CMAS

CONFÉDÉRATION MONDIALE DES ACTIVITÉS SUBAQUATIQUES

WORLD UNDERWATER FEDERATION

CMAS TRIMIX DIVER AND INSTRUCTOR

STANDARDS AND REQUIREMENTS

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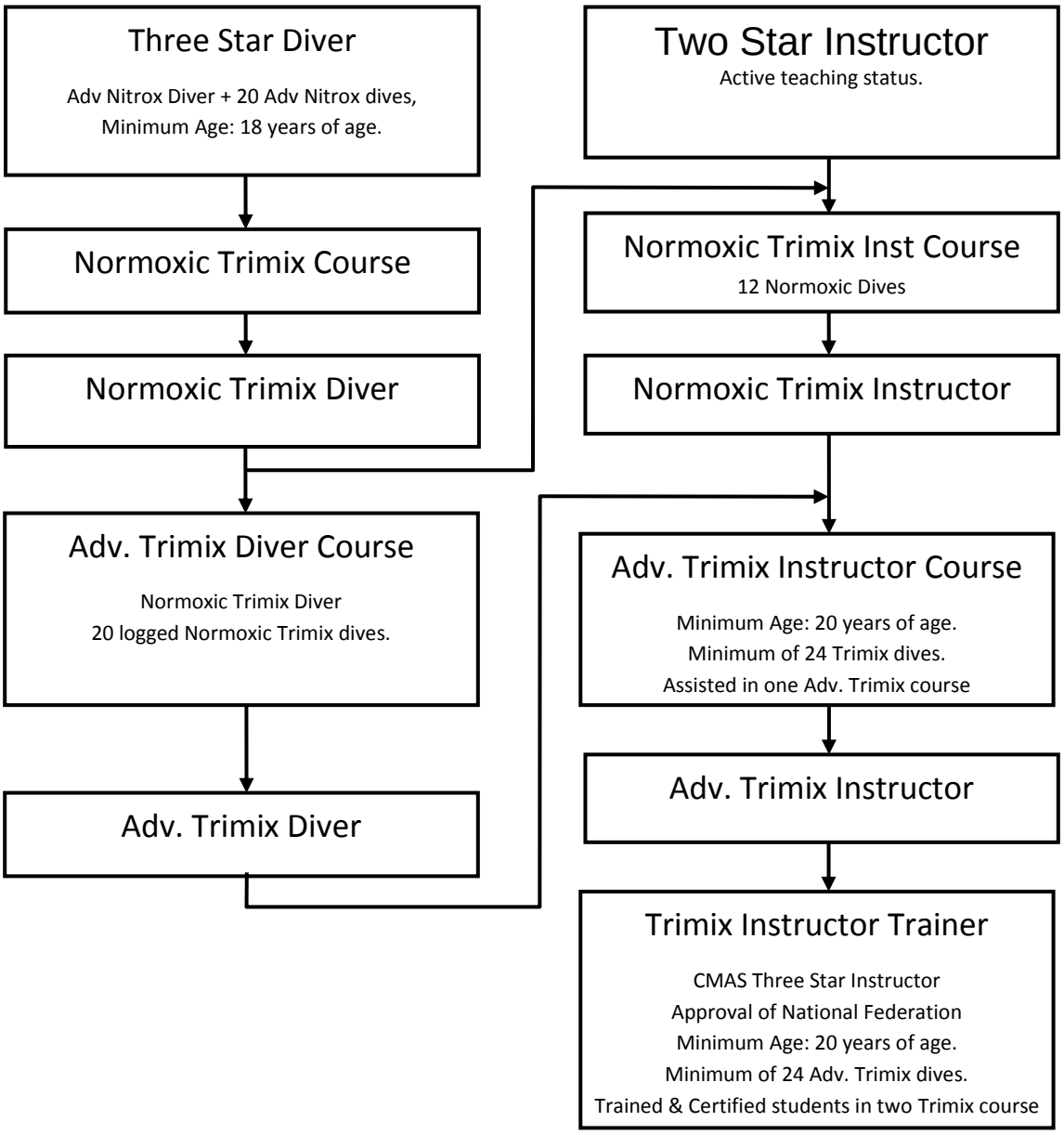
CMAS Trimix Training Scheme Overview



Normoxic Trimix Diver Standard

1. Course Classification (Type and level)

1.1. Classification

This CMAS Normoxic Trimix Diver course is an advanced speciality course, which can only be undertaken after satisfying the entry standards as set out below.

