



CMAS

CONFÉDÉRATION MONDIALE
DES ACTIVITÉS SUBAQUATIQUES

WORLD UNDERWATER FEDERATION

CMAS NITROX BLENDER

STANDARDS AND REQUIREMENTS TRAINING PROGRAMME

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CMAS NITROX BLENDER

PART 1 : STANDARDS & REQUIREMENTS

1 Course Classification (Type and level)

1.1 Classification

The CMAS Nitrox blender course is a Speciality certification.

As with all other secondary course types, this course can only be classified as an additional qualification.

1.2 Validity

There are no validity limits for this certificate.

2 Aims and main focus of the training

- 2.1 To give the student an extensive knowledge about the risks connected to mixing and filling gases. Especially the handling of pure oxygen under high pressure.
- 2.2 To teach the student to calculate how to make a desired gas mix and how to use tables and computers do facilitate this calculation.
- 2.3 To make the student aware of the health and life risks connected to improper mixing and handling of breathing gases.
- 2.4 To teach the student how to oxygen-clean the equipment as well as to check this status.

3 Course Prerequisites

- 3.1 Minimum age: 18 years

4 Instructor : Student ratio

- 4.1 Theory/classroom 1:10
- 4.2 Practical work / filling station 1:4

5 Requirements for the instructor/assistant

5.1 Instructor/course director

5.1.1. Instructor qualification: CMAS Nitrox Blender Instructor.

5.1.2. Practice Certification: The instructor must be in active teaching status, according to the requirements of his National Association.

5.2 Assistants

According to the requirements of the course director, but must be a Nitrox blender as a minimum.

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 instructor must provide all the necessary training aids, audio-visual aids, tables, calculation programs and other supporting material.
- 6.3 Course participants must bring their own personal equipment with them, especially oxygen analyzers.

7 Minimum course requirements

- 7.1 Course profile: using the official CMAS Training program for this course
- 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 participants.
- 7.4 Supervision: an authorised CMAS Nitrox Blender Instructor must be present during the entire course.
- 7.5 Each participant must at least calculate the amounts of different gases to be mixed to create a desired mixture, produce the mixture and analyse the gas afterwards. The result should be written in the course protocol and countersigned by the student.

8 Training objectives

At the end of the course, the participant must provide proof of his/her knowledge and skills as follows:

8.1 Theory:

- 8.1.1. Correct use of gas mixing tables.
- 8.1.2. Demonstrate the ability to calculate the parameters for gas mixing without tables.
- 8.1.3. List and explain the main topics of the local legal framework within the gas mixing is performed.
- 8.1.4. List and explain the hazardous aspects of handling oxygen under pressure and the meaning of "oxygen service".
- 8.1.5. List the required minimum data on the gas tag (label) to be put on the tank

8.2 Practice:

- 8.2.1. Check and make sure that all equipment used is in "oxygen clean" condition prior to filling
- 8.2.2. Carry out all other required and necessary safety precautions.
- 8.2.3. Perform a correct filling of a scuba tank with a desired gas mixture.
- 8.2.4. Analyse and document the result of the gas mixing.
- 8.2.5. Fill out the appropriate gas tag and put it on the tank (labelling)

9 Minimum course duration

- | | |
|-------------------------------------|-------|
| 9.1 Theory lessons and examination: | 5 hrs |
| 9.2 Practical lessons: | 3 hrs |

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 to hand out questionnaires to course participants and then to analyse the replies.

CMAS NITROX BLENDER : PART 2 : TRAINING PROGRAMME

11 Course schedule

Minimum duration:

- | | |
|--|-------|
| 11.1 Theory and examination | 5 hrs |
| 11.2 Practical workshop at filling station | 3 hrs |

12 Course content (syllabus)

Theory

T1 The pure gases

- Physical and chemical properties of the pure gases
- Biochemical properties of the pure gases
- Industrial gas production of the pure gases
- Utilisation of the different technical gases according to their purity

T2 Mixing and checking the gases

- Different gas mixing methods, their advantages and disadvantages
- Filling calculations for empty and partly empty gas cylinders
- Practical gas mixing; security measures and gas mixing log book
- How to check gas mixtures before and after mixing (filling)
- Labelling of tanks containing gas mixtures
- Problems regarding the storage of mixed gases

T3 Oxygen handling

- Oxygen and its reactivity
- The meaning of "oxygen clean", "oxygen design" and "oxygen service"
- Oxygen compatible and non-compatible materials
- Cleaning agents and methods for tanks and regulators
- Control methods and cleaning intervals

T4 Rules and legislation

- National and international legislation regarding production and handling of gases
- Rules regarding gas mixing and cleaning and maintenance of equipment
- Regulations and Rules for labelling tanks with gas mixtures
 - For your own use
 - For others in your club
 - For clients on a commercial basis

13 Practice

P1 Gas mixing

- Analysis of gas mixture and measurement of pressure in partly empty cylinder
- Calculation of how to make the desired gas mix by calculator and by table
- Filling in the right sequence and with correct gas flow and final pressure
- Documentation and administrative procedures
- Storage and final control

P2 Equipment cleaning and maintenance

- Disassembly of the equipment
- Cleaning
- Drying
- Final control
- Assembly with the use of oxygen compatible grease

14 Knowledge review & skills assessment

Theory:

- Recommended methods: final assessment at end of theory or end of course
- Recommended form: in written form
- Recommended structure: all major topics to be covered
- Allotted time: 60 minutes
- Questioning technique: multiple choice
- Recommended number of questions: 30
- Allowed support material for participants: pocket calculator and tables.
- Minimum score for passing: 80%

Practice:

In order to pass, the student must correctly

- a. demonstrate and explain how to prepare corresponding equipment for the use with oxygen enriched mixtures
- b. demonstrate and explain all necessary safety precautions for filling and handling of oxygen and oxygen enriched mixtures
- c. produce a given mixture with an previously empty tank
- d. produce a given mixture with a partially filled tank
- e. perform and explain the gas check and the labelling of the tank after filling

15 Certification

To be given to successful course participants at the end of the course. Only course participants who have attended the whole course and have successfully passed the examination may receive the corresponding recognition material:

- CMAS CARD
- WALL CERTIFICATE

CMAS NITROX BLENDER INSTRUCTOR

Standards and Requirements

16 Prerequisites

- 16.1 Minimum Age: 18 years
16.2 Instructor qualification: CMAS Basic Nitrox Instructor

17 Assessment and certification

- 17.1 Pass a written examination which covers all relevant technical and legal aspects plus the way how to teach the course.
17.2 Successfully demonstrate the ability to teach at least one Nitrox Blender course to a group of real students under the supervision of an instructor trainer delegated by the Federation. The instructor trainer will assess the performance and file a written report to the corresponding body within the federation.
17.3 Fulfil any additional requirement imposed by the national legislation.

18 Qualification

The CMAS Nitrox Blender Instructor is qualified to conduct CMAS Nitrox Blender courses and to certify the successful candidates.