Confédération Mondiale des Activités Subaquatiques

World Underwater Federation

MIXED GAS DIVING STANDARDS

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1. INTRODUCTION

1.1. SCOPE

This document covers mixed gas diving, an emerging diving technique which was developed primarily in the USA by proprietary diving organisations and which is now spreading in the rest of the sport diving world.

It must be noted that in accordance with present CMAS (see Chapter 2), the scope of this document is restricted to breathing nitrox and pure oxygen.

CMAS standards for mixed gas diving do not, for the moment, include :

- trimix and heliox gas mixtures,
- the use of any rebreather.

The intention of the CMAS TC/TTC working group is to monitor the development of the above matters until sufficient experience has been gained to enable the working group to propose to CMAS Technical Committee a modification to this position.

1.2. OBJECTIVE

The objective of this document is to provide CMAS member federations with minimum safety rules and recommendations for the safe development of mixed gas diving.

This objective is supported by the CMAS policy on mixed gas diving and a planned and controlled approach to mixed gas diving. This approach is based on a specific working group which will define and implement the standards, will monitor and organise audits to review their performance, and will continuously work on their improvement.

1.3. RESPONSIBILITIES

The standards provided were established by a working group which was formed at the 1995 CMAS Instructors Meeting. The responsibility of the working group is to review, propose and edit CMAS standards for the safe and efficient practice of mixed gas diving.

Its the responsibility of the member federations to adopt and/or modify the CMAS minimum requirements and guidelines to their local regulations and needs.

1.4. DEFINITIONS

1.4.1. CMAS diver
A diver affiliated to a member federation of the CMAS Technical Committee.

1.4.2. CMAS member federation
A national diving federation which is a member of the CMAS Technical Committee.

1.4.3. Enriched air nitrox (EANx)
An expression used by some diving organisations to designate nitrox mixtures with an oxygen percentage higher than 21%.

1.4.4. Heliox
A breathing gas mixture of helium and oxygen. Heliox mixtures are noted A/B, where A represents the oxygen percentage and B the helium percentage. Example : heliox 20/80 contains 20% of oxygen and 80% of helium.

1.4.5. Mixed gas diving
Diving with a breathing mixture other than air.

1.4.6. Nitrox
A breathing gas mixture of nitrogen and oxygen. Nitrox mixtures are noted A/B, where A represents the oxygen percentage and B the nitrogen percentage. Example : a nitrox 40/60 contains 40% of oxygen and 60% of nitrogen.

1.4.7. Safe Air
A registered expression used by an American organisation to designate nitrox mixtures.

1.4.8. Trimix
A breathing gas mixture of oxygen, nitrogen and helium, generally used for diving deeper than 50 m.

1.5. REFERENCES

References are made in the text to various regulations and rules. These references are derived mainly from the USA, UK and French regulations and the industry standards (Association of Diving Contractors (AODC)).

The training standards developed in this document comply with the basic outline format of the CMAS International Certificates Commission.

2. CMAS POLICY ON MIXED GAS DIVING

2.1. CMAS APPROACH TO MIXED GAS DIVING

The CMAS Mixed Gas Diving project was first presented at the General Assembly of the Technical Committee in Cyprus in 1993. The current position of the CMAS Technical Committee was discussed and it was agreed that member federations were in favour of producing guidelines and standards to cover this activity. A Working Group of the Training and Techniques Commission was set up to work on the development of the project. After consultation with several federations and experts a first draft was circulated for comment in September 1994 and the project was re-presented to the CMAS Instructors Conference in Paris in April 1995, where broad agreement was reached on the path to be followed.

The working group was reconstituted at the 1995 CMAS Instructors Conference and currently includes :

- M Busuttili, UK, President of the Training and Techniques Commission
- M Riedi, Switzerland
- C Touloumdjian, France
- C Thomas, France
- JP Imbert, France

The brief to the working group was to edit and propose standards and guidelines for the safe and efficient practice of mixed gas diving.

