

MINING AIR QUALITY ISO 23875

Introduction to mining operator cab air quality
standard and performance requirements



| L | S | M |
TECHNOLOGIES

Lack of machine cabin air quality standardisation in the mining industry is a detriment to **Health, Safety, Production, Maintenance Costs & Trade**



ISO 23875 standardises mining cabin air quality control system requirements

What is ISO 23875?

ISO 23875 is currently a draft international standard, with the final standard expected to be published by Q1 2021.

The standard creates a consistent approach to designing, testing, operating, and maintaining operator enclosures with respect to air quality in the mining industry.

Adoption of the practices outlined in the Standard to protect personnel inside operator enclosures through:

1. Exclusion of harmful respirable particulate exposure (RCS, DPM, etc) / fibre to HEPA- both Recirculation and External (fresh) air supply.
2. Maintaining safe levels of CO₂ - excess causes premature fatigue, lack of concentration, microsleeps, etc.
3. Conducting routine performance testing of air quality control systems throughout the **lifecycle** of the cabin to maintain compliance. Testing cab pressure, CO₂ concentration & fresh + recirculation filtration effectiveness at machine service intervals.
4. In- Cabin monitoring / warning to Operator for Cabin pressure loss and Co₂ concentration.

Cross-Industry Team of Experts

Committee that wrote standard composed of cross-functional members, including:

- 22 Subject matter experts
- 10 Countries
- 6 Industrial hygienists
- 6 Mining machine manufacturers
- 3 International mining companies
- 3 Consultants to the mining industry
- 2 Suppliers to the mining industry
- 1 Field engineering company

Additional comments on draft from:

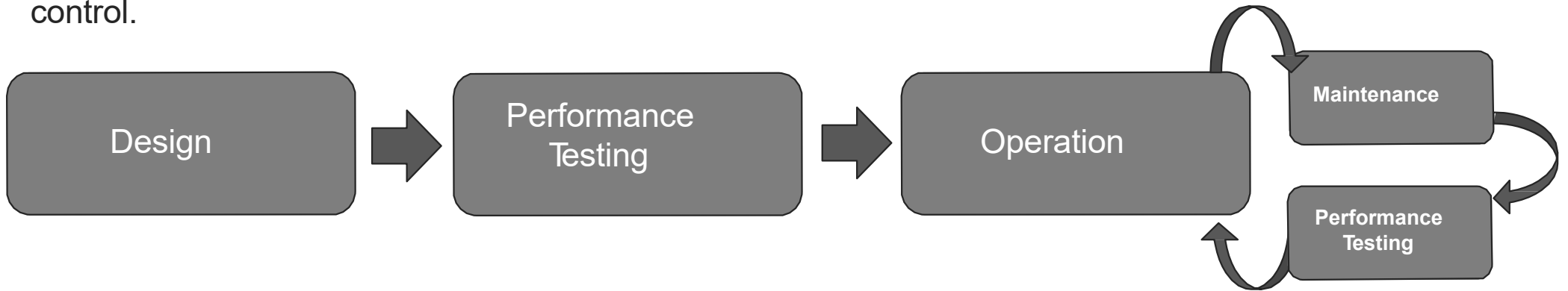
- TC-42 WG4 – ISO 29463
- Rio Tinto
- Volvo
- EPIROC
- NIOSH – USA
- MSHA – USA
- OSHA – USA

Life-cycle standard creates consistency across the life of a machine

A life-cycle standard follows a machine from the date that it is certified compliant once fitted with the mitigation control- ensuring compliant design, testing and maintenance over the life of the machine / cabin.

The standard promotes operational integration, bringing stakeholders together from different functional areas and seniority levels to focus on operator air quality and maintaining compliance (eg PCBU).

Ensures a consistency in compliance and mitigation control performance and effectiveness of the control.



The key benefits of ISO 23875

Health, Safety and Operational Benefits

- Reduces the incidences of lower-lung chronic health conditions of machine operators in the work force.
- Establishes requirements that can be consistently monitored, tested and managed.
- Improves employee retention and recruiting by addressing a key environmental hazard, creating a safer workplace.
- Lowers equipment maintenance costs; HVAC system will run longer and more effectively (***HVAC repair costs are known to be approx. \$20k- \$40k / annum / machine***).
- Reduces un- scheduled Production loss.
- Defines maintenance practices and service intervals to maintain required cab performance.
- Creates consistent global standard and approach to cab air control systems, reducing impacts of regional regulations and multiple iterations of machines, platforms, and parts.
- Avoids risk of Regulator penalties- potential civil action.



