Operation and Maintenance Manual

for the

ACS3920

CO2 Free / Dry Air Compressor System



Thunder Scientific[®]Corporation

623 Wyoming Blvd. SE ✓ Albuquerque, New Mexico 87123-3198 Ordering: (800) 872.7728 ✓ Tel: (505) 265.8701 ✓ FAX: (505) 266.6203 www.thunderscientific.com Copyright © 2021 by Thunder Scientific Corporation, All Rights Reserved

ACS3920 Operation and Maintenance Manual Document Edition – 004

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WARNING

To ensure the safety of operating personnel, and to avoid damage to this equipment:

DO NOT operate this unit without a properly grounded, properly polarized power cord. **DO NOT** connect this unit to a non-grounded, non-polarized outlet.

WARNING

HIGH VOLTAGE is used in the operation of this equipment.

SEVERE INJURY OR DEATH

may result if personnel fail to observe safety precautions. Before working inside the equipment, turn power off and disconnect power cord.

WARNING

HIGH TEMPERATURES

exist in this equipment.

FIRE and SEVERE BURNS may result if personnel fail to observe safety precautions.

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1 INTRODUCTION

The ACS3920 Air Compressor System with integral CO2 Adsorber/Dryer is designed to be used as the gas supply for the Thunder Scientific 3920 Low Humidity Generator. The ACS3920 Air Compressor System consists of a vibration isolated oil-less compressor, membrane style air dryer, CO2 Adsorber/Dryer, and adjustment regulators, all incorporated into a sound muffling cabinet. The ACS3920 is ideal for laboratory use because of its 100 psiG pressure output at 10 L/min capability, 100% duty cycle, low sound level of less than 70 db(A), and long service life.

NOTE: When using the ACS3920 with a Model 3920 or Model 3900 low humidity generator the working range of the generator will be limited by the lower pressure and overall dryness outputted by the ACS3920. You will only be able to generate down to around a -70 °C frost point when using the ACS3920. It is also important to adjust the internal Model 3920 or Model 3900 regulator to 80 to 90 psiG to assure proper pressure control.

2 SPECIFICATIONS and ENVIRONMENTAL CONDITIONS

2.1 Specifications

Voltage/Frequency:	110-120/115-120VAC 50/60Hz, 7A
Voltage/Frequency (Optional):	
Pressure Output (maximum):	100 psiG
Ambient Pressure Frost Point:	
Flow Rate (maximum):	
Sound Level:	
Duty Cycle:	
Physical Dimensions: 2	8.9 w" x 18.1 d" x 12.7 h" (73.4 cm x 46 cm x 32.2 cm)
Dry Weight:	

2.2 Environmental Conditions

Operating Temperature:	15 to 30 °C
Storage Temperature:	> 0 to 50 °C
Humidity:	5 to 90% non-condensing

2.3 Warranty

Thunder Scientific Corporation (TSC) warrants this product to be free of defects in material and workmanship under normal use and service when operated within the specified design limitations for a period of 90 days from date of shipment or 2000 operating hours, whichever comes first. TSC's obligation under this warranty shall be limited to the following: Product is returned to TSC with transportation charges prepaid and that TSC's examination reveals the Product to be defective, TSC, at its option, shall repair or replace at TSC's plant, any part or parts of the Product which is or are defective. This warranty shall not apply to any Product that has become damaged or inoperative because of ordinary wear, misuse, cold, heat, rain, excessive humidity, freeze damage, use of improper chemicals, negligence, accident, failure to operate the product in accordance with the instructions provided in the Operation and Maintenance Manual(s) supplied with the product, improper maintenance, the use of accessories or attachments not recommended by TSC or unauthorized repair or alterations.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, AND ALL OTHER LIABILITIES AND OBLIGATIONS ON THE PART OF TSC; TSC SHALL NOT BE LIABLE FOR ANY INCIDENTAL, INDIRECT OR CONSEQUENTIAL LOSS, DAMAGE, OR EXPENSE THAT MAY RESULT FROM ANY DEFECT, FAILURE OR MALFUNCTION OF THE PRODUCT. All warranties: express or implied, with respect to any device or component not manufactured by TSC but incorporated into its Product are the responsibility of the original manufacturer and shall not affect or apply to TSC.

