High pressure CO₂ systems

Technical data sheets



Unit 36-38 APD Industrial park Elsecar street, Kya Sand

Tel: +27 (0)11 708 0160 <u>sales@redg.co.za</u> <u>www.redg.co.za</u>





Table of contents

Item	Description	Page No
I	Table of contents	2
II	CO ₂ agent specification	3
111	High pressure CO ₂ cylinders	4
IV	Cylinder mounting straps and pipe clamps	5
V	Electrical actuator for CO_2 Valves with reset tool	6
VI	CO ₂ cylinder valve	7
VII	Pneumatic and manual actuators	8
VIII	High pressure discharge hose	9
IX	Pneumatic pilot hose and pneumatic slave hose	10
х	End plug and Odouriser	11
XI	Non return valve	12
XII	Total flood and local application nozzles	13
XIII	Discharge manifold	14
XIV	Warning signage	15
XV	General arrangement	16
XVI	General installation notes	17
XVII	Material safety data sheet	18-19



CO₂ Agent specification

The original "clean" agent, carbon dioxide suppresses fire without leaving behind an agent to damage sensitive equipment. And because there is no agent to clean up, you're back in business faster. To provide the most economical system arrangement without sacrificing performance, we offer both *Total Flooding* and *Local Application*, high pressure systems (excluding distribution pipework and fittings)

DESCRIPTION

Carbon dioxide is a plentiful, non-corrosive, non-conductive, dry, clean agent gas that does not support combustion nor react with most substances. It has a low toxicity classification by Underwriters Laboratories (Group 5a). It is commonly compressed under its own pressure to the liquid state for storage and transportation in ISO 9809-1 cylinders. Upon release, it discharges under its own pressure giving the appearance of steam as its low temperature crystalizes water in the air. For fire suppression purposes the discharge is designed to raise the carbon dioxide concentration in the hazard. This removes the free oxygen which supports combustion*, and results in fire extinguishment. The resultant lack of free oxygen dictates that total flooding hazards are evacuated immediately, and carbon dioxide from local application be avoided by personnel.

For local application systems, the liquid phase and vapour phases of the CO₂ are used to accomplish fire suppression.

PERFORMANCE

Carbon dioxide is an effective fire extinguishing agent that can be used on many types of fires. It is effective for surface fires, such as flammable liquids and most solid combustible materials. It expands at a ratio of 450 to 1 by volume. Other desirable attributes are its high degree of effectiveness, its excellent thermal stability, and freedom from deterioration. In addition, carbon dioxide has so many additional commercial uses that refills are available in practically every large city or seaport throughout the world. Criteria for quantity and concentration of carbon dioxide are developed in SANS 306:4 for both local and total flooding applications.

ORDERING INFORMATION

Carbon dioxide cylinders for use in engineered systems may be ordered in 45kg cylinder sizes.

APPROVALS

The 45kg CO₂ cylinders are manufactured in accordance with ISO 9809-1 and all have TUV approval certificates.

The manifolds are pressure tested to 190Bar in accordance with SANS 306:4 by a SANAS approved HP test station.

All ancillary valves and actuators have VDS approval.

All discharge and pneumatic hoses have SANAS testing approval.

PHYSICAL DATA

Chemical Symbol CO₂ Molecular Weight 44.01 Specific volume @ 20°C & 101,325 kPa 547 ml/g Density gas @ 101,325 kPa & 20°C 1.839 kg/m3 Relative density (Air=1) @ 101,325 kPa 1,522 Colour None Taste Acidic



FINISH

306:4

Primed and painted

accordance with SANS

signal RED in

High pressure CO₂ cylinders – 45kg capacity



TECHNICAL REQUIREMENTS

1: Manufacture Standard: ISO 9809-1:2010;

2: Manufacture Process: Seamless Steel Tube;

3: Working Pressure: 166.7bar;

- 4: Hydraulic Testing Pressure: 250bar;
- 5: Minimum Burst Pressure: 400bar;

6: Material: 37Mn, Chemical Composition

	-								
Material	С	Si	Mn	Р	S	Cr	Ni	Cu	V+Ti+B+Nb+Zr
	0.31	10	1.45	<0.020	<0.010				
37Mn	10.00					≤0.30	≤0.30	≤0.20	≤0.15
	/0.38	/0.35	/1.75	P+S≤ 0.02	25				

