Safety accessories

Preventing and reducing risks in the work place

Working with cryogenic liquids, and liquid nitrogen in particular (-196°C), requires strict rules to be followed. These rules are designed to prevent or reduce two major hazards: anoxia and cryogenic burns caused by contact with liquid nitrogen.

Anoxia

Oxygen is an essential element in maintaining life. Therefore, it is necessary to assure that the air one works in has an adequate level of oxygen. Anoxia, caused by insufficient levels of oxygen, is a real risk in all areas of cryogenic activities and applications, e.g. bio-repositories and cryogenic laboratories.

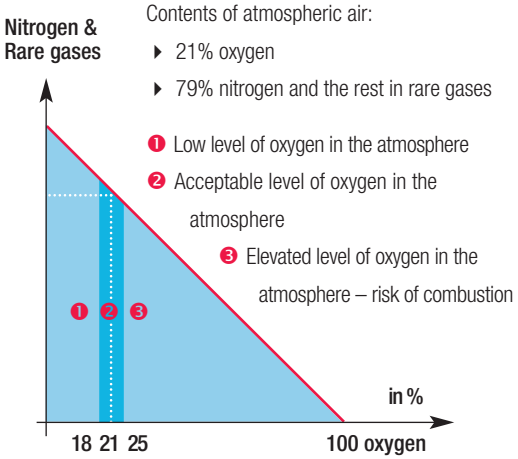
The response of an organism to under-oxygenation in the air is highly variable from one individual

to the next. In addition, human sensory organs are incapable of

detecting the dangers of low oxygen levels in the air.

The cause of anoxia: a lack of oxygen in the air

The air we breathe is made up of 21% oxygen, 79% nitrogen and very small amounts of rare gases. At normal atmospheric pressure, liquid nitrogen will vaporize above -196°C. A decrease in oxygen levels, caused by an increase in the nitrogen levels in the air, can easily occur in any cryogenic area or room during routine activities and procedures, e.g. loading and unloading samples in cryogenic freezers and using vessels that store liquid nitrogen. In fact, the manipulation of liquid nitrogen will result in its vaporization and at normal atmospheric pressure 1 liter of liquid nitrogen will produce 691 liters of gas when warmed up to an ambient room temperature.



Tel +33 (0)1 64 76 15 00 **Fax** +33 (0)1 64 76 16 98 **E-Mail** order.cryopal@airliquide.com **Web** www.cryopal.com

Anoxia

Detecting under – oxygenation
WARNING!

Most of the gases used in cryogenic applications are undetectable by humans

Best method and practices for measuring oxygen levels:
A continuous method of measurement is necessary for areas and rooms where the concentration of oxygen may be dangerously altered during routine activities and procedures, e.g. loading and unloading samples in cryogenic freezers and using vessels that store liquid nitrogen.

A non-continuous method of measurement may be used if the time-lapse between two readings and analyses of the oxygen levels in the air are realized in a short enough time frame to signal an alarm is the oxygen levels are too low.

Preventing anoxia: some precautions to take

A small amount of nitrogen gas in liquid phase has the potential to create a much larger volume in an atmospheric phase. Consequently, a liquid nitrogen leak or spill in a confined or inadequately ventilated space can very quickly result in a dangerously low level of atmospheric oxygen. To eliminate this risk, the user needs to make sure that where the nitrogen liquid or gas is present, both in the work and storage spaces, that there is sufficient ventilation and if needed permanent or portable oxygen detectors and for emergency situations portable individual respirators should be made easily accessible.

Safety accessories

Burns caused from splashing or contact

Handling products stored in liquid nitrogen or working with cryogenic fluids create an extremely high risk factor for cryogenic burns.

These burns can have serious consequences, especially when the eyes or face are involved.

Therefore, it is imperative to reduce the risks of burns from splashing or contact with liquid nitrogen.

Recommendations and pictograms to use when working with liquid nitrogen

Warning signs: extreme low temperature

Mandatory: to read the user's manual

Mandatory: protection of hands by using correctly adapted cryogenic protective gloves or related equipment.

Mandatory: protection of the face and eyes by using correctly adapted cryogenic protective glasses, visor or related equipment.

Mandatory: make sure that all cryogenic work and storage rooms are correctly ventilated and have the appropriate oxygen level detectors and alarms and Anoxia safety masks

Not allowed: do not touch directly, at any time, items that have been in contact with liquid nitrogen

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Safety in the workplace

Wear safety glasses or a visor, gloves and protective accessories, e.g. cryo apron and gaiters.

A portable oxygen detector is also recommended for detecting dangerous levels of:

- carbon-monoxide
- hydrogen sulphide, oxygen
- nitrogen oxide
- sulphur dioxyde

Prescription eye glasses are not protective.

The unprotected hand should never manipulate any items that have been in contact with liquid or gaseous nitrogen.

The hands, even when wearing the cryo-gloves, should never be submerged in a cryogenic liquid.

Safety accessories		References
A: Visor		ACC-SECU-1
B: Protective glasses		ACC-SECU-2
C: Cryogenic gloves	size 8	ACC-SECU-15
	size 9	ACC-SECU-16
	size 10	ACC-SECU-17
	size 11	ACC-SECU-18
D: Gaiters	size M (38-42)[1]	ACC-SECU-12
	size L (42-46)[2]	ACC-SECU-13
E: Portable oxygen detector		ACC-SECU-102
F: Cryo-apron	unique size	ACC-SECU-19

1) M = diameter of calves 46.5 up to 48.5 cm.

2) L = diameter of calves 47.5 up to 49.5 cm.