

# NITROX DIVING GUIDELINES

The following sets out the requirements for the use of the use of Nitrox by Flinders University divers.

**1** Prerequisites

* 1. **Authorisation**
1. Written authorisation from the Maritime Safety Dive Officer (MSDO) and relevant College Dean must be obtained before nitrox can be used on any Flinders University dive.
2. Any proposed nitrox dive must be flagged clearly by the Dive Coordinator on the dive plan as part of the dive approval process.
	1. **Training**

A diver wishing to undertake nitrox diving must

• hold an approved Nitrox diver certification from a recognised diver training organisation; and

• have logged at least 10 dives using nitrox.

**1.3 Certification Requirements**

To obtain a Nitrox diver certification, which must be obtained via a suitable RTO, each diver must demonstrate proficiency in skills and theory in written, oral, and practical examinations covering:

• Written examinations covering the information presented in the classroom training session (i.e., gas theory, oxygen toxicity, partial pressure determination, etc);

• Practical examinations covering the information presented in the practical training session (i.e., gas analysis, documentation procedures, etc);

• Open water checkout dives, to appropriate depths, to demonstrate the application of theoretical and practical skills learned.

**2 Flinders University Nitrox Diving Requirements**

**2.1 Dive Personnel Requirements**

1. On any dive during which nitrox will be used by any team member, the Dive Coordinator must be an authorised Flinders University Nitrox Diver, and hold appropriate authorisations required for the dive as specified above.
2. In addition to responsibilities listed in *Section 1* of the [Diving and Snorkelling Safety Manual](https://staff.flinders.edu.au/content/dam/staff/documents/whs/diving-procedures-manual.pdf), the Dive Coordinator must:

• As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorised;

• As part of the pre-dive procedures, confirm with each diver the nitrox mixture the diver is using, and establish dive team maximum depth and time limits, according to the shortest time limit or shallowest depth limit among the team members;

• The Dive Leader must also reduce the maximum allowable pO2 exposure limit for the dive team if in-water conditions change during the dive.

* 1. **Oxygen Exposure Limits**
1. The inspired oxygen partial pressure experienced at depth should not exceed 1.4 ATA.
2. All dives performed using nitrox breathing mixtures must comply with the current NOAA Diving Manual “Oxygen Partial Pressure Limits for ‘Normal’ Exposures”.
3. The maximum allowable exposure limit must be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected, and the MSDO should consider this in the review of any dive plan application, which proposes to use nitrox.
4. The Dive Coordinator must review on-site conditions and reduce the allowable pO2 exposure limits if conditions indicate this would reasonably be warranted.
5. If using the equivalent air depth (EAD) method the maximum depth of a dive must be based on the oxygen partial pressure for the specific nitrox breathing mix to be used.
	1. **Bottom Time Limits**
6. Maximum bottom time should be based on the depth of the dive and the nitrox mixture being used.
7. Bottom time for a single dive should not exceed the NOAA maximum allowable “Single Exposure Limit” for a given oxygen partial pressure, as listed in the current NOAA Diving Manual.
	1. **Decompression Tables and Gases**
8. A set of Flinders University approved nitrox decompression tables must be available at the dive site for all nitrox dives unless using the equivalent air depth (EAD) method
9. .in which case EAD dives should be conducted using the short form DCIEM air decompression tables.
10. If nitrox is used to increase the safety margin of air-based dive tables, the maximum operating depth (MOD), oxygen exposure and time limits for the nitrox mixture being used must not be exceeded.
11. Breathing mixtures used while performing in-water decompression for safety stops or for bail-out purposes, must contain the same or greater oxygen content as that being used during the dive, within the confines of any applicable depth limitations and the oxygen partial pressure limits outlined above.

**3 Nitrox Dive Computers**

1. Dive tables are required for planning all University dives.
2. Diver computers may be used to assist the Divers to stay within safe limits
3. Written approval from the MSDO is needed if a dive computer is to be used to compute decompression status during nitrox dives.
4. Use of a nitrox dive computer will only be permitted subject to the following:

• Any computer used must be set to a personal adjustment level determined by the MSDO before use;

• The diver must follow the manufacturer’s guidelines and operating instructions for the computer to be used

• The MSDO must be satisfied that any Flinders University diver seeking approval to use a nitrox dive computer demonstrates a clear understanding of the operation and manipulation of the computer.

• Where nitrox is used to increase the safety margin of an air-based dive computer, the MOD and oxygen exposure and time limits for the nitrox mixture being dived must not be exceeded;

• Dive computers capable of pO2 limit and fO2 adjustment MUST be checked by the diver prior to the start each dive to ensure compatibility with the mix being used.

**4 Repetitive Diving**

1. Repetitive dives using nitrox mixtures must be performed in compliance with all procedures required by the specific dive tables used.
2. Residual nitrogen time should be based on the EAD for the specific nitrox mixture to be used on the repetitive dive, and not that of the previous dive.
3. The total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24-hour period must not exceed the current NOAA Diving Manual 24-hour Oxygen Partial Pressure Limits for “Normal” Exposures.
4. When repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers must account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (CNS) and chronic (pulmonary) oxygen toxicity concerns should be addressed.

**5 Oxygen Parameters**

**5.1 Gas Mixes**

Only gas mixes that are approved by the MSDO and College Dean may be used for nitrox diving. These would usually be either EAN32 or EAN36.

**5.2 Purity**

Oxygen used for mixing nitrox breathing gas must meet the purity levels for “Medical Grade” (U.S.P.) or “Aviator Grade” standards.

In addition to the [AAUS Standards](https://aaus.org/diving_standards) Air Purity Guidelines, the additional below requirements must also be met for breathing air that is either;

a) Placed in contact with oxygen concentrations greater than 40%, or

b) Used in nitrox production by the partial pressure mixing method with gas mixtures containing greater than 40% oxygen as the enriching agent:

**6 Gas Mixing and Analysis**

**6.1 Personnel Requirements**

1. Individuals responsible for producing and/or analysing nitrox mixtures must be trained and experienced in all aspects of the technique; and
2. Only those individuals approved by the MSDO are permitted to be responsible for mixing and/or analysing nitrox mixtures.

**6.2 Production Methods**

1. The specific nitrox production method used for a Flinders University diving operation must be approved by the MSDO and relevant College Dean as part of the Dive Plan;
2. Prior to any dive each diver is responsible for analysing the oxygen content of his/her scuba cylinder, and acknowledging in writing the following information for each cylinder:
3. pO2, MOD, cylinder pressure,
4. date of analysis,
5. user’s name.

**7 Nitrox Diving Equipment**

**7.1 Equipment requirements**

1. AS2299.2 Scientific Diving Standard applies to diving equipment used in nitrox SCUBA operations.
2. Additional equipment necessary for nitrox diving operations includes:
3. Labelled SCUBA cylinders
4. Oxygen analysers; and
5. ‘Oxygen clean’ regulators/gauges where this is recommended by the equipment manufacturer.

**7.2 Oxygen Cleaning and Maintenance Requirements**

1. All equipment which during a dive or cylinder filling process is exposed to concentrations of greater than 40% oxygen at pressures above 10 ATA must be cleaned and maintained for oxygen service.
2. Equipment used with oxygen or mixtures containing over 40% by volume oxygen must be designed and maintained for oxygen service.
3. The following equipment, which operates at greater than 8 ATA must have slow-opening shut-off valves:

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| scuba cylinders | cylinder pressure gauges |
| scuba and other regulators | cylinder valves |
| hoses  | diver support equipment |
| compressors | fill station components & plumbing |

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