INTERNATIONAL STANDARD

ISO 24805

First edition
2022-08

Recreational diving services — Requirements for rebreather diver training — Decompression diving to 45 m

Services relatifs à la plongée de loisirs — Exigences concernant la formation des plongeurs à l'utilisation des recycleurs — Plongée avec décompression jusqu'à 45 m

Reference number
ISO 24805:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 228, *Tourism and related services*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 329, *Tourism services*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

Rebreathers (i.e. breathing devices that recirculate some or all of the diver's exhaled breath and replenish any consumed oxygen to maintain a breathable mixture) are becoming much more widely available and popular among divers. The market for rebreather diving has been constantly growing in recent years and is now considered to be large enough that the need for standards on minimum training requirements for training organizations is evident. Rebreathers allow divers to dive for longer and to greater depths. Such depths can go beyond 30 m and therefore require mandatory decompression stops. If rebreathers are used improperly they can be hazardous; divers have had fatal accidents due to incorrect use of these devices. It is therefore important to specify training for diving with such devices.

Training organizations offering training that conforms with this document may exceed any of the requirements in terms of the volume or complexity of training but should at least ensure the students master all the skills and knowledge defined in this document.

Recreational diving services — Requirements for rebreather diver training — Decompression diving to 45 m

1 Scope

This document specifies requirements for rebreather diver training programmes which provide the competencies required to perform dives with a rebreather to 40 m using a nitrox breathing mixture or to 45 m using a trimix breathing mixture, requiring mandatory decompression stops.

This document specifies evaluation criteria for these competencies.

This document specifies the requirements under which training is provided, in addition to the general requirements for recreational diving service provision in accordance with ISO 24803.

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 11107, *Recreational diving services — Requirements for training programmes on enriched air nitrox (EAN) diving*

ISO 24801-2, *Recreational diving services — Requirements for the training of recreational scuba divers — Part 2: Level 2 — Autonomous diver*

ISO 24802-2, *Recreational diving services — Requirements for the training of scuba instructors — Part 2: Level 2*

ISO 24803, *Recreational diving services — Requirements for recreational diving providers*

ISO 24804, *Recreational diving services — Requirements for rebreather diver training — No-decompression diving*

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
rebreather
apparatus that has a supply of gas carried by the diver, allowing the diver to breathe underwater, which enables the diver to inspire gas from a facepiece connected to a counterlung and to pass exhaled gas through a carbon dioxide absorption material before it is rebreathed from the counterlung and inspired partial pressure of the gases within the apparatus remain within acceptable physiological limits so that gas is thus recirculated within the apparatus

Note 1 to entry: A rebreather can also be called a self-contained rebreathing diving apparatus.

Note 2 to entry: A facepiece can be a mouthpiece assembly, a half mask, a full-face mask or a helmet.

[SOURCE: EN 14143:2013, 3.1, modified — Note 1 to entry modified and Note 2 to entry added. This content has been reproduced with the permission of CEN. Copyright remains with CEN.]

3.2
rebreather type
primary rebreather design

EXAMPLE Closed-circuit rebreather (CCR), manually controlled closed-circuit rebreather (mCCR), electronically controlled closed-circuit rebreather (eCCR), semiclosed-circuit rebreather (SCR), manually controlled SCR (mSCR), electronically controlled SCR (eSCR), hybrid closed-circuit rebreather (hCCR)

3.3
rebreather unit
type of *rebreather* (3.1) having consistent controls, displays and configuration over several *rebreather models* (3.4) where the operation is essentially the same from model to model

3.4
rebreather model
specific individual design of *rebreather* (3.1) made by a manufacturer

3.5
breathing gas
gas present in the *breathing loop* (3.13) inspired by the diver

3.6
supply gas
gas present in a cylinder which may be added to the *breathing loop* (3.13)

3.7
bailout gas
gas present in a cylinder that may be breathed directly by the diver

3.8
nitrox
breathable mixture of nitrogen and oxygen with more than 21 % oxygen content, which may contain trace gases at levels no higher than those found in normal air

[SOURCE: ISO 11107:2009, 3.5]

3.9
trimix
gas comprising a specified mixture of oxygen, helium and nitrogen, capable of supporting human life under appropriate diving or hyperbaric conditions

Note 1 to entry: This includes manufactured gas mixtures made up from combinations of pure oxygen, pure helium and pure nitrogen, with or without compressed air.

