Hard Rock Mine Refuge Chambers

The MineARC MineSAFE Standard Design Range

Designed to provide a refuge or 'safe-haven' for miners suddenly trapped in a hazardous or toxic environment.

mineARC SYSTEMS | mineSAFE STANDARD DESIGN

The world's most trusted refuge chamber in metalliferous (hard rock) and non-metal mines

MS-SD2-12-SIV-36

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The world's leading manufacturer of emergency life-saving refuge

mineARC SYSTEMS

www.minearc.com

Company Profile

MineARC Systems is the global leader in the manufacture and supply of emergency safe refuge solutions for the mining, tunnelling, chemical processing and disaster relief industries.

With over 15 years' experience, our dedication to ongoing research and development is driven by our key focus to continually offer the best and most advanced safety solutions on the market.

Our team of qualified engineers, electrical designers and technical experts form a global network across six international locations including;

- Perth, Western Australia
- Johannesburg, South Africa
- Dallas, Texas
- Santiago, Chile
- Beijing, China
- Barcelona, Spain

This allows MineARC to provide 24 hour service and engineering support to our expanding list of clients in over 40 countries across the globe.

All MineARC Refuge Chambers and Safe Havens comply with the highest international regulations and recognised 'world's best practice' industry guidelines. Our key focus on quality control and product advancement has meant that MineARC Refuge Chambers have successfully saved lives in multiple real life industrial emergencies around the globe.

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Bureau Veritas ISO 9001:2008 Quality Management Systems

MineARC® HRM Refuge Live Risk Assessment Testing

Australian C-Tick Standards: AS4100-1998, AS3570.1-18, AS2208, AS3000, AS1716-15

Canadian Standards Association (CSA)

United States National Electrical Code (NEC) 2013/14

European CE Certified to Machinery Norms

Helping safeguard miners in over 40 countries, across six continents, the MineARC MineSAFE series is the world's most trusted refuge chamber in metal (hard rock) and non-metal mines.

MS-SD3-16-SIV-36

Emergency refuge forms an integral part of an underground mine's wider Emergency Response Plan (ERP). Fires, explosions, rock-falls, flooding and the release of smoke and other forms of toxic gas are the types of incidents that occur all too frequently, despite the high levels of planning and the safety precautions in place.

In these types of emergencies, when evacuation is no-longer safe or practical, emergency refuge is designed to provide a safe and secure 'go-to' area for personnel to gather and await extraction. MineARC Refuges have been successfully used around the world in multiple mine and tunnelling emergencies to save lives.

Refuge chambers should be deployed throughout the mine to create a refuge 'network' accessible to all underground personnel whilst on foot. Depending on the country/region, regulations usually state acceptable 'safe distances' between refuge chambers.

Standard Configurations

In consultation with the world's leading mining companies and regional mining authorities, the MineARC MineSAFE has been continuously re-engineered and refined to create a safe-refuge solution that is fully integrated with today's modern underground mining environment.

Now in its fourth series, the MineSAFE Standard Design (SD) Refuge Chamber provides miners with optimum safety features, functionality and performance.

Standard configurations are available based on occupancy – from 8 to 30 people - with each model engineered for maximum durability and manoeuvrability, both above and below ground.

MineSAFE Standard Design Refuge Chamber (MS-SD2-12-SIV-36)

Ultimately an SD refuge chamber's dimensions and its rated occupancy can be custom-engineered to site specifications, without compromising on safety or performance.

Special transport configurations include narrow builds specifically tailored for shaft mines, or modular builds, allowing a complete refuge chamber to be split into smaller sections before being transported and then reassembled underground.

