

CCR DIVER

INTENT

The CCR Diver program provides divers with the knowledge and training necessary to independently plan and conduct unit specific no decompression closed-circuit rebreather (CCR) dives to a maximum depth of 30 meters/98 feet, using a manufacturer approved CCR unit with air as diluent utilizing CCR Diving procedures with a dive buddy diving on a rebreather or diving open circuit.

REQUIRED INSTRUCTOR RATING

An active status unit-specific CCR Instructor or higher may conduct the unit-specific CCR Diver program.

TEACHING RATIOS

- The maximum number of students for CCR training is 3:1
- The maximum number of students for no-decompression CCR training where one (1) student is making a crossover or doing a refresher is 4:1

These ratios should be reduced as required if the situation and/or environmental conditions call for it.

STUDENT PREREQUISITES

- Nitrox certification
- Have logged 20 open water dives
- Minimum age: 18
- For KISS Sidekick CCR only:
 - Student must have some level of technical diver training. At a minimum advanced nitrox or recreational trimix or equivalent.
 - Students must be able to rig a sidemount rebreather as well as 2 cylinders.

DURATION

- Recommended hours for course completion: 40
- Minimum number of days: 4
- Minimum number of hours for Academics and Dry practical: 8

MATERIALS AND EQUIPMENT

The minimum required student and instructor equipment for this program includes:

A complete KISSCCR Unit that:

- Is compliant to local laws, is approved by the training agency and is properly functioning
- Has no non-manufacturer approved modifications
- Depth gauge & bottom timer, or dive computer
- A single off-board bailout gas 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
- For Open water and lake environments with the exception of cave/overhead environments a Delayed Surface Marker Buoy (DSMB) and a spool / reel appropriate for the planned dive depth.
- cutting device
- Access to an appropriate gas analyzer

The minimum required student and instructor materials for this program includes:

- KISS Rebreather unit specific user manual
- Agency student training manual or online training course
- Agency instructor manual (electronic instructor manuals meet this requirement)

- Course liability release and assumption of risk (in accordance with local laws)
- Training agency approved medical document
- Unit specific checklist (units equipped with a built in electronic checklist, meet this requirement)
- Manufacturer's sign off sheet/course completion document

All skills must be demonstrated by the instructor on the specific unit being trained

REQUIREMENTS FOR COMPLETION

Academics

Students shall have sufficient understanding and knowledge in the following subject areas listed. They should be capable of planning dives in the typical local conditions and environment and be able to plan for typical emergency situations.

1. Practical mechanics of a CCR
 - Assembly and disassembly specific to KISS rebreather being used. Use unit specific manual as a guide
 - Unit Specific Check list
 - Design and overview of the KISS unit
 - Insert O-rings where required
 - O-ring location and condition
 - Absorbent canister
 - Breathing loop
 - Automatic Diluent Valve: automatic and manual use
 - Manufacturer's supported add-ons: BOV, etc
 - KISS Sidekick: understand risk of high work of breathing & importance of securing unit, cylinders
2. Loop volume - minimum / optimum
 - Determine the correct counterlung size, & understand how to attain and maintain proper loop volume
3. Gas Physiology
 - Oxygen risks, Hypoxia, Hyperoxia
 - Carbon dioxide (CO₂) toxicity, Hypercapnia
 - Nitrogen absorption
4. Proper scrubber filling; in accordance with KISS recommendations
 - Manufacturer's recommended scrubber medium, & procedures according to KISS user manual
5. Electronic or Manual or Mechanical Systems Design and Maintenance
 - Oxygen (O₂) metabolizing calculations
 - Oxygen Sensors, limitations, care and replacement regime
 - System electronics functionality and calibration procedures
 - KISS manual gas addition valve design and function. (raising and lowering of constant flow; determining correct flow rate for each individual)
6. Dive Tables
 - Constant partial pressure of oxygen (PPO₂) theory
 - Central nervous system (CNS) and Oxygen Tolerance Unit (OTU) tracking and awareness
7. Dive Computers
 - Mix adjustable

- Constant PO₂
 - Decompression conservatism / Gradient factor selection
 - Oxygen (O₂) integrated
8. Dive Planning
- Operational planning
 - Gas consumption
 - Scrubber duration
 - Gas requirements including bailout scenarios
 - Oxygen limitations
 - Nitrogen limitations
9. Emergency Procedures
- Flooded loop
 - Cell warnings
 - Battery warnings
 - Electronic failures

Skills

1. Pre-dive checks
 - Specific Unit Checklist
 - Verify diluent and oxygen (O₂) cylinder contents using gas analyzers
 - Unit build-up
 - Scrubber canister filling
 - Breathing loop check including mouthpiece one way valves and positive and negative check
 - Sensor calibration in oxygen, with verification in air
 - 5 minute pre-breathe
 - Bailout bottle/stage cylinder rigging
 - KISS Sidekick: unit rigging, diluent/oxygen cylinder rigging/rigging for best work of breathing/how to resolve incorrect rigging
2. Demonstrate correct pre-dive planning procedures including
 - Limits based on system performance
 - Limits based on oxygen exposures at chosen PO₂ levels
 - Limits based on nitrogen absorption at planned depth and PO₂ set point
 - Appropriate selection of decompression conservatism / gradient factors for the planned dive
 - Thermal constraints
3. Underwater verification
 - Stop at 3-6 meters/9-19 feet on descent for leak bubble check
 - Counterlung & Over Pressure Valve adjustment, if necessary
4. Mouthpiece familiarity skills
 - BOV: switch between open and closed circuit
 - DSV: switch to bailout system
5. Adding diluent gas/ADV familiarity skills
 - ADV: Adding diluent gas and understand how it works
 - BOV: Use BOV to add diluent gas to the loop – 2 ways