1.2. Qualification term

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

1.3. Qualification Limits Qualification Limits

Graduates are qualified to dive:

1.3.1. Using so-called "Normoxic" Trimix.

1.3.2. To a maximum operating depth (MOD) of 60m, subject to a ppO_2 maximum of 1.4bar at the MOD.

1.3.3. Using Nitrox and /or oxygen for decompression purposes, subject to a maximum ppO_2 of 1.6bar.

1.3.4. To a maximum Equivalent Narcotic Depth (END) of 40m.

1.4. Course documentation

Instructor will provide all necessary course documentation.

2. Aims & objectives of the training

2.1. To provide the candidate with a clear understanding of subject matter related "Normoxic" Trimix diving including the practical use of the additional diving and associated equipment.

2.2. To provide a clear understanding of the physical and physiological aspects of Normoxic Trimix diving and strategies to cope.

2.3. To provide a clear understanding of the extensive dive planning required for Normoxic Trimix diving, including Risk assessment, equipment selection, equipment configuration, Back-up gas, escape routes, accelerated decompression and support teams.

3. Course entry qualifications

3.1. Minimum age 18years.

3.2. Diving qualification: 3-Star diver CMAS or equivalent CMAS Advanced Nitrox Diver (level 2) or equivalent qualification from a recognised diver training agency.

3.3. Minimum number of logged qualifying dives: Candidates must show proof of 150 logged dives, plus logged proof 20 dives as an Advanced or Extended Range Nitrox Diver.

3.4. Medical declaration: Candidates must provide a medical declaration of fitness to dive, as set out by their National Federation.

3.5. Equipment: Candidate will provide all necessary diving equipment to complete this course (see suggest list below).

4. Instructor / candidate Ratio:

Theory/classroom: Instructor / Candidates maximum ratio 1:12

Practical/open water: Instructor / Candidates maximum ratio 1:3

5. Requirements of the instructor/assistants

5.1. Instructor /Course Leader:

5.1.1. Minimum 18 year of age.

5.1.2. CMAS 2 Star Instructor or equivalent.

5.1.3. CMAS Normoxic or Advanced Trimix Instructor.

5.2. National Qualifications: Instructor must have a valid instructor classification according to the requirements of his/her National Organisation or CDC.

5.3. Assistants: According to the requirements of the course leader.

6. Personal Equipment

6.1. Candidates will only provide their own diving equipment they are familiar with (Note: This is not a course for experimentation with new equipment).

6.2. All equipment used must well maintained and fit for the purpose.

6.3. Oxygen Service: Candidates will provide certification to prove that all:

6.4. Equipment for use with gas mixtures other than air is in "oxygen service",

6.5. Dive cylinders are in "test".

6.6. 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; Two stage-decompression cylinders including harnesses; one twin bladder Buoyancy Control device (BCD) (when diving in dry-suit single bladder BCD is sufficient); One runtime underwater slate/wet notes; one demand valve (DV) with standard inter-stage hose and one DV with 1.5m long inter-stage hose plus two decompression DVs all 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 50m 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) DV's;

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 (PDC's); two timing devices and a Jon-line.

7. Course Facilities:

7.1. A Class room suitable to match the needs of the course and number of candidates.

7.2. Open water diving locations suitable for the training needs:

7.2.1. One shallow for practising skills (20m maximum).

7.2.2. One deep for qualifying dives (60m maximum, subject to local conditions).

The course requires candidates to satisfactorily complete six open water dives, with a minimum of 300 minutes spent underwater. The first two dives using air or Nitrox, with a maximum depth of 20m, shall be used for practising Normoxic Trimix diving skills. The second pair of dives, to a maximum of 40m, should be Nitrox dives again practising skills and run-times. The final pair of dives shall be Normoxic Trimix dives to a maximum of 60m. All six dives must be performed with the candidates and Instructor(s) configured for Normoxic Trimix diving. The maximum ppO_2 at the Maximum Operating Depth (MOD) will be limited to 1.4bar. Additionally, Trimix dives must have a maximum Equivalent Narcotic Depth (END) of 40m.