The first mission of the working group was to focus on nitrox diving. The project was organised in the following way :

1. collection and review of the available documentation on nitrox diving,
2. contact with organisations and personalities with significant expertise on nitrox diving for advice on these standards
3. analysis of the safety information related to nitrox diving (hyperoxia, decompression sickness),
4. preparation of a second draft of the proposed standards
5. dispatch of the second draft for review and comments to the CMAS TC commission presidents and to the CMAS TC member federations.
6. edition of final document to be submitted for approval to the General Assembly of the CMAS TC.

The second mission of the working group was to monitor the development of rebreather use and heliox/trimix diving until sufficient experience can be collected for CMAS to consider extending the present nitrox standards to other breathing gas mixtures.

2.2. CMAS POLICY ON MIXED GAS DIVING

The CMAS policy on mixed gas diving was first presented at the 1993 CMAS meeting in Cyprus. This policy is summarised below :

- The use of Nitrox is associated to specific hazards and risks and only divers who have received specialised training from a qualified organisation should undertake Nitrox diving.
- The use of Nitrox offers practical advantages. As a bottom mixture, Nitrox allows reduced decompression times in a limited depth range. As a decompression mixture, Nitrox (including pure oxygen) allows shorter and safer decompression.
- The use of Nitrox offers an additional safety margin when the dives are conducted using air decompression tables or air dive computers.
- Nitrox diving should only be undertaken using correctly rated equipment, Nitrox identified tanks, checked in the presence of the diver prior to the dive.
- Gas suppliers providing diving gas mixtures should follow Quality Assurance standards.

2.3. CMAS MIXED GAS DIVING CODE OF CONDUCT

Because mixed gas diving is recognised as an advanced form of diving and as such carries a degree of risk and responsibility not normally associated with recreational diving, CMAS has identified the following duties and responsibilities for mixed gas divers.

- The CMAS mixed gas diver must continually demonstrate his maturity by his willingness to follow established guidelines in diving techniques and to develop skills appropriate to safe mixed gas diving.
- The CMAS mixed gas diver always maintains his personal physical fitness. He is aware of the problems caused by abuse of smoking, recreational drug use, alcohol abuse, obesity and sub-standard physical or mental fitness insofar as they relate to diving.
- The CMAS mixed gas diver always maintains his life support equipment and never starts a dive before he has checked his equipment and is satisfied that it is in full working order.
- The CMAS mixed gas diver strives to improve his knowledge of diving procedures and equipment.
- The CMAS mixed gas diver will not encourage or recruit other persons to dive with mixed gas without proper training. If approached, he will direct such persons to recognised training locations ;
- The CMAS mixed gas diver will make every effort to pass on his knowledge to novice mixed gas divers and the diving community if requested to do so, whether through formal instruction, answering questions or via appropriated publication in books, journals and magazines.

3. SAFETY REQUIREMENTS

3.1. SAFETY MANAGEMENT

3.1.1. Method of Risk Analysis.

Recent developments in the commercial diving industry have emphasised the fact that the safety of a dive should be planned. Tools have been developed to plan the safety of a dive that are simple enough to be implemented in recreational diving.

One of the simplest tools is the « five step » hazard identification and risk assessment method. It allows the evaluation of the hazards and their associated risks from the conditions of the dive and the development of preventative methods or means for each of them.

The five step risk assessment method not only provides a flexible approach to safety but also allows feed-back from the lessons learned from experience. It is opposed to any detailed prescriptive code of practice, where any change in conditions or equipment renders the rules obsolete. .

This method which was used in preparing these recommendations is presented in appendix no. 1.

3.1.2. Hazards related to mixed gas diving

Mixed gas diving is associated with hazards and risks additional to traditional air diving. The hazards specifically related to mixed gas diving are listed below.

Physiological hazards :

- Nitrogen narcosis,
- Exposure to hyperbaric oxygen,
- Exposure to high partial pressure of CO2 or CO (defective compressor or surpressor, polluted gas, etc.)
- Possible exposure to hypoxia or anoxia due to inadequate gas mixing or delivery,
- Decompression sickness,
- Breathing dense gas, which may introduce exhaustion and hyperventilation (access to increasing depths),
- Etc.

Environmental/Operational hazards

- Depth control,
- Bottom time control,
- Error in table selection, table reading,
- Etc.