- Bail out second stage: Use to add diluent gas to the loop
 - Dual button MAV: Adding diluent gas (if unit is shipped with this item)
6. Emergency procedures: demonstrate appropriate response to the following; each dive should have a minimum of 2 “diver emergencies” that the student must react to.
 - Practical bailout skills: including 2 open circuit ascents from approximately 18 meter/59 feet.
 - Gas shutdowns and loss of gas
 - Broken hoses
 - Flooded absorbent canister
 - Carbon dioxide (CO₂) breakthrough
 - Low oxygen drills
 - High oxygen drills
 - Flooding loop
 - Electronics, sensor, and battery failure
 7. Practice transferring to open circuit bailout
 8. Rescue skill session as outlined by the training agency
 9. Use of a buoyancy control system
 - Buoyancy/trim control during dive
 - Buoyancy/trim control at safety stop
 10. Controlling and monitoring for PPO2 levels:
 - Raising/lowering PPO2
 - Starting PPO2
 - PPO2 monitoring every minute
 - Manual Add Valve verification: static at constant depth, monitor change over several minutes
 - Electronics systems monitoring for PPO2 levels (SETPOINT) and setpoint switching using manual and pre-programmed methods when available (when the unit is equipped with an on board decompression computer that monitors sensors)
 11. Electronic systems use:
 - Use and adjustment of Heads Up Display, position, brightness, colour
 - Use and adjustment of PPO2/depth/time display, position, brightness, colour
 - Use and adjustment of decompression computer, set up/gas switching, battery verification, etc
 12. Use of lift bag / DSMB and reel (where relevant and applicable)
 13. Mask removal and replacement
 14. Proper execution of the dive within all pre-determined dive limits
 15. Demonstration of safety stops at pre-determined depths (on all dives)
 16. Constant loop volume management
 17. Cell validation checks with appropriate use of diluent and oxygen
 - Oxygen sensor verification at depth
 - Linearity check of sensors at approximately 5 meter/16 feet on pure oxygen
 18. Post dive clean of unit
 - Mouth piece and hoses
 - Clean and disinfect unit

- Inspect components of unit

19. Diver maintenance of unit

- Cell removal and replacement
- Mouthpiece care
- Replacing or re-charging of batteries

EXTRA REQUIREMENTS FOR COMPLETION

- Demonstrate an adequate level of fitness by completing a minimum of a 50m/164 feet surface diver tow with both the rescuer and the victim wearing a complete CCR diving system and bailout cylinder(s) applicable to their specific program.
- Complete all academic sessions and unit specific assessments as specified in the training material of the Training Agency and the Manufacturer.
- Complete a minimum of seven (7) training dives, including confined water skill development of at least one (1) hour, and six (6) core open water training dives with a minimum run time of 30 minutes each.
- Complete at least a minimum of 420 minutes of total in-water time on the applicable CCR unit.
- Be able to independently complete a full dive plan
- Complete a final course exam as set out by the training agency and / or manufacturer with a required minimum pass rate of 80% with 100% remediation.
- When the feature is available on a rebreather, download the student's dive logs of all training dives and retain for a minimum of seven years.
- If the feature is not available on a rebreather, download the dive logs from the students dive computer and retain for a minimum of seven years
- Fill in and sign a course completion form confirming all academics and practical sessions have been completed

Dive logs and student-signed course completion form are to be submitted to the manufacturer of the specific unit on request

DEPTH LIMITATIONS

- Open Water Training Dives shall be initially shallow, progressively increasing in depth.
- Two (2) dives must be deeper than 20 meters/65 feet for certification
- All dives must be conducted at a depth shallower than 30 meters/98 feet.

NOTES

- All training dives must be planned within the no-decompression limits of the Combined Air/EAN Tables or the student's personal dive computer or computer-generated decompression profiles.
- Bailout cylinder gas is to be based on a maximum PPO₂ of 1.6 at the maximum depth of the dive.
- Divers should not carry an on-board diluent gas with a ppO₂ higher than 1.1 bar at the bottom.
- The maximum loop set point is 1.3 bar.
- It is recommended that the student finish the training course within 6 weeks of the starting date.
- It is recommended that the student have access to, or purchase a unit within 3 months of completing the training program.
- Only approved training agencies and instructors may teach a KISS rebreather course.

Diving in an overhead environment

This course shall not be conducted in an overhead environment. Subject to training agency approval certain dive sites can be deemed suitable for the CCR Diver course under the following conditions:

- The student must remain in the daylight zone where there is no need for the use of a dive light
- The student must never be a distance of more than 132 linear feet / 40 linear meters from the surface

SEQUENCE

Open Water Training Dives 1 and 2 may only be conducted after completing the equipment configuration section, the surface diver tow and all confined water sessions.

CERTIFICATION

The unit specific CCR Diver certification entitles the holder to dive with a buddy, diving on a rebreather or diving open circuit, utilizing CCR diving procedures to make non decompression dives to depths of up to 30 meters/98 feet, providing that dives are conducted in environments similar to those of the diver's training and experience.

CCR DECOMPRESSION DIVER

INTENT

The intent of the Decompression CCR Diver program is to provide divers with the training necessary to independently plan and conduct unit specific decompression dives using air or Trimix with a minimum of 20% oxygen and a maximum of 35% Helium, to a maximum depth of 40 meters/131 feet with air diluent or 45 meters/147 feet with Trimix, using decompression mixtures of up to 100% oxygen and utilizing CCR diving procedures with a dive buddy diving on a rebreather or diving open circuit.

Note: The CCR Decompression Diver with Trimix curriculum is near identical to the Air-diluent program. Air should only be used if Helium is not an option.

REQUIRED INSTRUCTOR RATING

An active status unit-specific Decompression CCR Instructor or higher may conduct the unit-specific Decompression CCR Diver program. The instructor must be qualified as a unit-specific CCR Trimix 45m Instructor or higher to conduct the Decompression CCR Diver program with Trimix (min 20% O₂ and maximum 35% He) as diluent.

TEACHING RATIOS

- The maximum number of students for CCR training is 3:1
- The maximum number of students for no-decompression CCR training where one (1) student is making a crossover or doing a refresher is 4:1

These ratios should be reduced as required if the situation and/or environmental conditions call for it.