The maximum ppO_2 during stage-decompression must not exceed 1.6bar. Safety requirements: On this course, candidates must under the direct supervision of a CMAS Trimix Instructor at all times.

8. Aims of the participants

At the end of the course, candidates must be able to demonstrate the required knowledge and skills related to Normoxic Trimix diving to the satisfaction of the Course Leader as follows:

8.1. Sit and pass the Normoxic Trimix theory examination.

8.2. Demonstrate, through application, a thorough understanding of the diving planning process {i.e. all trainees will plan their own dives; these plans will assessed by the Course Leader}.

8.3. Complete all the Normoxic Trimix in-water Skills to the satisfaction of the CMAS Trimix Course Leader.

9. Minimum course duration

Theory/practical lectures:	10 hours
Open water dives:	Six dives, with a minimum of 300 minutes in-water experience. No more than two dives per day. The surface interval between Dive one and Dive two will be not be less than 3-hours. The Bottom-Time at 60m will no greater than 15 minutes.

10. Quality Assurance

For the sake of safety and quality assurance CMAS highly recommend that Trimix authorised Federations use only high quality equipment. Federations are also commended to ask candidates to complete quality assurance feed-back questions, which can be used to analyse training courses; completed questionnaire to be returned to the National Federation.

Definitions

Normoxic: For the purpose of this Standard "Normoxic" means any mixture of breathable gas must have an oxygen content that will support human life at the surface, usually 21% but never lower than 18%.

Maximum partial pressures of oxygen limits at:

a. Maximum Operating Depth (MOD): 1.4bar.

b. Stage-stop depth: 1.6bar.

Normoxic Trimix Training Programme

1. Course Schedule

Minimum Duration

1. Theory: 10-hours.
2. Minimum amount of dives in open water: 6 dives with a minimum of 300 minutes in Water.

2. Course Content

2.1 Theory

T1 Theory lesson 1: Introduction

1. The benefits of Trimix.
2. Problems with Trimix.
3. A brief history of Mixed Gas Diving.

T2 Theory lesson 2 Physiology and Physics of Helium

1. Properties of Helium.
2. Tissue Solubility – a brief overview Oxygen, Nitrogen and Helium's solubility in human tissues.
3. Main Effects of Helium.
4. HPNS – A brief introduction to show it is not a concern for the Normoxic Trimix diver.
5. Other Inert Gas – a brief history of other inert gas not to be used.
6. Long Term Effects of deep diving – possible bone necrosis.
7. Bubble Formation and DeeP-stops

T3 Theory lesson 3 Planning Gas Mixtures

1. Travel Mixes, Decompression Gas
2. Selecting a gas mix:
    a. Standard Mixes.
    b. Custom.
3. The Best Mix.
4. Blending Trimix.
5. Heliair, Helium Safety, Trimix.
6. Cylinders cylinder markings.

T4 Theory lesson 4 Planning Gas Consumption

1. Gas Consumption.
2. Travel Gas: Ascent and Descent.
3. Loss of Travel Gas.
4. Bottom Mix. Decompression Reserves, Safety Reserves.
5. Run Time.
6. Oxygen Tracking, OTUs and CNS.
7. Emergency first aid Management.

T5 Theory lesson 5 Trimix Equipment

1. Basic Trimix Equipment.
2. Reels and distance lines.
3. Decompression Equipment:
    a. Up-line reels.
    b. Delayed surface Marker Buoys:
        i. Red to mark diver position.
        ii. Yellow for requiring emergency help.
    c. Trapeze systems
    d. Drop tanks.
    e. Drinking water.