MS-SD1-08-SIV-36 (8 Person)

MS-SD2-12-SIV-36 (12 Person)

MS-SD3-16-SIV-36 (16 Person)

MS-SD4-20-SIV-36 (20 Person)

MS-SD5-26-SIV-36 (26 Person)

MS-SD6-30-SIV-36 (30 Person)

Standard Dimensions

Model	Occupancy (persons)	Height (m/inch)	Width (m/inch)	Length (m/inch)	Weight (kgs/lbs)
MS-SD1-08-SIV-36	8	2.21 / 87"	2.25 / 89"	3.89 / 153"	4300 / 9400
MS-SD1-08-SIV-36 (w/ airlock)	8	2.21 / 87"	2.25 / 89"	5.10 / 201"	5100 / 11100
MS-SD2-12-SIV-36	12	2.21 / 87"	2.25 / 89"	4.80 / 189"	4700 / 10200
MS-SD2-12-SIV-36 (w/ airlock)	12	2.21 / 87"	2.25 / 89"	6.02 / 237"	5600 / 12400
MS-SD3-16-SIV-36	16	2.21 / 87"	2.25 / 89"	6.02 / 237"	5400 / 11900
MS-SD3-16-SIV-36 (w/ airlock)	16	2.21 / 87"	2.25 / 89"	7.23 / 285"	6200 / 13600
MS-SD4-20-SIV-36	20	2.21 / 87"	2.25 / 89"	7.23 / 285"	6000 / 13200
MS-SD4-20-SIV-36 (w/ airlock)	20	2.21 / 87"	2.25 / 89"	8.44 / 332"	6600 / 14500
MS-SD5-26-SIV-36	26	2.21 / 87"	2.25 / 89"	8.44 / 332"	8400 / 18500
MS-SD6-30-SIV-36	30	2.21 / 87"	2.25 / 89"	9.64 / 380"	8600 / 19000

Custom dimensions and occupancies available. Refuge dimensions are ultimately designed to client specifications.
Weights provided are Australian standard 36hr models.
Indicative weights only. Custom variations will impact final refuge chamber weight.

Chamber Exterior Front

SIREN
- 112 dBA motion activated

STROBE LIGHTING
- Extra low voltage
- Green & red LED

AIR VENTS / CHECK VALVES

12MM PORTHOLE WINDOW
- AS 2208
- Blast resistant upon request

PAINT
- Sand blasted to 2.5 grit

SEALING DOOR
- Outward opening
- Vacuum tested seal

REFLECTIVE SIGNAGE
- Safety & operational
- Optional extra: Multiple languages

FIRE EXTINGUISHER
- Optional for non-Australian orders. Supplied separately as Dangerous Goods

ROTATING HANDLES
- Double locking

SKID BASE
- 250 x 100mm forklift slots
- Front and rear mounted tow points
- Front mounted 25mm steel plate push blocks

The 'face' of the refuge chamber is designed primarily for easy identification and quick access during an emergency.

The strobe lighting, warning siren and reflective signage alert passers-by to the chamber's location, whilst the rotating door handles provide simple, straight forward access to the safety of the interior.

Chamber Interior

Inside a MineSAFE Standard Design Refuge Chamber, a number of vital life-support systems combine to create a safe, ongoing environment for occupants. The chamber features a MineARC Series IV Controller; the most advanced safe-refuge technology, anywhere in the world.

Systems include; primary and secondary air (oxygen) supplies, air conditioning systems, positive pressure systems, electrical systems, gas detection and CO_2 / CO removal.

The MineSAFE Standard Design uses MineARC's unique voice activated Series IV electrical scrubbing system in conjunction with MARCISORB chemicals to 'scrub' the build up of harmful CO_2 (carbon dioxide) and CO (carbon monoxide) from the air inside the refuge chamber.

In high enough concentrations, both CO_2 and CO can cause serious injury leading to a loss of consciousness and eventually, death. CO_2 and CO are expired by the occupants as part of their normal breathing activity.

Carbon monoxide can also enter the main chamber via the compressed air intake (if it becomes compromised), and as occupants enter and/or exit the main entrance, making CO_2 / CO scrubbing a vital necessity.

i.V.A.N.

The digital controller interface is the operational hub of the refuge chamber. From here, all power, lighting and scrubbing systems can be managed with the push of a button.

