SUB'ROCA

Underground Safety Life

EMERGENCY RESCUE CHAMBER

MADE IN FRANCE

WG 5 ITA ; BS EN 16191 ; EN 12021 ; 97/23/CE ; IEC 60364 ; ISBN 0-7176-2006-9 COMPLIANT

Our values

EXCELLENCE
We surpass ourselves every day to give the best of ourselves.

PROXIMITY
We maintain relationships of trust, based on listening and proximity.

BENEVOLENCE
Our aim is to make security accessible to everyone.

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SUB'ROCA REFUGE CHAMBERS

Modular SHELT'AIR Rescue Chambers for Mining and Tunnelling

SUB'ROCA is a leading manufacturer of equipment for tunneling and mining environments. Our decades of experience in mining have allowed us to introduce the best technologies and practices in our range of emergency shelters. We are continually researching and developing this range to meet the demands of the international mining and tunneling market.

Emergency shelters, also known as survival cabins or chambers, are equipment designed to increase the chances of survival for personnel in the event of an underground disaster. They provide a safe area where personnel can regroup while awaiting extraction by a specialized team.

Based on know-how recognised by the main players operating in underground environments, SUB'ROCA has developed four ranges of emergency and rescue shelters to suit all your projects:

STANDARD RANGE

The STANDARD range complies with ITA and EN standards and offers all the necessary features for the safety of personnel.

NARROW RANGE

The NARROW range features a narrow width to fit the shelter into small spaces such as narrow galleries and veins.

COMPACT RANGE

The COMPACT refuges are very mobile and can accommodate a limited number of people.

CUSTOMIZABLE RANGE

The CUSTOMISABLE range can be adapted to your specific needs, for example to integrate a shelter on specific equipment (tunnel boring machine or rescue vehicle).

Our Shelt'Air shelters are designed to be simple and intuitive to use. They incorporate state-of-the-art technology for monitoring and controlling indoor and outdoor parameters. Given the risks frequently encountered in underground environments, such as fires, explosions and the release of smoke and other toxic gases, a high level of safety planning must be in place.

TRANSPORTABLE and MODULAR

The emergency shelter is designed as a modular system with modules that can be assembled and easily moved to active work areas, depending on the phasing of the work. Each module is equipped with:

- ✓ Robust skid base section
- ✓ Towing points (front and rear)
- ✓ Fork lift slots (side for larger chambers, front & sides for smaller chambers)
- ✓ Lifting eyes on all four corners.

STRUCTURE

The emergency shelter is designed and built on a steel structure, which is totally airtight, making uncontrolled air leakage impossible once the doors are closed.

- ✓ Control valves at the front of the shelter ensure that the interior space of the shelter is sufficiently pressurised to prevent pollution from outside.
- ✓ The walls and structures are constructed from 4mm steel plate continuously welded to ensure watertightness. Numerous tube and profile reinforcements ensure the mechanical strength of the whole structure when lifting or moving.

The skid frame, also known as a sled, is specially designed to withstand the high stresses created by frequent movement to different locations in the underground site.

MODULAR DESIGN

The modules are simply assembled by screwing the perimeter flanges together, after the application of a fire resistant seal.

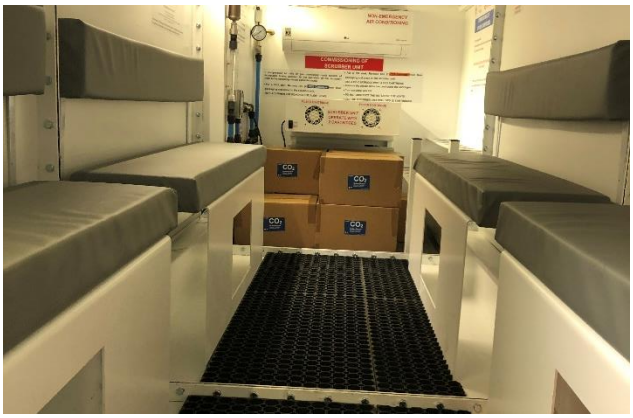
The use of fire resistant and efficient gaskets allows the operator to be self-sufficient in assembling or disassembling the shelter modules if necessary.

CAPACITY

Each shelter is equipped with side benches to accommodate the occupants. The capacity is directly proportional to the number of seating modules installed. This number can evolve over time

The autonomy of the shelter is designed to ensure all the main functions necessary for life for the desired duration.