3 SAFETY GUIDELINES

All compressed gases, including air, can be dangerous. Know and follow all safety rules when using compressed air and especially when disconnecting and venting compressed air lines.

Always operate the ACS3920 Air Compressor System in a clean, dry, well-ventilated area, free of combustible materials, or solvent vapors. Operate in an open area at least 12 inches away from any wall or obstruction that would restrict the flow of fresh air to the ventilation openings. Restricting any of the housing openings will cause serious overheating leading to probable failure or possible fire.

The ACS3920 Air Compressor System is an electrically powered device. Never operate in wet conditions and never operate with cover removed. Failure to provide adequate grounding could result in serious injury or death from electrocution. Make certain that the electrical circuit provides proper electrical grounding, correct voltage, and adequate fuse protection.

Attempting to operate the ACS3920 with damaged or missing parts or attempting to repair with protective cover removed can expose you to moving parts and can result in serious injury. Any required repair should be performed by authorized personnel. Repairs attempted by unqualified personnel can result in serious injury or death by electrocution.

The compressed air from the ACS3920 is **not safe** for breathing and should never be used to supply air for human consumption. The compressed air will contain less oxygen than normal air and will not meet breathing air standards for oxygen content. The air stream may also contain carbon monoxide, toxic vapors, or solid particles. Breathing these contaminants can cause serious injury or death.

Always operate the ACS3920 in a stable secure position to prevent accidental movement of the unit.

Refer to Gast Manufacturing 71R Series Rocking Piston Oil-Less Pump Operating and Maintenance Manual for additional specifications, service instructions, safety guidelines, hazard and warning information.

4 INSTALLATION

4.1 Unpacking

Unpack the ACS3920 Air Compressor System carefully and inspect it for any damage that may have occurred during shipment. If there is shipping damage, notify the carrier immediately. Verify that the power cord, air supply tubing with connection fittings, and operation manual are present. If possible, save shipping container for future use.

4.2 Location

Locate the ACS3920 on the floor with the outlet within five feet of the generator's gas inlet and at least 12 inches away from the wall or other obstructions that would restrict the flow of air to or from the ventilation openings. The enclosure is designed to allow for proper cooling therefore ventilation openings must remain unrestricted to maintain proper operating temperature.

4.3 Air Supply Tubing

Connect the 1/8" OD air supply tubing between the ACS3920 outlet and the generator's gas inlet. The VCR type fitting connections require that face seal gaskets must be used.

4.4 Power

The ACS3920 is equipped with a power receptacle (RCP1) and cord having a grounding wire with an appropriate grounding plug. The plug must be used with an outlet that has the same configuration and has been installed and grounded in accordance with all local codes and ordinances.

Power of the appropriate voltage, frequency, and current capacity, as indicated on the equipment label, is applied via the power cord to the ACS3920 power receptacle.

4.5 Remote-Control ACS Cable

This cable is used only if the 3920 Low Humidity Generator is configured with the Remote-Control ACS option.

If configured, connect the ACS1 control cable between the humidity generator and the ACS3920 Air Compressor System. This will allow the humidity generator to start and stop the air compressor when required for humidity generation operation.

5 COMPONENTS and CONTROLS

Refer to paragraph 5.10 for Component Locations

5.1 Power Switch

The Power Switch (CBS1) allows power to be turned ON/OFF at this location independent from the humidity generator. The Power Switch also has a built-in circuit breaker for protection of the ACS3920 air compressor system.

5.2 Remote/Manual Operation Switch

The Remote/Manual Switch (S1) allows the operator to select between Manual and Remote-Control operation of the ACS3920. In Manual mode the air compressor will run continuously until the main Circuit Breaker Switch (CBS1) is toggled off.

In remote mode the air compressor is controlled by the humidity generator if configured with the Remote-Control ACS option.

