

INTERNATIONAL
STANDARD

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6425

Third edition
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Divers' watches

Montres de plongée



Reference number
ISO 6425:1996(E)

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 6425 was prepared by Technical Committee ISO/TC 114, *Horology*, Subcommittee SC 3, *Water resistant watches*.

This third edition cancels and replaces the second edition (ISO 6425:1984), which has been technically revised.

Annex A forms an integral part of this International Standard.

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Divers' watches

1 Scope

This International Standard specifies requirements and test methods for divers' watches and for divers' watches for use in deep diving (see annex A which deals with watches for mixed-gas diving).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 764:1984, *Horology — Antimagnetic watches*.

ISO 1413:1984, *Horology — Shock-resistant watches*.

ISO 2859-1:1989, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection*.

ISO 2859-2:1985, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*.

ISO 2859-3:1991, *Sampling procedures for inspection by attributes — Part 3: Skip-lot sampling procedures*.

1) 1 bar = 10⁵ Pa = 10⁵ N/m²

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 diver's watch: A watch designed to withstand diving in water at depths of at least 100 m and processing a system to control the time.

NOTE 1 Hereafter "diver's watch" is referred to simply as "watch".

4 Designation

Any watch bearing the designation "diver's watch" in relation to diving depths of 100 m and beyond, or any other similar term, shall satisfy the minimum requirements laid down in clause 6.

5 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 ($\Delta p = L/10$ bar¹⁾) followed by
- b) 3 m of water for 1 h per dive ($\Delta p = 0,3$ bar).

NOTES

- 2 L is the depth of dive guaranteed by the manufacturer.
- 3 Crowns can be manipulated at atmospheric pressure.

6 Requirements

6.1 Time-preselecting device

The watch shall be equipped with a time-preselecting device, for example a rotating bezel or a digital display. Such a device shall be protected against inadvertent rotation or wrong manipulation. If it is a rotating bezel, it shall have a minute scale going up to 60 min. The markings indicating every 5 min shall be clearly indicated. The markings on the dial, if existing, shall be coordinated with those of the preselecting device and shall be clearly visible.

If the preselecting device is a digital display, it shall be clearly visible.

6.2 Visibility

The following items of the watch shall be legible at a distance of 25 cm in the dark:

- a) time (the minute hand shall be clearly distinguishable from the hour hand);
- b) set time of the time-preselecting device;
- c) indication that the watch is running;
- d) in the case of battery-powered watches, a battery end-of-life indication.

6.3 Antimagnetic properties

The watch shall be antimagnetic in accordance with the requirements of ISO 764.

6.4 Shock resistance

The watch shall be shock resistant in accordance with the requirements of ISO 1413.

6.5 Salt water resistance

The watch shall be salt water resistant; i.e. after being submitted to the tests as described in 7.3.3, it shall not show important changes on the case or on the accessories and the moving parts shall continue to function normally.

6.6 Reliability under water

During the test indicated in 7.3.4, the mechanisms required to function in the water, for example the time-preselecting device and the light switch, shall function correctly. No mist shall appear on the glass

when carrying out the test according to 7.3.8 and no damage shall be caused to the mechanical function.

6.7 Resistance to an external force

6.7.1 Attachments

No item shall become detached from the watch or be displaced when the watch is tested as described in 7.3.1.

6.7.2 Crowns and other setting devices

No condensation shall be observed and the watch shall function normally when tested as described in 7.3.6.

6.8 Resistance to thermal shock

The watch shall be resistant to thermal shock; i.e. it shall not show condensation, and the watch shall function normally when tested as described in 7.3.5.

6.9 Air-tightness at an air overpressure

(optional test)

The watch shall show no air-flow exceeding 50 µg/min when tested as described in 7.3.2.

6.10 Water-tightness at a water overpressure

The watch shall show no condensation when tested as described in 7.3.7. Furthermore, it shall function normally, in particular the second hand shall continue to function normally, during and after the test as indicated in 7.3.7.

6.11 Resistance to atmospheres containing gas mixtures

It should be noted that use of a watch in an atmosphere containing gas mixtures may result in the watch failing to function normally. In this case, refer to annex A.

7 Test methods

7.1 Type testing and 100 % single-watch testing

Testing of the watch is divided in two groups:

- type testing, and
- 100 % testing.

Tests for the requirements given in table 1 shall be conducted as type testing, in accordance with parts 1 to 3 of ISO 2859.

