29. Mixed Gas Closed Circuit Rebreather Instructor Course Unit Specific-Poseidon Discovery MK VI / SE7EN

29.1 Introduction

This is the instructor level certification course for instructors wishing to teach the mixed gas closed circuit rebreather course on the Poseidon MK VI / SE7EN. The objective of this course is to train instructors to teach mixed gas rebreather diving, and to develop technical rebreather diving skills appropriate to diving to a maximum depth 48 metres / 157 feet or the maximum depth set by the manufacturer, using Trimix with a minimum 16 percent oxygen (O₂) or greater.

Instructors can be qualified to teach on any unit that TDI has diver standards for.

29.2 Qualifications of Graduates

Upon successful completion of this course, graduates may teach the TDI Poseidon MK VI / SE7EN Mixed Gas Closed Circuit Rebreather course not to exceed the manufacturer’s designed depth maximum or 48 metres / 157 feet with mixed gas diluent. This course is unit specific.

29.3 Who May Teach

Any active TDI Poseidon MK VI / SE7EN CCR Mixed Gas Rebreather Instructor Trainer may teach this course

29.4 Student to Instructor Ratio

**Academic**

1. Unlimited, so long as adequate facility, supplies and time are provided to ensure comprehensive and complete training of subject matter

**Confined Water (swimming pool-like conditions)**

1. A maximum of 2 students per instructor trainer; it is the instructor trainer’s discretion to reduce this number as conditions dictate

**Open Water (ocean, lake, quarry, spring, river or estuary)**

1. A maximum of 2 students per instructor trainer; it is the instructor trainer’s discretion to reduce this number as conditions dictate

29.5 Student Prerequisites

1. Minimum age 21
2. TDI Poseidon MK VI / SE7EN CCR Air Diluent Decompression Procedures Instructor (or equivalent) with 15 students taught and 1 year teaching experience on the Poseidon MK VI / SE7EN CCR

And
3. Properly verified proof of 30 logged mixed gas dives on a rebreather with 15 logged dives beyond 35 metres / 115 feet

29.6 Course Structure and Duration

Open Water Execution
1. Four dives

Course Structure
1. TDI allows instructors trainers to structure courses according to the number of students participating and their skill level

Duration
1. The minimum number of classroom and briefing hours is 6

29.7 Administrative Requirements

The following are the administrative tasks:
1. Collect the course fees from all the instructor candidates
2. Ensure that the instructor candidates have the required equipment
3. Communicate the training schedule to the instructor candidates
4. Have the instructor candidates:
   a. Complete the TDI Liability Release and Express Assumption of Risk form
   b. Submit the TDI Medical Statement form signed by a licensed physician

Upon successful completion of the course the instructor trainer must:
1. Issue the appropriate TDI certification by submitting the appropriate TDI Dive Leader Registration form to TDI Headquarters

29.8 Training Material

Required Material:
1. TDI Diving Rebreathers Instructor Guide
2. TDI Diving Rebreathers Diver Manual
3. TDI Standards and Procedures Manual
4. Rebreather Course Evaluation Form
5. Poseidon Discovery MK IV User Manual

Optional Material:
1. TDI Diving Rebreathers PowerPoint Presentation Series
3. Kenneth Donald - Oxygen & The Diver
6. Bob Cole – *Rebreather Diving*
7. Jeffrey Bozanic – *Mastering Rebreathers*

### 29.9 Required Equipment

The following equipment is required for each student:

1. Poseidon MK VI / SE7EN CCR: the student must own, or have access to Poseidon MK VI / SE7EN CCR
2. Depth gauge and automatic bottom timer and / or dive computer
3. Mask, fins
4. Exposure suit suitable for the diving environment
5. Knife
6. Slate and pencil
7. Bailout bottle with a minimum capacity of 5 litres/ 40 cubic feet
8. Ascent reel with lift bag / surface marker buoy appropriate for maximum planned depth minimum of 12kg / 25 lbs

### 29.10 Required Subject Areas

Instructor trainers must use the *TDI Diving Rebreathers* Student Manual, instructor guide, manufacturer’s manual and the current *TDI Standards and Procedures* Manual, but may also use any additional text or materials that they feel help present these topics. The following topics must be covered during this course and the instructor candidate must demonstrate instructor level knowledge in all topics:

1. History and Evolution of Rebreathers
2. Comparison of Open Circuit, Closed Circuit and Semi Closed Circuit Rebreather systems and the Benefits/Problems with Each
3. Practical Mechanics of the System
   a. Assembly and disassembly of the MK VI / SE7EN Discovery
   b. Layout and design of the unit
   c. Absorbent canister design and maintenance
   d. Breathing loop de-contamination procedures
   e. Automatic diluent valve (ADV)
   f. Keying valve to individuals metabolic rate
   g. Valve maintenance
   h. DSV (mouthpiece) use, design and limitations
4. Gas Physiology
   a. Oxygen toxicity
   b. Nitrogen absorption
   c. Helium
   d. CO₂ toxicity
   e. Gas consumption
5. Electronic Systems Design and Maintenance
a. O₂ metabolizing calculations
b. Equivalent air depth (EAD) theory revision
c. Fuel cells
d. Configuration software
e. System electronics functionality and power-up self test
f. Controlling resources
   i. Oxygen supply
   ii. RNDT (modified with 40 metres / 132 feet deco battery)
   iii. OTU
   iv. Amount of diluent
   v. Battery supply
g. Time to surface alarm (TTS)
h. Smart battery condition / testing
   i. Charge times
   ii. Learn cycles
   iii. 48 metre / 157 feet deco Trimix
   i. Firmware updating

6. Dive Tables
   a. Equivalent air depth (EAD) operation
   b. Constant PPO₂ theory
   c. CNS and awareness of OTU tracking

7. Dive Computers
   a. Mix adjustable
   b. Constant PO₂
   c. O₂ integrated

8. Dive Planning
   a. Operational planning
   b. Gas requirements including on-board open circuit bailout scenarios / limitations
   c. Oxygen limitations
   d. Nitrogen limitations
   e. Off board open circuit bailout

9. Emergency Procedures
   a. Omitted decompression procedures
   b. Use of B.A.D.D.A.S.S.
   c. Three H’s problems
   d. Flooded loop
   e. Cell warnings
   f. Battery warnings / failure
29.11 Required Skill Performance and Graduation Requirements

The following skills must be completed by the instructor candidate. The maximum training depth shall not exceed 48 metres / 157 feet.

The following skills must be completed by the Instructor candidate. The maximum training depth shall not exceed the manufacturer’s design limit. Over the course of the practical sessions, instructor candidates must set up and break down the Poseidon MK VI / SE7EN a minimum of 4 times running through the start-up procedures each time.

1. Demonstrate proper analysis of all gas mixtures to be used
2. Demonstrate proper loading of scrubber canister
   a. Cartridge properly oriented top and bottom
   b. Top plate inspection and inserting
   c. Canister sponge inspection
3. Demonstrate a complete systems check and rebreather configuration
4. Demonstrate appropriate pre-dive planning
   a. Limits based on personal gas consumption
   b. Limits based on oxygen consumption and exposures at planned depth
   c. Limits based on nitrogen absorption at planned depth
5. Properly execute the planned dive within all pre-determined limits
6. Demonstrate the proper procedures for
   a. Buoyancy control with minimal air use
   b. ADV use
   c. Mask clearing with minimal air loss
   d. Bail-out
      i. On-board with ascent while safely conducting any simulated decompression obligations
      ii. Off-board while maintaining depth (switch back to loop before ascent)
   e. Mouthpiece removal
   f. Clearing loop of water
   g. Ascent techniques
   h. Simulated emergency
      i. Omitted decompression procedures
      i. Buddy checks
   j. Safety stops
7. Properly execute the break down and maintenance of rebreather
8. Post dive clean of unit
   a. Mouth piece and hoses
   b. Clean and disinfect unit
   c. Inspect components of unit
9. Diver maintenance of unit
   a. Cell remove and replace
   b. Mouthpiece strip and rebuild
c. Smart battery
   i. Proper storage
   ii. When to replace

**In order to complete this course, students must:**

1. Satisfactorily complete the TDI Closed Circuit Rebreather Course written examination with a minimum score of 80 percent without reference, and be able to adequately explain each answer to a prospective student.
2. Demonstrate mature, sound judgment concerning training, dive planning and execution
3. Complete all open water requirements safely and efficiently
4. Demonstrate proficiency in teaching all skills in the unit specific diver standards
5. Present 1 graded presentation on a closed circuit mixed gas rebreather topic
6. Present and evaluate all subjects covered in the Poseidon MK VI / SE7EN diver standards