Exclusive to the MineARC Series IV Control System, iVAN (Intelligent Voice Audio Navigation) represents a breakthrough in safe-refuge technology. iVAN is an on-board navigation assistant that guides occupants through operational procedures and can be programmed into languages other than English.

MARCISORB Chemical Cartridges

The MineARC Series IV Scrubbing System uses pre-packaged MARCISORB chemical absorber cartridges.

MineARC's MARCISORB CO_2 and MARCISORB CO cartridges provide superior scrubbing capacity, are easy to load, safe to handle, and can store for long periods.

Air Conditioning

Air conditioning is vital to combat the potentially fatal effects of heat stress. A continuous build up in heat is caused by the occupant's metabolic activity, as well as any ambient (external) heat affecting the refuge chamber's internal temperature.

Model	8	12	16	20	26	30
36 hr	2	2	3	3	4	4

Optional Features

Custom Design

- Custom heights, widths, lengths and designs available upon request

Blast Shield Protection

- Polycarbonate window protector
- External protection for AC and mine air
- Protection for lights and sensors

Blast Rating Upgrade

- Additional 100mm x 50mm upright stiffeners
- Additional lateral stiffeners

Airlock System

- Separate flushing area prior to entry to main chamber
- Primary flushing via connection to mine air supply, regulated with simple ball valve operation
- Emergency push button flushing via 8,000L (282ft^3) breathable air cylinders

Carbon Monoxide Safety Off System (COSOS)

- In-line compressed air carbon monoxide detection
- Automatically isolates compressed air feed when CO reaches 25ppm

60amp Macey Plug

- Medium/high voltage connectors available
- Meets Australian standards

Transformer

- Standard 1000V Step Down to 240-220V
- Custom configurations available

MineARC System Intelligence

Reduces Operational Costs:

- ✓ Reduced servicing time
- ✓ Real-time troubleshooting, reducing maintenance staff down-time
- ✓ Advanced maintenance planning
- ✓ Extended calibration periods for gas monitoring
- ✓ Reduced gas sensor replacement costs
- ✓ Extended sensor life
- ✓ Faster and easier sensor replacement
- ✓ Lower energy costs through the optimisation of mine air usage
- ✓ Flood protection, eliminating costly chamber refurbishment
- ✓ Reduction in replacement parts due to theft
- ✓ Reduced service kit costs
- ✓ Streamlined purchasing process

Improves Operational Safety:

- ✓ Operational communication during emergency use
- ✓ Direct video and gas monitoring for evacuation planning
- ✓ Greater system automation for reduced risk of human error
- ✓ Centralised diagnostics and analysis of entire MineARC Refuge Chamber fleet via computer, tablet or smartphone
- ✓ Programmable push email notifications for important refuge chamber events
- ✓ Voice prompting gas monitoring for chemical change-out and oxygen regulation
- ✓ Air toxicity shut off prevents smoke and carbon monoxide ingress via the compressed airline
- ✓ Increased monitoring ensures all critical components remain in the chamber
- ✓ Reduced 'out-of-service' time for all refuge chambers
- ✓ Eliminates chamber misuse

