



**SLOVENSKI STANDARD**  
**SIST EN 13319:2000**  
**01-julij-2000**

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DcHdd`Uj\_UcdfYa UË; `cV]bca Yf]`]b`\_ca V]b]fUbYbUdfUj YnUa Yf`Yb`Y[ `cV]bY]b  
UgUË: i b\_W]cbUby]b`j UfbcgfbYnUa hYj Y`hYf`dfYg\_i gbY`a YrcXY

Diving accessories - Depth gauges and combined depth and time measuring devices -  
Functional and safety requirements, test methods

Tauch-Zubehör - Tiefenmesser und kombinierte Tiefen- und Zeitmeßgeräte -  
Funktionelle und sicherheitstechnische Anforderungen, Prüfverfahren

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EUROPEAN STANDARD

EN 13319

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2000

ICS 97.220.40

English version

## Diving accessories - Depth gauges and combined depth and time measuring devices - Functional and safety requirements, test methods

Accessoires de plongée - Profondimètres et instruments combinant la mesure de la profondeur et du temps - Exigences fonctionnelles et de sécurité, méthodes d'essai

Tauch-Zubehör - Tiefenmesser und kombinierte Tiefen- und Zeitmeßgeräte - Funktionelle und sicherheitstechnische Anforderungen, Prüfverfahren

This European Standard was approved by CEN on 20 January 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 136 "Sports, playground and other recreational equipment", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

This standard specifies functional and safety requirements for depth gauges, depth gauge features of other instruments, and both depth and time measurement features of other instruments.

This standard is not applicable to any information displayed to the user besides depth and time. Any information on decompression obligations displayed by equipment covered by this standard is explicitly excluded from its scope.

This standard is applicable to instruments measuring water depth by the environmental pressure as used by divers. Requirements for time measurement are only applicable if instruments are automatically counting the dive time.

## 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.

ISO 1413  
Horology – Shock-resistant watches

## 3 Definitions

For the purposes of this standard, the following definition applies:

**3.1 dive time:** Time spent under overpressure, measured between the limits given in 4.2.1 and 4.2.2.

## 4 Requirements

### 4.1 Depth measurement

#### 4.1.1 Gauge factor for the transformation from pressure to depth

The gauge factor shall be such that an increase of pressure of 1 bar would cause an increase in the depth displayed of 10 m.

NOTE: This rule assumes a water density of 1,0197 kg/l, i.e., in fresh water of 1,00 kg/l the geometric depth is 102 % of the display while in sea water of a density of 1,03 kg/l the geometric depth is 99 % of the display. Since the physiological relevant figure is the environmental pressure only, the geometric depth is of much inferior relevance for the diver.

#### 4.1.2 Accuracy of depth measurement

The display of the depth within the depth range specified by the manufacturer shall correspond to the values given in table 1 after testing in accordance with 5.1 and 5.3.8.

If the maximum depth specified by the manufacturer is deeper than 60 m, the values of table 1 have to be extended to this specified depth in increments of 15 m and in test pressure increments of 150 kPa with constant error margins of  $\left( \begin{smallmatrix} + \\ - \end{smallmatrix} \begin{smallmatrix} 10 \\ 15 \end{smallmatrix} \right)$  kPa.

**Table 1 - Test pressure**

Depth m	Test pressure kPa
3	$(p_o + 30) \begin{smallmatrix} + 8 \\ - 4 \end{smallmatrix}$
6	$(p_o + 60) \begin{smallmatrix} + 8 \\ - 4 \end{smallmatrix}$
9	$(p_o + 90) \pm 8$
15	$(p_o + 150) \begin{smallmatrix} + 10 \\ - 12 \end{smallmatrix}$
30	$(p_o + 300) \begin{smallmatrix} + 10 \\ - 12 \end{smallmatrix}$
45	$(p_o + 450) \begin{smallmatrix} + 10 \\ - 15 \end{smallmatrix}$
60	$(p_o + 600) \begin{smallmatrix} + 10 \\ - 15 \end{smallmatrix}$
$p_o$ = atmospheric pressure during the test 100 kPa = 1 bar	

#### 4.1.3 Display increments

At least depths of 3, 6, 9 and 12 or 15 m shall be displayed as numbers.

From 9 m to 60 m the display shall be in increments of 3 m or less. Above 60 m the display shall have increments of 5 m or less. Testing in accordance with 5.3.7.

#### 4.2 Dive time measurement

##### 4.2.1 Dive time counting start

When submerged in water, dive time counting shall start automatically within 5 s of the pressure reaching a maximum of  $p_o + 16$  kPa or the display reading 1,6 m. Testing in accordance with 5.3.9.

##### 4.2.2 Dive time counting stop

Dive time counting shall not stop before the pressure is lowered to  $p_o + 16$  kPa or the display reading 1,6 m. Testing in accordance with 5.3.9.

##### 4.2.3 Dive time display

The indicated time increments shall be 1 min or shorter. The dive time shall be continuously displayed, or intermittently displayed with a maximum interruption of 20 s, or displayed on request. Testing in accordance with 5.3.10.

