



CMAS

CONFÉDÉRATION MONDIALE
DES ACTIVITÉS SUBAQUATIQUES

WORLD UNDERWATER FEDERATION

CMAS

ADVANCED TRIMIX DIVER STANDARDS AND REQUIREMENTS

(VERSION 2006/01)

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PART 1 STANDARDS & REQUIREMENTS

I. Course Classification (Type and level)

a. Classification

The CMAS Advanced Trimix course is a speciality course

This course can only be classified as an addition, as is with all other continuation course types.

b. Validity

This CMAS qualification has no expiry date. Subject to national standards (including medical status).

c. Qualification Limits

Graduates are qualified to dive:

c.1. With so-called "Advanced" Trimix.

c.2. To a maximum operating depth (MOD), on completion of this course, of 100-metres, subject to a ppO₂ maximum of 1.4bar at the MOD (However, the maximum depth during training will be limited 85metres).

c.3. Using Nitrox and /or oxygen for decompression purposes, subject to a maximum ppO₂ of 1.6bar.

II. Aims & priorities of the training

- a. To provide a clear understanding of the physical and physiological aspects of Sub-normoxic Trimix diving and the strategies to cope.
- b. To provide the candidate with a clear understanding of subject matter related "Subnormoxic" Trimix diving including the practical use of the additional diving and associated equipment, equipment configuration and supporting requirement.
- c. To provide a clear understanding of the extensive dive planning required for Sub-Normoxic Trimix diving, including Risk assessment, equipment selection, Back-up gas, escape routes, accelerated decompression and support teams.

III Course entry qualifications

- a. Minimum 18 years of age.
- b. Diving qualification: 3-Star diver CMAS or equivalent.
- c. CMAS Normoxic Trimix Diver or equivalent.
- d. CMAS Advanced Nitrox Diver (level 2) or equivalent qualification from a recognised diver training agency.
- e. Minimum number of logged qualifying dives:
 - e.1. candidates must show logged proof of 20 Normoxic Trimix, and
 - e.2. with two within the last month.
- f. Medical declaration: Candidates must provide a medical declaration of fitness to dive, as set out by their National Federation.
- g. Personally owned necessary technical equipment (see suggested equipment list below)

IV. Instructor / candidate Ratio:

Theory/classroom Instructor / Candidates ratio: 1:8

Practical/open water Instructor / Candidates ratio: 1:2

V. Requirements of the instructor/assistants

- a. Instructor/Course Leader: i. Minimum 21 years of age.
- b. Dive instructor qualifications: CMAS 2 star dive instructor.
- c. CMAS Advanced Trimix instructor
- d. National Qualifications: The instructor must have a valid instructor classification according to the requirements of his/her National Organisation or CDC.

Assistants: According to the assessment of the Course Leader, Assistants may be either a fully qualified Advanced Trimix Instructor (FQATI) or candidates ATI who have complete all the necessary theoretical and practical NTI training but still requires hands-on experience instructing at this level. Equally, the Course Leader may have a mix of fully qualified instructors and undergraduate instructor assistants.

VI. Personal Equipment

- a. Candidates will only provide their own diving equipment they are familiar with (This is not a course for experimentation with new equipment).
- b. All equipment used must well maintained and fit for the purpose.
- c. Oxygen Service: Candidates will provide certification to prove:
 - c.1. That all equipment for use with gas mixtures other than air is in "oxygen service",
 - c.2. All dive cylinders are in "test".
- d. Candidates will pay the cost of all the breathing gases that they use or store in their dive cylinders.

Equipment list

One Twin cylinder set (bottom gas); Travel gas cylinders and stage-decompression cylinders including harnesses; one twin bladder Buoyancy Control device (BCD) (when diving in dry-suit single bladder BCD is sufficient); One run-time underwater slate /wet notes; Demand valves (DVs) for all gas cylinders including one DV fitted with 1.5metre long inter-stage hose, all fitted with submersible contents pressure gauges; one primary underwater torch and one back-up underwater torch; two small very sharp knives (or small sharp knife and a line-cutter); two face masks; two decompression reels each with 100metres of line; one Red delay surface marker buoy (DSMB) and one Yellow DSMB these may inflated either by their own mini-cylinders or from a gas-gun supplied via one of the diving (not deco) DVs; Dive-suit to accommodate the expected water temperature (dry-suit to have a separate suit inflation system; two depth gauges or two suitable personal decompression computers (PDCs); two timing devices and a Jon-line.

VII. Course Facilities:

- a. A Class room suitable to match the needs of the course and number of candidates.
- b. Depth limits maximum 90-metres according to the local conditions and at the discretion of the Course Leader.
- c. 4 dives totalling 300 minutes.
 - c.1. The first dive should be a skills checkout dive to maximum 20 metres.
 - c.2. The second should be a normoxic Trimix dive to maximum 50 metres.
 - c.3. The final two dives should be Advanced Trimix dives to maximum 90 metres, subject to the maximum depth allowed by national training standards
- d. All 4 dives should be carried out with an Advance Trimix equipment configuration.

All dives must be limited to an upper ppO₂ limit of 1.4bar. Additionally, training dives must have a maximum END of 30metres. The maximum ppO₂ at stage-decompression must not exceed 1.6bar.

Safety requirements: On this course, candidates must be under the direct supervision of a CMAS Trimix Instructor at all times.