[SOURCE: EN 14143:2013, 3.20. This content has been reproduced with the permission of CEN. Copyright remains with CEN.]

3.10
PO_2
partial pressure of oxygen in a gas mixture

Note 1 to entry: This usually refers specifically to the breathing-gas mixture inhaled by a diver.

3.11
set-point
PO_2 setpoint
PO_2 value that is used by a control system to determine when a solenoid valve injects oxygen into the *breathing loop* (3.13)

3.12
respiratory minute volume
RMV
product of the tidal volume and breathing frequency measured in litres per minute

[SOURCE: EN 14143:2013, 3.10. This content has been reproduced with the permission of CEN. Copyright remains with CEN.]

3.13
breathing loop
portion of a rebreather through which gas circulates, usually consisting of a mouthpiece, breathing hose(s), counterlungs, non-return valves and a CO_2 absorbent canister

3.14
scrubber
canister in the *breathing loop* (3.13) containing CO_2 absorbent

3.15
confined water
swimming pool with a depth appropriate to the activity or body of water, offering similar conditions with regard to visibility, depth, water movement and access

[SOURCE: ISO 24801-2:2014, 3.5]

3.16
open water
body of water significantly larger than a swimming pool, offering conditions typical of a natural body of water

[SOURCE: ISO 24801-2:2014, 3.6]

3.17
service provider
entity (individual or organization), including any individual acting on behalf of such an entity, which offers one or more of the following services:

— introductory diving activities;

— snorkelling excursions;

— provision of training and education;

— organized and guided diving for qualified divers;

— rental of diving equipment.

[SOURCE: ISO 24803:2017, 3.1]

3.18
safety stop
non-mandatory decompression stop near the surface prior to surfacing

3.19
decompression stop
mandatory stop during ascent from depth prior to surfacing

3.20
decompression diving
diving with mandatory *decompression stops* (3.19)

4 Competencies

The training programme shall ensure that students are qualified to independently plan and conduct dives requiring mandatory decompression stops using the specific rebreather unit for which the diver has received training.

Divers qualified in accordance with this document are competent to dive with a suitably qualified buddy:

— to 40 m using a rebreather that supplies a nitrox breathing mixture; or

— to 45 m using a rebreather that supplies a trimix breathing mixture using a trimix supply gas with a minimum of 20 % oxygen and a maximum of 35 % helium.

In order to be deemed qualified to dive with a specific rebreather unit other than the one that the diver has received initial training for, a diver requires further rebreather unit-specific training.

The training program shall ensure that the student has a full understanding of any theoretical concepts or skills applicable to the rebreather type, rebreather unit and rebreather model they will use. Students shall be provided with an overview of any information that is not specific to their rebreather, but this only needs to be informative in nature so that they are aware of the general possible configurations that other divers may use.

5 Prerequisites for training

5.1 General

The service provider shall ensure that the student fulfils the following prerequisites to take part in the training course envisaged.

5.2 Minimum age

The minimum age to participate in a training programme in accordance with this document shall be 18 years.

5.3 Diving experience

In order to participate in a training programme in accordance with this document, students shall either:

— have met all competency requirements in accordance with ISO 24804 and have logged 20 open-water dives with at least 20 hours underwater using a rebreather;

or

— be qualified in accordance with ISO 24801-2;

— be qualified in accordance with ISO 11107;

— be trained in procedures of decompression diving and have conducted at least five dives with actual or simulated staged decompression; and

— have logged 30 open-water dives with at least 25 h underwater using open-circuit scuba and have logged at least five dives to a minimum depth of 30 m.

5.4 Health requirements

Documented evidence shall be obtained that the student has been medically screened as suitable for recreational diving by means of an appropriate questionnaire or medical examination.

NOTE See Reference [2] for an example of a medical questionnaire and accompanying guidance to physicians.

In case of doubt, the training service provider shall refer students to proper medical resources. If the student is not examined by a physician, the student shall be obliged to confirm by signature that he or she has understood written information given by the instructor on diseases and physical conditions which can pose diving-related risks.