STUDENT PREREQUISITES

- An advanced level of Nitrox understanding. This is to include but not limited to the use of gases up to 100% Oxygen for decompression, tracking of CNS and OTU's, gas planning and accelerated decompression.
- Have logged 40 open water dives
- Minimum Age: 18
- For KISS Sidekick CCR only:
 - Student must have some level of technical diver training. At a minimum advanced nitrox or recreational trimix or equivalent.
 - Students must be able to rig a sidemount rebreather as well as 2 cylinders.

OR

- CCR diver with minimum 20 dives / 20 hours on the specific unit
- Minimum age: 18
- For KISS Sidekick CCR only:
 - Student must have some level of technical diver training. At a minimum advanced nitrox or recreational trimix or equivalent.
 - Students must be able to rig a sidemount rebreather as well as 2 cylinders.

DURATION

- Recommended hours for course completion: 40
- Minimum number of days: 4
- Minimum number of hours for Academics and Dry practical: 8

MATERIALS AND EQUIPMENT

The minimum required student and instructor equipment for this program includes:

A complete CCR Unit that:

- Is compliant to local laws, is approved by the training agency, is properly functioning and is appropriate for bailout and accelerated decompression diving
- Has no non-manufacturer approved modifications
- Depth gauge & bottom timer, or dive computer

- A single off-board bailout gas 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
- Backup OC/CCR computer for bailout in the event of a system failure
- For Open water and lake environments with the exception of cave/overhead environments a Delayed Surface Marker Buoy (DSMB) and spool / reel appropriate for the planned dive depth
- A back up Delayed Surface Marker Buoy (DSMB) and spool / reel appropriate for the planned dive depth
- cutting device
- Access to appropriate gas analyzers

The minimum required student and instructor materials for this program includes:

- KISS Rebreather unit specific user manual
- Agency student training manual or online training course
- Agency instructor manual (electronic instructor manuals meet this requirement)
- Course liability release and assumption of risk (in accordance with local laws)
- Training agency approved medical document
- Unit specific checklist (units equipped with a built in electronic checklist, meet this requirement)
- Manufacturer's sign off sheet/course completion document

All skills must be demonstrated by the instructor on the specific unit being trained.

REQUIREMENTS FOR COMPLETION

Academics

Students shall have sufficient understanding and knowledge in the following subject areas listed. They should be capable of planning dives in the typical local conditions and environment and be able to plan for typical emergency situations.

1. Practical mechanics of a CCR
 - Assembly and disassembly specific to KISS rebreather being used. Use unit specific manual as a guide
 - Unit Specific Check list
 - Design and overview of the KISS unit
 - Insert O-rings where required
 - O-ring location and condition
 - Absorbent canister
 - Breathing loop
 - Automatic Diluent Valve: automatic and manual use
 - Manufacturer's supported add-ons: BOV, ADV, etc
 - KISS Sidekick: understand risk of high work of breathing & importance of securing unit, cylinders
2. Loop volume - minimum / optimum
 - Determine the correct counterlung size, & understand how to attain and maintain proper loop volume
3. Gas Physiology
 - Oxygen risks, Hypoxia, Hyperoxia
 - Carbon dioxide (CO₂) toxicity, Hypercapnia
 - Nitrogen absorption
 - Advantages of Trimix with 20% Oxygen and 35% Helium
4. Proper scrubber filling; in accordance with KISS recommendations
 - Manufacturer's recommended scrubber medium, & procedures according to KISS user manual

5. Electronic or Manual or Mechanical Systems Design and Maintenance
 - Oxygen (O₂) metabolizing calculations
 - Oxygen Sensors, limitations, care and replacement regime
 - System electronics functionality and calibration procedures
 - KISS manual gas addition valve design and function. (raising and lowering of constant flow; determining correct flow rate for each individual)
6. Dive Tables
 - Constant partial pressure of oxygen (PPO₂) theory
 - Central nervous system (CNS) and Oxygen Tolerance Unit (OTU) tracking and awareness
7. Dive Computers
 - Mix adjustable
 - Constant PO₂
 - Decompression conservatism / Gradient factor selection
 - Oxygen (O₂) integrated
8. Dive Planning
 - Operational planning
 - Gas consumption
 - Scrubber duration
 - Gas requirements including bailout scenarios
 - Oxygen limitations
 - Nitrogen limitations
9. Emergency Procedures
 - Flooded loop
 - Cell warnings
 - Battery warnings
 - Electronic failures

Skills

1. Pre-dive checks
 - Specific Unit Checklist
 - Verify diluent and oxygen (O₂) cylinder contents using appropriate gas analyzers
 - Unit build-up
 - Scrubber canister filling
 - Breathing loop check including mouthpiece one way valves and positive and negative check
 - Sensor calibration in oxygen, with verification in air
 - 5 minute pre-breathe
 - Stage cylinder rigging
 - KISS Sidekick: unit rigging, diluent/oxygen cylinder rigging/rigging for best work of breathing/how to resolve incorrect rigging
2. Demonstrate correct pre-dive planning procedures including
 - Limits based on system performance
 - Limits based on oxygen exposures at chosen PO₂ levels
 - Limits based on nitrogen absorption at planned depth and PO₂ set point

- Appropriate selection of decompression conservatism / gradient factors for the planned dive
 - Thermal constraints
3. Underwater verification
 - Stop at 3-6 meters/9-19 feet on descent for leak bubble check
 - Counterlung & Over Pressure Valve adjustment, if necessary
 4. Mouthpiece familiarity skills
 - BOV: switch between open and closed circuit
 - DSV: switch to bailout system
 5. Adding diluent gas/ADV familiarity skills
 - ADV: Adding diluent gas and understand how it works
 - BOV: Use BOV to add diluent gas to the loop – 2 ways
 - Bail out second stage: Use to add diluent gas to the loop
 - Dual button MAV: Adding diluent gas (if unit is shipped with this item)
 6. Emergency procedures: demonstrate appropriate response to the following ; each dive should have a minimum of 2 “diver emergencies” that the student must react to.
 - Practical bailout skills: including 2 open circuit ascents from approximately 18 meter/59 feet.
 - Gas shutdowns and loss of gas
 - Broken hoses
 - Flooded absorbent canister
 - Carbon dioxide (CO₂) breakthrough
 - Low oxygen drills
 - High oxygen drills
 - Flooding loop
 - Electronics, sensor, and battery failure
 7. Practice transferring to open circuit bailout
 8. Rescue skill session as outlined by the training agency
 9. Use of a buoyancy control system
 - Buoyancy and trim control at safety stop
 - Buoyancy and trim control during dive
 10. Controlling and monitoring for PPO2 levels:
 - Raising/lowering PPO2
 - Starting PPO2
 - PPO2 monitoring every minute
 - Manual Add Valve verification: static at constant depth, monitor change over several minutes
 - Electronics systems monitoring for PPO2 levels (SETPOINT) and setpoint switching using manual and pre-programmed methods when available (when the unit is equipped with an on board decompression computer that monitors sensors)
 11. Electronic systems use:
 - Use and adjustment of Heads Up Display, position, brightness, colour
 - Use and adjustment of PPO2/depth/time display, position, brightness, colour
 - Use and adjustment of decompression computer, set up/gas switching, battery verification, etc
 12. Use of lift bag / DSMB and reel (where relevant and applicable)