Caution: Do not toggle "Remote/Manual" switch (S1) when compressor is running. Use ON/OFF Circuit Breaker Switch (CBS1) to stop and then toggle "Remote/Manual" switch to change operating modes.

5.3 Hour Meter

The Hour Meter (HM1) tracks total run hours of the ACS3920 air compressor system.

5.4 Air Compressor

The Oil-less Air Compressor (COMP) provides oil-free air regulated to a pressure of 140 psiG (G1).

Note: Compressor pressures higher than 140 psiG will shorten the life of the compressor and should be avoided.

5.5 Compressor Pressure Regulator

The Compressor Pressure Regulator (REG1) is a back-pressure regulator, set to 140 psiG, that regulates the pressure from the compressor to the membrane dryer. The compressor pressure is indicated on pressure gauge G1.

Turn the 9/32" (7mm) adjustment shaft on the compressor pressure regulator clockwise to increase pressure and counterclockwise to decrease pressure. Set the pressure to 140 psiG as indicated on pressure gauge G1. This is the pressure coming from the compressor and is <u>not</u> the final output pressure. The final output pressure can be read on pressure gauge G3 located inside the unit.

Note: Adjustment may be necessary after one hour of run time to keep the indicated pressure at 140 psiG (G1).

5.6 Compressed Air Membrane Dryer

The Compressed Air Membrane Dryer (AD1) is located after the air compressor and is specifically designed to remove water vapor from the compressed air stream prior to the CO2 Adsorber/Dryer (AD2) inlet. The membrane dryer removes water vapor from the gas stream by the selective permeation of water molecules through polymer. Excess dry air from REG1 flows through the shell side of the dryer purging water vapor permeate as it is vented to atmosphere.

5.7 CO2 Adsorber/Dryer Inlet Pressure Regulator

The CO2 Adsorber/Dryer Inlet Pressure Regulator (REG2) regulates the pressure from the membrane dryer to the CO2 Adsorber/Dryer and is indicated on pressure gauge G2 (viewable inside unit with top cover removed). This pressure is factory set to 120 psiG as indicated on the pressure gauge (G2) and should not require adjustment.

5.8 Outlet Pressure Regulator

The Outlet Pressure Regulator (REG3) controls the pressure available from the CO2 Adsorber/Dryer to the ACS3920 outlet and is indicated on pressure gauge G3 (viewable inside unit with top cover removed). This pressure is factory set to the maximum outlet pressure of 100 psiG as indicated on the pressure gauge (G3) and should not require adjustment.

Note: If an outlet pressure lower 100 psiG is desired, rotate the adjustment knob of REG3 counterclockwise until the desired outlet pressure is reached.

5.9 Dimensional Drawing

Refer to drawing: ACS39001-115



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5.10 Component Locations

ITEM DESCRIPTION

- 1. Air Outlet
- 2. Air Dryer / Membrane (AD1)
- 3. Air Dryer / CO2 Adsorber (AD2)
- 4. On / Off Circuit Breaker Switch (CBS1)
- 5. Circulation Fan (CF1)
- 6. Circulation Fan (CF2)
- 7. Air Compressor (COMP)
- 8. Check Valve (CV1)
- 9. Air Intake Filter (F1)
- 10. Pressure Gauge (G1)
- 11. Pressure Gauge (G2)
- 12. Pressure Gauge (G3)
- 13. Heat Limit Switch (HLS)

ITEM DESCRIPTION

- 14. Hour Meter (HM1)
- 15. Remote Power Jack (J1)
- 16. Particulate Filter (LF1)
- 17. Particulate Filter (LF2)
- 18. Particulate Filter (LF3)
- 19. Particulate Filter (LF4)
- 20. Power Receptacle (RCP1)
- 21. Pressure Regulator (REG1)
- 22. Pressure Regulator (REG2)
- 23. Pressure Regulator (REG3)
- 24. Remote/Manual Switch (S1)
- 25. Solenoid Valve (SOL1)





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6 GENERAL OPERATION

6.1 Start-up

Be sure the "Air Supply Tubing" installation of paragraph 4.3 has been completed before proceeding.