Students shall be advised of the importance of appropriate regular medical examinations.

6 Introductory information

Information in accordance with ISO 24803 shall be made available to the students prior to or during the first class or meeting.

In particular, the students shall be informed that they will be trained to dive:

— to 40 m using a rebreather that supplies a nitrox breathing mixture; or

— to 45 m using a rebreather that supplies a trimix breathing mixture using a trimix supply gas with a minimum of 20 % oxygen and a maximum of 35 % helium.

7 Theoretical knowledge

7.1 Rebreather basics

The training programme shall ensure that students have knowledge concerning the following:

— the definition of a rebreather;

— the difference between a rebreather and open-circuit scuba;

— advantages and limitations of different rebreather types;

— the concept of rebreather unit-specific requirements;

— maintaining PO_2 within physiological limits.

7.2 Function of rebreather components

The training programme shall ensure that students have knowledge concerning the function of the following components of a rebreather, with emphasis on the specific features of the rebreather unit they will use during their training:

— breathing loop, definition of “minimum/optimum breathing loop” and breathing loop volume;

— counterlungs;

— inhalation and exhalation hoses;

— non-return (mushroom) valves;

— scrubber (CO_2 absorbent);

— oxygen sensor(s);

— gas supplies (this shall include, where applicable, oxygen, diluent or other supply gases);

— gas addition valves [this shall include, where applicable, manual, automatic diluent valve (ADV) or other automatic gas addition];

— regulator(s), including the first stage pressure relief valve (if applicable);

— overpressure valve (OPV);

— mouthpiece, dive surface valve (DSV);

— bailout valve (BOV);

— displays (including, where applicable, handsets, head up display (HUD) or other);

— control modules;

— alarm and warning systems;

— firmware, software, including updates and downloads of dive profiles;

— gas cylinder(s);

— regulator(s);

— cylinder valve(s);

— cylinder pressure indicators;

— CO_2 and helium monitoring systems.

7.3 Breathing performance using a rebreather

The training programme shall ensure that students have knowledge concerning the following factors affecting breathing performance using a rebreather:

— choice of gases (see additional information in Annex A), effect of density, maximum depth of the gases and advantages of trimix (e.g. 20 % oxygen and 35 % helium);

— gas density;

— ventilation rate and ventilation volume of the diver;

— rebreather design (e.g. rebreather type, rebreather unit, rebreather model);

— diver attitude and trim;

— size, fit and placement of counterlungs;

— impact of overall equipment configuration on counterlungs and the importance of not restricting counterlung inflation and deflation;

— breathing loop volume.

The training programme shall ensure that students have the following knowledge concerning gas metabolism with rebreathers:

— oxygen consumption;

— CO_2 production.

7.4 Rebreather assembly and checks

The training programme shall ensure that students have knowledge concerning the following aspects of rebreather assembly and checks (as applicable to the specific rebreather unit used for the training):

— use of rebreather unit checklist(s);

— battery power;

— oxygen sensors (e.g. age, integrity and calibration);

— control system setup and function, including PO_2 monitoring and control;

— CO_2 monitoring system;

— scrubber canister, proper preparation for diving, including filling and seals;

— non-return (mushroom) valves;

— mouthpiece valve operation, bite integrity and security;

— gas supplies (composition and pressure of all gases);

— the need to slowly pressurize any gas systems, particularly high-pressure oxygen systems;

— gas connections and feeds to the system;

— bailout system;

— breathing loop integrity, including positive and negative pressure tests;

— breathing loop overpressure valve (OPV) function and how to set to dive mode where required;

— displays and warning systems;

— buoyancy compensator fit and function;

— placement of weights;

— harness assembly and adjustment.

7.5 Gas supply duration

The training programme shall ensure that students have knowledge concerning the following factors affecting the gas supply duration:

— frequent activation of gas addition valves;

— mask clearing;

— flushing the breathing loop;

— frequent changes in depth;

— inflating a drysuit and buoyancy compensation device (BCD) (if fed from the rebreather gas supply).

7.6 CO_2 absorbent duration

The training programme shall ensure that students have knowledge concerning the following factors affecting the CO_2 absorbent duration:

— water temperature;

— water ingress;

— size of the canister;

— depth and gas density;

— work rate;

— absorbent material and grain size specified by the manufacturer.

