



**International
Standard**

ISO 23745

**Ships and marine technology —
General specification for shipborne
meteorological instruments**

First edition

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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.

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 document 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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 13, *Marine technology*.

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.

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Introduction

A shipborne meteorological instrument (SMI) forms a combined system installed on a ship and is used to measure meteorological elements at the ship's position. The meteorological information acquired by the system can be used as input for meteorological applications that support forecasts, warning and climatological services, with a view to ensuring for safe navigation. This meteorological information can also be used for commercial or scientific needs.

Information sharing is an important feature at the time of publication of this document. The importance of exchanging or sharing meteorological information is also evident.

The number of ships that carry shipborne meteorological instruments with diverse sensors is extensive and in flux. It is generally desirable that the meteorological data measured by ship meteorological instruments can be exchanged and shared with other ships, land-based meteorological information platforms or global meteorological observation systems such as the Voluntary Observing Ship (VOS) Scheme of the World Meteorological Organization (WMO).

This document establishes a set of general technical specifications for all shipborne meteorological instruments, including terms, definitions and test methods, to ensure the quality of different shipborne meteorological instruments and the efficiency in exchanging or sharing meteorological information. In doing so, this document aims to help shipborne meteorological instruments play a more important role in safe navigation, weather forecast and other climatological services, such as wind energy or commercial or technical research.

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Ships and marine technology — General specification for shipborne meteorological instruments

1 Scope

This document specifies the technical requirements and test methods for shipborne meteorological instruments (SMIs).

This document applies to shipborne meteorological instruments installed on ships that shares marine meteorological data with other ships, national meteorological services or other users.

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 10596:2009, *Ships and marine technology — Marine wind vane and anemometers*

IEC 60092-101:2018, *Electrical installations in ships — Part 101: Definitions and general requirements*

IEC 60092-305, *Electrical installations in ships — Part 305: Equipment — Accumulator (storage) batteries*

IEC 60092-376, *Electrical installations in ships — Part 376: Cables for control and instrumentation circuits 150/250 V (300 V)*

IEC 60092-504:2016, *Electrical installations in ships — Part 504: Automation, control and instrumentation*

IEC 60533, *Electrical and electronic installations in ships — Electromagnetic compatibility (EMC) - Ships with a metallic hull*

WMO-No 8, *Guide to Instruments and Methods of Observation (2021 edition)*

WMO-No 488, *Guide to the Global Observing System (2010 Edition, Updated in 2017)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 shipborne meteorological instrument SMI

system installed on a ship that includes one or more meteorological sensors to measure meteorological parameters, and components to process, store and transmit the meteorological data

Note 1 to entry: The meteorological parameters include air temperature, relative humidity, wind direction, wind speed, atmospheric pressure, visibility, sea-surface temperature, etc.

3.2

true north

northerly direction of the meridian

Note 1 to entry: See ISO 19018:2020, 5.1.1 for further information.

3.3

true wind

vector with a speed referenced to the fixed earth and a direction referenced to *true north* (3.2)

Note 1 to entry: The true wind is calculated from the *relative wind speed* (3.4.2) and *direction* (3.4.1), the ship's motion (speed and course over ground), and *true heading* (3.8).

3.3.1

true wind direction

TWD

direction relative to *true north* (3.2) from which the wind is blowing

3.3.2

true wind speed

TWS

magnitude of the *true wind* (3.3) vector

3.4

relative wind

wind vector measured relative to the ship

3.4.1

relative wind direction

RWD

direction relative to the bow of the ship from which the wind is blowing

Note 1 to entry: The direction conventions are 0° for wind from the bow, 90° for wind from the starboard side, 180° for wind from the stern, and 270° for wind from the port side.