7: Heat Treatment Process: Quenched and Tempered;

8: Mechanical Properties as Below:

Rmg (N/mm ²)	Reg (N/mm ²)	A(%)	a kv(-50 ^o CJ Transverse	/cm²)	Hardness (HB	
≥780ª	≥660	≥14	Minimum	Average	225-275	
			28	35		

9: Thread Specification as Below:

"A"	Standard
PZ27.8	GB8335
1".14	BS 341
W28.8-1/14	DIN 477
25E	ISO11363-1
¾-14NGT	CGA V-1

10: Specification Of The Cylinder;

Capacity ^{+5%/} 0(L)	67.5
Length ±15 (mm)	1500
Weight (kg)	~ 76



Cylinder mounting straps and pipe clamps



P/N RED011

CYLINDER STRAPS – P1127

Cylinder straps are used to secure the cylinder in place. Two per single cylinder system or a single row in a multiple cylinder system.

The straps may be connected into unistrut which may be secured to any structurally solid surface. Anchoring into plaster or any other facing material is not acceptable.

DESCRIPTION

Cylinder Straps are made of galvanised steel. All mounting hardware is supplied by the system installer.

MATERIALS:

Galvanised Steel

2 PIECE PIPE CLAMPS

Supplied as a one piece including fastener

Body and screw - galvanised steel (EG)

Design load of 200kg (safety factor of 5)

Suitable for manifolds and distribution pipework



Part Number	Overall Diameter	Bolt size mm	Material Thickness (mm)
RED001	(1/2")	M6 x M 20	1.6
RED002	(3/4")	M6 x M 20	1.6
RED003	(1")	M6 x M 20	1.6
RED004	(1 ¼")	M6 x M 20	1.6
RED005	(1 ½")	M8 x M20	2
RED006	(2")	M8 x M20	2



Electrical actuator for CO₂ Valves



P/N COF1120004 – (Electrical Actuator for P/N COA023076 valves) – VDS / UL / FM APPROVED

Technical Data:

power supply 24VDC +/- 4VDC

power consumption 12W

current 0,5A



P/N COF0150007 – Reset tool for Electrical Actuator COF1120004 - VDS / UL / FM APPROVED



CO₂ cylinder valve



P/N COF2021002 - VDS / UL / FM APPROVED

¾" Valve for High Pressure Fire Suppression Systems

Technical Data:

valve seat	DIN 477
max. working pressure	360 bar
extinguishing agents	CO ₂
outlet	1/2"
activation	manually, pneumatically or / and electrically



Pneumatic actuator



P/N COF1120011 - VDS / UL / FM APPROVED

Pneumatic Actuator for Valves COF2021002Technical Data:pilot pressure:pmin. = 20 bar at max. cylinder pressure
360 barConnections:2 x G1/8"

Pneumatic / manual actuator



P/N COF1120006 - VDS / UL / FM APPROVED

Pneumatic / Manual Actuator for Valves COF2021002Technical Data:pilot pressure:pmin. = 8 bar at max. cylinder pressure
360 barConnections:2 x G1/8"

Manual actuator



P/N COF1120005 - VDS / UL / FM APPROVED

Manual Actuator for Valves COF2021002

Technical Data:

pilot pressure:

pmin. = 8 bar at max. cylinder pressure 360 bar



High Pressure discharge hose



P/N CO2023

 $\frac{1}{2}$ " Flexible high pressure discharge hose

Technical Data:

12.7 x 480

max. working pressure 360 bar

To be installed with 2 x P/N CO2024 washers



Pneumatic pilot hose and pneumatic slave hose



P/N CO2036

High Pressure Pilot hose - Ø5mm (including connectors – P/N CO2023)

Technical Data:

inside diameter4,6 mmlength650 mmmax. working pressure360 bar

P/N CO2037

High Pressure slave hose - Ø5mm (including connectors – P/N CO2023)

Technical Data:

inside diameter 4,6 mm length 450 mm max. working pressure 360 bar



End plug



P/N CO2034

Technical Data:

1/8″ NPT Brass fitting

Fit the end plug into the port of the double entry pneumatic or manual/pneumatic actuator which is on the last cylinder in the bank.

Tighten with a spanner.

