OCEAN ZONE DIVERS
Performance Under Pressure

CMAS
TRIMIX DIVER

8 Days

Costs include: **Boat trips, Decompression mixes, Certification**
Extra coasts: **Equipment, Helium mixes**

I. Course classification (Type & level)

1. Classification

The CMAS Trimix course is a speciality course.
This course can only be classified as an addition, as is with all other continuation course types.

2. Validity period

There are no validity restrictions on this certificate.

3. Qualification

Successful students are qualified to dive with Trimix.

II. Aims & priorities of the training

• To impart to the diver a good understanding of the special Trimix subject
o matter and in particular to ensure a clear understanding of the use of the
o additional equipment.
• To ensure that the diver has a clear understanding of the additional
o physical problems that could possibly arise during Trimix diving.
• To ensure that the diver has clear knowledge of the extensive technical
o and mental pre-dive preparations which are necessary requirements for
o diving with Trimix.

III. Prerequisites

Minimum age : 18 years
License level : 3 Star diver CMAS or equivalent
CMAS Advanced Nitrox Diver (level 2) or equivalent license from another comparable organisation.
Medical attestation : Actual medical examination, according to the definitions of the National Membership Organisation.
Personally owned necessary technical equipment (see equipment list)

IV. Maximum amount of participants

Theory/classroom : ratio instructor / students 1/4
Practical/open water: ratio instructor / students 1/2

V. Requirements of the instructors/assistants

1. Instructors/course leaders

1. Dive instructor qualifications: CMAS 2 star dive instructor
2. Additionally: CMAS Trimix instructor
3. Prerequisites: The instructor must be actively employed as a dive instructor, according to the requirements of his/her National Organisation.

2. Assistants

According to the requirements of the course leader.

VI. Equipment

• All systems being used must be in prime maintenance condition.
• All components must have been tested by a certified Testing Institute (CE).
• The instructor must provide all necessary course documentation as well as the technical gasses.
• The participants must bring their own personal equipment with which they have, over a fairly long time, had experience.
• Independent double tanks, 2 sling tanks, harness & double bladder, 2 run time boards, 4 x 1st stage and 5 x 2nd stage, 2,50m LP tube, 2 lamps, 2 cutting tools, 2 masks, 1 reel, 1 deco balloon, argon, dry dive suit, 2 depth gauges, 2 calculators

Units per participant : 1 unit for 1 participant
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VII. Minimum course requirements

1. Course profile: using the CMAS training programme
2. Certification by the equipment manufacturers (TÜV & CE).
3. Infrastructure: An appropriate classroom for the course requirements and amount of participants, as well as a suitable open water dive site.
4. Depth limits according to the local conditions (75m dark cold water or 85m light warm water). The first of the 6 prescribed dives should take place with modified and for the course, correct equipment – with compressed air, to a maximum water depth of 50 metres.
5 Minimum duration of each dive : 45 minutes.
6. All dives must be carried out with a maximum PPN_2 limit of 4.0 bar and a PPO_2 limit of 1.4 bar.
7. Safety requirements:
A CMAS Trimix instructor must be present at all times during the entire course.

VIII. Aims of the participants

At course completion participants must prove their knowledge of the following:

a] Theory:

1. Description of the physical and technical characteristics of helium and the use of Trimix.
2. Illustrate emergency procedures (change of gas & type).
3. Explain the correct planning and use of run time tables.
4. Demonstrate sure knowledge of pre-dive preparation with technical gasses.
5. Physiological risk areas of technical gasses (under cooling, OTU, HPNS, CNS, stress, REPEX, vasolidation, isobar return diffusion, etc.
6. Planning, calculation and mixing of bottom, travel & deco mixes.
7. Three part rules, travel times, fluids, tables.
8. Usage planning with emergency reserves (litres)

b) Practical

1 Planning and execution of dives within the limits of the chosen gas mixture, emergency stage.
2 Demonstration of all pre-checks as well as all planned gas changes.
3 Demonstrate the test procedure for Trimix mixtures.
4 Demonstrate buoyancy abilities with complete equipment.
5 Demonstrate correct and sure use of the deco balloon and reel.
6 Sure dive control with demonstration of loss of gas.

IX. Minimum course duration:

1. Theory/practical lectures : 18 hours
2. Open water dives : 6 dives (minimum each 45 min., max. 2 dives per day)

X. Quality assurance

CMAS highly recommends that all Organisations authorise only the use of high quality equipment in order to ensure quality assurance. A system in widespread use and of proven effectiveness is to send questionnaires to the students , followed by an analysis of the feedback.
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CMAS TRIMIX DIVER : PART 2 (TRAINING PROGRAM)

1. Course schedule

Minimum duration

1. Theory: 8 hours
2. Mixed gas program / workshop: 4 hours
3. Minimum amount of dives in open water: 6 dives (min. 45 min. each dive)

