



# CMAS

CONFÉDÉRATION MONDIALE  
DES ACTIVITÉS SUBAQUATIQUES

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WORLD UNDERWATER FEDERATION

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**CMAS Trimix Gas-blender**  
**STANDARD AND REQUIREMENTS**  
**and**  
**TRAINING PROGRAMME**

**VERSION 2008/01**

**( CA 158 12/01/08 )**

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# I. Course Outline

## 1. Course Classification (Type and level)

### 1.1 Classification

The CMAS Trimix Gas-blender is a Speciality course, which is an addendum for qualified divers.

### 1.2 Validity

There are no time limits for this certificate.

### 1.3 Advantages and responsibilities

Successful students will be able to blend any type of breathing mix required for Trimix diving.

## 2. Course Objectives

2.1 To give the candidate an extensive knowledge about the risks connected with gas mixing and cylinder gas filling.

2.2 To teach candidates gas-blending calculations for Trimix diving and the use of diving gas tables and computers to facilitate this end.

2.3 To teach the calculation of best mix.

2.4 To make candidates aware of the health and safety risks connected with improper mixing and handling of Trimix gases.

## 3. Student Prerequisites

3.1 Minimum age: 18 years

3.2 Certification level: Certified CMAS Nitrox Blender or equivalent from a recognised training agency.

## 4. Maximum amount of Students

4.1 Theory/classroom: Ratio Instructor : Students: 1:10

4.2 Practice/filling station: Ratio Instructor : Students 1:4

## 5. Requirements of the Instructor/Assistants

5.1 Instructor/course leader

5.1.1. Instructor qualification: CMAS Two-Star Instructor

5.1.2. Additional: CMAS Trimix Gas-blender Instructor.

5.1.3. Practice Certification: The Instructor must be active as a Dive Instructor, as required by the National Federation requirements

5.2 Assistants

According to the requirements of the Course Director but should have the minimum qualification of a Trimix Blender.

## 6. Equipment

6.1 The filling station used for the training, as well as the necessary auxiliary equipment, must fulfil the legal requirements of the country in which the course is conducted. (CE, TÜV, BS ISO etc.)

6.2 The course Instructor must provide all the necessary training aids, audio-visual aids, tables and calculation programmes.

6.3 Trimix Analyser

6.4 Gas mixing tables/gas planning tool

6.5 Adequate gas volumes of Helium, Oxygen and air.

6.6 Course Students must bring their own personal equipment with them. (This may include a Trimix analyser)

## 7. Course Requirements

7.1 Course profile: using the CMAS Training programmes

7.2 Approval by the producer of the gas mixing equipment.

7.3 Infrastructure: An appropriate classroom for the course requirements and the amount of Students.

7.4 Supervision: An authorised CMAS Trimix Gas-blender Instructor must be present during the entire course.

7.5 Candidates must successfully blend and analyse a minimum of two cylinders of Trimix.

7.6 Candidates may work in groups of two.

## 8. Students Goals

At the end of the course, candidates should provide proof of their knowledge as follows:

### 8.1 Theory:

- 8.1.1. Demonstrate the ability to calculate the parameters for the gas mixing.
- 8.1.2. Be able to calculate the best mix for a dive
- 8.1.3. Know the local legal framework within which gas mixing is performed.

### 8.2 Practice:

- 8.2.1. Correctly blend a given Trimix to  $\pm 1\%$  and to the working pressure of the dive cylinder in use.
- 8.2.2. Implement all proper safety precautions.
- 8.2.3. Analyse and document the result of the gas mixing.

## 9. Minimum course duration

9.1 Theory lessons: 4 Hours

9.2 Practical lessons: 1 Hours

## 10. Quality assurance

In order to guarantee the quality assurance, CMAS recommends that all Associations use only high quality systems. A proven and widely used method is also to hand out questionnaires to course Students and then to analyse the replies.

# II. Training Programme

## 1. Course Schedule

### Minimum durations:

- 1.1 Theory 4 hours
- 1.2 Practical workshop at filling station 1 hour minimum

## 2. Course Content (syllabus)

### 2.1 Theory

#### T1 The Gases

- a. Physical and chemical properties of the pure gases.
- b. Industrial gas production of the pure gases.
- c. Utilisation of the different technical gases according to their purity.

#### T2 Mixing the Gases

- a. Different gas mixing methods: advantages and disadvantages.
- b. Calculations for empty and partially full gas cylinders.
- c. Best mix calculation for Trimix diving.
- d. Practical gas mixing, including safety measures and gas mixing log book.
- e. Gas storage requirements for gas and gas mixtures.
- f. The use of a helium analyzer and the correction of inaccurate Trimix blends.

#### T3 Rules and Legislation

- a. National and International legislation regarding production and handling of gases
- b. Regulations for gas mixing and equipment maintenance and cleanliness.
  - For personal use.
  - For Club use.
  - Commercial sale.

### 2.2 Practical

#### P1 Gas Mixing

- a. Gas mixture analysis and pressure measurement of a partially full cylinder.
- b. Best Trimix calculations.
- c. Gas filling sequence at the correct gas flow rate.
- d. Documentation and administrative procedures
- e. Storage and final control

## 3. Knowledge Review & Skills Assessment

### Theory:

The final theory examination will include two multiple choice papers each with an allotted time of one hour. Candidates are allowed to use "silent" no programmable calculators and gas tables.

## 4. Certification

Certification will be given to successful candidate at the end of the course. Only candidates who have participated in the whole course and have successfully passed the examination may receive the corresponding recognition material

- CMAS C-Card
- Wall Certificate

# III. CMAS Trimix Gas-Blender Instructor Standard and Requirements

## 1. Prerequisites

- 1.1 Minimum Age: 18 Years
- 1.2 Instructor qualification: CMAS Nitrox Blender Instructor  
CMAS Trimix Gas-blender or equivalent.

## 2. Assessment and certification

- 2.1 Pass written examination.
- 2.2 Demonstrate the ability to teach a group of students how to mix gases in a safe and controlled manner.
- 2.3 Fulfil additional requirement imposed by the national legislation.

## 3. Qualification

The CMAS Trimix Gas-blender Instructor is qualified to conduct CMAS Trimix Gas-blender course and to certify successful candidates.