Odouriser



P/N CO2025

Technical Data:

1/2" NPT Brass fitting

To be installed on the manifold (or distribution piping for a one cylinder system)

The odouriser emits a citrus odour during CO_2 gas discharge



Non return valves



P/N CO2021

Non-return valve

Technical Data:

15mm x 20mm

Material: Brass

To be fitted between the discharge hose and manifold



Nozzles – Total flood and Local application



TOTAL FLOOD APPLICATION NOZZLES

P/N CO2041

 $\%^{\prime\prime}$ NPT universal brass male nipple and nozzle – 360 deg

P/N CO2041B

½" NPT universal brass male nipple and nozzle – 180 deg

Technical Data:

Material: Brass

Nozzle orifice to be drilled and the orifice code to be stamped in accordance with hydraulic calculations



LOCAL APPLICATION CONE NOZZLES

P/N CO2042

1/2" directional nozzle

Technical data:

Steel painted housing – RED

Brass inner

Nozzle orifice to be drilled and the orifice code to be stamped in accordance with hydraulic calculations



Discharge manifold

For multiple cylinder system banks. The discharge manifolds are all manufactured with ASTM A Grade B, schedule 80 piping and pressure tested to 190 Bar in accordance with SANS 306:4 at our SANAS accredited HP testing station.

Finish: Painted - signal RED.



Part Number	Description	Туре	Part Number	Description	Туре
COMAN2	CO ₂ Manifold 2-Port	Straight	COMAN2 T	CO ₂ Manifold 2-Port	T shaped
COMAN3	CO ₂ Manifold 3-Port	Straight	COMAN3 T	CO ₂ Manifold 3-Port	T shaped
COMAN4	CO ₂ Manifold 4-Port	Straight	COMAN4 T	CO ₂ Manifold 4-Port	T shaped
COMAN5	CO ₂ Manifold 5-Port	Straight	COMAN5 T	CO ₂ Manifold 5-Port	T shaped
COMAN6	CO ₂ Manifold 6-Port	Straight	COMAN6 T	CO ₂ Manifold 6-Port	T shaped
COMAN7	CO ₂ Manifold 7-Port	Straight	COMAN7 T	CO ₂ Manifold 7-Port	T shaped
COMAN8	CO ₂ Manifold 8-Port	Straight	COMAN8 T	CO ₂ Manifold 8-Port	T shaped
COMAN9	CO ₂ Manifold 9-Port	Straight	COMAN9 T	CO ₂ Manifold 9-Port	T shaped
COMAN10	CO ₂ Manifold 10-Port	Straight	COMAN10 T	CO ₂ Manifold 10-Port	T shaped
COMAN11	CO ₂ Manifold 11-Port	Straight	COMAN11 T	CO ₂ Manifold 11-Port	T shaped
COMAN12	CO ₂ Manifold12 -Port	Straight	COMAN12 T	CO ₂ Manifold 12-Port	T shaped
COMAN13	CO ₂ Manifold 13-Port	Straight	COMAN13 T	CO ₂ Manifold 13-Port	T shaped
COMAN14	CO ₂ Manifold 14-Port	Straight	COMAN14 T	CO ₂ Manifold 14-Port	T shaped



Warning signage

Safety signs shall be installed at all entrances to CO₂ protected areas and manual operation points.



P/N CO2039

Manual release CO₂ caution signage

To be installed at any CO2 manual release point





General arrangement





General installation notes:

Pipe Sealant:

Only PTFE tape or SWAK may be used as pipe sealants for the piping and fittings

Piping:

Grade ASTM A-Grade B

Pipe Fittings:

3000lb steel

Lock off / isolating switches to be installed at the entrance to every CO₂ gas protected area.

All open ended piping shall be pneumatically tested in a closed circuit for a period of 10 min at 3 bar. At the end of 10 min, the pressure drop shall not exceed 20 % of the test pressure