13. Mask removal and replacement
14. Proper execution of the dive within all pre-determined dive limits
15. Demonstration of safety stops at pre-determined depths
16. Constant loop volume management
17. Cell validation checks with appropriate use of diluent and oxygen
 - Oxygen sensor verification at depth
 - Linearity check of sensors at approximately 5 meter/16 feet on pure oxygen
18. Post dive clean of unit
 - Mouth piece and hoses
 - Clean and disinfect unit
 - Inspect components of unit
19. Diver maintenance of unit
 - Cell removal and replacement
 - Mouthpiece care
 - Replacing or re-charging of batteries
20. Decompression related in water skills
 - Demonstrate the ability to drop and retrieve one (1) bailout cylinder while maintaining position in the water column
 - Demonstrate appropriate reaction to gas hemorrhage from bailout valve, first stage, second stage or SPG
 - Demonstrate appropriate reaction to simulated free-flowing deco regulator
 - Demonstrate the ability to Buddy breathe from a decompression gas
 - Oxygen rebreather mode at less than six (6) meter/19 foot stop
 - Complete two (2) bailout scenario at depth to include decompression obligation on open circuit

EXTRA REQUIREMENTS FOR COMPLETION

- Demonstrate an adequate level of fitness by completing a minimum of a 50m/164 ft surface diver tow with both the rescuer and the victim wearing a complete CCR diving system and bailout cylinder(s) applicable to their specific program
- Complete all academic sessions and unit specific assessments as specified in the training material of the Training Agency and the Manufacturer.
- Complete a minimum of seven (7) training dives, including confined water skill development of at least one (1) hour, and six (6) core open water training dives with a minimum run time of 30 minutes each.
- Complete at least a minimum of 420 minutes of total in-water time on the applicable CCR unit.
- Be able to independently complete a full dive plan
- Complete a final course exam as set out by the training agency and / or manufacturer with a required minimum pass rate of 80% with 100% remediation.
- When the feature is available on a rebreather, download the student's dive logs of all training dives and retain for a minimum of seven years.
- If the feature is not available on a rebreather, download the dive logs from the students dive computer and retain for a minimum of seven years
- Fill in and sign a course completion form confirming all academics and practical sessions have been completed

Dive logs and student-signed course completion forms are to be submitted to the manufacturer of the specific unit on request

DEPTH LIMITATIONS

Air as diluent:

- Open Water Training Dives shall be initially shallow, progressively increasing in depth.

- Two (2) dives must be deeper than 30 meters/98 feet for certification
- All dives must be conducted at a depth shallower than 40 meters/131 feet.

Trimix as diluent:

- Open Water Training Dives shall be initially shallow , progressively increasing in depth.
- Two (2) dives must be deeper than 35 meters/114 feet for certification
- All dives must be conducted at a depth shallower than 45 meters/147 feet.

CREDIT

- Students upgrading from CCR Diver to CCR Decompression Air Diluent Diver need to perform an evaluation dive, plus a minimum of four (4) open water divers with two (2) dives greater than 30m/98 feet.
- Students upgrading from CCR Diver to CCR Decompression Diver with Trimix need to perform an evaluation dive, plus a minimum of four (4) open water divers with two (2) dives greater than 35m/114 feet.
- Students upgrading from CCR Decompression Air diluent diver to CCR Decompression diver with Trimix need to complete a minimum of two (2) dives deeper than 35m/114 feet.

NOTES

- Bailout cylinder gas is to be based on a maximum PPO₂ of 1.6 at the maximum depth of the dive.
- Divers should not carry an on-board diluent gas with a ppO₂ higher than 1.1 bar at the bottom.
- The maximum loop set point is 1.3 bar.
- It is recommended that the student finish the training course within 6 weeks of the starting date.
- It is recommended that the student have access to, or purchase a unit within 3 months of completing the training program.
- Only approved training agencies and instructors may teach a KISS rebreather course.

Diving in an overhead environment

This course shall not be conducted in an overhead environment. Subject to training agency approval certain dive sites can be deemed suitable for the CCR Diver course under the following conditions:

- The student must remain in the daylight zone where there is no need for the use of a dive light.
- The student must never be a distance of more than 132 linear feet / 40 linear meters from the surface

SEQUENCE

Open Water Training Dives 1 and 2 may only be conducted after completing the equipment configuration section, the Surface Diver tow and all confined water sessions.

CERTIFICATION

The unit-specific Decompression CCR Diver (with or without Trimix) certification entitles the holder to dive with a buddy, diving on a rebreather or diving open circuit, on dives utilizing CCR diving procedures to depths of up to 40m /131 feet with air diluent and 45m/147 feet with Trimix and requiring staged decompression stops providing that dives are conducted in environments similar to those of the diver's training and experience.

TRIMIX CCR DIVER 60m

INTENT

The intent of the CCR Trimix 60m Diving program is to provide divers with the training necessary to independently plan and conduct unit specific multiple-stop decompression dives to depths of up to 60m/196 feet using trimix with a minimum of 16% oxygen and utilizing CCR diving procedures with a buddy diving on a rebreather or diving open circuit.