Equipment Operators



Industrial Hygienists



Regulators



Mining Companies



Insurers



Service Managers



Engineers



Equipment Manufacturers



HR and Recruiting Mgrs

Standardising cab air quality through performance requirements

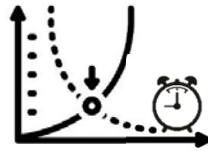
ISO 23875 Performance Requirements

The primary objective of an air quality mitigation control system is to protect a machine operator from harmful particulates / fibre outside (and inside) of the cab through effective filtration and cab pressurisation.



Maintain Defined CO₂ Levels

Provide adequate fresh air flow to ensure ventilation- maximum allowable CO₂



Recirculation Air Filtration + Efficiency

HEPA Filtration and maximum respirable particulate matter concentration $\leq 25 \mu\text{g}/\text{m}^3$ at start/end of decay test, maximum of 120 seconds decay time



External Air Filtration Maintains Cab Pressurisation

HEPA Filtration and minimum sustained pressurisation, when the machine starting device moves to the "on" position shall be $\geq 20 \text{ Pa}$, maximum sustained pressure shall not exceed 200 Pa

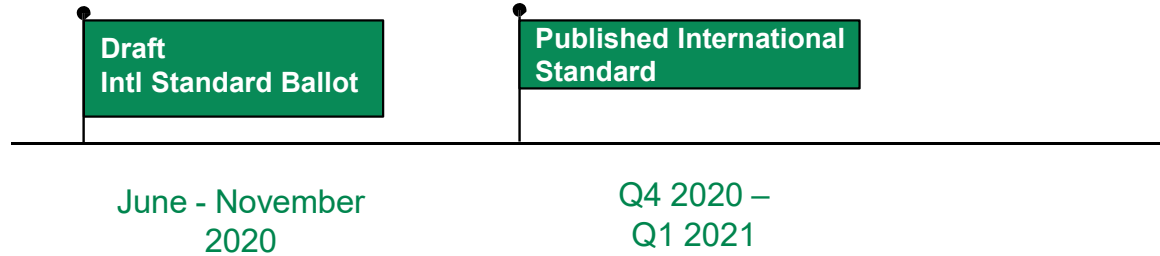


Real-time Operator Cab Monitoring

Cab pressurisation and CO₂ levels monitored by permanently installed monitoring system

A Certificate of Compliance is required for new and retrofitted machines that meet the requirements of ISO 23875

ISO 23875 Timeline and next steps



- ISO 23875 is in the final stages of balloting and approval
- International standard set to be finalised and published in Q4 2020 – Q1 2021
- Australia are represented on the ISO and vote for acceptance of the Standard

Start planning and implementing ISO 23875 strategy

SY- KLONE RESPA® / QCABAIR® quality Cabin Air Technology

World class Cabin Air Quality mitigation
technology for over 20 years.