3.4.2

relative wind speed

RWS

speed of the wind relative to the ship

3.5

apparent wind

wind vector measured on the vessel with a direction relative to the *true north* (3.2) instead of the bow of the ship

3.5.1

apparent wind direction

equal to the *relative wind direction* (3.4.1) adjusted from the *true north* (3.2)

3.5.2

apparent wind speed

equal to the *relative wind speed* (3.4.2)

3.6

speed over the ground

SOG

speed of the ship relative to the Earth, measured on board of the ship

Note 1 to entry: See ISO 19018:2020, 6.3.4 for further information.

3.7
course over the ground
COG

direction of the ship's movement relative to the Earth, measured on board the ship, expressed in angular units from *true north* (3.2)

Note 1 to entry: See ISO 19018:2020, 6.1.14 for further information.

3.8
true heading
HDT

horizontal direction at which the bow of a ship is pointing, expressed as an angular displacement from *true north* (3.2)

Note 1 to entry: See ISO 19018:2020, 6.1.5 for further information.

4 Requirements

4.1 General requirement

4.1.1 Appearance and installation

4.1.1.1 The coated surface of an SMI shall be uniform and free of peeling. The structural parts of an SMI shall be free of mechanical damage or cracks.

4.1.1.2 Signs or marks of an SMI shall be clear and correct.

4.1.1.3 All parts of an SMI shall be installed correctly, firmly and reliably, and the adjustable mechanical parts shall be free from being sluggish, stuck or loose.

4.1.1.4 An SMI shall be treated against moisture, salt mist and mildew.

4.1.1.5 The underwater parts of an SMI shall be treated against erosion by living plants and animals (algae, scum, coral, etc.).

4.1.1.6 See [Annex A](#) for details on the installation of sensors.

4.1.2 Material

The material of an SMI shall be in accordance with IEC 60092-101:2018, 4.7.

4.1.3 Cable

If cables are provided, they shall be in accordance with IEC 60092-376.

4.1.4 Battery

If batteries are provided, they shall be in accordance with IEC 60092-305.

4.2 Technical specification of meteorological parameter measurement

The specifications in [Table 1](#) shall be met.

Table 1 — Technical specifications of sensors used

Meteorological parameter	Range	Uncertainties	Resolution
Wind speed ^a	0 ms ⁻¹ to 60 ms ⁻¹	0,5 ms ⁻¹ (≤ 5 ms ⁻¹) 10 % (> 5 ms ⁻¹)	0,1 ms ⁻¹
Wind direction ^b	0° to 360°	5°	1°
Air temperature	-40 °C to 60 °C	0,2 °C	0,1 °C
Relative humidity	5 % to 100 %	3 % (≤ 80 %) 5 % (> 80 %)	1 %
Atmospheric pressure	800 hPa to 1 060 hPa	0,3 hPa	0,1 hPa
Visibility	50 m to 20 000 m	50 m (≤ 600 m) 10 % (> 600 m to $\leq 1 500$ m) 20 % ($> 1 500$ m)	1 m
Sea-surface temperature	-2 °C to 40 °C	0,2 °C	0,1 °C

NOTE Meteorological parameters acquired by an SMI are not limited to those shown in Table 1. For example, precipitation or net-radiation are possible additional parameters. The meteorological parameters shown in Table 1 can be selected as needed.

^a Wind speed is the relative wind speed.

^b Wind direction is the relative wind direction.

4.3 Safety

Safety marks against electric shock, mechanical hazard and combustion shall comply with IEC 60092-101 and IEC 60092-504.

4.4 Environmental conditions

Environmental conditions shall be in accordance with IEC 60092-101:2018, 4.6.

4.5 Enclosure protection

Enclosure protection shall be in accordance with IEC 60092-101:2018, 4.14.

4.6 Electromagnetic compatibility

Electromagnetic compatibility shall be in accordance with IEC 60533.

4.7 Sampling, algorithm and meteorological data quality control

4.7.1 Sampling rate

Based on WMO-No.488 and WMO-No.8, the sampling rate of meteorological parameters should comply with the recommendations in Table 2.