



Rebreather Training Council

Standard

Technical Rebreather Diver Level Two

Rebreather Training Council: WARNING - IMPORTANT NOTICE - DISCLAIMER

Scuba diving (Recreational and Technical) is a potentially dangerous activity that can result in serious injury and death. Diving with Rebreathers amplify inherent risks of hypercapnia, hyperoxia, hypoxia and equipment failures that can result in divers becoming incapacitated without warning, which creates even greater risk of death. For these reasons the Rebreather Training Council ("RTC") was formed by industry experts, training agencies and stakeholders to develop rebreather training standards to be utilized as a minimum curriculum for all RTC Members.

RTC Standards are developed as a membership service by the RTC to enhance rebreather training procedures for a minimum level of consistency set forth by RTC Member Training Associations. The RTC Standards contain information and practices designed to promote safer rebreather diving applicable to all local, regional and international rebreather training. The RTC Standards are designed as broadly as possible to incorporate minimum information and skills applicable for training all types of rebreathers produced by all rebreather manufacturers. Any member training organization wishing to offer a course complying any of the standards shall publish detailed course outlines that meet or exceed the applicable RTC Training Standard.

The RTC Standards shall be construed as minimum training standards to be enhanced and expanded upon at the discretion of each RTC Member Training Association. RTC Standards shall be modified as new technologies and trends effect rebreather divers. HOWEVER, NO BOOK, TRAINING CURRICULUM, CHECKLIST, DIVE PLAN AND OR CONTINGENCY PLAN CAN ELIMINATE ALL RISKS ASSOCIATED WITH REBREATHER DIVING. ULTIMATELY IT IS EACH DIVER'S PERSONAL RESPONSIBILITY TO ACCEPT THE INHERENT RISKS OF REBREATHER DIVING.

THE RTC MAKES NO WARRANTIES OR REPRESENTATIONS AND ASSUMES NO LIABILITY CONCERNING THE VALIDITY OF ANY INFORMATION, PROCEDURES OR GUIDELINES EXPRESSED IN THESE MATERIALS. EACH TRAINING AGENCY IS RESPONSIBLE FOR DEVELOPING THEIR OWN MINIMUM TRAINING CURRICULUMS FOR REBREATHER TRAINING AND CERTIFICATION. ALL INDIVIDUALS AND ENTITIES RELYING ON RTC STANDARDS DO SO AT THEIR OWN RISK.

THE RTC IS AN INTERNATIONAL NON-FOR-PROFIT ORGANIZATION COMPRISED OF VOLUNTARY MEMBER TRAINING ASSOCIATIONS AND AFFILIATE STATEHOLDERS TO PROMOTE RESPONSIBLE REBREATHER TRAINING. THE RTC IS A NON-REGULATORY ORGANIZATION WHICH HAS NO LEGAL AUTHORITY TO REGULATE OR CONTROL INDIVIDUAL TRAINING AGENCIES OR INDIVIDUALS AND SHALL NOT BE HELD LIABLE FOR ANY TRAINING AGENCIES, TRAINING FACILITIES, TRAINERS OR PARTICIPANTS THAT RESULTS IN INJURY OR DEATH TO ANY PERSON OR PERSONS.

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1. Scope

This standard describes the requirements for the training of a Technical Rebreather Diver Level Two. Training Organizations offering a course that complies with this standard may exceed any of the requirements in terms of the volume or complexity of training, but must at least ensure the students master all the skills and knowledge defined in this standard. Safety limits for depth, partial pressures of gases, etc. may not be exceeded during a course.

2. Terms and Definitions

a. Training Organization

An RTC member organization that designs the training program, authorizes instructors, issues certifications and quality assures the delivery of the training.

b. Certification

A certificate of competency may be issued to the student by the training organization and RTC member organizations can state that the certification meets the requirement of this standard. Certification will be issued at the instructor's discretion when the student has met all the requirements of this standard.

c. Instructor

An individual approved by an RTC member organization to certify divers at this level.

d. Certified Assistant

An individual approved by an RTC member organization to act as an assistant to an instructor for this course.

e. Confined Water

Swimming pool with a depth appropriate to the activity or body of water that offers similar conditions with regard to visibility, depth, water movement and access

f. Open Water

A body of water significantly larger than a swimming pool offering conditions typical of a natural body of water

g. Rebreather



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A breathing device that recirculates some or all of the diver's exhaled breath and replenishes any consumed oxygen and remove carbon dioxide to maintain a breathable mixture.

h. CCR

A Closed Circuit Rebreather

i. SCR

A Semi-closed Circuit Rebreather

j. Heliox

A mixture of oxygen and helium

k. Trimix

A mixture of oxygen, helium and nitrogen

l. Normoxic Trimix

For the purposes of this standard, this is a mixture of Trimix with a minimum oxygen content of 16%

(Note that according to EN 12021 and other sources, normoxic is defined as having an oxygen level compatible with air i.e. 21% +/-1% oxygen)

m. Hypoxic Trimix

For the purposes of this standard, this is a mixture of Trimix with an oxygen content of less than 16% which may be hazardous to breathe at the surface or in relatively shallow water

n. Equivalent Narcotic Depth (END)

The depth at which a particular breathing mixture would produce the same narcotic effect as when breathing air



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3. Competencies of a Technical Rebreather Diver Level 2

A diver able to dive with a rebreather and two or more off-board bailout cylinders in the company of at least one other certified diver without supervision in conditions similar to those experienced during this course.

