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Recreational diving services — Requirements for gas blender training programmes

Services relatifs à la plongée de loisirs — Exigences relatives aux programmes de formation à la préparation des mélanges gazeux

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Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13293 was prepared by Technical Committee ISO/TC 228, *Tourism and related services*.

Introduction

The requirements specified in this International Standard are minimum requirements; they do not preclude the provision of additional training or the assessment by a service provider of additional competencies. This International Standard represents a tool for comparison of existing (or future) qualifications of gas blenders who want to mix gases for diving purposes.

Recreational diving services — Requirements for gas blender training programmes

1 Scope

This International Standard specifies requirements for gas blender training programmes and the competencies required of an individual in order to obtain a gas blender certificate from a training organization, attesting that he/she has met or exceeded the requirements specified in this International Standard.

This International Standard specifies two levels of gas blender qualification, as follows:

— Level 1 gas blender;

— Level 2 gas blender.

This International Standard recognizes that a training programme can be organized and delivered in a modular way.

2 Normative references

The following referenced documents are indispensable for the application 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 11107:2009, *Recreational diving services — Requirements for training programmes on enriched air nitrox (EAN) diving*

ISO 24802-1, *Recreational diving services — Safety related minimum requirements for the training of scuba instructors — Part 1: Level 1*

ISO 24802-2, *Recreational diving services — Safety related minimum requirements for the training of scuba instructors — Part 2: Level 2*

3 Terms and definitions

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

3.1
training organization
entity which provides training in accordance with this International Standard and awards qualifications, and which is responsible for the implementation and quality management of such training

NOTE Can include scuba diving federations and scuba diver training agencies.

3.2
enriched air nitrox
EAN
mixture of nitrogen and oxygen with more than 21 % oxygen

3.3
helium-based gas mixture
helium-based gas blend
mixture of oxygen and helium, or breathable mixture of oxygen, helium and nitrogen

3.4
trimix
mixture of oxygen, helium and nitrogen

3.5
heliox
mixture of oxygen and helium

3.6
oxygen clean
verified that particulates, fibres, oils, greases and other contaminants are absent

NOTE Any mixture of gases can contain trace gases at levels no higher than those found in ambient air. Permissible levels of trace gases can be specified in national, regional and/or International Standards.

3.7
oxygen compatible
capable of coexisting with elevated oxygen concentrations and a potential source of ignition without flashing, based on a system's maximum operating pressure and temperature

3.8
oxygen-compatible air
air with a reduced level of condensable hydrocarbon mist or vapour

3.9
oxygen design
design that minimizes any tendency for heat generation, ignition of particulates, or the accumulation of contaminants for an intended partial pressure of oxygen and temperature

3.10
oxygen service
system or component that has been designed and tested for oxygen use, has been tested as oxygen clean and is oxygen compatible

4 Competencies of gas blenders

The gas blender training programme shall ensure that persons assessed in accordance with Clause 8 are qualified to blend gases for diving purposes, following accepted safety protocols and standards.

This International Standard specifies two levels of competence for gas blenders, as follows:

a) Level 1 gas blenders are qualified to blend enriched air nitrox (EAN);

b) Level 2 gas blenders are qualified to blend and supply any gases and gas mixes covered by this International Standard.

Gas blenders are competent to provide specific mixtures of gases in a compatible cylinder (e.g. working pressure, correct marking, test validity).

The completion of a training programme in accordance with this International Standard does not qualify a person to do the following:

— advise a diver on the gas mixture to be used for a given dive;

— establish operational parameters for a diver, e.g. the maximum operating depth or maximum partial pressure of a component gas;

— provide oxygen cleaning and servicing of diving equipment.

5 Theoretical knowledge

5.1 Purpose of gas blender training

The training programme shall ensure that students have knowledge of issues related to the following aspects of diver breathing gas mixes (appropriate to Level 1 or Level 2 gas blender qualification) for diving purposes and associated risks:

— safe production;

— analysis;

— handling;

— use.

5.2 Gas blending and delivery methods

The training programme shall ensure that students for both the Level 1 and the Level 2 gas blender qualification have knowledge of operating principles, design features, advantages, disadvantages and safety issues related to the following gas blending and delivery methods:

— nitrogen reduction methods (e.g. using a membrane or a molecular sieve);

— continuous blending;

— partial pressure blending;

— using premixed gases;

— "gravimetric mixing method" (mixing by weight);

— booster pumps.

5.3 Gases and gas blends

5.3.1 The training programme shall ensure that students for both the Level 1 and the Level 2 gas blender qualification have knowledge of the uses, characteristics, advantages, disadvantages and safety issues of the following gases and gas mixtures used by divers:

— oxygen;

— nitrogen;

— air;

— enriched air nitrox (EAN).

NOTE It is advisable that the training programme states that gases obtained from a third party which will be used in breathing mixtures for diving purposes need to be formally certified to be fit for use for breathing purposes (e.g. diving grade oxygen, medical grade oxygen, aviator grade oxygen or any other formally certified breathing-grade oxygen).

5.3.2 In addition to the items listed in 5.3.1, the training programme shall ensure that students for the Level 2 gas blender qualification have knowledge of the uses, characteristics, advantages, disadvantages, safety issues of the following gases and gas mixtures used by divers:

— helium,

— argon;

— trimix;