MATERIAL SAFETY DATA SHEET (MSDS) CARBON DIOXIDE

DATE: July 2013 Ref. No.: MS093	Version: 3	Page 1 of 3
1 PRODUCT AND COM	PANY IDENTIFICATION	asphyxiant. Concentrations of 10% or more can produce death of
Product Name Chemical Formula Trade Names	CARBON DIOXIDE CO ₂ Technical Carbon Dioxide Industrial Carbon Dioxide Food Carbon Dioxide Instrument Grade Carbon Dioxide Laser Grade Carbon Dioxide	unconsciousness. Lower concentrations may cause sweating headache, rapid breathing, increase heartbeat, shortness of breath dizziness, mental depression, visual disturbance, shaking. Consciou persons should be assisted to an uncontaminated area and inhal fresh air. Quick removal from contaminated area is most importan Unconscious persons should be removed to an uncontaminate area, given mouth-to-mouth resuscitation and supplemental oxygen.
	Pharmaceutical Grade Carbon Dioxide	5 FIRE FIGHTING MEA
Colour coding	Carbon Dioxide (N4.5) Medical Carbon Dioxide With the exception of Medical CO ₂ , all other grades have Green (H.07) bodies, with relevant grades stencilled or denoted by decals, on the bodies of the cylinders. Medical CO ₂ has a Green (H.07) body	Extinguishing Media Carbon dioxide is an extinguishing medium. Specific Hazards Carbon dioxide does not support life. It can act as a simpl asphyxiant by diluting the concentration of oxygen in the air below th levels to support life. Emergency Actions
Valve	All above grades are fitted with 3S-Brass	If possible, shut off the source of excess carbon dioxide. Evacuat area. All cylinders should be removed from the vicinity of the first
Company Identification	0.860-inch by 14 tpringht-hand male valve African Oxygen Limited 23 Webber Street Johannesburg, 2001 Tel No: (011) 490-0400 Eav Nei (011) 490-0506	Cylinders that cannot be removed should be cooled with water from safe distance. Cylinders that have been exposed to excessive hea should be clearly identified and returned to the supplier. CONTAC THE NEAREST AFROX BRANCH. Protective Clothing
EMERGENCY NUMBER	0860 020202 or (011) 821 3000 (24 hours)	Self-contained breathing apparatus. Safety gloves and shoes, o boots, should be worn when handling cylinders.
2 COMPOSITION/INFO	RMATION ON INGREDIENTS	Carbon dioxide is heavier than air and could accumulate in low-lyin
Chemical Name	Carbon Dioxide	areas. Care should be taken when entering a potentially oxyger deficient environment. If possible, ventilate the affected area.

Contraction of the second second	the set of the set is an internet in the set
Chemical Family	Carbon Anhydride
Synonyms	Carbonic Acid Gas
CAS No.	124-38-9
UN No.	1013
ERG No.	120
Hazard Warning	2 C Non flammable Gas

3 HAZARDS IDENTIFICATION

Main Hazards

Carbon dioxide does not support life. It can act as a simple asphyxiant by diluting the concentration of oxygen in air below the levels necessary to support life. As it is heavier than air it will tend to concentrate at lower levels.

Adverse Health Effects

Carbon dioxide acts as a stimulant and depressant on the central nervous system. Increases in heart rate and blood pressure have been noted at a concentration of 7.6 percent, and dysonea (laboured breathing), headache, dizziness and sweating occur if exposure at that level is prolonged.

Chemical Hazards

Carbon dioxide is relatively non-reactive and non-toxic. In the presence of moisture it can aggressively bring about corrosion in a variety of steel materials.

Biological Hazards

The greatest physiological effect of carbon dioxide is to stimulate the respiratory centre, thereby controlling the volume and rate of respiration. It is able to cause dilation and constriction of blood vessels and is a vital constituent of the acid-base mechanism that controls the pH of the blood.

Vapour Inhalation

At concentrations of 10% and above, unconsciousness can result in one minute or less. Impairment in performance has been noted during prolonged exposure to concentrations of 3% carbon dioxide even when the oxygen concentration was 21%.

4 FIRST AID MEASURES

Eye/Skin Contact No known effect.

(See Section 3 above)

Ingestion Prompt medical attention is mandatory in all cases of overexposure to carbon dioxide. Rescue personnel should be equipped with selfcontained breathing apparatus. Gaseous carbon dioxide is an

ŋg

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions

Do not enter any area where carbon dioxide has been spilled unless tests have shown that it is safe to do so.

Environmental Precautions

As carbon dioxide is classified as a "greenhouse" gas, any spillage should be avoided at all times.

Small Spills Shut off the source of escaping carbon dioxide. Ventilate the area. Large Spills

Evacuate the area. Shut off the source of the spill if this can be done without risk. Restrict access to the area until completion of the cleanup procedure. Ventilate the area using forced-draught if necessary.