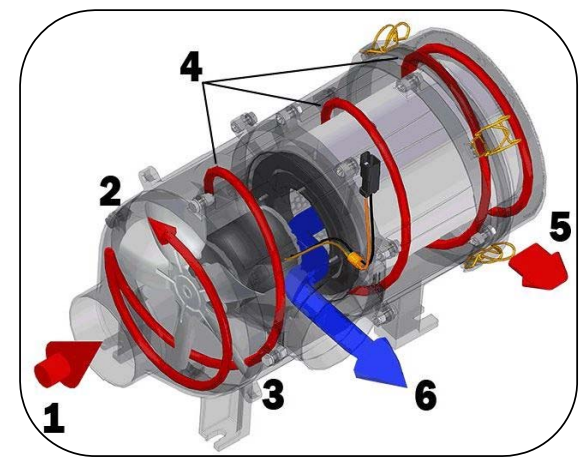


L | S | M
TECHNOLOGIES

RESPA® Features & Benefits

- **Field Tested & Certified:** USA (NIOSH) and Australian (QME 2008 RESPA® Field Report) authorities / regulators.
- **Exceeds ISO 23875 Compliance:** HEPA Filters are batch tested & ensures >EN1822 H13 / ISO H35 compliance with an arrestance of >99.99% @ 0.3 micron / >99.95% at 0.63 microns MPPS.
- **Fit- for Purpose:** Robust construction to meet operating conditions & arduous operating environments of Mobile / Fixed Cabins.
- **RESPA® CF2 (External Air):** Patented Hyperflow / Vortex Pre- cleaning technology- ejects 97% of debris before Filter.
- **Self Cleaning Filter:** Patented “self cleaning” design of RESPA® Filters- ensures consistent performance & extended service life >500- 1,000 hours.
- **Large Filter Elements:** Standard & Extended length with upto ca 1.2- 1.7 m2 of media- maintain performance even when loaded.
- **RESPA® CFX2 (Recirculation Air):** Not simply a replacement Panel Filter. Rapidly removes airborne contamination agitated inside of Cabin ingresses from open doors, Operator boots, clothing.
- **Filter Elements:** Extensive range of Filter Elements- ABEK1, HEPA, Merv16, Odour, etc
- **Motor Service Life:** VLL Compact & Brushless Motors provide between ca 15,000 to 30,00 hours.
- **Versatile Construction:** Effective in other applications- eg electrical enclosures.

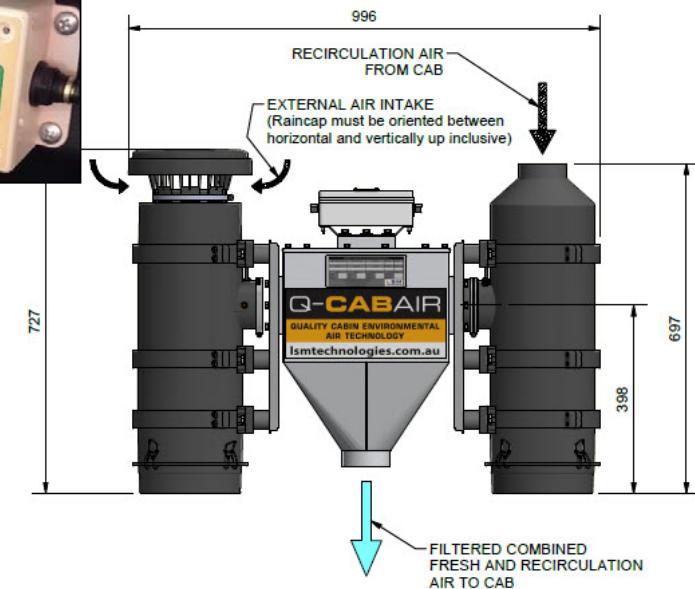
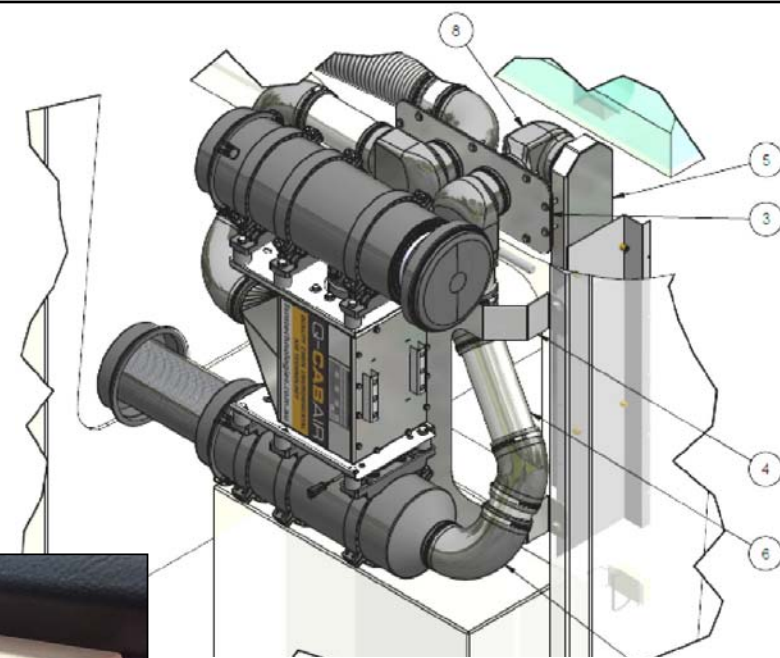
How it works.....