Equipment hazards :

- Gas storage and mixing,
- Oxygen handling,
- Equipment compatibility to oxygen,
- Error in gas analysis or marking,
- Equipment failure,
- Gas shortage, wrong gas supply,
- Etc.

This list of hazards should be used as a guideline to plan the safety of a proposed dive. For each of the risks identified, a solution should be developed and implemented until the diver is satisfied that the dive can be carried out with a known and acceptable risk.

3.1.3. Emergency preparedness

For risks that cannot be removed completely, CMAS divers should be trained in the appropriate emergency procedures. CMAS mixed gas divers should be fully conversant in the emergency procedures related to the risks they accept.

3.2. MAXIMUM PERMITTED PARTIAL PRESSURE (PO2)

3.2.1. Central Nervous System (CNS) toxicity

The maximum PO2 must not exceed 1.6 bar in water. This limit value is consistent with the requirements or recommendations of the :

- UK commercial diving regulations (Diving operations at work regulations. 1981. ISBN 0 11 885599 9).
- Norwegian commercial diving regulation (Regulations relating to manned underwater operations in the petroleum activity. Norwegian Petroleum Directorate. ISBN 82 7257 335 9).
- French commercial diving regulations (Travaux en milieu hyperbare. Mesures particulières de prévention. 1992 Journal Officiel de la République Française. ISBN 261 160 73322 ISSN 0767-4538).
- European Diving Technology Committee (Report on the first workshop towards the harmonisation of European diving standards. Luxembourg April 1994).

It is however admitted that some member federations may decide to define a recommended maximum permitted PO2 lower than 1.6 bar.

During habitat, chamber, bell or wet bell dives, the maximum PO2 may reach 2.2 bar.

3.2.2. Pulmonary toxicity

Generally, oxygen exposures of CMAS mixed gas divers will not involve any risk of pulmonary toxicity.

However, CMAS mixed gas divers should check that their planned oxygen exposure remains within safe limits according to a system approved by their CMAS member federation.

Note that no system exists in the scientific literature which is fully and internationally recognised for the calculation of the maximum oxygen exposure with regards to pulmonary effects.

3.3. APPROVED DECOMPRESSION TABLES

The decompression procedures for mixed gas diving (pre-printed or generated by a computer or diving computer), should comply with the criteria defined in the proceedings of the Undersea Medical Society Workshop on Validation of Decompression Schedules (Bethesda, Maryland, 13-14 February 1986).

3.4. GAS ANALYSIS

Any CMAS diver involved in a mixed gas dive should personally analyse his breathing gas mixtures for oxygen percentage (or supervise the analysis of the breathing gas mixture) prior to his dive.

The oxygen analyser should be calibrated according to manufacturer’s recommendations by a competent person and documented evidence of calibration should be available for inspection.

3.5. GAS MIXTURE ACCURACY

Procedures designed for nitrox diving should accept a ± 5% accuracy in the measurement of oxygen percentage.

Example :
A dive is planned with nitrox 40/60. Any nitrox mixture with an actual oxygen percentage of oxygen ranging from 38% to 42 % is acceptable for the dive.

3.6. GAS CYLINDER LABELLING AND COLOUR CODING

Mixed gas cylinder and gas storage tanks should be labelled and colour coded according to national regulations.

In European countries, a reference to be used is the AODC guideline No. 016 Rev. 1 March 1994, Marking and colour coding of gas cylinders, quads and banks for diving applications, which specifies black and white quarters shoulder for nitrogen/oxygen mixture cylinders.

Mixed gas cylinders should be marked (label, sticker, pen, etc.) with the following information :

- nature of the gas mixture (nitrox, trimix, heliox),
- pressure of the cylinder,
- nominal oxygen percentage,
- actual measured oxygen percentage,
- name of the checker

See Appendix no 2.

3.7. METHODS OF GAS MIXING

CMAS does not currently have any recommendation for a specific method but insists on the fact that any method used should be subjected to a hazard identification and risk analysis study prior to its selection.

3.8. OXYGEN COMPATIBILITY REQUIREMENTS

Standard SCUBA equipment can be employed with a nitrox mixture up to 40% oxygen content.

Any nitrox mixture containing more than 40% oxygen requires equipment suitable for oxygen service. Equipment suitable for oxygen service is defined as :

- being inspected and declared compatible for oxygen use,
- having been cleaned for oxygen using an approved procedure.

