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Horology — Divers' watches

Horlogerie — Montres de plongée

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 114, Horology, Subcommittee SC 3, Water-resistant watches.

This fourth edition of ISO 6425 cancels and replaces the third edition (ISO 6425:1996) which has been technically revised.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document has been drawn up to meet a global demand for specifications for divers' watches. It is a reference and clarifies the terms used, defines the criteria to be met by the product and specifies the marking which may appear on them.

It also stipulates the tests to be applied in homologation by the manufacturer and at the production stage to demonstrate that the manufacturer’s products satisfy this document.

The manufacturer is responsible for stating whether a specific activity falls within the field of use of a particular watch. Similarly, it defines the warranty conditions and the precautions to be taken to maintain the quality of the watch over an extended period of time.

Horology — Divers' watches

1 Scope

This document specifies requirements and test methods for divers' watches and for saturation divers' watches for use in deep diving (see Annex A which deals with watches for saturation diving).

It applies to divers' watches designed to withstand diving in water at depths of at least 100 m and equipped with a secured measuring system to indicate the diving time, which is visible in darkness.

Moreover, it indicates the marking which the manufacturer is authorized to apply to them.

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.

ISO 764:2002, *Horology — Magnetic resistant watches*

ISO 1413:2016, *Horology — Shock-resistant wrist watches*

ISO 9227:2017, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 17514:2004, *Time-measuring instruments — Photoluminescent deposits — Test methods and requirements*

ISO 22810:2010, *Horology — Water-resistant watches*

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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
SCUBA diving
mode of underwater diving in which a diver uses a self-contained underwater breathing apparatus (SCUBA) to breathe underwater

3.2
saturation diving
diving technique that allows divers to reduce the risk of decompression sickness ("the bends") when they work at deep diving for long periods of time

Note 1 to entry: In saturation diving, the divers live in a pressurized environment corresponding to the diving depth, which can be a hyperbaric chamber. This may be maintained for up to several weeks, and the divers are decompressed to surface pressure only once, at the end of their tour of duty. By limiting the number of decompressions in this way, the risk of decompression sickness is significantly reduced.

3.3
divers' watch
watch designed to withstand SCUBA diving

3.4
divers' watch for saturation diving
divers' watch designed to withstand saturation diving

3.5
diving time
elapsed time since immersion

Note 1 to entry: See Annex C.

3.6
diving time indicator
device used to measure the diving time

4 Test methods and requirements

4.1 General

4.1.1 Temperature

Unless otherwise specified, tests in water or in air are made at a temperature of (23 ± 5) °C.

4.1.2 Visual checking

Visual checking shall be carried out without a magnification instrument.

4.1.3 Tested product configuration

Unless otherwise specified, the tests are conducted on the watch head only. For technical reasons or when the bracelet cannot be removed from the watch head, the tests are conducted on the complete watch.

4.1.4 Practical meaning

All operations described are intended to simulate conditions in which watches will remain undamaged and still operate after diving at:

a) L m of water for 1 h per dive ($\Delta p = L/10$ bar[1)]), followed by

b) 3 m of water for 1 h per dive (Δp = 0,3 bar).

NOTE 1 L is the depth in metres of dive guaranteed by the manufacturer.

NOTE 2 Unless otherwise specified, all functional parts are manipulated at atmospheric pressure.

NOTE 3 Unless otherwise specified, all mobile systems shall be in their rest positions.

4.1.5 Diving time indicator

The watch shall be equipped with a diving time indicator (e.g. rotating bezel, digital display, or other). Such a device shall be protected against inadvertent handling. This device shall allow the reading of the diving time with a resolution of 1 min or better over at least 60 min.

For analogue displays, the markings indicating every 5 min shall be clearly indicated.

1) 1 bar = 10^5 Pa = 10^5 N/m^2

4.1.6 Type testing and 100 % single watch testing

4.1.6.1 Type testing

The following tests are used for type testing (homologation). They shall be performed respecting the chronological order below (see Table 1). Every one of the test samples shall pass every test.

Table 1 — Tests order

Test N°	Test name	Clause
1	Visibility	4.2
2	Magnetic resistance properties	4.3
3	Temperature cycling	4.4
4	Salt spray test (with bracelet)	4.5
5	Shock resistance properties (on watch head)	4.6
6	Water-resistance	4.7
7	Shock resistance properties (free-fall)	4.8
8	Resistance of attachments	4.9

4.1.6.2 100 % single watch testing

In the production process, every watch shall undergo the test resistance at a water overpressure, according to 4.7.4.

4.2 Visibility

4.2.1 In the light

The diving time indicator shall be legible with a minimum lighting of 50 lx.

4.2.2 In the dark

Exposure to light shall be made in accordance with ISO 17514:2004, Clause 4. Minimum 180 min after the exposure, the visibility and readability of the following items shall be checked at a distance of 25 cm in the dark:

— the time (the minute indicator shall be clearly distinguishable from the hour indicator);

— the diving time, which shall be legible with an uncertainty of ±2,5 min or less;

— for analogue displays, the markings indicating every 5 min;

— the indication that the watch is running;

— in the case of battery-powered watch, the battery end-of-life indication.