7.7 Rebreather pre-water entry checks

The training programme shall ensure that students have knowledge concerning the following aspects of rebreather pre-water entry checks:

— use of rebreather unit checklist(s);

— recalibration of the rebreather unit (if required);

— gas supplies on;

— bailout access and operation;

— inflation systems (e.g. gas addition valves, BCD; dry suit);

— electronics on;

— confirming inspired oxygen level (e.g. PO_2 or FO_2);

— the importance of pre-breathing the rebreather.

7.8 Dive conduct

The training programme shall ensure that students have an appropriate knowledge concerning the conduct of dives using a rebreather, including:

— how and when to analyse gases;

— dive planning;

— how to add conservatism to decompression models (e.g. gradient factors);

— water entries;

— safety precautions to be considered during surface swims with a rebreather;

— descents with a rebreather, bubble checks and safety drills;

— automatic diluent or gas valve (ADV) function during descent;

— controlling inspired oxygen levels (e.g. set point changes);

— ascents with a rebreather and exits;

— counterlung placement, loading and rigging;

— optimum breathing loop volume;

— functions of the mouthpiece of a rebreather;

— use of a bailout valve (BOV);

— use of alternative bailout options, including accessing gas from another diver;

— weight, buoyancy and trim when diving with a rebreather;

— control system monitoring (use of displays and gauges), including the importance of monitoring PO_2 changes, especially during descent and ascent;

— hand signals and communications;

— how to track oxygen exposure with a rebreather;

— maximum operating depth of a specific supply gas;

— control of buoyancy when ascending while breathing from bailout source;

— how to help an unresponsive rebreather diver at the surface and underwater;

— how to dive with an open-circuit buddy.

7.9 Decompression dives

7.9.1 General

The training programme shall ensure that students have the following knowledge concerning the conduct of decompression dives:

— equipment required to be able to conduct decompression dives;

— identifying vital systems and planning for redundancy;

— planning and conducting decompression dives.

7.9.2 Techniques

The training programme shall ensure that students have knowledge concerning techniques for:

— open-circuit bailout ascent;

— flushing of the counterlung;

— manual gas control (e.g. oxygen, diluent or other supply gas).

7.10 Identifying and reacting to potential issues

7.10.1 General issues

The training programme shall ensure that students have knowledge concerning the cause, anticipation and prevention of the following issues that can arise while diving with a rebreather so they can recognize and properly react to these issues, with emphasis on the specific features of the rebreather unit students will use during their training:

— loss of supply gases;

— loss of breathing gas;

— loss of mouthpiece;

— battery depletion;

— failure of oxygen sensors;

— identifying incorrect PO_2 display (e.g. PO_2 display not reflecting gas or depth changes);

— failure of gas injection systems (e.g. oxygen solenoid, ADV or supply gas system);

— water in the breathing loop;

— caustic cocktail;

— loss of means to control buoyancy.

7.10.2 CO_2-related issues

The training programme shall ensure that students have knowledge concerning the following potential CO_2 issues with the rebreather and how to prevent or respond to them:

— scrubber malfunction or exhaustion;

— non-return valve failure;

— failure of CO_2 monitoring systems;

— rebreather unit assembly errors.

7.10.3 Actions to be taken where the diver is able to breathe from the breathing loop

The training programme shall ensure that students have knowledge concerning the following actions to be taken in the case of an actual or suspected rebreather issue where the diver is still able to breathe from the breathing loop:

— switching to an open-circuit bailout breathing gas supply;

— manual operation of an electronically controlled rebreather;

— manual operation in semi-closed mode;

— operation as an oxygen rebreather at a depth of 6 m or less.

7.10.4 Actions to be taken where the diver is not able to breathe from the breathing loop

The training programme shall ensure that students have knowledge concerning the following actions to be taken in the case of an actual or suspected rebreather issue where the diver is no longer able to breathe from the breathing loop:

— switching to an open-circuit bailout breathing gas supply;

— ascending to the surface following bailout decompression requirements;

— controlling buoyancy during ascent while breathing from a bailout source.