T6 Theory lesson 6 Temperature and Exposure

1. Body Warmth.
2. Symptoms of Hypothermia.
3. Argon Suit inflation.
4. Underwater urination.

T7 Theory lesson 7 Dive and Decompression Planning

1. Teams, Operations.
2. Before the Dive, Enter the water, Descent, on the Bottom, Ascent.
3. Decompression strategies.
4. Surfacing
5. De-kitting.

T8 Theory lesson 8 Trimix Decompression Tables

1. Available Tables.
2. Computer Generated Tables.

2.2 Practical

P1 Practical lesson 1 Dive maximum depth of 20m with Air or Nitrox

1. Fully equipped with decompression tank.
2. Prepare a full dive plan, including dive gas and back-up gas, and escape routes for the proposed dive.
3. Exercising with the Normoxic Trimix diving skills.
4. Exercising with hooking and unhooking of stage or side-mount cylinders. Buoyancy Checks.
5. Exercising Diving skills (revision):
   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 you're your buddy with no mask.
   d. Demonstrate correct buoyancy at depth when cylinders are full; ± 0.5 metres.
   e. Demonstrate correct swimming trim (attitude).
   f. Demonstrate correct fining 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. Reel Laying a distance line (to return to the origin i.e. Anchor).
   k. Deploy a DSMB, working as a team, to the surface using the course procedure.
   l. Ascend the DSMB line, as a team, to the decompression stops and surface.

P2+3 Practical lesson 2+3 Dive max. 40m with Air or Nitrox

1. Fully equipped with decompression cylinder filled with a suitable decompression gas for the planned dive.
2. Stage-stop decompression with appropriate mixture(s)
   Where pure oxygen is used the:
   a. oxygen floor.
   b. decompression ceiling must be meticulously observed.
3. 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, using the existing line, to indicate assistance is required e.g. more gas!
4. Using Run-Time procedure.
5. Diving skills as above in P1-5.

P4 Practical lesson 4 Dive max. 50m with Trimix

1. Fully equipped with decompression cylinder filled with a suitable decompression gas for the planned dive.
2. Stage-Decompression Dive.
3. Using Run Time.

P5 Practical lesson 5 Dive max. 60m with Trimix

1. Fully equipped with decompression cylinder filled with a suitable decompression gas for the planned dive.
2. Stage-Decompression Dive.
3. Using Run Time.

P6 Practical lesson 6 Dive max. 60m with Trimix

1. Fully equipped with decompression cylinder filled with a suitable decompression gas for the planned dive Decompressing using oxygen there are two limits to observe the
   a. oxygen FLOOR.
   b.. decompression ceiling.
2. Stage-Decompression Dive.
3. Using Run Time procedure.

3. Examination

Recommended method (Practical): evaluate each module including the dive planning exercise mentioned in 2.1.2 above.

Recommended form (Theory): Written examination; Questioning technique: Multiple choice and written answers. Support material allowed: Calculator, Dive Tables, Oxygen Toxicity Tables etc.

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.

Advanced Trimix Diver Standard

1. Course Classification (Type and level):

1.1. 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.

1.2. Validity

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

1.3. Qualification Limits

Graduates are qualified to dive:

1.3.1. With so-called "Advanced" Trimix.

1.3.2. To a maximum operating depth (MOD), on completion of this course, of 100m, subject to a ppO_2 maximum of 1.4bar at the MOD (However, the maximum depth during training will be limited 85m).

1.3.3. Using Nitrox and /or oxygen for decompression purposes, subject to a maximum ppO_2 of 1.6bar.

2. Aims & priorities of the training:

2.1. To provide a clear understanding of the physical and physiological aspects of Sub-Normoxic Trimix diving and the strategies to cope.

2.2. To provide the candidate with a clear understanding of subject matter related "Sub-Normoxic" Trimix diving including the practical use of the additional diving and associated equipment, equipment configuration and supporting requirement.

2.3. 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.

3. Course entry qualifications:

3.1. Minimum 18 years of age.

3.2. Diving qualification: 3-Star diver CMAS or equivalent.

3.3. CMAS Normoxic Trimix Diver or equivalent.

3.4. CMAS Advanced Nitrox Diver (level 2) or equivalent qualification from a recognise diver training agency.

3.5. Minimum number of logged qualifying dives:

3.5.1. candidates must show logged proof of 20 Normoxic Trimix,

3.5.2. with two within the last month.