3.9. OXYGEN CLEANING PROCEDURES

Oxygen cleaning procedures should be recommended by the CMAS member federations.

In European countries, a reference to be used is the AODC guideline No. 029, November 1984, Oxygen cleaning.

3.10 DEPTH CONTROL

CMAS mixed gas divers should have two different means of measuring their depth.

4.1. TRAINING REQUIREMENTS FOR NITROX

The CMAS training scheme for nitrox diving is based on two levels of training for the diver, and the equivalent two levels of qualification for the instructors :

- CMAS Basic Nitrox Diver
- CMAS Advanced Nitrox Diver
- CMAS Nitrox Instructor
- CMAS Advanced Nitrox Instructor

The corresponding training standards are developed in the following chapters.

4.2. TRAINING REQUIREMENTS FOR HELIOX AND TRIMIX

Current CMAS policy recognises that insufficient knowledge is available on the actual performance of trimix and heliox diving techniques to be able to draw documented safe standards for mixed gas diving.

The objective of CMAS is to continue to monitor the development of such diving techniques, which are taught and practised by some private diving organisations, and used by communities such as cave or wreck divers.

CMAS will regularly review the performance of these techniques until it is acknowledged that further action can be planned related to these diving techniques.

Until this time, CMAS will not undertake the issuing of standards for mixed gas diving except for nitrox and pure oxygen.

5. CMAS BASIC NITROX DIVER
Course outline

PART I
(Standards & Requirements)

PART II
(Training Program)

5.1. CMAS BASIC NITROX DIVER: PART I (STANDARDS & REQUIREMENTS)

I. Course classification (Type & Level)

1. *Classification*
The CMAS BASIC NITROX DIVER course is considered a basic-level speciality course.

2. *Validity period*
There is no specific period of validity for this certificate.

3. *Benefits & responsibilities*
Successful students will be qualified to dive using nitrox mixtures containing up to 40% oxygen.

II. Aims & Objectives of course

- To introduce the diver to the techniques involved in diving with nitrox to a limit of 40% oxygen.
- To make the diver aware of the additional physiological problems encountered when diving with gases other than air.
- To make the diver aware of the special dive planning procedures appropriate to diving with nitrox.
- To introduce the diver to the problems of equipment approved for oxygen and procedures for gas mixing.
- To prepare the diver for the first dives using nitrox, and to lead toward further experience before taking the Advanced Nitrox Diver course.

III. Entry requirements (prerequisites)

Student's minimum age :	18 years,
Certification level :	2-star Diver CMAS, or equivalent,
Minimum number of dives :	25 (at least 4 of these performed within 8 weeks prior to the course),
Medical certificate :	according to member federation requirements,

IV. Maximum student/instructor ratios

According to member federation requirements.

V. Instructor / assistant requirements

1. *Instructor/course director*

Certificate level :	national/CMAS 2-star instructor
Speciality :	CMAS Nitrox Instructor or equivalent
Proof of experience :	Instructor must be in active teaching status as required by his national federation. Must be of proven ability and experience (at least 20 logged dives in this speciality).

2. *Assistants*
As required by the course director.

VI. Special course requirements

- Course outline : must be approved by the federation's Technical Committee or must use a standard outline proposed by the federation itself.
- Course approval : approval by national technical committee.
- Facilities : adequate classroom, according to the needs of the course and the students, normal open water diving site.
- Depth limits according to qualification level of each diver (as a maximum under best conditions) and according to local circumstances.
- Minimum duration of any one dive is 15 minutes.
- All diving is done within a maximum oxygen partial pressure limit of 1.6 bar.
- Supervision : During the complete course, at least one authorised course director (instructor as outlined above) must always be present.

VII. Student performance objectives

By the end of the course, students should be able to :

a) knowledge-related :
   1. Identify the problems and advantages related to diving with Nitrox
   2. Explain the physiological phenomena associated with diving with Nitrox
   3. Correctly use standard diving equipment for diving with Nitrox
   4. Demonstrate their knowledge of diving with Nitrox

b) skill-related :
   If their basic diving experience requires a practical evaluation, students should be able to demonstrate their ability to plan and execute dives using Nitrox.