Every watch shall undergo the test of water resistance to an overpressure of water (100 % testing), including the tests indicated in 7.3.7.

7.2 Summary of requirements and tests

The order for carrying out the tests given in table 1 is only a suggestion.

7.3 Description of tests

Visual checking shall be carried out without a magnifying instrument.

7.3.1 Resistance of attachments to an external force

The watch shall be subjected to an external force of 200 N, as shown in figure 1.

The bracelet of the watch being tested shall be closed.

7.3.2 Air-tightness at an air overpressure (optional test)

Any watch undergoing this optional test shall be subjected to an air overpressure of $\Delta p = 2$ bar and the flow of air entering the watch shall be measured.

Comparable test methods, for example with inert gases, are permitted.

Watches giving a high flow of air shall be eliminated from the test immediately.

Table 1 — Designation of tests and requirements

Designation	Requirements	Test methods
Time-preselecting device	6.1	7.3.3/7.3.4
Visibility	6.2	7.3
Antimagnetic property	6.3	(see ISO 764)
Resistance of attachments to an external force	6.7.1	7.3.1
Air-tightness at an air overpressure (optional test)	6.9	7.3.2
Salt water resistance	6.5	7.3.3
Reliability under water	6.6	7.3.4
Resistance to thermal shock	6.8	7.3.5
Resistance of crowns and other setting devices to an external force	6.7.2	7.3.6
Shock resistance	6.4	(see ISO 1413)
Water-tightness and resistance at a water overpressure	6.10	7.3.7

Dimensions in millimetres

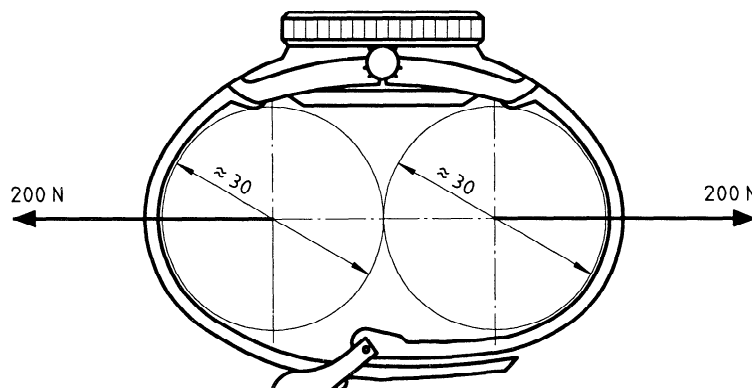


Figure 1 — Representation of the test for resistance of attachments

7.3.3 Resistance to salt water

The watches under test shall be put in a 30 g/l sodium chloride solution and kept there for 24 h at 18 °C to 25 °C. After this test, the case and accessories shall be examined for any possible changes. Moving parts, particularly the rotating bezel, shall be checked for correct functioning.

7.3.4 Reliability under water

The watches under test shall be immersed in water to a depth of $30 \text{ cm} \pm 2 \text{ cm}$ for 50 h at 18 °C to 25 °C and all the mechanisms shall still function correctly.

The condensation test as described in 7.3.8 shall be carried out before and after this test to ensure that the result is related to the above test.

7.3.5 Resistance to thermal shock

The watches under test shall be subjected to the following test cycle when immersed to a depth of $30 \text{ cm} \pm 2 \text{ cm}$ in water:

- immersion in water at $40 \text{ °C} \pm 2 \text{ °C}$ for 10 min;
- immersion in water at $5 \text{ °C} \pm 2 \text{ °C}$ for 10 min;
- immersion in water at $40 \text{ °C} \pm 2 \text{ °C}$ for 10 min.

The time of transition from one immersion to the other shall not exceed 1 min.

The condensation test as described in 7.3.8 shall be carried out before and after this test to ensure that the result is related to the above test.

7.3.6 Resistance of crowns and other setting devices to an external force

The watches under test shall be subjected to an overpressure in water of $(L + 0,25L)/10$ bar for 10 min and to an external force of 5 N, as shown in figure 2.

The condensation test as described in 7.3.8 shall be carried out before and after this test to ensure that the result is related to the above test.

7.3.7 Water-tightness and resistance at a water overpressure

The watches under test shall be immersed in water contained in a suitable vessel. Then an overpressure of $\Delta p = (L + 0,25L)/10$ bar shall be applied within 1 min and maintained for 2 h.

Subsequently the overpressure shall be reduced to 0,3 bar within 1 min and maintained at this pressure for 1 h. The watches shall then be removed from the water and dried with a rag.