3.6. Medical declaration: Candidates must provide a medical declaration of fitness to dive, as set out by their National Federation.

3.7. Personally owned necessary technical equipment (see suggested equipment list below)

4. Instructor / candidate Ratio:

Theory/classroom	Instructor / Candidates ratio: 1:12
Practical/open water	Instructor / Candidates ratio: 1:3

5. Requirements of the instructor/assistants:

5.1. Instructor/Course Leader: i. Minimum 21 years of age.

5.2. Dive instructor qualifications: CMAS 2 star dive instructor.

5.3. CMAS Advanced Trimix instructor

5.4. 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 theatrical 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.

6. Personal Equipment:

6.1. Candidates will only provide their own diving equipment they are familiar with (This is not a course for experimentation with new equipment).

6.2. All equipment used must well maintained and fit for the purpose.

6.3. Oxygen Service: Candidates will provide certification to prove:

6.3.1. That all equipment for use with gas mixtures other than air is in "oxygen service",

6.3.2. All dive cylinders are in "test".

6.4. 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 1.5m 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 50m 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.

7. Course Facilities:

7.1. A Class room suitable to match the needs of the course and number of candidates.
7.2. Depth limits maximum 90m according to the local conditions and at the discretion of the Course Leader.
7.3. 4 dives totalling 300 minutes.
  7.3.1. The first dive should be a skills checkout dive to maximum 20m.
  7.3.2. The second should be a Normoxic Trimix dive to maximum 50m.
  7.3.3. The final two dives should be Advanced Trimix dives to maximum 90m, subject to the maximum depth allowed by national training standards
7.4. All 4 dives should be carried out with an Advance Trimix equipment configuration.

All dives must be limited to an upper ppO_2 limit of 1.4bar. Additionally, training dives must have a maximum END of 30m. The maximum ppO_2 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.

8. 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:
8.1. Sit and pass the Advanced Trimix theory examination.
8.2. Complete all the Advanced Trimix in-water Skills to the satisfaction of the CMAS Trimix Course Leader.

9. 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.

10. 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-back questions, which can be used to analyse training courses.

Definitions:

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.
Maximum diving ppO_2 limit: 1.4bar. {i.e. the ppO_2 at the maximum operating depth (MOD) of any dive must not exceed 1.4bar.}
Maximum decompressing ppO_2 limit: 1.6bar. {ie the ppO_2 during any section of the Stage-stop decompression process must not exceed 1.6bar.}

Advanced Trimix Diver 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

2.1. Theory

Run- time
Various decompression methods
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 ppO2incurred by exceeding the ppO2 of 1.6bar, HPNS, stress, vasodilatation, isobaric counter-diffusion, dehydration and in-water re-hydration).

2.2. Practical

2.2.1.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!

2.2.2.P2 Practical lesson 2 / Dive max. 50m 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)
4. Where pure oxygen is used the:
   a. Oxygen floor.
   b. Decompression ceiling must meticulously observed.
5. 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!
6. In-water re-hydration at the Stage-stop level.
7. 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).
   f. 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.

2.2.3.P3+4 Practical lesson 3+4 / Dive max. 90m 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 onP2-3.
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.

Normoxic Trimix Instructor Standard

1. Course Classification (Type and level):

1.1. Classification

This CMAS Normoxic Trimix Diver Instructor course is an advanced speciality course, which can only be undertaken after satisfying the entry standards as set out below.

1.1. Qualification term

This CMAS qualification has no expiry date. However, this requirement is subject to national standards (including medical status).

1.2. Qualification Limits

Qualification Limits

Graduates are qualified to instruct others to dive:

1.1.1. Using so-called "Normoxic" Trimix.

1.1.2. To a maximum operating depth (MOD) of 60metres, subject to a ppO_2 maximum of 1.4bar at the MOD.

1.1.3. Using Nitrox and /or oxygen for decompression purposes, subject to a maximum ppO_2 of 1.6bar.

1.1.4. To a recommended maximum Equivalent Narcotic Depth (END) of 40m.

1.2. Course documentation

The Course Director will provide all necessary course documentation.