VIII Minimum course duration

1. Minimum duration of course : 2 days
2. Recommended number of sessions : 4 sessions.
3. Minimum classroom duration : 6 hours (*2* sessions)
4. Minimum number of dives : 2 dives

IX. Quality assurance

CMAS strongly recommends and encourages all federations to use an adequate system for 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.

Questionable cases should be further investigated and measures taken to avoid similar situations in the future.

5.2. CMAS BASIC NITROX DIVER PART II (TRAINING PROGRAM)

I. Course schedule

1. Recommended number of sessions : 4 sessions over two days.
2. Minimum duration : classroom 6 hours (2 sessions), open water 2 hours (2 sessions).
3. Minimum number of dives : 2 dives using nitrox should be included in the course.
4. Lessons & topics (brief overview) : See II.1.

II. Minimum course content (syllabus)

1. Theory lessons (Classroom)

TH1 (classroom ; approx. 1.5 hours.)

a) **Introduction**, course administration

b) **Topics :** Overview of oxygen physiology and oxygen toxicity, including reasons for, and methods of avoiding, central nervous system toxicity and pulmonary toxicity, and effects of these on human physiology.

TH2 (classroom ; approx. 1.5 hours.)

a) **Introduction**

b) **Topics :** Symptoms and effects of nitrogen on human physiology and the reduction or avoidance of these effects by the use of appropriate nitrox mixtures, within recreational diving depths.

TH3 (classroom ; approx. 1.5 hours.)

a) **Introduction**

b) **Topics :** Procedures for diving with nitrox up to 40% oxygen, including appropriate equipment selection, practical dive planning, and an understanding of the concept of Equivalent Air Depths and nitrox decompression procedures.

TH4 (classroom ; approx. 1.5 hours.)

a) **Introduction**

b) **Topics :** Basic nitrox diving safety, including oxygen equipment compatibility, colour coding and labelling of equipment, gas analysis requirements, and an introduction to gas mixing methods.

2. Practical lessons (Confined and Open Water)

PR1 (open water, dive 1 ; approx. 1 hr.)

a) site orientation, dive planning, depth limits, choice of mixture.

b) pre-dive briefing, equipment check including gas analysis

c) open water dive 1 ; objectives : observe nitrox diving depth disciplines.

d) special equipment : oxygen analyser

e) post-dive review (debriefing).

PR2 (as PR1)

III. Knowledge review & skills assessment

1. Theoretical knowledge :

a) suggested type: final evaluation

b) suggested form: written,

c) suggested structure: 4 main topics, 5 questions for each, allotted time 45 minutes.

d) question technique: multiple-choice,

e) allowed support material (for student): decompression tables, EAD tables.

IV. Awarding of certification material

May be given to successful students at end of course. Only students who have attended the whole course (and/or successfully passed any required assessment / evaluation) may receive the corresponding recognition material :

- CARD
- BADGE
- WALL CERTIFICATE

6. CMAS ADVANCED Nitrox diver
Course outline

PART I
(Standards & Requirements)

PART II
(Training Program)

6.1. CMAS ADVANCED NITROX DIVER: PART I (STANDARDS & REQUIREMENTS)

I. Course classification (Type & Level)

1. ***Classification***
   The CMAS ADVANCED NITROX DIVER course is considered an advanced-level speciality course.
2. ***Validity period***
   There is no specific period of validity for this certificate.
3. ***Benefits & responsibilities***
   Successful students will be qualified to dive using all nitrox mixtures, and to use pure oxygen for decompression purposes.

II. Aim(s) & Objectives of course

- To provide the diver with a good understanding of the techniques involved in the use of nitrox mixtures for bottom and/or decompression use, including the use of pure oxygen for decompression purposes.
- To make the diver aware of the additional physiological problems encountered when using nitrox mixtures and pure oxygen.
- To provide the diver with a good understanding of the special dive planning procedures appropriate to diving with nitrox mixtures and pure oxygen.
- To provide the diver with a good understanding of the problems of equipment oxygen compatibility and standards for gas mixing
- To provide the diver with the opportunity to gain further experience using nitrox .