7.11 Hypercapnia, hypoxia and hyperoxia

The training programme shall ensure that students have knowledge of the definition, causes, signs and symptoms, associated rebreather warnings and indications of hypercapnia, hypoxia and hyperoxia and know what actions to take if any of these occur.

7.12 Buddy system

The training programme shall ensure that students are aware of the importance of maintaining the buddy system when diving with rebreathers. Elements which shall be included are:

— agreeing on the purpose or mission of the dive;

— use of pre-dive checklists;

— pre-dive buddy checks monitoring the buddy during their pre-breathe;

— mutually verifying dive plan procedures throughout the dive (e.g. when switching gases or changing set points);

— planning dives so that each diver can respond to emergencies independently, but so that buddies stay in close proximity and are able to provide support if necessary;

— diving the same set-points and following the same plan in a buddy team;

— being aware that any diver can bailout or end the dive at any time, for any reason;

— always staying together in a buddy team from entry to exit, in particular if a diver needs to abort the dive;

— asking for assistance from a buddy in case of an emergency, including options for sharing bailout gas.

7.13 Rebreather maintenance

The training programme shall ensure that students have knowledge concerning the necessity to clean and disinfect a rebreather and how to do so.

The training programme shall ensure that students have knowledge concerning the following main consumables used in a rebreather and when and how to replace them:

— oxygen sensors;

— CO_2 absorbent;

— batteries;

— gas, including analysing and labelling.

The training programme shall ensure that students have knowledge concerning the importance of:

— staying up-to-date with user manual updates;

— performing required rebreather software updates;

— complying with the manufacturer's maintenance requirements;

— recognizing the risk associated with contamination of oxygen systems.

7.14 Maintaining knowledge and skills

The training programme shall ensure that students are aware of the importance of:

— maintaining a high level of rebreather diving knowledge;

— regularly practicing routine and emergency skills, including rebreather unit-specific procedures.

8 Practical skills

8.1 General

All new skills shall be introduced in confined water and students shall be proficient in all skills in that environment before attempting them in open water.

All of the following skills shall be completed except when the rebreather being used by the student does not include the specific capabilities to allow the student to demonstrate a particular skill.

8.2 Pre-dive procedures

The training programme shall ensure that students are able to demonstrate the following skills:

— planning time and depth for the dive, taking into account the limitations of gas supply and scrubber endurance based on the rebreather manufacturer's specifications, the environment, decompression procedures, oxygen exposure, previous dives and other factors that may apply;

— assembling and setting up the rebreather in accordance with the manufacturer's instructions (e.g. using the specified absorbent material and oxygen sensors) using a checklist (manual or digital), taking into account the aspects in accordance with 7.4;

— performing a complete rebreather pre-dive check, in accordance with the manufacturer's instructions using a checklist (manual or digital), taking into account the aspects in accordance with 7.7;

— donning and adjusting the rebreather and the bailout system for proper fit, including breathing hoses, mouthpiece, mouthpiece retaining strap (MRS) (where fitted) and counterlung placement;

— performing a buddy check (see 7.12);

— ensuring proper weighting and trim weight placement;

— pre-breathing in accordance with the manufacturer's instructions.

8.3 Dive conduct

The training programme shall ensure that students are able to demonstrate the following skills:

— entering the water using a technique appropriate for the environment;

— establishing proper in-water weighting, buoyancy and trim;

— performing a bubble check and display check;

— monitoring the buddy throughout the dive;

— demonstrating awareness of system status by monitoring the rebreather's displays and gauges frequently throughout the dive, with particular emphasis on PO_2;

— monitoring of the remaining time of CO_2 absorbent;

— following procedures for retaining breathing loop integrity;

— clearing mask with a rebreather while maintaining neutral buoyancy;

— performing a controlled descent to the planned depth with a buddy;

— demonstrating correct use of oxygen control selections and features of the control system;

— changing to appropriate set-point if not initiated automatically;

— if set-point changes are initiated automatically, confirming the set-point changes;

— checking oxygen sensors are not current-limited (linearity check) if not initiated automatically;

— demonstrating proper operation of mouthpiece closure mechanism;

— removing water from the breathing hoses;

— maintaining optimum breathing loop volume;