2. Aims & objectives of the training are to provide:

2.1. The candidate with a clear understanding of CMAS standards and limitations related "Normoxic" Trimix diver instruction including the practical use of the additional diving and associated equipment.

2.2. A clear understanding of the physical and physiological aspects of Normoxic Trimix diving and strategies to cope.

2.3. Under the supervision of a Trimix Course Director, classroom teaching experience, practical open water skills teaching and assessment in open water at the CMAS Trimix level.

3. Course entry qualifications:

3.1. Minimum age 20years.

3.2. **Diving qualification**: CMAS Normoxic Trimix Diver or equivalent qualification from a recognised diver training agency.

3.3. **Instructor qualifications:** CMAS 2-Star Instructor and CMAS Advanced Nitrox Instructor.

3.4. **National Qualifications:** Must be an instructor with an active teaching status according to the requirements of his/her National Organisation or CDC.

3.5. **Other qualifications:** CMAS Gas Blender or equivalent qualification from a recognised diver training agency.

3.6. **Minimum number of logged qualifying dives:** Candidates must show proof of 12 Normoxic Trimix dives.

3.7. **Medical declaration**: Candidates must provide a medical declaration of fitness to dive, as set out by their National Federation.

3.8. **Insurance**: A suitable Third Party and Public liability insurance is held, as required by their National Federation covering this type of diving.

3.9. **Equipment**: The candidate will provide all necessary diving equipment to complete this course (see suggest list below).

4. Instructor / candidate maximum Ratio:

4.1. **Theory/classroom:**	Instructor / Candidates ratio:	1:8
4.2. **Practical/open water:**	For the air or Nitrox course dives:	1:4
	Dives involving Trimix ratio:	1:2

5. Personal Equipment:

5.1. Candidates will only provide their own diving equipment they are familiar with (Note: This is not a course for experimentation with new equipment).

5.2. All equipment used must properly maintained and fit for the purpose.

5.3. Oxygen Service: Candidates will provide certification to prove that all:

5.4. Equipment for use with gas mixtures other than air is in "oxygen service",

5.5. Dive cylinders are in "test".

5.6. 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; Two 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 slate; one demand valve (DV) with standard inter-stage hose and one DV with a minimum of 1.5metre long inter-stage hose plus two-decompression DVs all with submersible contents pressure gauges; one primary underwater torch and one back-up underwater torch depending on underwater visibility conditions; two small very sharp knives (or small sharp knife and a line-cutter); two face masks; two decompression reels each with 50m 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.

Additionally, candidates will either have direct access to or own a Helium (He) and Oxygen (O_2) gas analyser.

6. Course Facilities:

6.1. A Class room suitable to match the needs of the course and number of candidates.

6.2. Open water diving locations suitable for the training needs:

6.2.1. One shallow for practising skills (20m maximum).

6.2.2. One deep for qualifying dives (60m maximum, subject to local conditions).

7. Aims of the participants:

At the end of the course, candidates must be able to demonstrate the required knowledge and teaching skills related to Normoxic Trimix diver instruction to the satisfaction of the Course Director as follows:

7.1. Sit and pass the Normoxic Trimix theory examination.

7.2. Demonstrate, through application, the teaching of at least two of the Normoxic Trimix classroom lessons.

7.3. Demonstrate the teaching of all the Normoxic Trimix in-water Skills.

7.4. Demonstrate through practical the in-water assessment of at least two trainee Normoxic Trimix Trainee divers.

7.5. Demonstrate through practical application the assessment of at least two dive plans presented by trainee Normoxic Trimix Trainee divers.

8. Minimum course duration:

Theory/practical lectures:	6 hours (3 of which have to be on the theory)
Open water dives:	Four dives, with a minimum of 160 minutes in-water experience. No more than two dives per day. The surface interval between Dive one and Dive two will be not be less than 3-hours. The Bottom-Time at 60m will no greater than 20 minutes.

