

29. KISS GEM Sidekick Diver

29.1 Introduction

This is the entry-level certification course for recreational divers wishing to utilize the GEM Sidekick Semi-closed Circuit Rebreather (SCR) in recreational diving. The objective of this course is to instruct divers in the procedures, benefits and hazards of semi-closed circuit diving using the GEM Sidekick.

29.2 Qualifications of Graduates

Upon successful completion of this course graduates may engage in no-decompression diving utilizing the GEM Sidekick SCR with a nitrox mix of between 32% and 40% to a maximum depth of 30 metres / 100 feet with a PO_2 not to exceed 1.4 ATA based on cylinder contents.

29.3 Who May Teach

Any active TDI KISS GEM Sidekick Instructor 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 4 students per instructor

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

1. A maximum of 4 students per instructor; it is the instructor's discretion to reduce this number as conditions dictate

29.5 Student Prerequisites

1. Minimum age 18
2. Provide proof of
 - a. SDI Advanced Diver or equivalent at the discretion of the instructor
 - b. SDI or TDI Nitrox Diver or equivalent, may be combined in the program at the discretion of the instructor

29.6 Course Structure and Duration

Confined Water Execution

1. A minimum of 1 confined water dive with a minimum of 60 minutes of accumulated bottom time

Open Water Execution

1. A minimum of 5 dives with a minimum of 200 accumulated minutes; two dives must be deeper than 15 metres / 50 feet

Course Structure

1. TDI allows instructors to structure courses according to the number of students participating and their skill level
2. Dives conducted to a maximum depth of 30 metres / 100 feet, not to exceed the maximum depth of the diver's current certification

Duration

1. The minimum number of classroom and briefing hours is 6; minimum course duration 3 days
2. A minimum of 2 hours must be spent on equipment overview and maintenance

Crossovers

1. For divers that have already received training on a KISS GEM with dive experience on the GEM within the past 3 months must meet all GEM Sidekick standards with the exception of the following:
 - a. A minimum of 3 hours is required for briefing. This includes going through the PowerPoint specific for the Sidekick, as well as equipment preparation
 - b. Minimum of 2 open water dives for a minimum accumulated bottom time of 80 minutes
2. For divers that have already received training on a TDI approved SCR with dive experience on that SCR within the past 3 months must meet all GEM Sidekick standards with the exception of the following:
 - a. Minimum of 3 open water dives for a minimum accumulated bottom time of 120 minutes. The 60 minutes of confined water time is still required

29.7 Administrative Requirements

Administrative Tasks:

1. Collect the course fees from all the students
2. Ensure that the students have the required equipment
3. Communicate the schedule to the students
4. Have the students complete the:
 - a. *TDI Liability Release and Express Assumption of Risk Form*
 - b. *TDI Medical Statement form*

Upon successful completion of the course the instructor must:

1. Issue the appropriate TDI certification by submitting the *TDI Diver Registration Form* to TDI Headquarters or registering the students online through member's area of the TDI website

29.8 Training Material

Required material

1. *KISS GEM Sidekick* owner's manual
2. *TDI KISS GEM* PowerPoint Slides
3. *TDI KISS GEM Sidekick* PowerPoint Slides

Optional Material

1. TDI plastic EAD and PO₂ tables

29.9 Required Equipment

1. The following equipment is required for each student
 - A complete GEM Sidekick SCR
2. Printed checklists from the GEM Sidekick owner's manual
3. GEM Sidekick SCR owner's manual
4. A minimum of 1 integrated PO₂ monitoring for each GEM Sidekick
5. Access to oxygen analyzer (instructor may supply)
6. Adequate CO₂ absorbent (ExtendAir™ cartridge or equivalent) for the dives to be conducted
7. Underwater slate
8. Depth gauge and automatic bottom timer AND/OR nitrox dive computer
9. Mask and fins
10. Exposure suit appropriate for the open water environment
11. Appropriate weight
12. Tool-kit with appropriate spares (instructor may supply)
13. Disinfectant (instructor may supply)
14. One line cutting device

29.10 Required Subject Areas

The KISS GEM Sidekick Owner's Manual and KISS GEM Sidekick PowerPoint Slides are mandatory for use during this course but instructors may use any additional text or materials that they feel help present these topics. The following topics must be covered during this course:

1. History and Evolution of Rebreathers
2. Comparison of Open Circuit, Closed Circuit, and Semi-closed Circuit
3. Practical Mechanics of the GEM Sidekick SCR System
 - a. Assembly and disassembly of the GEM Sidekick SCR
 - b. Layout and design
 - c. Lung volume control system
 - d. Scrubber replacement
 - e. Pre-dive safety check sequence
 - f. System maintenance and storage
 - g. Breathing loop decontamination procedures
4. Review of Nitrox
 - a. Dalton's Law (triangle)
 - b. Optimum nitrox mix
 - c. Oxygen tracking
 - d. Gas preparation and analysis
5. Gas Physiology
 - a. Oxygen toxicity
 - b. Hyperoxia
 - c. Hypoxia
 - d. Asphyxia
 - e. Hypercapnia
 - f. Nitrogen absorption
 - g. CO₂ toxicity
 - h. Gas consumption
 - i. Cylinder sizes
 - j. Depth and workload
6. Formula work / metabolic consumption
 - a. Cylinder size/duration equation
 - b. Equivalent air depth
7. Dive Tables
 - a. Inspired O₂ table
 - b. Equivalent air depth.
8. Dive Computers
 - a. Mix adjustable
 - b. O₂ integrated
 - c. PO₂ monitoring devices

9. Dive Planning
 - a. Operational planning
 - b. Gas requirements including bailout scenarios
 - c. Oxygen limitations
 - d. Nitrogen limitations
10. Problem Solving
 - a. Canister flooding
 - b. Mouthpiece loss
 - c. Scrubber exhaustion
 - d. Battery or sensor failure
 - e. Breathing bag rupture
 - f. Open circuit bailout
 - g. Hyperoxia scenario
 - h. Hypoxia scenario
 - i. Hypercapnia scenario
 - j. Loop flood recovery
 - k. Supply gas disconnect
 - l. Post problem maintenance of equipment

29.11 Required Skill Performance and Graduation Requirements

The dive depth shall not exceed one point four (1.4 ATM) PO₂. The following skills must be completed by the student during confined and open water dives

Confined Water Skills

1. Complete GEM Sidekick Pre-dive Checklist
2. Pre-dive checks (minimum 1 time)
 - a. Scrubber packing
 - b. Unit assembly
 - c. One-way valve check
 - d. Positive and negative pressure tests
3. Properly analyze supply cylinder
4. Properly calibrate and verify oxygen sensors
5. Proper fitting and adjustment of counter lung system
6. Correct starting orientation of mouthpiece, readjust underwater
7. Perform in water bubble check
8. Demonstrate proper PO₂ monitoring
9. Perform 1 stationary bailout
10. Perform 1 bailout ascent from a depth not shallower than 1.5 metres / 5 feet

11. Lung volume control system adjustment
12. Disconnect and re-connect the gas supply underwater
13. Practice breathing in different positions and note the change in the work of breathing in each position
14. Perform a complete unit disassembly and cleaning

Note: All pool dives must be conducted with a minimum of 40% (+/- 1%) oxygen in the source cylinder

Open Water Skills

1. Properly analyze gas mixture
2. Properly calibrate and verify oxygen sensors
3. Perform pre-dive check sequence with use of manufacturer's checklist for each dive
4. Demonstrate a leak check and repair scenario
5. Properly pack scrubber canister a minimum of 2 times
6. Properly execute set-up and breakdown for each dive
7. Demonstrate adequate pre-dive planning limits based on:
 - a. System performance
 - b. Oxygen exposures at planned depth with mix
 - c. Nitrogen absorption at planned depth with mix
8. Demonstrate switching to open loop or open circuit when depth is 6 metres / 20 feet or shallower
9. Properly execute the planned dives within all pre-determined limits
10. Demonstrate the proper adjustment of the counter-lung system underwater
11. Lung volume control system adjustment
12. Disconnect and re-connect the gas supply underwater
13. Properly execute a recovery from a system failure and switch to bailout stationary a minimum of 2 times per dive
14. Properly execute a recovery from a system failure and switch to bailout hovering a minimum of 2 times, one of the bailout scenarios the diver must switch to open circuit and complete dive and safety stop on open circuit (direct ascent must begin when diver switches to open circuit, this scenario should be conducted no deeper than 18 metres / 60 feet)
15. Properly demonstrate hose clearing technique after each bailout scenario
16. Proper PO₂ monitoring on all dives
17. Properly execute a mask clearing exercise with emphasis on minimal gas loss
18. Demonstrate comfort setting up and diving the unit
19. Demonstrate good buoyancy control and trim during the dive

20. Safely and properly execute a buddy out of air scenario, it is preferable the buddy be on an SCR unit also
21. Diver will demonstrate actual safety stops at pre-determined depths
22. Properly execute partial loop flood recovery procedures a minimum of 2 times
23. Properly execute gas switching procedures a least 3 times
24. Properly execute cleaning and maintenance of the GEM Sidekick SCR, including breathing loop decontamination

In order to complete this course, students must

1. Complete all open water requirements safely and efficiently
2. Demonstrate mature, sound judgment concerning dive planning and execution
3. Pass the diver final exam with 80% answered correctly and 100% remediation