6 to 32 people
24, 36 and 72 hours of autonomy



POWER

The SUB'ROCA refuge, in standby mode, are connected to the mains supply (mine or tunnel).

The inverter/charger of the refuge operates on 230 volts AC, 50 Hz and is protected by a 20A differential protection.

The shelter can be equipped with an optional 1000VAC transformer to connect to the site's electrical grid and convert the voltage to 230VAC, which can be used by the shelter.

BATTERY BACK UP

The emergency shelter uses a backup power source via batteries to power the shelter's electrical systems in the event of a loss of main power. The bi-directional inverter incorporates a floating charger which is used to continuously maintain the battery backup system so that it can power the refuge chamber in the event of a failure or disruption of the 'main power'.

The batteries are deep cycle gel, with no maintenance required.

Each battery is 2V 1000AH, designed for a critical application where frequent deep discharges are required.

The shelter incorporates a 24VDC inverter/charger that automatically initiates in the event of a loss of grid power.

The inverter is connected to 2VDC batteries in series, with fuse protection. The battery system is equipped with a lockable isolator to fully isolate the power source from DC.

PROCEDURES

Procedures and instructions on the wall:

- ✓ Operating Procedure
- ✓ Air management
- ✓ Refuge Chamber Control Panel
- ✓ CO/CO2 Scrubber
- ✓ Oxygen Flow Regulator Installation & Operation

A hard copy of the complete manual is also provided.

ELECTRICAL SYSTEM

The wiring is in accordance with the relevant standards.

The shelter is powered by 220-240V AC, 50Hz or is equipped with an optional transformer to convert the incoming voltage to that required by the 220-240V AC controller.

Thermal protection is installed to protect the equipment.

The steel structure of the shelter is earthed.

Mains power supplies the air conditioner and other auxiliary equipment and charges the batteries through the smart charger. In the event of a power failure, the inverter provides high quality sine wave power to all 230VAC equipment without interruption.

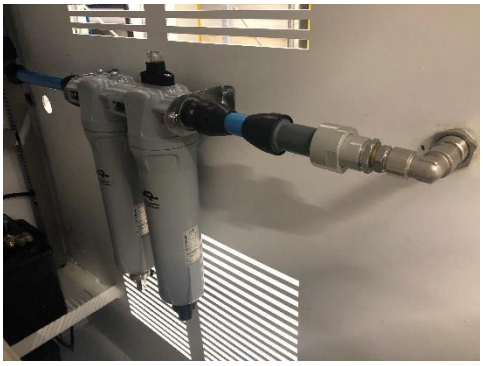
Fully charged backup batteries provide enough power to run all equipment for 24 hours.

The lighting operates on a 24VDC LED system, as well as external red and green strobes located on the side of the shelter entrance door.to the side of the Refuge Chamber entry door.

AUXILIARY CONNECTION

A plate can be provided to install a radio and/or a telephone (not supplied by SUB'ROCA), including sockets, wiring and cable glands.

An interior surveillance camera can also be installed and send the images to your GTC.



NETWORK COMPRESSED AIR

SUB'ROCA refuges can be equipped with a socket to allow connection to an external compressed air supply from a fixed network.

The site's compressed air is processed through an air filter kit located at the back of the refuge in the technical room.

The incoming air is purified through three stages of filtration, where each stage is equipped with an automatic drain for condensate removal. The network's compressed air supply circuit is equipped with a non-return valve to prevent the refuge from becoming depressurised if the network supply is lost.

To ensure the quality of the network air, compressors should be located above ground and free of oil to prevent the introduction of carbon monoxide.

The air supply from the site network can be switched on/off from inside the chamber using a 3-way valve.

The air inside the shelter is exhausted to the outside via control valves to ensure optimum pressurisation.

If there is no compressed air network on site, the installation of breathable compressed air cylinders is necessary.

CHEMICAL TOILET

Each chemical toilet has a capacity of 15 litres and is supplied with deodorant and toilet paper.

AIR CONDITIONING SYSTEM

The SUB'ROCA shelter incorporates an air conditioning unit to combat the potentially fatal effects of heat build-up.

R410A Refrigerant Gas
Kaden 2.5 kwh

CO/CO^2 SCRUBBER UNIT – SCRUB'TECH®

The CO/CO2 scrubber is a stand-alone unit located in the "living" area of the shelter.