REQUIRED INSTRUCTOR RATING

An active status unit specific CCR Trimix 60m Diving Instructor or higher may conduct the unit specific CCR Trimix 60m Diving program.

TEACHING RATIOS

- The maximum number of students for CCR training is 3:1

This ratio should be reduced as required if the situation and/or environmental conditions call for it.

STUDENT PREREQUISITES

- Decompression CCR Diver
- Have logged a minimum of 50 CCR dives over a minimum of 50 hours, including at least 20 dives deeper than 30m/98 feet and at least ten (10) dives requiring staged decompression.
- At least 25 dives / 25 hours are required on the specific unit.
- Minimum Age: 18

DURATION

- Minimum hours for course completion: 40
- Minimum number of days: 4

MATERIALS AND EQUIPMENT

The minimum required student and instructor equipment for this program includes:

A complete CCR Unit that:

- Is compliant to local laws, is approved by the training agency, is properly functioning and is appropriate for bailout and accelerated decompression diving
- Has no non-manufacturer approved modifications
- Depth gauge & bottom timer, or dive computer
- Two off-board stage cylinders, one for bottom bailout, one for decompression suitable for a safe return to the surface including all safety and decompression stops in the event of an emergency
- Backup OC/CCR computer for bailout in the event of a system failure
- For Open water and lake environments with the exception of cave, a Delayed Surface Marker Buoy (DSMB) and spool / reel appropriate for the planned dive depth
- A back up Delayed Surface Marker Buoy (DSMB) and spool / reel appropriate for the planned dive depth
- Backup mask
- Cutting device
- Access to appropriate gas analyzers

All skills must be demonstrated by the instructor on the specific unit being trained.

The minimum required student and instructor materials for this program includes:

- KISS Rebreather unit specific user manual
- Agency student training manual or online training course

- Agency instructor manual (electronic instructor manuals meet this requirement)
- Course liability release and assumption of risk (in accordance with local laws)
- Training agency approved medical document
- Unit specific checklist (units equipped with a built in electronic checklist, meet this requirement)
- Manufacturer's sign off sheet/course completion document

REQUIREMENTS FOR COMPLETION

Academics

Students shall have sufficient understanding and knowledge in the following subject areas listed. They should be capable of planning dives in the typical local conditions and environment and be able to plan for typical emergency situations.

1. Gas Physiology
 - Oxygen (O₂) toxicity, Hypoxia, Hyperoxia
 - Central nervous system (CNS) tracking
 - Oxygen tracking units (OTU)
 - Oxygen (O₂) metabolizing calculations
 - Carbon dioxide (CO₂) Toxicity, Hypercapnia
 - Nitrogen absorption
 - Equivalent narcosis depth theory
 - Helium absorption
 - HPNS
2. Gas mixing
3. Formula Work
4. Manually controlled closed circuit rebreathers
5. Dive Tables.
 - Creation of custom dive tables appropriate to dive depths
 - Creation of lower percentage of oxygen (PO₂) diluent to support loop flushing and bailout at depth
6. Dive Computers.
 - Mix adjustable
 - Constant PO₂
 - Decompression Conservatism / Gradient Factor selection
 - Oxygen (O₂) integrated
7. Dive Planning
 - Operational planning
 - Scrubber Duration
 - Gas requirements including bailout scenarios
 - Gas consumption
 - Gas management
8. Decompression on a CCR
 - Oxygen limitations
 - Nitrogen limitations
 - Helium limitations

9. Unit Assembly
 - Loop configurations
10. Unit Specific Check list
11. Equipment Maintenance
 - Fuel cell management
 - Date stamps
 - Replacement
12. Additional fitted equipment and modifications
 - Auto diluent addition
 - Dual mode mouthpieces
 - Heads up display
 - Additional manual injectors
 - Integrating oxygen monitors for dive computers

Skills

1. Pre-dive checks
 - Specific Unit Checklist
 - Verify diluent and oxygen (O₂) cylinder contents using appropriate gas analyzers
 - Unit build-up
 - Scrubber canister filling
 - Breathing loop check including mouthpiece one way valves and positive and negative check
 - Sensor calibration in oxygen, with verification in air
 - 5 minute pre-breathe
 - Stage cylinder rigging
 - KISS Sidekick: unit rigging, diluent/oxygen cylinder rigging for best work of breathing/how to resolve incorrect rigging
2. Demonstrate correct pre-dive planning procedures including
 - Limits based on system performance
 - Limits based on oxygen exposures at chosen PO₂ levels
 - Limits based on nitrogen absorption at planned depth and PO₂ set point
 - Appropriate selection of decompression conservatism / gradient factors for the planned dive
 - Thermal constraints
3. Underwater verification
 - Stop at 3-6 meters/9-19 feet on descent for leak bubble check
 - Counterlung & Over Pressure Valve adjustment, if necessary
4. Emergency procedures: demonstrate appropriate response to the following; each dive should have a minimum of 2 “diver emergencies” that the student must react to.
 - Properly execute a recovery from a system failure and conclude the dive and decompression on open circuit gases carried
 - Gas shutdowns and loss of gas, correct choice and switching to off board gases
 - Broken hoses, catastrophic failure scenarios
 - Flooded absorbent canister
 - Cell errors
5. Demonstrate competence managing two (2) bailout cylinders, including drop and recovery while maintaining position in the water