III. Entry requirements (prerequisites)

Student's minimum age :	18 years
Certification level :	2-star Diver CMAS and CMAS Basic Nitrox Diver, or equivalents
Minimum number of dives :	50 (at least 5 of these using nitrox mixture)
Medical certificate :	according to member federation requirements,

IV. Maximum student/instructor ratios

According to member federation requirements.

V. Instructor / assistants requirements

1. ***Instructor/course director***

Certificate level :	national/CMAS *2*-star instructor
Speciality :	CMAS Advanced Nitrox Instructor or equivalent
Proof of experience :	Instructor must be in active teaching status as required by his national federation. Must be of proven ability and experience (at least 20 logged dives in this speciality).

2. ***Assistants***
   As required by the course director.

VI. Special course requirements

- Course outline : must be approved by the federation's Technical Committee or must use a standard outline proposed by the federation itself.
- Course approval : approval by national technical committee.
- Facilities : adequate classroom, according to the needs of the course and the students, normal open water diving site.
- Depth limits according to qualification level of each diver (as a maximum under best conditions) and according to local circumstances.
- Minimum duration of any one dive is 15 minutes.
- All diving is to be done within a maximum oxygen partial pressure limit of 1.6 bar.
- Supervision : During the complete course, at least one authorised course director (instructor as outlined above) must always be present.

VII. Student performance objectives

By the end of the course, students should be able to :

a) knowledge-related :
   1. Identify the problems and advantages related to diving with nitrox mixtures and oxygen.
   2. Explain the physiological phenomena associated with diving with nitrox mixtures and oxygen.
   3. Correctly use standard diving equipment for diving with nitrox up to 40% and equipment rated for oxygen service for diving with higher concentrations of oxygen.
   4. Demonstrate their knowledge of diving with nitrox mixtures and oxygen.

b) skill-related :
   Students should be able to demonstrate their ability to plan and execute dives using nitrox mixtures, including decompression stops using oxygen.

VIII. Minimum course duration

a) Minimum duration of course : 2 days
b) Recommended number of sessions : 5 sessions.
c) Minimum classroom duration : 6 hours (2 sessions)
d) Minimum number of dives : 3 dives. One dive should include the use of oxygen during decompression.

IX. Quality control / assurance

CMAS strongly recommends and encourages all federations to use an adequate system for quality control and assurance. A system in widespread use and of proven effectiveness is to send questionnaires to the students, followed by an analysis of the feed-back.

Questionable cases should be further investigated and measures taken to avoid similar situations in the future.

6.2 CMAS ADVANCED NITROX DIVER: PART II (TRAINING PROGRAM)

I. Course schedule

1. Recommended number of sessions : 5 sessions over two days
2. Minimum duration : classroom 6 hours (2 sessions), open water 3 hours (3 sessions).
3. Minimum number of dives : 3 dives using nitrox should be included in the course, one of which should include decompression using pure oxygen.
4. Lessons & topics (brief overview) : See II.1.

II. Minimum course content (syllabus)

1. Theory lessons (Classroom)

TH1 (classroom ; approx. 90 minutes.)

a) **Introduction**, course administration

b) **Topics :** Advanced oxygen theory, advanced physiology and gas toxicity theory, including reasons for, and methods of avoiding, central nervous system toxicity and pulmonary toxicity, and effects of these on human physiology.

TH2 (classroom ; approx. 90 minutes.)

a) **Introduction**

b) **Topics :** The symptoms and effects of nitrogen on human physiology and the reduction or avoidance of these effects by the use of appropriate nitrox mixtures, within recreational diving depths. Recognition of symptoms of decompression sickness and emergency treatment procedures.

TH3 (classroom ; approx. 90 minutes.)

a) **Introduction**

b) **Topics :** Advanced deep diving procedures for depths to 40 metres, including appropriate equipment selection, practical decompression management using different gases. Advanced decompression planning for dives using different gas mixtures and pure oxygen.

TH4 (classroom ; approx. 90 minutes)

a) **Introduction**

b) **Topics :** Suitability of equipment for use with nitrox and oxygen. Gas mixing methods. Gas management and gas analysis.

