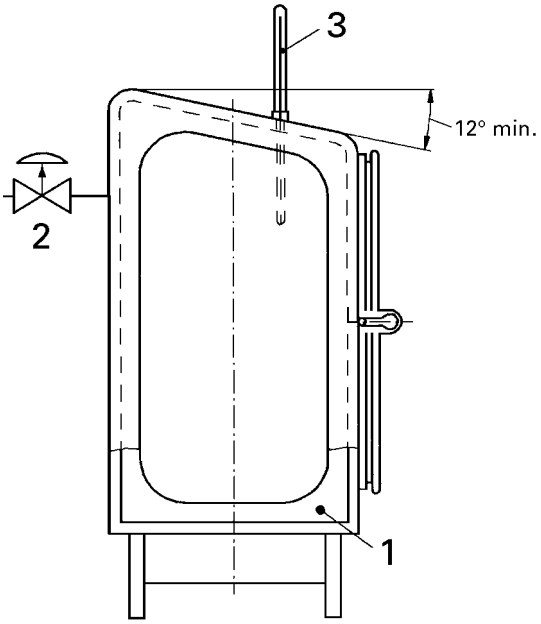
To avoid production of steam, the water temperature shall not exceed 60 °C. If the amount of water is not sufficient to heat up the air inside the testing apparatus, the air can be heated by using another method in addition.

NOTE 1 The heating-up time depends on the type and quantity of material to be tested, on the relation between water surface of the floor tank and wall surface of the testing chamber, and on the water temperature.

The dimensions of the climatic chamber and the arrangement of its thermometers and thermostats may be chosen freely, if the testing conditions are strictly adhered to.

The climatic chamber shall be equipped with a suitable door or another lockable opening allowing the charging and conditioning of the testing materials.

Climatic chambers without floor tanks shall be equipped such that the production of condensation water is sufficient for the material to be tested.



Key

1 Floor tank with water
2 Pressure control valve
3 Thermometer

Figure 1 — Example of a testing chamber with walls made of glass

The climatic chamber shall be in a room without corrosive agents (e.g. not in a chemical laboratory). This room shall have a temperature between 18 °C and 28 °C and a relative humidity of 75 % max. The climatic chamber shall be protected against draught and solar radiation. For comparative tests the room temperature shall be normal (23 ± 2) °C.

NOTE 2 A reduction of the temperature outside the testing chamber automatically leads to an increase in the production of condensation water.

The holding device for the material to be tested shall consist of a corrosion-proof material and should not have any effect on the corrosion of the material to be tested.

5.3.3 Testing procedure

5.3.3.1 Test setup

The floor tank shall be filled with pure water (de-ionized or distilled) to a minimum height of 10 mm.

The drawing instruments to be tested shall not show any influence on each other. If the drawing instruments to be tested can be influenced by the amount of condensation water produced, the amount of condensation water shall be determined with a suitable device within one testing cycle or within a period of 24 h.

The drawing instruments to be tested shall be positioned so that they do not touch each other and radiate heat. The following minimum distances shall be strictly adhered to:

— distance between drawing instrument and wall: 100 mm min.;

— distance between lower edge of drawing instrument and water surface: 200 mm min.;

— distance between the drawing instruments: 20 mm min.

Care shall be taken that during storing no condensation water from the walls of the testing chamber or from an upper layer of drawing instruments may drop onto the lower drawing instruments to be tested.

For the determination of the comparative amount of condensation water the following device is suitable.

The standard sample is a water-filled test-tube 18 mm × 180 mm. The condensation water which drops down from the test tube is collected over a glass funnel with a diameter of 55 mm in a cylindrical graduated measure with a nominal volume of 10 ml.

Place this device between the other samples in accordance with the distances specified above. The lower part of the test tube hangs on a thread, e.g. made of polyamide, 50 mm above the rim of the funnel that has been put into the cylindrical graduated measure.

After the drawing instruments have been put into the testing apparatus and the testing apparatus has been closed, switch on the heating for the water in the floor tank or the climate testing device and the testing environment is heated to the temperature for the first test period. This temperature shall be achieved within a period of 1,5 h. The surface of the drawing instruments shall then be covered with condensation water.

5.3.3.2 Testing under constant atmosphere

The temperature shall be the same during the whole testing procedure. An intermediate result is achieved by taking the samples out of the climatic chamber without switching off the heating and returning them again immediately after measuring.

5.3.3.3 Testing under non-constant humidity and temperature

The test consists of a number of climate cycles with a first and a second test period. Eight hours after starting, switch off the heating to terminate the condensation procedure (1st test period). Then open or ventilate the testing apparatus.

After another 16 h (2nd test period) measure the water level in the floor tank and add water if necessary. Then close the testing apparatus and switch on the heating to start a new cycle.

Obtain an intermediate result by taking the samples out of the climatic chamber and by returning them again immediately after measuring.

NOTE In some cases intermediate results can be achieved immediately after the heating has been switched off and the climatic chamber has been opened.

5.3.3.4 Testing under non-constant temperature

The test consists of a number of climate cycles with a first and a second test period. In a 24 h cycle switch off the heating after 8 h (1st test period) to terminate the condensation procedure. The testing apparatus remains closed.

After another 16 h (2nd test period) measure the water level in the floor tank and add water if necessary. Switch on the heating again to start a new cycle.

Obtain an intermediate result by taking the samples out of the climatic chamber and by returning them again immediately after measuring.

5.3.4 Termination of testing procedure

The test shall be terminated if a determined defect of the sample is visible or the determined testing period is over.

6 Designation and marking

The designation of a compass shall consist of the following elements, in the given order:

a) the description block "Compass";

b) a reference to this part of ISO 12753;

c) the compass type (capital letter, see ISO 12753-1:1999, clause 4);

d) the compass quality: "P" for precision or "S" for standard.

EXAMPLE

Designation of a precision compass (P) with interchangeable points (type A):

Compass ISO 12753-2 A P

The length of the compass may be part of the designation. This is left to the manufacturer's discretion.

The designation should be marked on the compass body.

7 Test report

The test report shall include the following information:

a) reference to this part of ISO 12753;

b) the date and place of test;

c) precise identification of the samples (see clause 6);

d) the results in accordance with this part of ISO 12753;

e) any deviations from the specified procedures; and

f) identification and signature of the tester.