column

6. Rescue skill session as outlined by the training agency
7. Use of Buoyancy control system
 - Buoyancy and trim control at safety stop
 - Buoyancy and trim control during dive
 - Demonstrate buoyancy control; ability to hover at fixed position in water column without moving hands or feet
8. Controlling and monitoring for PPO2 levels:
 - Raising/lowering PPO2
 - Starting PPO2
 - PPO2 monitoring every minute
 - Manual Add Valve verification: static at constant depth, monitor change over several minutes
 - Electronics systems monitoring for PPO2 levels (SETPOINT) and setpoint switching using manual and pre-programmed methods when available (when the unit is equipped with an on board decompression computer that monitors sensors)
9. Electronic systems use:
 - Use and adjustment of Heads Up Display, position, brightness, colour
 - Use and adjustment of PPO2/depth/time display, position, brightness, colour
 - Use and adjustment of decompression computer, set up/gas switching, battery verification, etc
10. Use of lift bag/DSMB and reel
 - Use of lift bag/DSMB and reel at depth, and mid water
 - Simulate failed lift bag/DSMB deployment
 - On two (2) of the dives, demonstrate an ascent with ascent reel and lift bag and perform staged decompression
11. Mask removal and replacement
12. Proper execution of the dive within all pre-determined dive limits
13. Demonstration of decompression stops at pre-determined depths
14. Cell validation checks with appropriate use of diluent and oxygen
 - Oxygen sensor verification at depth
 - Linearity check of sensors at approximately 5 meters/16 feet on pure oxygen
15. Decompression related in water skills
 - Demonstrate proper understanding and implementation of team diving procedures to conduct bailout from a depth greater than 30 meters/98 feet.
 - Demonstrate ability to plug in and share off-board gas, including sharing/swapping of off-board bailouts
 - Oxygen rebreather mode in depths less than six (6) meters/19 feet
16. Show good awareness of buddy and other team members through communications, proximity and team oriented dive practices

EXTRA REQUIREMENTS FOR COMPLETION

- Demonstrate an adequate level of fitness by completing a minimum of a 50m/164 feet surface diver tow with both the rescuer and the victim wearing a complete CCR diving system and bailout cylinder(s) applicable to their specific program
- Complete all academic sessions and unit specific assessments as specified in the training material of the Training Agency and the Manufacturer.
- Complete at least six (6) training dives, including one open water skill development session of at least one (1) hour, and a

minimum of five (5) open water training dives, with a minimum runtime of at least 30 minutes each.

- Complete a minimum of 360 minutes of total in-water time on the applicable CCR unit.
- Be able to independently complete a full dive plan
- Complete a final course exam as set out by the training agency and / or manufacturer with a required minimum pass rate of 80% with 100% remediation.
- When the feature is available on a rebreather, download the student's dive logs of all training dives and retain for a minimum of seven years.
- If the feature is not available on a rebreather, download the dive logs from the student's dive computer and retain for a minimum of seven years
- Fill in and sign a course completion form confirming all academics and practical sessions have been completed

Dive logs and student signed course completion forms are to be submitted to the manufacturer of the specific unit on request

DEPTH LIMITATIONS

- Open Water Training Dives shall be initially shallow, progressively increasing in depth.
- Two (2) dives should be deeper than 30 meters/98 feet
- And an additional two (2) dives should be deeper than 50 meters/164 feet for certification
- All dives must be conducted at a depth shallower than 60 meters/196 feet.

NOTES

- Dives 1 and 2 must be planned within the no-decompression limits of the Combined Air/EAN Tables or the student's personal dive computer or computer-generated decompression profiles.
- The planned decompression obligation (total ascent time including all decompression stops) for training dives must not exceed 30 minutes for dives 3 and 4, and must not exceed 60 minutes for dives 5 and 6.
- At least one (1) dive must have a total run time in excess of 60 minutes.
- If environmental or water conditions make it unsafe or impractical to meet the cumulative time requirement in six (6) dives, additional training dives should be scheduled.
- Bailout cylinder gas to be based on a maximum PPO₂ of 1.6 at the maximum depth of the dive.
- Divers should not carry an on-board diluent gas with a PPO₂ higher than 1.2 bar at the bottom.
- The maximum loop set point is 1.3 bar.
- The maximum END for the Diluent for the bottom part of the dive, cannot be greater than 30m/98 feet

Diving in an overhead environment

- All skills must be demonstrated in an open water environment prior to entering the overhead environment
- The Instructor must be an active status overhead instructor for the particular environment
- The Diver must hold the user level overhead certification for the particular environment

SEQUENCE

Open Water Training Dive 2 may only be conducted after completing the surface diver tow and all the open water skill development session.

CERTIFICATION

The unit-specific CCR Trimix 60m Diving certification entitles the holder to dive autonomously with a buddy, diving on a rebreather or diving open circuit, on dives using Trimix with a minimum of 16% oxygen, utilizing CCR procedures to depths of 60m/196 feet, and requiring unlimited staged decompression stops with a maximum of two bail out gas mixtures, providing that dives are conducted in environments similar to those of the diver's training and experience.

TRIMIX CCR DIVER 100m

INTENT

The intent of the CCR Trimix 100m Diving program is to provide divers with the training necessary to independently plan and conduct unit specific staged decompression dives to depths of up to 100m/328 feet using hypoxic Trimix mixtures and utilizing CCR diving procedures with a buddy diving on a rebreather or diving open circuit.

REQUIRED INSTRUCTOR RATING

An active status unit-specific CCR Trimix 100m instructor or higher may conduct the unit-specific CCR Trimix 100m program.

STUDENT PREREQUISITES

- CCR Trimix 60m Diving certification or equivalent.
- Have logged a minimum of 100 CCR dives over a minimum of 100 hours, including at least 30 dives deeper than 30m/98 feet, at least ten (10) dives deeper than 50m/164 feet and at least 20 dives requiring staged decompression.
- At least 50 dives / 50 hours are required on the specific unit.
- Minimum Age: 18

TEACHING RATIOS

- The maximum number of students for CCR training is 3:1
This ratio should be reduced as required if the situation and/or environmental conditions call for it.

DURATION

- Recommended hours for course completion: 30

MATERIALS AND EQUIPMENT

The minimum required student and instructor equipment for this program includes:

A complete CCR Unit that:

- Is compliant to local laws, is approved by the training agency, is properly functioning and is appropriate for bailout and accelerated decompression diving
- Has no non-manufacturer approved modifications
- Depth gauge & bottom timer, or dive computer
- Three (3) bailout stage cylinders, one for bottom bailout, all with 1-2 meter hose second-stage and SPG, low-pressure inflator hose or quick-connect compatible with the unit if applicable, Oxygen cleaned as required
- Backup OC/CCR computer for bailout in the event of a system failure
- Delayed Surface Marker Buoy (DSMB) and spool / reel appropriate for the planned dive depth
- A back up Delayed Surface Marker Buoy (DSMB) and spool / reel appropriate for the planned dive depth
- Backup mask
- Cutting devices
- Emergency spool
- Access to emergency decompression gas, by team sharing, staging, or from support divers
- Access to appropriate gas analyzers

All skills must be demonstrated by the instructor on the specific unit being trained.