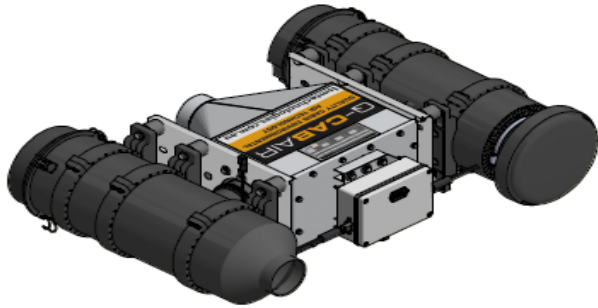
1. Contaminated laden Air enters the Unit Inlet.
2. The Fan creates a VORTEX, a tornado-like spinning motion, whipping the air & contaminant to the outside wall.
3. Spinning Air HYPER-accelerates as it passes through Louvers, further enhancing centrifugal force powerful enough to affect contaminant separation.
4. Contaminant is spun against the outside wall of the Unit & propelled rapidly around the Filter Element to the rear of the unit.
5. Contamination is ejected back into the environment via the ejection ports.`

QCABAIR®- Features & Benefits

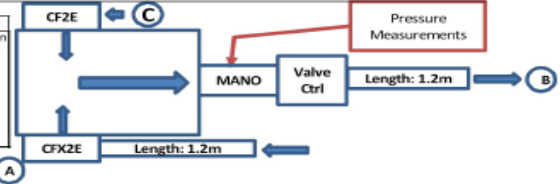
- ❑ **Combines RESPA®:** A complete system / singular core module ready for use & ISO 23875 / DOP tested / certification can be provided.
- ❑ **Ease of Mounting / Transferrable:** Robust stainless steel housing & can be mounted easily on any machine, single ducting in & out of Cabin, easily transferable to other machines. Saves time & ensures compliance for testing / commissioning.
- ❑ **Co2 Concentration:** Ensures adequate exhaust air flow / ventilation. Fresh Air Flow required to off- set Co2- AIRAH 10-15 l / seconds (20-30 Cfm) / Occupant.
- ❑ **Balances External / Recirculation Air:** Mixes both air sources to optimise HVAC dynamics.
- ❑ **Rapid Filtration of Recirculation Air:** Entrapped Contamination enters via Operator's clothing / boots, opening of doors / windows, etc.
- ❑ **Cabin Pressurisation:** Optimum Cabin pressurisation to 50-150 pascal- no over- pressurisation- max 200 pascal.
- ❑ **In Cabin Monitor:** Provides Monitoring of Co2 & Cabin Pressurisation.
- ❑ Data also sent back via LSM Technologies **FSM® Fleet Safety Management Telemetry System** for recording, alerting, reporting, validation of performance / compliance.



QCABAIR® / RESPA® - Performance Testing



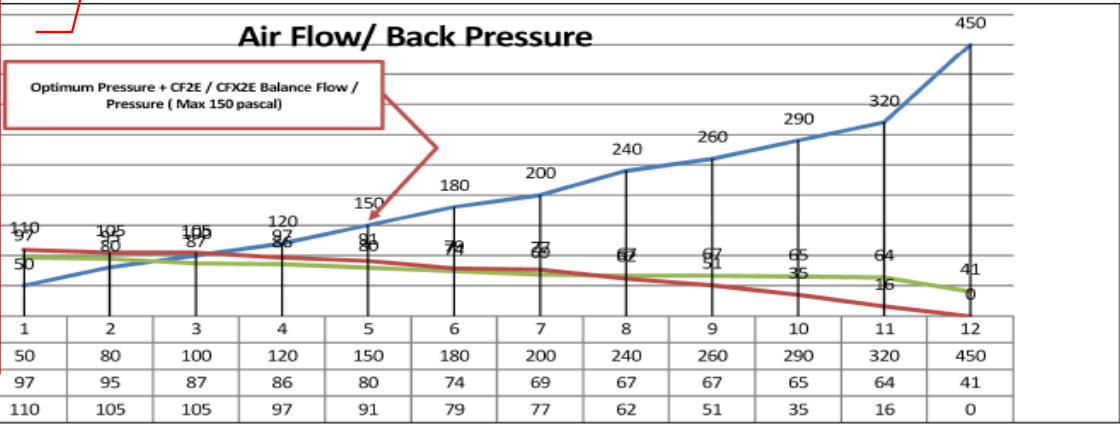
Completed by:	BW / PW / RD	General Notes
Date:	20/02/2020	Q-CABAIR Module with RESPA's CF2E + CFX2E. Flow taken at Suction of CFX2E Unit (position A) and Discharge Point (position B). Pressure taken at respective location. CO2 offset (8- 21 Cfm / 7.5- 10 l/sec) / person
Location:	LSM Workshop	
Description of test procedure:	RESPA CF2E+CFX2E (BLESS) Ext Units	
System Voltage:	24Vdc	
Filters Used:	HEPA or Merv19+	
HEPA Used:	HEPA H13	
Data Loggers used / location:		
Page:	1	Page No. 1



