
**Ships and marine technology —
Technical guidelines for active source
exploration with ocean bottom
seismometers (OBS)**

*Navires et technologie maritime — Lignes directrices techniques
relatives à l'exploration des sources actives avec des sismomètres de
fond de mer (OBS)*



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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 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 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.

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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

Exploration for the structures and movement of deep earth on the seafloor is one of the important approaches for human beings to recognize earth system evolution, predict seabed resources formation, and understand natural disaster mechanisms. Unlike the multi-channel seismic method which only obtains primary waves by hydrophone streamers on the ocean surface, the ocean bottom seismometer (OBS) is directly placed on the seabed and can receive both primary and shear waves, even Rayleigh and Love waves from earth interior. Such a new seismic method gives an opportunity to better image the structures, movement and rheology for the deep targets in solid earth beneath ocean which cover up to $\approx 71\%$ of the earth's surface. This method has been widely used in research on not only global continental margins, subduction zones, mid-ocean ridges, but also regional oil and gas fields, marine engineering constructions.

The signals received in OBS exploration can be either natural earthquakes or artificial excited seismic sources. Accordingly, OBS exploration is divided into passive and active source methods. Passive source exploration with OBS is a method by which OBSs just receive global natural earthquakes and obtain deeper and wider information from the earth interior. Active source exploration with OBS is usually used in a target region to reveal the structures, tectonics and composition of underground geological bodies or crust and upper mantle by a special designed array of OBSs and sources. Because of its strong pertinence, this active source method gradually becomes the main tool for regional deep earth exploration, and is widely used by industry and academia.

OBS is a mature technical product and widely used in various deep earth imaging. However, there is a lack of such a standard about active source exploration with OBS, which will seriously affect the testing, identifying, evaluating of the performance requirements and data quality of such products. It should therefore be necessary to standardize its technical requirements and basic procedures to promote healthy development of this industry of seabed OBS exploration. In view of the above, this document establishes the technical guidelines covering the main content of active source exploration with OBS from OBS instruments, seismic sources and fieldwork processes, to data services.

Ships and marine technology — Technical guidelines for active source exploration with ocean bottom seismometers (OBS)

1 Scope

This document specifies the technical requirements for system makeup, ocean bottom seismometer (OBS) instruments, active sources, field design, exploration operation, data processing for active source exploration with OBS, and their relative terms.

This document is applicable to active source exploration with OBS, but also a useful reference to the passive source exploration with OBS. It can be used in seabed resource exploration, geological disaster surveillance and submarine geoscience research.

2 Normative references

There are no normative references in this document.

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

ocean bottom seismometer OBS

seismic observation system with a seismic sensor placed on the seabed to record ground motions and an acoustic sensor to record signals in the water column

Note 1 to entry: The main components include *seismic sensing system* (3.3) and *acoustic sensing system* (3.4), *recording and storage unit* (3.5), *release unit* (3.8), *acoustic communication unit* (3.7), compass, internal clock, power supply, lighting system, cargo compartment and protective cover etc.

Note 2 to entry: There are mainly two types of OBS, broadband and short period. The short period OBS, with the lower corner of its frequency band not less than 2 Hz, usually used for active seismic source exploration.

3.2

active source exploration

exploration method in which sound wave signals are emitted in the water by ship-borne seismic sources such as air gun, propagated downward through the crust and upper mantle, finally return to the seabed and recorded by *ocean bottom seismometers* (3.1)

Note 1 to entry: The crust and upper mantle information carried by ocean bottom seismometers is in the form of elastic wave.

Note 2 to entry: Active source is artificially excited at sea by physical or/and chemical means. Air gun sources are used in arrays.

Note 3 to entry: Multiple sources of same or different volume are towed at designed offsets and field at defined time delay to shape the resulting pressure wave used as seismic source.