2. Course content (syllabus)

2.1. Theory

T 1: Theory lesson 1/ General

History of the usage of helium

1. What is helium:

Molecular weight & ordinal number
Saturation factor
Physiological problem zones

Physical influences
2. Operative ranges of Heliox / Trimix
Max. PPN_2 and PPO_2
Operative depths taking the ZNS factor into account
Speed rates for descent and ascent
Correct formulas
T 2: Theory lesson 2/ General
Physics & Physiology
An introduction to:
• Oxygen deficiency, oxygen poisoning, nitrogen narcosis, hypothermia
• Isobaric counter diffusion
• Storage problems of gas mixtures
• Saturation gradients
• Partial pressure – Dalton's law
• (Best mix) desired PPN_2 & PPO_2
• Changes of the PPN_2 during ascent
• PPHE / PPN_2 control the decompression parameters
Physiology
Reasons for:
• Oxygen deficiency
• Oxygen poisoning
• HPNS syndrome
• Hypothermia
• Vocal distortion
Symptoms and signals
General factors
T 3: Theory lesson 3/ General
Oxygen requirements
Oxygen in the metabolism
Calculation of the oxygen requirements
RMV method (Respiratory Minute Volume) = AMV (Atemminutenvolumen)
Conversion of the RMV in O_2 usage (P in Bar l)
Adequate mix preparation
Technical requirements
Fixing the safety reserve for the dive (method)
Fixing the minimal O_2 share in order to reach the maximum depth
Pressure container capacity (duration)
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Planning the dive
Use of the 3rd rule in dive planning
Rate of descent
Safety-stop according to the bottom time
Content capacity of the pressure container
ZNS clock
Rate of ascent and deco stops
Run time list (3 gases)
T 4: Theory lesson 4/ General
Standard equipment functions and configuration suggestions
Redundant safety techniques:
• 2 masks
• Hard, large flippers
• Per gas minimum 1 finimeter (pressure gauge)
• 4 first and 5 second stages (top quality & preferably free of O_2)
• Harness with D-rings, double bladder wing & double inflator
• Dry suit with argon as insulation gas
• All instruments doubled (depth gauge, bottom timer, calculator)
• 2 cutting tools (scissors, knife or cutter)
• 2 reels (90m & 150m) and at least 1 hoisting bag

• at least 1 run time board & 1 writing slate
• at least 2 underwater lamps
• Sufficient patent carbine hooks and approx. 2,5m surgical tubing

T 5: Theory lesson 5/ General

Physical influences / Servicing the equipment

Cleaning the O_2/50% over leading systems
Pre-dive check
Control of functions and damages
Control for completeness
Leak proofing of the mask
Storage time of mixed gases after filling
Management of repetitive dives

2.2 Practice

P 1: Practice lesson 1/ Equipment

System / Composition and functions

• Demonstration: complete assembly
• Control each single appliance for correct functions
• Pressure and PPO2 measurements before the dive
• Briefing by and documentation from the instructor
• Check of each single participant on his/her physical and psychological condition

P 2: Practice lesson 2/ 1st open water dive (max. 50 m)

System / Composition and functions, preparation before the dive

• Demonstration: complete assembly, dive with Nitrox
• Analysis and documenting of the gas mix
• Putting the sling tank on when at the water line
• Buddy-check, pre-dive check, dropdown-checks (5m & 10m)
• Keeping to the prescribed dive
• Speedy gas changes
• Setting the deco-balloon at depth, ascent on the reel-line
• Reeling in the reel with a travel weight

P 3: Practice lesson 3/ 2nd open water dive (max. 60 m)

First dive with double sling, preparation before the dive

• Analyse and document the gas mix
• Putting both sling tanks on first at the water line
• Buddy-check, pre-dive check, dropdown-checks (5m & 10m)
• Dive with Nitrox
• Keeping to the prescribed dive
• Speedy gas changes
• Setting the deco-balloon at depth, ascent on the reel-line
• Reeling in the reel with a travel weight

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P4: Practice lesson 4/ 3rd open water dive (max. 65 m)

First dive with Trimix, preparation before the dive

• Analyse and document the gas mix
• Putting both sling tanks on first at the water line
• Buddy-check, pre-dive check, dropdown-checks (5m & 10m)
• Dive with Trimix
• Keeping to the prescribed dive according to the run time
• Punctual gas changes
• Setting the deco-balloon adequately, ascent according to profile
• Reeling in the reel with a travel weight

P5: Practice lesson 5/ 4th open water dive (max. 65 m)

Dive with Trimix, carrying out emergency exercises

• Dive with Trimix
• Keeping to the prescribed dive according to the run time
• Carrying out the exercise (mask change at depth)
• Short breathing on the partner's reserve system

P6: Practice lesson 6/ 5th open water dive (max. 75 m)

Dive with Trimix, carrying out reel exercises
• Dive with Trimix
• Keeping to the prescribed dive according to the run time
• Carrying out the exercise (reeling up from the ground)
• Emptying of the pressure container according to third rule
P7: Practice lesson 7/ 6th open water dive (max. 75 m)
Preparing, planning and carrying out the dive
• A maximum depth of 75 meters
• Briefing and all checks
• Leading according to hand signals
• Keeping the distance to the ground and to the depth limits
• Observing the deco-stop and run time control
• Relaxed dive

3. Examination

Theory:
• Recommended method : final evaluation
• Recommended form : written
• Recommended structure : 4 main themes, allowed time 120 min.
• Questioning technique : multiple choice & written
• allowed support material :calculator and tables

4. Handing over the certification

May be given to successful course participants at the end of the course. Only course participants who have absolved the whole course, (and/or have successfully passed the required examination/assessments) may received the corresponding recognition material :
- CMAS CARD
- WALL CERTIFICATE