4.3 Magnetic resistance properties

The watch shall be tested in accordance with ISO 764:2002 and shall comply with its requirements.

4.4 Temperature cycling

An optional preliminary test may be performed on the watch, as described in Annex B.

The condensation test as described in 4.10 shall be carried out prior to this test to ensure that the result is related to this present test.

All devices secured for water-resistance must be locked (screw-down crown and pushers, etc.).

The watch under test shall be submitted to the following temperature cycling:

— put the watch at a temperature of (–20 ± 3) °C for (60 ± 3) min in air;

— allow the watch to stand at room temperature for (30 ± 3) min;

— put the watch at a temperature of (60 ± 3) °C for (60 ± 3) min in air;

— submerge the watch within 5 min in water of (2 ± 2) °C for (60 ± 3) min.

The watch shall then be removed from the water and wiped.

Carry out the condensation test as described in 4.10.

The watch shall function normally after the test.

4.5 Salt spray test (with bracelet)

All devices secured for water-resistance shall be locked (screw-down crown and pushers, etc.).

The watch, with its bracelet, shall be tested during 48 h in accordance with ISO 9227:2017, 5.2.2, using a NSS solution and under the conditions described in ISO 9227:2017, 8.2, Clause 9, Clause 10 and 11.4 relating to this test.

The watch and its bracelet shall be examined. They shall not show important changes and the moving parts shall continue to function normally.

4.6 Shock-resistance properties (on watch head)

The watch shall be tested in accordance with ISO 1413:2016, 5.2 and shall comply with its requirements.

Every one of the test samples shall pass every test.

4.7 Water-resistance

4.7.1 Functional devices in shallow water

The condensation test as described in 4.10 shall be carried out prior to this test to ensure that the result is related to this present test.

All mechanical devices related to water resistance, secured and not-secured, shall be tested. Devices (such as screw-down crown and pushers, etc.) for which the use in water is formally restricted in the accompanying documents of the watch (user manual, etc.) can be exempt from the test. In this case, those devices shall be in their rest position or secured if applicable and are therefore not submitted to the present test.

The watch under test shall be submitted to the following procedure:

— immerse in water at a depth of (30 ± 2) cm;

— operate in water all the mechanisms; they shall function correctly;

— keep immersed during (24 ± 1) h;

— operate in water all the mechanisms; they shall function correctly;

— keep immersed during (24 ± 1) h.

The watch shall then be removed from the water and wiped.

Carry out the condensation test as described in 4.10.

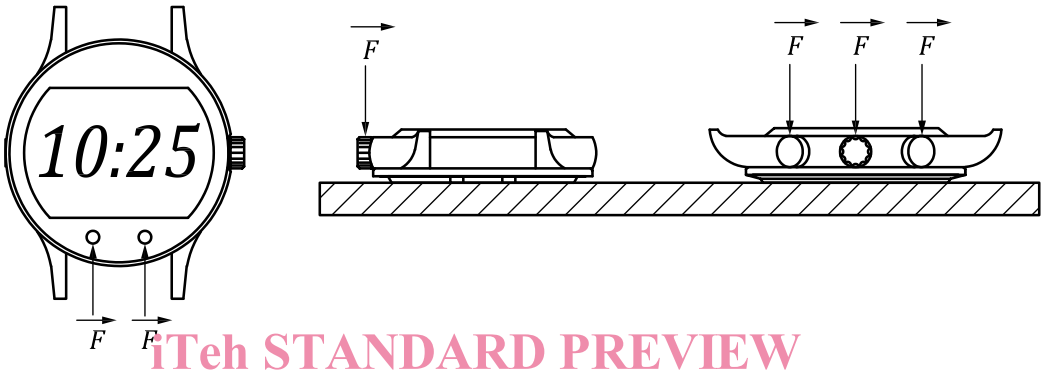
The watch shall function normally after the test.

4.7.2 Resistance when strain is applied to crown and other setting devices

All devices secured for water-resistance must be locked (screw-down crown and pushers, etc.).

The watch under test shall be submitted to the following procedure:

— immerse the watch in water with an overpressure of $\Delta p = (L + 0{,}25 \cdot L)/10$ bar minimum while applying a force of 5 N to the crown and push-pieces perpendicular to their axis for 10 min (see Figure 1).



Key

$\vec{F}$ applied force of 5 N

Figure 1 — Representation of the test of applying force to the crown and push-pieces

The watch shall then be removed from the water and wiped.

Carry out the condensation test as described in 4.10.

The watch shall function normally after the test.

4.7.3 Functional devices at a water overpressure

All devices secured for water-resistance must be locked (screw-down crown and pushers, etc.).

The watch under test shall be submitted to the following procedure:

— immerse the watch in water and apply an overpressure of Δp = 10 bar minimum within 10 min

— the following functional devices related to water resistance shall be operated 5 times:

  — all devices specified by the manufacturer to be used under water while diving;

  — all devices not protected against inadvertent operating.

— maintain the overpressure during 30 min

— reduce the overpressure to 0,3 bar within 10 min and maintain it during 30 min

The watch shall then be removed from the water and wiped.

Carry out the condensation test as described in 4.10.