Insure the ACS3920 circuit breaker power switch is in the OFF position. Insert the power cord into the ACS3920 power receptacle and secure receptacle clamp. Plug the power cord into an AC mains outlet of the appropriate voltage, frequency, and current capacity as indicated by the equipment label.

Insure the Remote/Manual switch (S1) is "Manual" to allow the air compressor system to run continuous. Apply power to the ACS3920 using the ON/OFF circuit breaker power switch (CBS1). The compressor will start immediately, and the pressure gauge (G1) will begin to indicate compressor pressure of approximately 140 psiG.

Caution: Do not toggle "Remote/Manual" switch (S1) when compressor is running. Use On/Off Circuit Breaker Switch (CBS1) to stop the compressor and then toggle "Remote/Manual" switch to change operating modes.

6.2 Compressor Pressure Adjustment

If compressor pressure adjustment is required adjust the compressor pressure regulator (REG1) to 140 psiG, during no-flow conditions. Turn the 9/32" (7mm) adjustment shaft clockwise to increase pressure and counterclockwise to decrease pressure.

6.3 Shutdown

Disconnect power to the ACS3920 using the ON/OFF circuit breaker power switch.

Important: All pressure <u>MUST</u> be vented before disconnecting the air supply tubing or personal injury may result.

7 INSPECTION and MAINTENANCE

7.1 Recommended Maintenance Schedule

<u>Periodic</u> <u>Maintenance</u>	<u>Hours</u> 100% Duty Cycle
Inlet Filter Element (F1) Inspection	1,000
Minor Compressor Service Kit Service Kit Gast #K634	2,000
Major Compressor Rebuild or Replacement	4,000
Replace MCA6 Desiccant Towers (If measured output is wet) 2ea # 51386	4,000

Note: Refer to the MCA6 users guide for additional "Inspection and Maintenance" information.

7.2 Filter Inspection and Replacement

The Compressor Intake Filter requires periodic inspection. Initial inspection is suggested at 1,000 hours; then user should determine the frequency thereafter. Most problems can be prevented by keeping the intake filter clean. A dirty intake filter will decrease compressor performance and can decrease compressor life.

Warning: Disconnect power and be sure all pressure has been vented before service!

- 1. Intake Filter Element (F1)
 - a. Remove ACS3920 top access cover.
 - b. Remove intake filter cover by pushing in and turning clockwise.
 - c. Replace or clean the filter element using air or vacuum.
 - d. Replace cover by pushing in and turning counterclockwise.
- 2. Particulate Filter Element (LF1) Clean or replace at 4,000 hours.
 - a. Remove ACS3920 top access cover.
 - b. Open membrane dryer retainer clips.
 - c. Lift compressor end of membrane dryer for access to filter.
 - d. Disconnect compressor outlet hose from filter inlet.
 - e. Remove the filter assembly from membrane dryer using a backup wrench on inlet elbow.
 - f. Unscrew the adapter (1) by turning counterclockwise.
 - g. Remove filter (3) and replace or clean with water and blow dry.
 - h. Inspect bowl (5) and seal (4). If dirty, clean by wiping the bowl with a soft dry cloth.
 - i. Ensure seal (2) is clean and in place then re-install filter and rotate the adapter clockwise until snug.
 - j. Re-install filter assembly using a backup wrench on inlet elbow turning clockwise.
 - k. Reconnect compressor outlet hose to filter inlet.
 - I. Snap membrane dryer back into place.



Particulate Filter (LF1)

7.3 Storage Procedures

Proper shutdown procedures must be followed to prevent compressor damage. Failure to do so may result in premature compressor failure. The non-lubricated compressor is constructed of ferrous metals and/or aluminum which are treated for corrosion protection but are still subject to possible rust and corrosion when pumping condensable vapors such as water.