4. Prerequisites for Course

a. Minimum Age

The minimum age for participants is 18.

b. Medical Screening

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. In any case of doubt, or at the instructor's discretion, students shall be referred to proper medical resources. If the student is not examined by an appropriate medical professional (e.g. 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 may pose diving-related risks.

c. General Diving Skills and Knowledge

The diver must have at least the competencies described in the RTC Technical Rebreather Diver Level 1 standard. In addition, they shall have logged 50 hours of experience with a CCR with at least 50% of them logged on the same configuration of CCR to be used in the course.

5. Breathing Gas

a. Acceptable Gas Mixtures

Course participants must be trained in the use of heliox and normoxic trimix mixtures with a recommended END of 30 metres/100 feet or shallower and an absolute maximum END of 40 metres/130 feet. Air may be used as a diluent for shallower training dives.

b. Maximum Oxygen Partial Pressures

- i. The maximum PO_2 during the dive is 1.4 bar.
- ii. A maximum PO_2 of 1.6 bar can be used during the decompression phase of the dive or for emergency open circuit bailout.
- iii. On-board diluent gases must have a maximum PO_2 of 1.1 bar at the expected maximum operating depth.

6. Training Dive Limits

- a. Planned stage decompression dives will be included in the course.



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- b. For any training dives that do not include required decompression stops, safety stops are strongly recommended.
- c. The training organization may specify a maximum depth for certified divers up to a maximum of 60 metres/200 feet. Students shall have experience of at least 80% of the specified maximum working depth during this course.

7. Theory Knowledge

By the end of the course the candidate shall have an appropriate knowledge of the following concepts for rebreather diving (course content should include all the following concepts unless inapplicable for the rebreather model used):

- a. All of the theory competencies outlined in the Technical Rebreather Diver Level 1 standard
- b. Additional equipment required to be able to conduct decompression dives
- c. Planning for redundancy of key life-support equipment
- d. Techniques to be able to conduct decompression diving
- e. Ensuring adequate bailout gas available for safe exit at any point during dive
- f. Staying within maximum limits to avoid central nervous system (CNS) oxygen toxicity
- g. Effect of gas density on breathing resistance
- h. Planning and conducting decompression dives
- i. Manual operation of a functioning rebreather
- j. Manual control options to manage a malfunctioning rebreather
- k. Techniques for:
 - I. Removing and replacing two bailout cylinders at the surface and underwater
 - II. Exchanging a bailout cylinder with another diver while stationary in mid-water and maintaining neutral buoyancy
 - III. Exchanging a bailout cylinder with another diver during a simulated open circuit bailout ascent
 - IV. Diluent flush
 - V. Use of CCR in SCR mode
 - VI. Manual oxygen control
 - VII. Manual diluent control
 - VIII. Manual setpoint control during ascent
 - IX. Off-board plug-in to a CCR of oxygen and diluent gas supplies



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8. Confined/Shallow Water Training

- a. All new skills shall be introduced in shallow water and all critical skills should be mastered by the student in that environment before attempting them in open water.

9. Practical Skills

The student shall have experience of at least 6 dives/water sessions and at least 360 minutes total open water time during the course.

By the end of the course the candidate shall be able to perform the following skills (course content should include all the following items unless inapplicable for the rebreather model used):

- a. All of the practical competencies outlined in the Technical Rebreather Diver Level 1 standard
- b. Remove and replace two bailout cylinders at the surface and underwater
- c. Exchange a bailout cylinder with another diver while stationary in mid-water and maintaining neutral buoyancy
- d. Exchange a bailout cylinder with another diver during a simulated open circuit bailout ascent
- e. Manual operation of the functioning rebreather
- f. Use an off-board plug-in diluent gas supply to diver's CCR
- g. Use an off-board plug-in oxygen gas supply to diver's CCR
- h. Manual setpoint control during ascent
- i. Manual response(s) to the following rebreather malfunctions (if applicable to the specific rebreather):
 - I. Hypoxia
 - II. Hyperoxia
 - III. Hypercapnia
 - IV. Cell problems
 - V. Loss of diluent
 - VI. Loss of oxygen
 - VII. Other rebreather warnings/alarms as appropriate
- j. Use of CCR in SCR mode
- k. Rescue of a rebreather diver
- l. Conduct of decompression or safety stops
- m. Switching to off board bail out and conducting an ascent
- n. Correctly respond to simulated emergencies



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10. Instructor Requirements

An instructor in teaching status with the training organization who is authorized to certify at this level.

11. Certification

Once the instructor has ensured the student has met all the requirements of this standard, the instructor shall send a certification application to the training organization who shall issue a certification to the student.