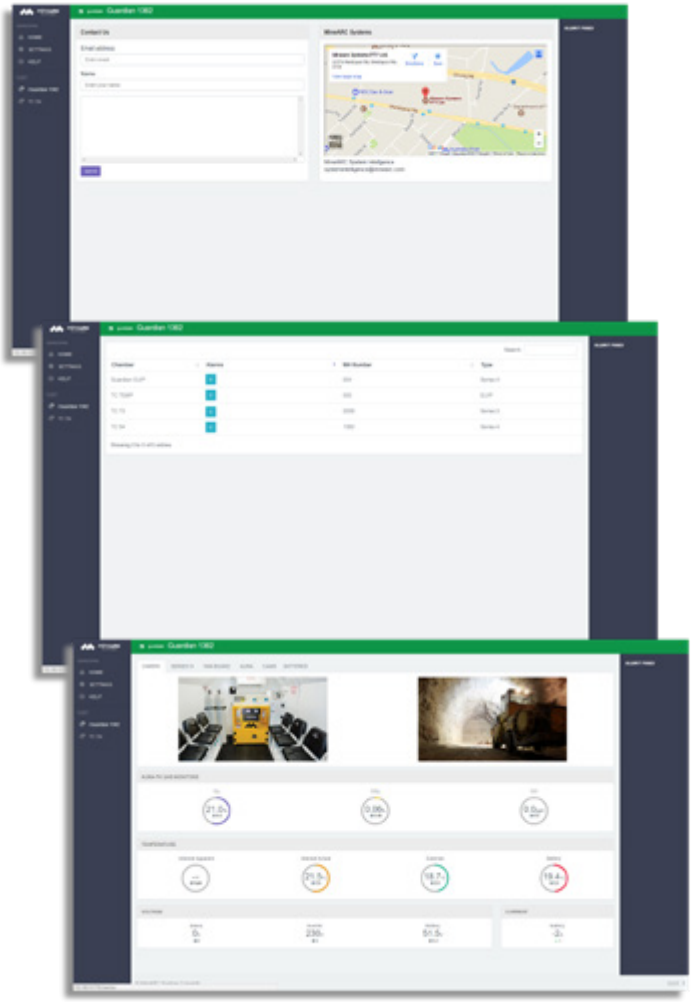
GuardIAN Remote Monitoring & Diagnostics System

MineARC's GuardIAN Remote Monitoring and Diagnostics System is an exciting new development in refuge chamber technology. GuardIAN enables real-time monitoring; providing confidence that an operation's fleet of refuge chambers are emergency ready at all times.

GuardIAN is an on-board system that continuously monitors all vital refuge operating systems. During standby mode GuardIAN checks for component faults and monitors refuge chamber usage or entry to the chamber.

GuardIAN's secure online interface is hosted on an internal server within the refuge chamber so that no client software installation is required. The responsive webpage is easily accessible from any computer, tablet or smartphone and features a summary of your entire refuge chamber fleet and overall operational status, with the ability to drill down to a detailed report of each chamber.

GuardIAN is an optional upgrade for the MineSAFE Standard Design.



MineARC
System Intelligence

Aura-FX Digital Gas Monitoring Diagnostics

MineARC's new Aura-FX Digital Gas Monitoring System is a proprietary fixed gas monitoring unit, designed specifically for use in MineARC refuge chambers and safe havens. A vast improvement on current digital gas monitors (DGMs) on the market, Aura-FX provides a refuge chamber specific solution to gas monitoring. Aura-FX has the ability to individually monitor up to 11 gases via a series of user-friendly, digital screens. Audible voice alarms will prompt occupants to replace scrubbing chemicals or adjust oxygen supply levels in the refuge chamber as required.

When utilised as part of the MineARC System Intelligence network, Aura-FX provides real-time gas monitoring data and analysis via the GuardIAN dashboard.

Aura-FX is a standard feature of the MineSAFE Standard Design.

GuardIAN Live Video Monitoring and VOIP Video Phone

Live video streaming can greatly assist in evacuation planning during an emergency; providing the capability to determine the capacity of the refuge chamber and monitor the well-being of occupants. Internal video monitoring is provided by a remote controlled, motion activated GuardIAN IP camera. When activated, the camera will send out a live, recorded stream of the interior of the refuge chamber. External video monitoring is also available as an optional upgrade to the GuardIAN System.

To assist occupants during an emergency or safety drill, GuardIAN also equips your refuge chamber with a VOIP video phone. This facilitates face-to-face communication between the refuge chamber and the surface; improving the psychological well-being of chamber occupants during an emergency, providing assistance to perform any difficult or technical procedures and facilitating face-to-face trouble shooting for service staff in order to reduce the need for multiple surface visits during a maintenance run.