— maintaining neutral buoyancy when swimming in a horizontal position at a given depth;

— controlling buoyancy by remaining at a single depth, plus or minus 1 m, for at least 90 s, with minimum use of fins or arms;

— managing depth changes;

— performing manual gas addition (e.g. oxygen, diluent or other supply gas);

— performing a gas flush;

— removing and replacing an off-board bailout cylinder while underwater;

— conducting simulated decompression stops at a minimum of two stop depths for a total time of at least 6 min;

— deploying a delayed surface marker buoy (DSMB);

— making a controlled ascent maintaining buddy contact and ascending at the correct rate;

— at the surface in open water, establishing positive buoyancy with the buoyancy compensation device (BCD), then closing the rebreather mouthpiece before removal;

— while unsupported at the surface in open water, demonstrating oral inflation of the BCD.

8.4 Emergency situations

The training programme shall ensure that students are able to anticipate and recognize the rebreather issues itemised in 7.10 and 7.11 and react to these situations by demonstrating the following skills:

— responding to a simulated rebreather emergency by performing a bailout ascent to the surface at a controlled rate accompanied by a buddy and performing simulated decompression stops;

— at the signal of a simulated emergency, breathe from an open-circuit bailout gas provided by a buddy and repeat as both donor and receiver;

— at the signal of a simulated emergency, bailout to an open-circuit source, then returning to the breathing loop after the exercise following proper procedures;

— performing a simulated rescue to the surface of a non-responsive rebreather diver.

8.5 Response to rebreather malfunctions

The training programme shall ensure that students are able to demonstrate skills regarding manual response(s) to the following potential rebreather malfunctions (if applicable to the specific rebreather):

— hypoxia;

— hyperoxia;

— hypercapnia;

— oxygen sensor malfunctions;

— rebreather electronic malfunctions;

— loss of diluent;

— loss of oxygen;

— loss of any other supply gas;

— flooded breathing loop;

— loss of buoyancy;

— other rebreather warnings or alarms as appropriate.

8.6 Post-dive procedures

The training programme shall ensure that students are able to demonstrate the following skills:

— removing at the surface any off-board bailout cylinders used;

— exiting the water using a technique appropriate for the environment;

— demonstrating appropriate post-dive care and disassembly of the rebreather, in accordance with the manufacturer's instructions.

9 Instructors

Instructors shall be qualified in accordance with ISO 24802-2 and shall have been trained and assessed as a unit-specific rebreather instructor.

The instructor shall regularly practice using the specific rebreather unit and have current experience of the rebreather being used. In order to instruct programmes which include the use of trimix, the instructor shall be qualified as a unit-specific rebreather trimix 45 m instructor.

10 Training equipment and materials

10.1 Training equipment

On training dives, both the instructor and the student shall be equipped with at least the following:

— a rebreather that is in good working order, that allows open-circuit bailout and decompression diving and is configured and used in accordance with the manufacturer's instructions;

— an open-circuit bailout system which is separate from and not required for the normal operation of the rebreather and which is suitable for a safe return to the surface from the planned maximum depth, including all safety and decompression stops in the event of an emergency;

— a means of generating and providing an appropriate open-circuit bailout profile backup and means of determining depth and duration in the event of a system failure, such as a backup computer;

— an appropriate gas analyser(s).

NOTE The use of a DSMB, a cutting device and spool or reel can be appropriate or required in certain diving environments.

Independent bailout gas shall be selected so that the student can carry the simplest viable equipment configuration for the dive while providing a reasonable level of safety in case of an open-circuit bailout.

The breathing rate for bailout shall be calculated with a minimum respiratory minute volume (RMV) of 50 l/min.

On all training dives the instructor and students shall use the same rebreather units.

Instructors and students shall have a system of logging all the training dives with the following minimum information: depth, dive time, date of dive and gases used.

10.2 Training materials

The training programme shall ensure that students and instructors have at least the following materials available:

— the manufacturer's user manual (including updates) specific for the rebreather type, rebreather unit and rebreather model and associated electronics being used during training;

— specific student training materials;

— specific instructor training materials;

— rebreather-specific checklist(s) for the assembly and operation of the rebreather (rebreathers equipped with a built-in electronic checklist meet this requirement);