The scrubber unit is controlled by the SUB'ROCA intelligence system and is designed to provide rapid emergency operation of the carbon monoxide (CO) and carbon dioxide (CO2) scrubber.

The scrubber is designed to clean the air in confined spaces where human life needs to be sustained over a period of time. The objective is to remove CO and CO2 from the air in the shelter to prevent carbon monoxide and carbon dioxide poisoning.

The scrubber unit is used in conjunction with medical oxygen cylinders (not supplied) and a medical grade flow regulator.

PILOTASSIST® & SAFETECH® TECHNOLOGY

The refuge is equipped with a PilotAssist© central unit, an intelligent system for controlling the refuge. This artificial intelligence analyses in real time all the parameters of the refuge, from the interior and exterior gases to the functioning of the equipment and actuators. All the information is recorded in a memory and can be used like a black box in aviation.

COMPRESSED OXYGEN CYLINDERS

SUB'ROCA refuges require medical oxygen cylinders with a minimum capacity of 10.6 m3 type B50 Air Liquide type Medical.

The number of cylinders required is based on the nominal occupancy of the refuge and the minimum duration of autonomy.

The oxygen flow rate is based on the European rule which specifies 0.5ltrs per minute of oxygen per person.

The number of cylinders required for different durations of use of the refuge is shown in the following table:

O2 for	24 Hour	36 Hour
8 people	1	1
12 people	1	2
18 people	2	2
24 people	2	3
32 people	3	4

STORAGE

The refuge is equipped with storage space under the seats, which can be used to store:

- SCRUB'TECH cartridges quantities are related to number of specified occupants
- Water, quantity per number of occupants
- First Aid Kit
- Food rations, quantity per number of occupants
- Stretcher
- Playing cards

GAS MONITORING SYSTEM

For safety reasons, our gas monitoring system is coupled with a gas measurement system using reagent tubes. In the event of a malfunction, the air quality can be measured manually at any time.

Also Available: Sensor'Box gas and dust monitoring system

SUB'ROCA offers a turnkey solution for the safety of your underground works. Our multi-gas monitoring boxes are designed to be simple and intuitive to use. They integrate a state-of-the-art technology that allows to measure in real time the evolution of the atmosphere.

For more information, please visit www.subroca.com

SUB'ROCA REFUGE CHAMBERS

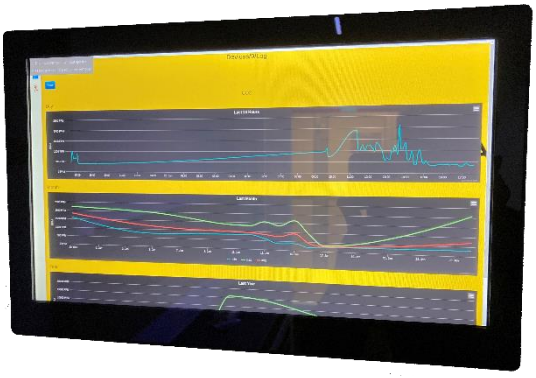
PilotAssist® & SafeTech® details

Shelt'Air is fitted with integrated intelligence with touch screen control and monitoring.
On this screen is reported all the information, including:

- gas levels CO, CO2, O2
- pressurization
- temperatures
- the operating states of the equipment.

When an operator arrives in the shelter, the sensor detects it and a voice message with instructions is played.

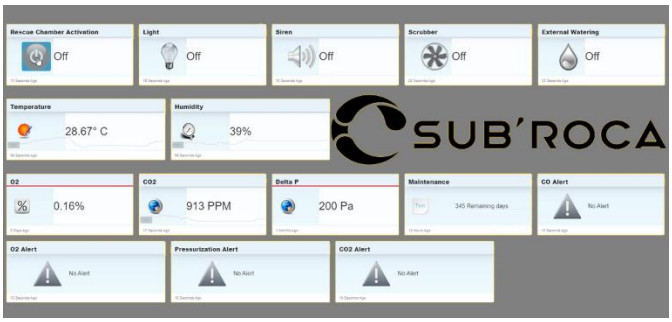
The Refuge is switched on by briefly pressing a button on the touch screen, opening the solenoid valves, switching on the refuge's overpressure, and starting up the auxiliary equipment.
As soon as a value changes, the default item is posted on the screen and the automated action is activated or the manual action to be carried out is displayed.