The minimum required student and instructor materials for this program includes:

- KISS Rebreather unit specific user manual
- Agency student training manual or online training course
- Agency instructor manual (electronic instructor manuals meet this requirement)

- Course liability release and assumption of risk (in accordance with local laws)
- Training agency approved medical document
- Unit specific checklist (units equipped with a built in electronic checklist, meet this requirement)

REQUIREMENTS FOR COMPLETION

Academics

Students shall have sufficient understanding and knowledge in the following subject areas listed. They should be capable of planning dives in the typical local conditions and environment and be able to plan for typical emergency situations.

1. Gas Physiology
 - Oxygen (O₂) toxicity, Hypoxia, Hyperoxia
 - Oxygen (O₂) metabolizing calculations
 - Central nervous system (CNS) tracking
 - Oxygen tracking units (OTU)
 - Carbon dioxide (CO₂) toxicity, Hypercapnia
 - Nitrogen absorption
 - Equivalent narcosis depth theory
 - Helium absorption
 - HPNS
2. Gas mixing
3. Formula Work
4. Manually controlled closed circuit rebreathers
5. Dive Tables.
 - Creation of custom dive tables appropriate to dive depths
 - Creation of lower percentage of oxygen (PO₂) diluent to support loop flushing and bailout at depth
6. Dive Computers.
 - Mix adjustable
 - Constant partial pressure of oxygen (PPO₂)
 - Decompression Conservatism / Gradient Factor selection
 - Oxygen (O₂) integrated
7. Dive Planning
 - Operational planning
 - Scrubber Duration
 - Gas requirements including bailout scenarios
 - Gas management
 - Gas consumption
8. Decompression on a CCR
 - Oxygen limitations
 - Nitrogen limitations
 - Helium limitations
9. Unit Assembly
 - Loop configurations

10. Unit Specific Check list
11. Equipment Maintenance
 - Oxygen Sensor management
 - Date stamps
 - Replacement
12. Additional fitted equipment and modifications
 - Auto diluent addition
 - Dual mode mouthpieces
 - Heads up display
 - Additional manual injectors
 - Integrating oxygen monitors for dive computers

Skills

1. Pre-dive checks
 - Specific Unit Checklist
 - Verify diluent and oxygen (O₂) cylinder contents using appropriate gas analyzers
 - Unit build-up
 - Scrubber canister filling
 - Breathing loop check including mouthpiece one way valves and positive and negative check
 - Sensor calibration in oxygen, with verification in air
 - 5 minute pre-breathe
 - Stage cylinder rigging
 - KISS Sidekick: unit rigging, diluent/oxygen cylinder rigging for best work of breathing/how to resolve incorrect rigging
2. Demonstrate correct pre-dive planning procedures including
 - Limits based on system performance
 - Limits based on oxygen exposures at chosen PO₂ levels
 - Limits based on nitrogen absorption at planned depth and PO₂ set point
 - Appropriate selection of decompression conservatism / gradient factors for the planned dive
 - Thermal constraints
3. Underwater verification
 - Stop at 3-6 meters/9-19 feet on descent for leak bubble check
 - Counterlung & Over Pressure Valve adjustment, if necessary
4. Emergency procedures: demonstrate appropriate response to the following; each dive should have a minimum of 2 “diver emergencies” that the student must react to.
 - Properly execute a recovery from a system failure and conclude the dive and decompression on open circuit gases carried
 - Gas shutdowns and loss of gas, correct choice and switching to off board gases
 - Broken hoses, catastrophic failure scenarios
 - Flooded absorbent canister
 - Cell errors
5. Demonstrate competence managing three (3) bailout cylinders, including drop and recovery while maintaining position in the water column
6. Ability to manage multiple failures in adverse conditions

7. Rescue skill session as outlined by the training agency
8. Use of Buoyancy control system
 - Buoyancy and trim control at safety stop
 - Buoyancy and trim control during dive
 - Demonstrate buoyancy control; ability to hover at fixed position in water column without moving hands or feet
9. Controlling and monitoring for PPO2 levels:
 - Raising/lowering PPO2
 - Starting PPO2
 - PPO2 monitoring every minute
 - Manual Add Valve verification: static at constant depth, monitor change over several minutes
 - Electronics systems monitoring for PPO2 levels (SETPOINT) and setpoint switching using manual and pre-programmed methods when available (when the unit is equipped with an on board decompression computer that monitors sensors)
10. Electronic systems use:
 - Use and adjustment of Heads Up Display, position, brightness, colour
 - Use and adjustment of PPO2/depth/time display, position, brightness, colour
 - Use and adjustment of decompression computer, set up/gas switching, battery verification, etc
11. Use of lift bag/DSMB and reel
 - Use of lift bag/DSMB and reel at depth, and mid water
 - Simulate failed lift bag/DSMB deployment
 - On two (2) of the dives, demonstrate an ascent with ascent reel and lift bag and perform staged decompression
12. Mask removal and replacement
13. Proper execution of the dive within all pre-determined dive limits
14. Demonstration of decompression stops at pre-determined depths
15. Cell validation checks with appropriate use of diluent and oxygen
 - Oxygen sensor verification at depth
 - Linearity check of sensors at approximately 5 meters/16 feet on pure oxygen
16. Decompression related in water skills
 - Demonstrate proper understanding and implementation of team diving procedures to conduct bailout from a depth greater than 40 meters/131 feet.
 - Demonstrate ability to plug in and share off-board gas, including sharing/swapping of off-board bailouts
 - Oxygen rebreather mode in depths less than six (6) meters/19 feet
17. Show good awareness of buddy and other team members through communications, proximity and team oriented dive practices
18. Demonstrate of surface support/support divers in dealing with bailout scenario

EXTRA REQUIREMENTS FOR COMPLETION

- Demonstrate an adequate level of fitness by completing a minimum of a 50m/164 feet surface diver tow with both the rescuer and the victim wearing a complete CCR diving system and bailout cylinder(s) applicable to their specific program
- Complete all academic sessions and unit specific assessments as specified in the training material of the Training Agency and the Manufacturer.
- Complete at least six (6) training dives, including one open water skill development session of at least one (1) hour, and a

minimum of five (5) open water training dives, with a minimum runtime of at least 30 minutes each.