Follow the steps below to assure correct shutdown and storage between uses:

- 1. **NEVER** oil this non-lubricated compressor as damage will result.
- 2. For long term storage of the ACS3920:
 - a. Disconnect power from ACS3920.
 - b. Remove ACS3920 top access cover.
 - c. Disconnect the air hose at the outlet of the compressor.
 - d. Apply power and run the compressor "open" for at least five minutes.
 - e. Disconnect power, cap compressor outlet.
 - f. The ACS3920 is now ready for long term storage.

7.4 Service Kit

Refer to Gast Manufacturing 71R Series Rocking Piston Oil-Less Pump Operating and Maintenance Manual for parts and procedures.

7.5 Heat Limit Switch

The non-recycling heat limit switch (HLS) trips at a predetermined set point shutting down the circuit until reactivated. This switch is tripped in the event of elevated enclosure temperature above the maximum operating temperature.

To reactivate limit switch:

- a. Disconnect power from ACS3920.
- b. Remove ACS3920 top access cover.
- c. Locate and remove the black slotted limit switch cap (20).
- d. Press the reset button (under black cap).
- e. Replace black slotted cap.
- f. Replace the ACS3920 top access cover.



8

Figure 1-1

110 VAC

Refer to drawing: ACS39001-115-F



Figure 1-2

220 VAC

Refer to drawing: ACS39001-220-F



Figure 1-3

9 TROUBLESHOOTING GUIDE

Possible Reason	No / Low Pressure	High Pressure	Excessive Noise	Over Heating	Won't Start	Wet Output
Dirty Intake Filter (F1)	Х					x
Dirty Particulate Filter (LF1)	Х					Х
Hose Leak	Х					Х
Regulator Adjustment	Х	Х	Х			
Worn or Damaged Compressor	X		Х		Х	Х
Worn or Damaged Fan			Х	Х		
Safety Valve "Popping Off"		Х	Х			
Low Voltage				Х	Х	
Blocked Ventilation Opening	Х		Х	Х	Х	Х
High Outlet Pressure					Х	
Overheating	Х	Х	Х	Х	Х	Х
Heat Limit Switch Tripped				Х	Х	
Excessive Flow Rate						Х
Desiccant Towers (End of Life)						Х

Note: Refer to the MCA6 users guide for additional trouble shooting for a "Wet Output"

10 PARTS LIST

Find #	Qty	Description	Part Number
CBS1	1	Circuit Breaker Switch	ACSPWRSW-1
HM1	1	Hour Meter	HRMETERACS
S1	1	Switch, Remote/Manual	RGSC D901RWB0
J1	1	Jack, Remote Control	L722AS
COMP	1	Compressor, Gast	71R555-P322-N570X
G1	1	Gauge, Pressure	G1X510
G2 & G3	2	Gauge, Pressure	G6X114
REG1	1	Regulator, Back Pressure	JBPREG
REG2 & 3	2	Regulator	REGNG200
AD1	1	Air Dryer, Membrane	MD1015
AD2	1	CO2 Adsorber/Dryer	MCA6-11
CF1 & 2	2	Fan, Circulation	MR2B3
F1	1	Filter Element, Air Intake	5Z768
LF1	1	Filter Element, Particulate Line	514275
LF2 & 4	2	Filter Element, Particulate Line	SS-4F-K4-7
LF3	1	Filter, Particulate Line	4HEU8
CV1	1	Valve, Check	32PLCK-4
SOL1	1	Valve, Solenoid	U147121-110
SSR-AC0	1	Relay, Solid State UPD Dual Output	UPD2415DF
HLS	1	Switch, Heat Limit	CAP-MR-140-SS
***	2	Desiccant Towers, MCA6 Adsorber/Dryer	51386
***	1	Service Kit, Gast Compressor	K634

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1 to 4 Inch Diameter PRISM[®] Membrane Installation Guide



QOP-43-07 (PRISM Membrane Installation Guide) Rev D

PA6 PRISM® Membrane Installation Guide



For More Information

To learn more about our global gas generation capabilities or to tell us more about your needs, contact us at:

Air Products and Chemicals, Inc. PRISM Membranes 11444 Lackland Road St. Louis, MO 63146-3544 Tel 800-635-8842 Fax 314-995-3500

tell me more www.airproducts.com/membranes