Inside the refuge a blue flash of one second every 30 seconds informs about the correct operation of the refuge.
As soon as a limit or fault is detected, a continuous red flash alerts the operators, in addition to the voice instructions and messages displayed on the screen.

This device also includes a black box function for post-accident data analysis.

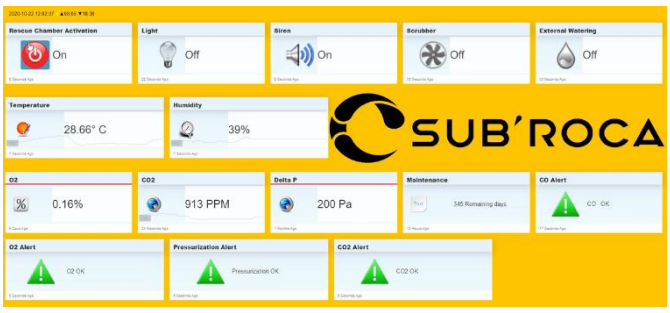
"STAND-BY" MODE



Standby mode is the mode that permits the accommodation of persons, without energy consumption, except for a limited quantity of devices.
The compressed air supply (network and/or bottle rack) is activated. However, the refuge's air solenoid valve remains closed. There is no air renewal of the refuge in Stand-by mode.
The external green lighting is on. This indicates the good functioning of the equipment, as well as the location of the refuge in case of a fire.

"ACTIVATED" MODE

The activated mode is started by briefly pressing on the start button from the touch screen. It automatically opens the solenoid valve of the main compressed air supply and orders the starting of the refuge's equipment.
In activated mode, external red light flashes are activated to identify the emergency shelter and to indicate that there are people in the shelter.
The compressed air comes into the refuge being controlled by a PLC in accordance with the target differential pressure.

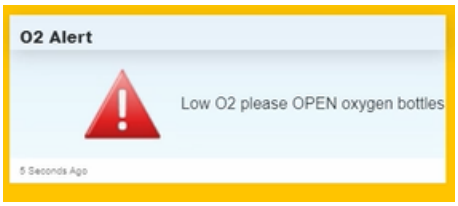


“ACTIVATED RESCUED” MODE

The Activated Rescued mode is automatically activated as soon as the main power supply voltage is switched off. It does not require any handling by the operators.

“GAS ALERT” MODE

The Gas Alert mode is automatically activated as soon as one of the programmed levels is affected. In this case, the oxygen level is too low.
A red light on the screen appears, as well as a red flash on the top of the PilotAssist box combined with a voice command in English (or other language on request) indicating the action to be done.



“OFF” MODE

The "OFF" mode means that the equipment is unavailable. All functions are switched off and it is forbidden to go inside the refuge for serious technical reasons.
A serious technical reason is defined as an event, a detection during the controls that does not allow to guarantee a good activation of the equipment.
The unavailability of compressed air, the damage of a door, a valve, a porthole are some of the serious technical problems requiring maintenance but which should require a curative maintenance operation.

SUB'ROCA REFUGE CHAMBERS

Chamber inclusions

	MANUAL	SMART
SLIM DESIGN FOR EASE OF LOCATION	X	X
24 or 36 HOURS STAND ALONE RUN TIME	X	X
24V DC BATTERY SYSTEM	X	X
240V AC CONNECTION POINT	X	X
BATTERY BOX ISOLATOR – 2 POLE – LOCKABLE	X	X
AIR CONDITIONER ISOLATION SWITCH		X
GREEN LED FOR VISIBILITY & LOCATION	X	X
RED LED INDICATOR FOR CHAMBER OCCUPANCY	X	X
ESCAPE HATCH WITH EXTERNAL AND INTERNAL HANDLES	X	X
SIREN 120 dB	X	X
4MM STEEL PLATE CONSTRUCTION	X	X
FULL SEAM WELDING	X	X
ROBUST SKID BASE	X	X
FRONT & SIDE FORKLIFT GUIDES PEAR EACH MODULE	X	X
REFLECTIVE SIGNAGE – OPERATIONAL & SAFETY	X	X
LIFTING LUGS	X	X
HEAVY DUTY, OUTWARD OPENING, SEALING MAIN DOOR	X	X
VIEWING WINDOW	X	X
FIXED HOUSING & PROTECTION FOR EXTERNAL COMPONENTS	X	X
HEAVY-DUTY LATERAL PROTECTION SHIELDS	X	X