- Complete a minimum of 360 minutes of total in-water time on the applicable CCR unit.
- Be able to independently complete a full dive plan
- Complete a final course exam as set out by the training agency and / or manufacturer with a required minimum pass rate of 80% with 100% remediation.
- When the feature is available on a rebreather, download the student's dive logs of all training dives and retain for a minimum of seven years.
- If the feature is not available on a rebreather, download the dive logs from the students dive computer and retain for a minimum of seven years
- Fill in and sign a course completion form confirming all academics and practical sessions have been completed

Dive logs and student signed course completion forms are to be submitted to the manufacturer of the specific unit on request

DEPTH LIMITATIONS

- Open Water Training Dives shall be initially shallow, progressively increasing in depth.
- Two (2) dives should be deeper than 40 meters/131 feet
- And an additional two (2) dives should be deeper than 70 meters/229 feet for certification
- All dives must be conducted at a depth shallower than 100 meters/328 feet

Local rules or regulations may dictate the maximum depth permitted. If so, the local rules would supercede any other standards.

NOTES

- Dives 1 must be planned within the no-decompression limits of the Combined Air/EAN Tables or the student's personal dive computer or computer-generated decompression profiles.
- The primary planned decompression obligation (total time of all decompression stops including deep stops, if used) for training dives must not exceed 30 minutes for dives 2, 3 and 4, and 60 minutes for dives 5 and 6.
- At least one (1) dive must have a total run time in excess of 60 minutes.
- If environmental or water conditions make it unsafe or impractical to meet the cumulative time requirement in six (6) dives, additional training dives should be scheduled.
- Bailout cylinder gas to be based on a maximum PPO₂ of 1.6 at the maximum depth of the dive.
- Divers should not carry an on-board diluent gas with a PPO₂ higher than 1.1 bar at the bottom.
- The maximum loop set point is 1.3 bar.
- The maximum END for the Diluent for the bottom part of the dive, cannot be greater than 30m/98 feet
- Preliminary dives 1 and 2 must have a minimum run time of 30 minutes.

Diving in an overhead environment

- All skills must be demonstrated in an open water environment prior to entering the overhead environment
- The Instructor must be an active status overhead instructor for the particular environment
- The Diver must hold the user level overhead certification for the particular environment

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SEQUENCE

Open Water Training Dives 2 may only be conducted after completing the surface diver tow and the open water skill development session.

CERTIFICATION

The unit-specific CCR Trimix 100m Diver certification entitles the holder to dive autonomously with a buddy, diving on a rebreather or diving open circuit, on dives using Hypoxic Trimix and utilizing CCR procedures to depths of 100m,/328 feet providing that dives are conducted in environments similar to those of the diver's training and experience.

CCR DIVER CROSSOVER

INTENT

The intent of the program is to provide divers already certified on a unit with additional unit specific training to get certified on an additional unit, following RESA minimum training standards.

REQUIRED INSTRUCTOR RATING

An active status unit specific CCR instructor at the level the candidate is crossing over for

ADMINISTRATIVE REQUIREMENTS

- Course liability release and assumption of risk (in accordance with local laws)
- Health screening document
- Anything else as required by the Training Agency or manufacturer

STUDENT PREREQUISITES

- Be certified as a CCR Diver or Decompression CCR Diver from a RESA recognized training agency
- Show proof of 10 logged CCR dives in the last 12 months
- Minimum age 18 years

NOTE

- Crossover is not allowed for certifications on SCR or PSCR, or for CCR certifications that only allow a lesser dive depth: in all these cases a full course is mandatory
- Crossover applies to rebreathers of different brand/manufacturers
- Crossovers between similar units of the same brand/manufacturer may require an upgrade course as specified by the manufacturer
- Standard KISS CCR/KISS Spirit Sidewinder to KISS Sidekick CCR: minimum of 60 minutes of confined water time, with an additional 140 minutes of in-water time. Overview of the KISS Sidekick CCR operating system.
- Standard KISS CCR/KISS Sidekick to KISS Spirit Sidewinder CCR: minimum of 180 minutes of open water training, conducted over 3 open water dives. Overview of the KISS Spirit Sidewinder configuration, and unit setup.

MATERIALS AND EQUIPMENT

- As specified in the specific diver level course standard

DURATION

- Recommended hours for course completion: 16 to 24
- The number of classes, hours and sessions per day are set by the training agency.

REQUIREMENTS FOR COMPLETION

The crossover course will include:

- CCR assembly workshop.
- A 60 minute water skills evaluation in a confined skill session. All skills from the level the candidate is crossing over at must be demonstrated successfully prior to open water dives.
- Complete a minimum of 4 open water dives and a total accumulated dive time of minimum 240 minutes, demonstrating proficiency in all skills from the level the diver is crossing over at
- Complete a final exam with a passing score as specified by the Training Agency and the Manufacturer.

CCR Trimix 60m Diver

- A diver certified as a CCR Trimix 60m diver may crossover that rating on the new unit after successfully meeting the crossover requirements for Decompression CCR diver on the new unit.

All CCR Trimix 60m diver standards must be met except; Minimum of 120 minutes open water training to be completed over a minimum of 2 dives to a maximum depth of 60m/196ft

- Must demonstrate proficiency in all required academics and skills at the CCR Trimix 60m diver level

CCR Trimix 100m Diver

- A diver certified as a CCR Trimix 100m diver may crossover that rating on the new unit after successfully meeting the crossover requirements for CCR Trimix 60m diver on the new unit.

All CCR Trimix 100m diver standards must be met except: Minimum of 120 minutes open water training to be completed over a minimum of 2 dives to a maximum depth of 100m/328ft

- Must demonstrate proficiency in all required academics and skills at the CCR Trimix 100m diver level