

KFT - Recommended action 4 for the preparation of Nitrox gas mixtures in the context of scientific diving operations in accordance with DGUV Regulation 101-023 " Operation of research divers".

Developed by the Research Diving Commission Germany in cooperation with the Employer's Liability Insurance Association for the Construction Industry - Prevention

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1. Scope of application

This recommended action of the Commission for Research Diving Germany (KFT) concerns the mixing of Nitrox gas mixtures (oxygen content greater than 21 %) for scientific diving operations in accordance with DGUV Regulation 101-023 "Use of research divers".

2. Prerequisite

For scientific dives using Nitrox as breathing gas, all members of the diving group must have additional training in the use of Nitrox (KFT Nitrox User, KFT Nitrox Instructor) recognised by the KFT. The training can take place in a scientific diver training facility authorised by the KFT and is certified after the successfully passed examination. The basis of the KFT-certified Nitrox training and the use of Nitrox during scientific dives is the KFT Recommendation for Action 1.

3. Regulations

In scientific diving, both state and German Social Accident Insurance (DGUV) regulations, rules and information must be taken into account. In principle, all dives should be carried out on the basis of DGUV Regulation 101-023 " Operation of scientific divers". In order to minimise the risks of the dives, a risk assessment must be prepared and documented in the planning phase, which ends at the diving site with an effectiveness check by the diving supervisor. The calculation of the dive is based on the DGUV Information 201-033 "Instructions for diving operations with mixed gas" in conjunction with the respective valid diving tables of the DGUV Regulation 101-023 " Operation of scientific divers".

4. Hazards when handling oxygen / medical oxygen

Oxygen is not combustible, but leads to a considerable increase in the rate of combustion even at low levels of enrichment in the breathing air. In addition, oxygen can cause spontaneous combustion of oil and grease as well as textiles contaminated with oil and grease. Increased oxygen concentrations can also adversely affect safety characteristics such as explosion limits, ignition and glow temperatures, explosion pressures and flame temperatures. There is thus an increased risk of fire and explosion. With the exception of precious metals and metal oxides of the highest oxidation state, all substances are flammable in oxygen, especially in compressed oxygen (e.g. titanium and its alloys). The reactions can be strongly influenced by foreign substances that act as catalysts or inhibitors (DGUV Information 213-073 "Oxygen").

Oxygen pressure surges on system components (e.g. valves, throttle elements, ...) must be avoided; these lead to heating and thus potentially to a change in the material structure. The



immediate danger of bursting of the pressurised fitting and an escape of oxygen is the consequence.

All materials that come into contact with an oxygen content greater than 21% must be oxygen compatible. This applies to all equipment needed for the production of Nitrox.

5. Knowledge required to handle oxygen and produce Nitrox for scientific diving missions

In order to obtain the required qualification for the production of Nitrox, the handling of pure oxygen, the production of Nitrox gas mixtures as well as the operation of the technical equipment used in each individual case must be taught. Appropriate training must be provided by qualified personnel (e.g. gas manufacturers, professional associations, operator course of the manufacturer of filling equipment ...).

5.1 Oxygen

The competence to handle oxygen can be acquired through training courses (e.g. at commercial providers under the term "Specialist training courses for competent persons - Fundamentals of oxygen" or similar).

The contents to be taught should correspond to DGUV Information 213-073 "Oxygen". Focal points for training in the handling of oxygen are:

- Properties and characteristics
- Manufacture, use, prohibition of use
- Health hazards
- Risk assessment
- Technical, organisational and personal protective measures
- First aid

5.2 Nitrox

Building on the knowledge acquired under 5.1, specialist training in the production of Nitrox gas mixtures is required. A corresponding training for the qualification must be carried out by trained specialist personnel (e.g. operator course of the manufacturer of filling systems, professional associations, ...).

The focal points to be taught for the production of Nitrox should include at least the following topics:

- Legal responsibilities when preparing Nitrox gas mixtures.
- Gas mixing and handling regulations.
- Gas components and their special features in Nitrox gas mixtures.
- Basics of oxygen handling in the preparation of Nitrox breathing gas mixtures.
- Oxygen hazards in the production of Nitrox breathing gas mixtures.
- Causes and prevention of oxygen fires in the production of Nitrox breathing gas mixtures.

- Technical systems and requirements of oxygen systems and systems for gas production and gas storage.
- Nitrox compatible compressors
- Nitrox compatible SCUBA (aLTG)
- Nitrox filter systems
- Nitrox measuring devices
- Nitrox mixing techniques
- Oxygen analysis
- SCUBA handling and labelling

The Contractor shall ensure that the special knowledge in handling the respective equipment used is imparted.