9. Quality Assurance:

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

Federations are also commended to ask candidates to complete quality assurance feed-back questions, which can be used to analyse training courses; completed questionnaire to be returned to the National Federation.

Definitions:

Normoxic: For the purpose of this Standard “Normoxic” means any mixture of breathable gas must have an oxygen content that will support human life at the surface, usually 21% but never lower than 18%.

Maximum partial pressures of oxygen limits at :

Maximum Operating Depth (MOD):	1.4bar.
Stage-stop depth:	1.6bar.

Advanced Trimix Instructor Standard

1. COURSE CLASSIFICATION (TYPE AND LEVEL):

1.1. Classification

This CMAS Advanced Trimix Instructor course is an extreme diving speciality course, which can only be undertaken after satisfying the entry standards as set out below:

1.2. Qualification term

This CMAS qualification has no expiry date, subject to national standards and medical status.

1.3. Qualification Limits

Graduates are qualified Instruct and Examine candidates for Advanced Trimix certification:

1.3.1. Using so-called "Advanced" Trimix to a maximum operating depth (MOD) of 100m, subject to a ppO_2 maximum of 1.4bar at the MOD with a maximum Equivalent Narcotic Depth (END) of not exceeding 40metres.

1.3.2. Nitrox and /or oxygen for decompression purposes, subject to a maximum ppO_2 of 1.6bar.

1.4. Course documentation

Instructor will provide all necessary course documentation.

2. AIMS & OBJECTIVES OF THE TRAINING:

2.1. To provide the candidate with a clear understanding of teaching and examining on the subject matter related "Advanced" Trimix diving including the practical use of the additional diving and associated equipment.

2.2. To ensure the candidate has a clear understanding of the physical and physiological aspects of Advanced Trimix diving and strategies to cope.

2.3. To ensure the candidate has a provide a clear understanding of the extensive dive planning required for

2.4. Advanced Trimix diving, including Risk assessment, equipment selection, equipment configuration, Backup gas, escape routes, accelerated decompression and support teams.

2.5. Demonstrate the use of different mixtures during the dive i.e. travel and bottom gases

2.6. Demonstrate Gas switching between travel and bottom mixtures.

3. ADVANCED TRIMIX INSTRUCTOR - COURSE ENTRY QUALIFICATIONS:

3.1. ***Minimum age,*** 20-years.

3.2. Diving qualification

CMAS Advanced Trimix Diver or equivalent qualification from a recognised diver training agency.

3.3. Instructor qualifications

CMAS Normoxic Trimix Instructor, or equivalent qualifications from a recognised diver training agency.

3.4. Minimum number of logged qualifying dives

Candidates must show proof of 24 Trimix dives (minimum of 10 dives 70-100m).

3.5. Trimix instruction experience

Acted as an assistant on at least one Advanced Trimix course.

3.6. Medical declaration

Candidates must provide a medical declaration of fitness to dive, as set out by their National Federation.

3.7. Insurance

Hold suitable Third Party and Public liability insurance as required by their National Federation.

3.8. Equipment

Candidate will provide all necessary diving equipment to complete this course (see suggest list below).

4. ASSISTANT TRIMIX ADVANCED INSTRUCTOR - COURSE ENTRY QUALIFICATIONS:

4.1. Minimum age

20-years

4.2. Minimum Instructing Qualification

CMAS Normoxic Trimix Instructor (active status)

4.3. Other Qualifications

Advanced Trimix Diver or equivalent

4.4. Limitations

May not sign authorisation on C-Cards.

5. INSTRUCTOR. CANDIDATE RATIO:

Theory/classroom

Instructor / Candidates maximum ratio: 1:8

Practical/open water

Instructor / Candidates maximum ratio: 1:4 up to 40m
1.2 beyond 40m

6. PERSONAL EQUIPMENT:

6.1. Candidates will provide diving equipment they are familiar with (Note: This is not a course for experimentation with new equipment).

6.2. All equipment used must well maintained and fit for the purpose.

6.3. Oxygen Service: Candidates will ensure that all:

6.3.1. equipment for use with gas mixtures other than air is “oxygen clean”,

6.3.2. dive cylinders are certified for use.