GuardIAN System Monitoring, Event Logging and Fault Diagnostics

MineARC's Series IV Digital Controller links directly to GuardIAN, streaming real-time system data to a surface control room(s). Data includes automated system checks, fault logging (battery, scrubber, temperature and inverter), system diagnostics, internal and external temperature measurements, and system actions such as scrubber activation.

System faults, events and scheduled service notifications can be sent to designated personnel as email alerts; notifying them of upcoming service requirements, potential emergencies or mal-use as they occur.

Compressed Air Management System Diagnostics

The MineARC Compressed Air Management System (CAMS) is a dedicated air management unit designed specifically for use in refuge chambers. The unique air management system monitors and regulates compressed air flow into the chamber. When utilised as part of the MineARC System Intelligence network, vital information relating to the integrity of the internal refuge chamber atmosphere is communicated in real-time via the GuardIAN dashboard. An increase in CAMS activity would indicate a breach of the refuge chamber seal, thus sending an alert to designated personnel that the chamber is compromised.

CAMS is a standard feature of the MineSAFE Standard Design.

Chamber Exterior Rear

A secure cabinet at the rear of the MineSAFE houses the refuge chamber's UPS battery back up (Uninterruptible Power Supply). The UPS is a fail-safe system that can power the refuge chamber's internal life support systems for a minimum of 24hrs, should mine power become cut-off.

The Compressed Air Management System (CAMS) allows regulated compressed air into the refuge chamber when the pressure inside drops below 200Pa. This process optimises mine air usage and guarantees against over-pressurisation of the refuge chamber. CAMS' gas toxicity monitor automatically diverts compressed air if oxygen levels in the airline fall below a set level (18% oxygen in free air), signifying air contamination. Additionally, the incorporated flood protection valve automatically shuts down compressed air to avoid catastrophic and costly chamber damage in the event of water ingress.

Optional: Satellite UPS System

MineARC's Satellite UPS System has been engineered specifically for use in conjunction with refuge chambers; designed to ensure batteries perform at full capacity for their expected life span and reducing manual handling-related injuries.

By ensuring atmospheric conditions are optimal, monitoring battery activity and adding electronics to the charging system, the Satellite UPS System limits all primary aspects of battery degradation and allows MineARC's high quality batteries to operate as intended.

For more information please visit **www.minearc.com/systemintelligence**

Feature Summary

MS-SD2-12-SIV-36

5mm Steel Plate	**Viewing Porthole**
CO_2 & CO Scrubbing	**Gas Monitoring**
Breathable Air (O_2) Supply	**Advanced Digital Controller**
Air Conditioning	**iVAN** (Intelligent Voice Audio Navigation)
36-96hrs UPS Battery	**Remote Monitoring System**

Standard Features

- 5mm steel plate construction
- Blast rating: 5psi
- CO_2 & CO scrubbing
- Pre-packaged chemical cartridges
- Advanced digital control system
- Breathable air (O_2) supply
- Air conditioning and dehumidifying
- Aura-FX Digital Gas Monitoring System
- Battery backup (UPS) - 36hrs minimum
- iVAN (Intelligent Voice Audio Navigation)
- Rear escape hatch with internal/external access
- Viewing porthole
- Stainless steel hardware throughout
- Ergonomically designed seating
- Lifting lugs, skid base and forklift slots
- Emergency food and water rations

Optional Features

- Fully flushing, pressurised airlock
- Special dimensions and transport configurations available
- GuardIAN Remote Monitoring & Diagnostics
- Satellite UPS System
- Battery backup UPS upgrade to 48, 72, 96hrs
- First aid kit
- Internal LCD monitors screens
- Step-down transformer
- Overpressure blast resistance
- Receptacle plug (trailing cable connecting plug)
- Fire resistant structure
- Blast shield protection (reinforced construction) to withstand percussion blasting
- Blast rating upgrade
- Carbon Monoxide Safety Off System (COSOS)

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SCAN TO REQUEST
A QUOTE

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