HANDLING AND STORAGE

Do not allow cylinders to slide or come into contact with sharp edges. Carbon dioxide cylinders should be stacked vertically at all times, should be firmly secured in order to prevent them from being knocked over. Use a "first-in first-out" inventory system to prevent full cylinders from being stored for excessive periods of time. Keep out of reach of children.

EXPOSURE CONTROLS/PERSONAL PROTECTION 8

Occupational Exposure Hazards

As carbon dioxide is a simple asphyxlant, avoid any areas where spillage has taken place. Only enter once testing has proved the atmosphere to be safe, and remember that gas is heavier than air. Engineering Control Measures

Engineering control measures are preferred to reduce exposure to oxygen-depleted atmospheres. General methods include forceddraught ventilation, separate from other exhaust ventilation systems. Ensure that sufficient fresh air enters at, or near, floor level Personal Protection

Self-contained breathing apparatus should always be worn when entering area where oxygen depletion may have occurred. Safety goggles, gloves and shoes, or boots, should be worn when handling cylinders

Skin No known effect.

9 PHYSICAL AND CHEMICAL PROPERTIES



Dage 2 of 3

High pressure Carbon Dioxide fire suppression systems

Version: 3



MATERIAL SAFETY DATA SHEET (MSDS) CARBON DIOXIDE

DATE: July 2013

Ref. No.: MS093

PHYSICAL DATA CO₂ Chemical Symbol Molecular Weight 44.01 Specific volume @ 20°C & 101,325 kPa Density gas @ 101,325 kPa & 20°C 547 mi/g 1.839 kg/m3 Relative density (Air=1) @ 101,325 kPa 1.522 Colour None Taste Acidic Odour None

10 STABILITY AND REACTIVITY

Conditions to avoid

The dilution of oxygen in the atmosphere to levels which cannot support life. Never use cylinders as rollers or supports, or for any other purpose than the storing of carbon dioxide. Never expose the cylinders to excessive heat, as this may cause sufficient build-up of pressure to rupture the cylinders.

Incompatible Materials

As dry carbon dioxide is inert it may be contained in systems constructed of any of the common metals that have been designed to safely withstand the pressures involved. Hazardous Decomposition Products None

11 TOXICOLOGICAL INFORMATION

Acute Toxicity	TLV 5000 VPM
Skin & eye contact	No known effect
Chronic Toxicity	No known effect
Carcinogenicity	No known effect
Mutagenicity	No known effect
Reproductive Hazards	No known effect
(For further information	see Section 3. Adverse Health effects)

12 ECOLOGICAL INFORMATION

Carbon dioxide is heavier than air and can cause pockets of oxygendepleted atmosphere in low-lying areas. It does not pose a hazard to the ecology.

13 DISPOSAL CONSIDERATIONS

Disposal Methods

Small amounts may be blown to the atmosphere under controlled conditions. The gas supplier should only handle large amounts. Disposal of Packaging

The gas supplier must only handle the disposal of cylinders.

1013

14 TRANSPORT INFORMATION

ROAD TRANSPORTATION UN No ERG No Hazchem warning

120 2C Non-flammable Gas



SI		1013
C	ass	
Pa	ackaging group	
La	abel	Non-flammable Gas
A	R TRANSPORTATION	
IC	AO/IATA Code	1013
C	855	2.2
Pa	ackaging group	
Pa	ackaging instructions	
-	Cargo	200
-	Passenger	200
M	aximum quantity allowed	
-	Cargo	150kg
5	Passenger	75kg

15 REGULATORY INFORMATION

EEC Hazard class Non-flammable

Risk Phrase	Description	Safety Phrase	Description
R44	Risk of explosion if heated under confinement	S2	Keep out of reach of Children
R58	May cause long-term adverse effects in the environment	S3	Keep in a cool place
		S9	Keep container in a well- Ventilated place
		S36	Wear suitable protective clothing
		S38	In case of insufficient ventilation, wear suitable respiratory equipment

National legislation None

Refer to SABS 0265 for explanation of the above.

16 OTHER INFORMATION

Bibliography

Compressed Gas Association, Arlington, Virginia Handbook of Compressed Gases – 3rd Edition Matheson, Matheson Gas Data Book – 6th Edition SABS 0265 - Labelling of Dangerous Substances

17 EXCLUSION OF LIABILITY

Information contained in this publication is accurate at the date of publication. The company does not accept liability arising from the use of this information, or the use, application, adaptation or process of any products described herein.