VIII. Aims of the participants

At the end of the course, the candidate must provide proof of their knowledge and skills related to Advanced Trimix diving as follows:

- a. Sit and pass the Advanced Trimix theory examination.
- b. Complete all the Advanced Trimix in-water Skills to the satisfaction of the CMAS Trimix Course Leader.

IX. Minimum course duration.

Theory/practical lectures:	10 hours
Open water dives:	four dives, with a minimum of 300 minutes in-water experience. No more than one dives per day.

X. Quality assurance

For the sake of quality assurance CMAS highly recommend that Advanced Trimix authorised Federations use only high quality equipment.

Federations are also commended to ask candidates to complete quality assurance feed-backquestions, which can be used to analyse training courses.

Definitions

- 1 Sub-normoxic: For the purpose of this "Sub-normoxic" diving Standard means any Trimix diving gas mixture with an oxygen content of less than 18%. Such a gas mix must not be used at the surface because is not considered suitable to support human life.
- 2 Maximum diving ppO₂ limit: 1.4bar. {ie the ppO₂ at the maximum operating depth (MOD) of any dive must not exceed 1.4bar.}
- 3 Maximum decompressing ppO₂ limit: 1.6bar. {ie the ppO₂ during any section of the Stage-stop decompression process must not exceed 1.6bar.}

Training Programme

1. Course schedule

Minimum Duration:

- 1.1 Theory 10 Hours.
- 1.2 Minimum amount of dives in open water 4 Dives with a minimum of 300 minutes in open water

2. Course content

1.3 Theory

Rune- time
Various decompression method
Calculation of the Best-Mix.
Dive planning.
Management of the remaining gas.
Equipment.
Stream-lining – Equipment configuration (including positioning of travel and decompression gases (rich on the right).
Emergency first-aid procedures.
Physiological risks related to the use of various gas mixtures (cooling, CNS toxicity, OTUs including the importance of not exceeding limits (ie % per minute acceleration of ppO₂ incurred by exceeding the ppO₂ of 1.6bar, HPNS, stress, vasodilatation, isobaric counter-diffusion, dehydration and in-water re-hydration).

1.4 Practical

P1 Practical lesson 1 / Dive max. 20 Metres with Air or Nitrox

- 1 Prepare a full dive plan, including dive gas and back-up gas, for the proposed dive.
- 2 Buoyancy check.
- 3 Exercises of hooking/unhooking of travel gas and decompression cylinders.
- 4 Exercises with delayed surface marker buoy (DSMB):
 - a. Deploying a Red DSMB from depth to indicate the diver's position to the surface crew.
 - b. Deploying a Yellow DSMB from a Stage-stop depth to indicate assistance is required. eg more gas!

P2 Practical lesson 2 / Dive max. 90 metres with Trimix, travel gas and decompression gas subject to the maximum depth allowed by national training standards

- 1 Fully equipped with appropriate Travel and decompression gas.
- 2 Prepare a full dive plan, including dive gas and back-up gas, for the proposed dive.
- 3 Stage-stop decompression with appropriate mixture(s)
Where pure oxygen is used the:
 - a. oxygen floor.
 - b. decompression ceiling.
Must meticulously observed.
- 4 Exercises with delayed surface marker buoy (DSMB):
 - a. Deploying a Red DSMB from depth to indicate the diver's position to the surface crew.
 - b. Deploying a Yellow DSMB from a Stage-stop depth to indicate assistance is required. eg more gas!
- 5 In-water re-hydration at the Stage-stop level.
- 6 Exercising Diving skills:
 - a. Demonstrate correct isolation and shut-down procedures for leaking DVs etc on every dive.
 - b. No mask swim drill: follow a line for 10m without a mask on.
 - c. Lost mask drill: either get the spare from your pocket and refit or find your buddy with no mask.
 - d. Demonstrate correct buoyancy at depth when cylinders are full; ± 0.5 metres.
 - e. Demonstrate correct swimming trim (attitude).
 - e. Demonstrate correct finning technique to avoid disturbing the sea floor.
 - g. Demonstrate the correct use of the Run-time method of dive management.
 - h. Demonstrate the recovering of your tracks along a severed distance-line.
 - i. Demonstrate the Out-of-air drills, and then swim 20m breathing from buddy's gas source.
 - j. Deploy a DSMB, working as a team, to the surface using the course procedure.
 - k. Ascend the DSMB line, as a team, to the decompression stops and surface.

P3+4 Practical lesson 3+4 / Dive max. 85 75 metres with Trimix

- 1 Fully equipped with appropriate Travel and decompression gas.
- 2 Prepare a full dive plan, including dive gas and back-up gas, for the proposed dive.
- 3 Stage-stop decompression Dive as above on P2-3.
- 4 DSMB exercise as above in P2-3.
- 5 In-water re-hydration at the stage-stop level.
- 6 Diving skills as above in P2-4.

3. Examination

Recommended method: evaluation of each module, including the dive planning exercises mentioned above in each practical session. Recommended form: written Question technique: multiple choice and written Allowed support material: calculator and tables

4. Certificate Presentation

Candidates must attend for the full duration of the course and complete the full duration of training dives, completely satisfy the Course Instructor with regard to the practical assessment and attain a pass mark in the written examination of 80%. On the satisfactory completion of the full programme successful candidates may be presented the CMAS qualification "Normoxic Trimix Diver", reflected in the CMAS Card and Wall Certificate.