The condensation test as described in 7.3.8 shall be carried out before and after this test to ensure that the result is related to the above test.

7.3.8 Condensation test

The watch shall be placed on a heated plate at a temperature between 40 °C and 45 °C until the watch has reached the temperature of the heated plate (in practice, a heating time of 10 min to 20 min, depending on the type of watch, will be sufficient). A drop of water, at a temperature of 18 °C to 25 °C shall be placed on the glass of the watch. After about 1 min, the glass shall be wiped with a dry rag.

Any watch which has condensation on the interior surface of the glass shall be eliminated.

8 Marking

Watches which satisfy the requirements of clause 6 are marked with the following terms in the respective languages:

- in English: divers's watch *L* m;
- in French: montre plongeur *L* m, or montre de plongée *L* m;
- in Russian: водонепроницаемые *L* м.

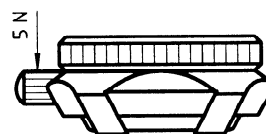


Figure 2 — Representation of the test of applying force to the crown

The abbreviation "diver's *L* m" may be used in English.

Equivalent terms in other languages are admissible.

The letter *L* indicates the diving depth, in metres, guaranteed by the manufacturer.

As a precaution in real use, the following recommendations shall be given clearly in the operating instructions:

- a) do not operate the crown in water at an over-pressure;
- b) not to be used for deep diving (diving with a gas mixture) or at a depth greater than that indicated.

Annex A (normative)

Divers' watches for mixed-gas diving

A.1 General

Diving at a great depth and for a long period is done in a diving chamber, with the diver spending time alternately in the water and in a pressurized environment, breathing a gas mixture. In this case, the watch is subjected to the pressure of the gas mixture and its functioning can be disturbed. Consequently, it is recommended to subject the watch to the special extra test indicated in this annex.

A.2 Definition

A.2.1 diver's watch for mixed-gas diving: A watch required to be resistant during diving in water to a depth of at least 100 m and to be unaffected by the overpressure of the mixed gas used for breathing.

NOTE 4 Hereafter, "diver's watch for mixed-gas diving" is referred to simply as "watch".

A.3 Requirements and tests

All the requirements specified in clause 6 of this International Standard shall be satisfied completely. The test described in A.3.1 is obligatory, but that described in A.3.2 is complementary.

A.3.1 Test of operation at a gas overpressure

The watch is subjected to the overpressure of gas which will actually be used, i.e. $(L + 0,25 L)/10$ bar, for 15 days. Then a rapid reduction in pressure to the atmospheric pressure shall be carried out in a time not exceeding 3 min.

After this test, the watch shall satisfy the requirements given in 6.10.

An electronic watch shall function normally during and after the test. A mechanical watch shall function normally after the test (the power reserve normally being less than 15 days).

A.3.2 Test by internal pressure (simulation of decompression)

Remove the crown together with the winding and/or setting stem. In its place, fit a crown of the same type with a hole. Through this hole, introduce the gas mixture which will actually be used and create an overpressure of $\Delta p = L/20$ bar in the watch for a period of 10 h (see figure A.1).

Then carry out the test at a water overpressure according to 7.3.7. In this case, the original crown with the stem shall be refitted beforehand.

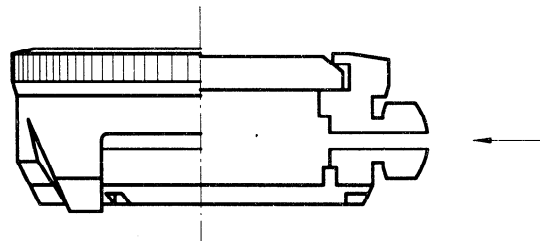


Figure A.1 — Representation of the internal pressure test

After this test, the watch shall satisfy the requirements of clause 6.

A.4 Marking

Watches used for mixed-gas diving which satisfy the requirements of A.3 are marked as follows:

- in English: diver's watch L m for mixed-gas diving;
- in French: montre de plongée en saturation L m;
- in Russian: часы для подводного плавания с газовой смесью L м.

The letter *L* indicates the diving depth, in metres, guaranteed by the manufacturer. The composition of

the gas mixture used for the test shall be given in the operating instructions accompanying the watch.

Equivalent terms in other languages are admissible.

ICS 39.040.10

Descriptors: horological industry, time measuring instruments, diving equipment, watches, specifications, leaktightness, water-tightness, tests, marking.

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