2. Practical lessons (Confined and Open Water)

PR1 (open water, dives 1 ; approx. 1 hr.)

a) site orientation, dive planning, depth limits, choice of mixture.

b) pre-dive briefing, equipment check including gas analysis

c) open water dive 1 ; objectives : observe nitrox diving depth disciplines.

d) specific equipment : oxygen analyser

e) post-dive review (debriefing)

PR2 (as PR1 but with use of nitrox as a decompression gas)

PR3 (as PR1 but with use of pure oxygen as a decompression gas)

III. Knowledge review & skills assessment

1. Theoretical knowledge :

a) suggested type: final evaluation

b) suggested form: written,

c) suggested structure: 4 main topics, 5 questions for each, allotted time 45 minutes.

d) question technique: multiple-choice,

e) allowed support material (for student): decompression tables, EAD tables.

IV. Awarding of certification material

May be given to successful students at end of course. Only students who have attended the whole course (and/or successfully passed any required assessment / evaluation) may receive the corresponding recognition material :

- CARD
- BADGE
- WALL CERTIFICATE

7. CMAS NITROX INSTRUCTOR

STANDARDS AND REQUIREMENTS

I. Entry Requirements

Minimum age :	18 years
Certification level :	CMAS 2-star Instructor, CMAS Advanced Nitrox Diver.
Minimum number of nitrox dives :	10.
Experience:	Must have participated on at least one Basic Nitrox Diver course in the role of Assistant Instructor.

II. Assessment and certification.

1. Must be assessed in accordance with procedures laid down by the national member federation, using procedures aimed at assuring the instructor's theoretical knowledge and practical ability.
2. On completion of the assessment procedure, can be certified by the member federation as a Nitrox Instructor.

III. Qualification

The CMAS Nitrox Instructor is qualified to organise and instruct on Basic Nitrox Diver courses and to evalute and certify successful candidates, in accordance with member federation requirements.

8. CMAS ADVANCED NITROX INSTRUCTOR

STANDARDS AND REQUIREMENTS

I. Entry Requirements

Minimum age :	18 years
Certification level :	CMAS Nitrox Instructor, CMAS Advanced Nitrox Diver.
Minimum number of nitrox dives :	25.
Experience:	Must have participated on at least one Advanced Nitrox Diver course in the role of Assistant Instructor.

II. Assessment and certification.

1. Must be assessed in accordance with procedures laid down by the national member federation, using procedures aimed at assuring the instructor's theoretical knowledge and practical ability.
2. On completion of the assessment procedure, can be certified by the member federation as an Advanced Nitrox Instructor.

III. Qualification

1. The CMAS Advanced Nitrox Instructor is qualified to organise and instruct on Basic and Advanced Nitrox Diver courses and to evalute and certify successful candidates, in accordance with member federation requirements.
2. The CMAS Advanced Nitrox Instructor is qualified to instruct on Nitrox Instructor courses, in accordance with member federation requirements.

9. APPENDIX 1

THE FIVE STEP RISK ASSESSMENT METHOD

Step no. 1

The safety of mixed gas diving should be based on a clear assessment of the hazards involved for such an activity. Mixed gas diving should be systematically evaluated with regard to the problems related to :

- the physiology,
- the environment
- the operations,
- the equipment.

Step no. 2

For each hazard identified, the risks should be evaluated. For instance, the use of any gas mixture other than air is a hazard which will systematically introduce the risk of hyperoxia, hypoxia or anoxia.

Step no. 3

For each of the identified risks, means should be developed to either remove the risk or control it until it becomes acceptable. For instance, a depth limitation on nitrox breathing should protect divers from hyperoxia, provided the gas mixtures are manufactured according to, and confirmed to be within, specifications. Redundancy will be sought for functions that cannot be made 100% reliable, such as breathing equipment, etc.

Step no. 4

Procedures and equipment should be implemented to prevent or remove the risks. This is where training standards should be developed. This is also where specific diving procedures and equipment should be specified, etc.

Step no. 5

Procedure problems/equipment incidents should be monitored, and safety track records should be established in order to document the efficiency of the procedures or equipment used and permit reaction in any case where a problem is identified.

10. APPENDIX 2

LABEL FOR NITROX CYLINDER.