SUB'ROCA REFUGE CHAMBERS

Chamber inclusions - INTERNAL

	MANUAL	SMART
SPLIT SYSTEM AIR CONDITIONER WITH EMERGENCY POWER SUPPLY		X
NON-ELECTRIC UNIT COOLER BY COLD POCKETS (COOL'SOFT)	X	
MEDICAL GRADE OXYGEN FLOW REGULATOR	X	X
CARBON DIOXIDE SCRUBBER (INCLUDED CARTRIDGES)	X	X
CARBON MONOXYDE SCRUBBER (INCLUDED CARTRIDGES)	X	X
GAS MEASURMENT BY COLORYMETRIC METHODS FOR CO, CO2 & O2	X	X
GAS MEASUREMENTS BY INTELLIGENT AUTOMATON (SAFE'TECH)		X
RECORDED MONITORING OF MEASUREMENTS		X
AUTOMATIC PRESSURIZATION REGULATION (PILOT'ASSIST)		X
MANUAL PRESSURIZATION CONTROL PANEL	X	
INVERTER CHARGER WITH AUTOMATIC SWITCH OVER TO UPS SYSTEM	X	X
COLOUR SYSTEM MONITOR SCREEN		X
CABLE AVAILABLE FOR RADIO OR TELEPHONE	X	X
OBSERVATIONAL PORTHOLE WINDOW	X	X
INTERNAL LED LIGHTING	X	X
CUSHIONED SEATING	X	X
UNDER SEAT STORAGE	X	X
FIRST AID KIT	X	X
EYE WASH	X	X
STRETCHER	X	X
WATER	X	X
FOOD	X	X
PLAYING CARDS	X	X
PORTABLE TOILET & CHEMICAL	X	X
NON SLIP FLOORING	X	X
OPENING HATCH	X	X

SUB'ROCA REFUGE CHAMBERS

Chamber inclusions - OPTIONAL

	MANUAL	SMART
EXTENDED BATTERY BACK UP DURATION	X	X
EXTERNAL GAS MONITORING	X	Included
1000V STEP DOWN TRANSFORMER	X	X
DIGITAL GAS MONITOR	X	Included
MOBILE FRAME WHEELS	X	X
4 STAGE AIR FILTRATION SYSTEM - FLOOD PROTECTION WATER TAP	X	X
BY-PASS FOR EXTRA AIR ENTRY (NETWORK and /or BOTTLES)	X	X

SUB'ROCA REFUGE CHAMBERS

Technical data

Seating	8	12	18	24	32
Autonomy	6 - 12 - 24 - 36 hours and more				
Height (mm)	2160				
Width (mm)	NARROW: 1400 / STANDARD: 2100				
Length (mm)	5470	6650	8270	9770	11920
Tech Module	1				
Seat Module	1	2	3	3	4
Airlock Module	1				
Wall thickness (mm)	4				
Number of shield reinforcements on the sides	3 (thickness 6 mm)				
Number of shield reinforcements on top	2 (thickness 6 mm)				

RULES OF SECURITY

- Place the device on a stable, linear surface.
- Do not use the shelter as direct protection against:
  - A fire
  - The presence of flammable products, such as hydrocarbon gases
  - Floods or submersions
  - A collapse of the lining, ground collapse or major rock fall.
- Never move the shelter without using the lifting and pulling devices.
- Never place any object that may hinder access to the shelter or its exit.
- Never partially or totally obstruct the air inlet and/or outlet openings.
- Never smoke near or inside the shelter.
- Avoid shocks and jolts
- If you do not plan to use the shelter for a long period of time, keep it away from moisture and dirt in a well-ventilated area.
- Use the shelter only under the conditions described in the manual. Any other use is not recommended and may lead to malfunctions.

SIMPLIFY USER GUIDE

1. Place the shelter on a flat, stable spot.
2. Connect the shelter to its power supply if you have the electric model.
3. Connect the shelter to its supply of breathing air (cylinder or network) and oxygen.
4. Wait for the manufacturer's visit for commissioning.
5. Checking the operating points

SUB’ROCA EXPORTS INTERNATIONNALLY

Our network

https://subroca.com/company/worldwide/