CF2E Active	CFX2E Active	(A) CF2XE Suction (Cfm)	(A) CF2XE Suction (l/Sec)	(B) Disch (Cfm)	(B) Disch (L/Sec)	(C) CF2E Contrib (Cfm)	(C) CF2E Contrib (L/Sec)	Flow % Suct	Flow % External	Back-Pressure (Pa)	Co2 Offset (@16 Cfm / 7.5 L/Sec/ Per) / No Off People	Co2 Offset (@21 Cfm / 10 L/Sec / Per) / No Off People
On	On	97	46	207	96	110	52	47%	53%	50	6.88	5.24
On	On	95	45	200	94	105	50	48%	53%	80	6.56	5.00
On	On	87	41	192	91	105	50	45%	55%	100	6.56	5.00
On	On	90	41	183	86	97	46	47%	53%	120	6.00	4.62
On	On	80	38	171	81	91	43	47%	53%	150	5.69	4.33
On	On	74	35	153	72	79	37	48%	52%	180	4.94	3.76
On	On	69	33	146	69	77	36	47%	53%	200	4.81	3.67
On	On	67	32	129	61	62	29	52%	48%	240	3.88	2.95
On	On	67	32	118	56	51	24	57%	43%	260	3.19	2.43
On	On	65	31	100	47	35	17	65%	35%	290	2.19	1.67
On	On	64	30	80	38	16	8	80%	20%	320	1.00	0.76
On	On	59	0	0	0	0	0	0%	0%	450	0.00	0.00

Optimum Performance

- **Cabin Pressurisation:** 150- 200 pascal
- **Co2 Offset:** for upto 4 Occupants
- **Rapid Filtration:** Inside Cabin at ca 40 litres / sec (80Cfm)



TEST RESULTS

1. Operating Voltage select 24VDC or 12VDC
2. Amps 12 VDC Start 20 / Run 12 each RESPA.
3. Amps 24 VDC Start 14 / Run 6 each RESPA.
4. Amps for Q-CABAIR Plenum (2 x RESPA's) 12 VDC 40 Start / 24 Run and 24 VDC Start 28 Amp / Run 12.
5. Wiring - 16 AWG. 16 " (1406 mm) leads
6. Fusing should be: 24 Vdc Motors=7.5 amp and for 12Vdc Motors= 15 amp

Rev	Date	Changes	ECR	By	Client/Description:	Designed by	Checked by	Approved by	Date	Date	Scale
A	3/08/18	Issued	0114	JAL	L.S.M. Technologies Q-CABAIR	Jasonl	P.W.	Peter Woodford	1/02/2021	4/08/2018	NTS
B	30/07/20	Information added	0215	JAL	DESIGN REGISTRATION PENDING! This drawing is copyright protected. No part of this drawing in any form or means is to be replaced, stored by retrieval system, transmitted or used by third parties without the written permission of LSM Technologies Pty Ltd	LSM TECHNOLOGIES	Ph: 07 3725 8100 Fax: 07 3725 8199 26 Bluestone Circuit Seventeen Mile Rocks QLD 4073 http://www.lsmtechnologies.com.au/	Q-Cab Lite Respa and Plenum Assembly			
C	22/01/21	Addition of Electrical Components	0246	ACF				03-03-0435			1/1 Sheet 3 / 3

LSM Technologies- About

- ❑ LSM Technologies has been in operation since 2002 providing a range of OH&S mitigation engineering controls that make the workplace safer and healthier
- ❑ Are an Australian developer, manufacturer & supplier of world class OH&S Mitigation engineering controls
- ❑ LSM Technologies customers range from operators of heavy equipment in earthmoving, mining, road transport, heavy haulage, agriculture, construction- even domestic users
- ❑ Represents Sy- Klone RESPA Cabin Pressurisers / Filtration Systems that are a worldwide leading industry in air filtration solutions
- ❑ LSM Technologies continues to innovate and grow to exceed complex customer needs and compliance- before- it becomes a Standard

For more information visit: www.lsm.com.au

LSM Technologies- Capabilities

- ❑ Understands how to maintain and protect your Human & Equipment Assets
- ❑ A Solutions Provider- Not a “Me Too”
- ❑ Adds Value to the unique Product Technologies we manufacturer / represent.
- ❑ We do not just Supply- but provide:
 - Engineering Design
 - Installation / Commissioning
 - Documentation / Manuals / Drawings
 - Training / Education / Support
 - Inventory / Parts holding
 - Trouble-shooting & Update

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