6.4. Equipment list

One Twin cylinder set (manifolded with central isolation or matched cylinders without manifold); Two 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; one demand valve (DV) with standard inter-stage hose and one DV with minimum of a 1.5m long interstage hose plus two-decompression DVs all 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.

Additionally, candidates will either have direct access to or own a Helium (He) and Oxygen (O_2) gas analyser.

Scooters may be used at the discretion of the course director.

7. COURSE FACILITIES:

7.1. Any Class room must be suitable to match the needs of the course and number of candidates.

7.2. Open water diving locations suitable for the training needs:

7.2.1. One shallow section for practising skills (20m maximum).

7.2.2. One deep section for qualifying dives (80m maximum, subject to local conditions).

7.3. The course requires candidates to satisfactorily complete six open water dives, with a minimum of 300-minutes spent underwater. The first two dives using air or Nitrox, with a maximum depth of 20m, shall be used for practising Advanced Trimix diving skills. The second pair of dives, to a maximum of 40m, should be Nitrox dives again practising skills and run-times. The final pair of dives shall be Advanced Trimix dives to a maximum of 80m. All six dives must be performed with the candidates and Instructor(s) configured for Advanced Trimix diving.

The maximum ppO_2 at the Maximum Operating Depth (MOD) will be limited to 1.4bar. Additionally, Trimix dives must have a maximum Equivalent Narcotic Depth (END) of not exceeding 40m.

The maximum ppO_2 during stage-decompression must not exceed 1.6bar.

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

8. AIMS OF THE PARTICIPANTS:

At the end of the course, candidates must be able to demonstrate the required knowledge and skills related to Advanced Trimix diving and to the satisfaction of the Course Director as follows:

8.1. Pass the Advanced Trimix theory examination.

8.2. Demonstrate, through application, a thorough understanding of the diving planning process {i.e. all trainees will plan their own dives; these plans will assessed by the Course Director}.

8.3. Complete all the Advanced Trimix in-water Skills to the satisfaction of the CMAS Trimix Course Director.

9. MINIMUM COURSE DURATION:

9.1. Theory/practical lectures

10 hours

9.2. Open water dives

Six dives, with a minimum of 300-minutes in-water experience. No more than two dives per day. The surface interval between Dive one and Dive two will be not be less than 3-hours. The Bottom-Time at 80m will no greater than 15 minutes one dive per day at this depth.

10. QUALITY ASSURANCE:

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

Federations are also recommended to ask candidates to complete quality assurance feed-back questions, which can be used to analyse training courses; completed questionnaire to be returned to the National Federation.

DEFINITIONS:

Advanced

For the purpose of this Standard “Advanced” means that the Bottom Gas will not support life on the surface.

Maximum partial pressures of oxygen limits at

10.1.1. Maximum Operating Depth (MOD): 1.4bar

10.1.2. Stage-stop depth: 1.6bar

Travel Gas

A gas mixture, usually Nitrox, used on the surface and to travel from the to the desired gas switching depth. It is used to overcome the short comings of the “Bottom Gas”.

Bottom Gas

For this course and qualification it is a mixture of oxygen, helium and nitrogen termed as Trimix and is designed to limit the toxic effects of oxygen and nitrogen at depth. Therefore, during advanced Trimix dives the content of oxygen may not support human life at the surface.

Trimix Instructor Trainer Standard

1. Course Goals – Instructor Profile

The CMAS Trimix Instructor Trainer is qualified to assess and evaluate CMAS Trimix Instructors and CMAS Advanced Trimix Instructors and will have knowledge of Trimix Blending.

2. Appointment Pre-requisites:

2.1. Minimum Age:	20 years
2.2. Entry Qualifications:	CMAS Three Star Instructor actively teaching Trimix. Needs to have trained and certified students in two courses. The National Federation has to approve this person.
2.3. Minimum number of dives:	24 logged Advanced Trimix dives
2.4. Fitness to dive:	Have a valid medical assessment according to National Standards

3. Certification

Recognition will be given by each National Federation as appropriate.