##### 4.2.4 Accuracy of dive time measurement

Dive time counting error shall be not more than  $\pm 1$  min in 120 min. Testing in accordance with 5.3.11.

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### 4.3 Readability

Depth and dive time values shall be clearly readable in light conditions of  $(50 \pm 10)$  lx, from a distance of  $(30 \pm 5)$  cm and at an angle which visibly has the highest contrast. Subsequently, determine the readability of the display at aspect angles  $15^\circ$  higher or lower than the optimum angle, perpendicular to the base line of the displayed numbers and/or text. Testing in accordance with 5.3.7.

### 4.4 Fixture

If a fixture is given as wrist band it shall not get loose or be visibly damaged when tested in accordance with 5.3.4.

### 4.5 Water tightness

After the pressure cycling test the test sample shall not show any indication of leakage. Testing in accordance with 5.3.6.

### 4.6 Operability

Any operations necessary for the depth and dive time functions while submerged shall be possible to be operated when wearing protective gloves (3-finger,  $6 \pm 1$  mm, double-lined). Testing in accordance with 5.3.12.

### 4.7 Sea water resistance

After submerging in natural or artificial sea water, the instrument shall not show visible changes or signs of corrosion. Testing in accordance with 5.3.3.

## 5 Testing

### 5.1 Test conditions

Unless otherwise stated all tests in water or air are made at room temperature between  $18^\circ\text{C}$  and  $28^\circ\text{C}$ .

Prior to the tests adjustments and pressure equilibrations according to the instructions for use shall be made.

The atmospheric pressure during the test shall be recorded in the test protocol.

The tests shall be performed on one test sample in the following order:

- temperature cycling (5.3.1);
- shock test (5.3.2);
- sea water resistance (5.3.3);
- testing of wrist fixture (if applicable) (5.3.4);
- pressure cycling (5.3.5);
- water tightness (5.3.6);
- readability (5.3.7);
- accuracy (5.3.8);
- dive time functions (if applicable) (5.3.9, 5.3.10, 5.3.11).

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If, after any of the above tests there are indications that the test sample is inoperable, the test sequence may be terminated.

## 5.2 Apparatus

### 5.2.1 Test manometers

The test manometers for accuracy testing shall have an accuracy of  $\pm 0,2 \%$ .

### 5.2.2 Test timers

Timers used for time measurements shall have an accuracy of at least  $\pm 1 \text{ min}/24 \text{ h}$ .

### 5.2.3 Test hammer

The impact surface of the test hammer shall be adapted to have at least the same dimensions as the impacted surface of the test sample.

## 5.3 Procedure

### 5.3.1 Temperature cycling

Subject the test alternately to temperatures of  $(-20 \pm 3) ^\circ\text{C}$  and  $(60 \pm 3) ^\circ\text{C}$  for  $1 \text{ h} \pm 3 \text{ min}$  in air. Between each test allow the sample to stand at room temperature for at least  $(30 \pm 3) \text{ min}$ . After the last high temperature cycle submerge the test sample within  $(5 \pm 1) \text{ min}$  in water of  $(2 \pm 2) ^\circ\text{C}$  for  $(60 \pm 3) \text{ min}$ .

### 5.3.2 Shock testing

Shock testing shall be according to ISO 1413 with the exception stated in 5.2.3.

### 5.3.3 Sea water resistance

Submerge the test sample in natural or artificial sea water (see annex A) at  $(23 \pm 3) ^\circ\text{C}$  for  $(24 \pm 1) \text{ h}$ . Make a visual and manual check and the test sample shall not show important changes on the case or on the accessories and the moving parts shall continue to function normally.

### 5.3.4 Testing of the wrist fixture

Apply a test force of 150 N to the test sample with closed lock according to figure 1.

Make a visual check for any damage.

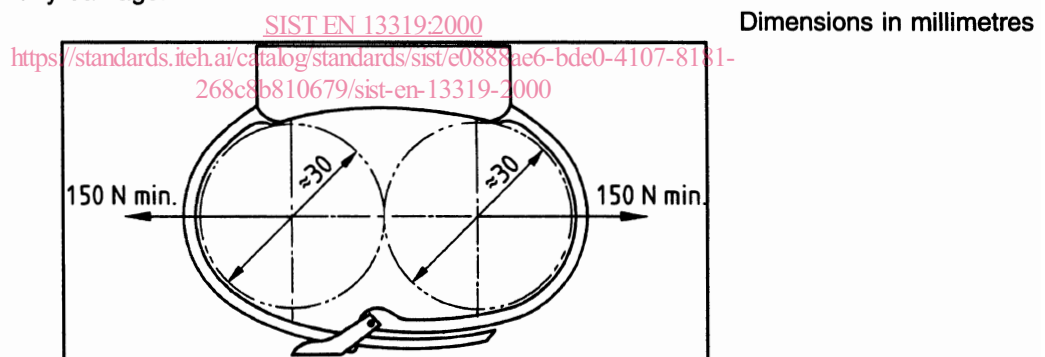


Figure 1 - Testing of the wrist fixture