

Z MED Medical Air System

Part number 4107 9029 52 Revision 01 22 August 2023





Installation, Operation and Maintenance Manual Z MED Medical Air Systems W/ Mk5 Touch Central Controller (ZR/ZT Systems)

This unit purchased	d from:
Date purchased: _	
Model number: -	
Serial number: -	
Option(s) included:	

Any information, service or spare parts requests should include the machine serial number and be directed to:

BeaconMedæs

1059 Paragon Way Rock Hill, SC 29730

Tech. Services 1-888-4MEDGAS (1-888-463-3427) Fax: (803) 817-5750

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Z MED Medical Air System

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Revision History

Revision	Description	Date
00	Initial release	February 14, 2022
01	Added Next Gen Filter data to Appendix C	August 22, 2023



Safety Precautions

Pressurized air from the system may cause personnel injury or property damage if the unit is improperly operated or maintained.

Operator should have carefully read and become familiar with the contents of this manual before installing, wiring, starting, operating, adjusting and maintaining the system.

Operator is expected to use common sense safety precautions, good workmanship practices and follow any related local safety precautions.

In addition:

- Before starting any installation or maintenance procedures, disconnect all power to the package.
- All electrical procedures must be in compliance with all national, state, and local codes and requirements.
- A certified electrician should connect all wiring.
- Refer to the electrical wiring diagram provided with the unit before starting any installation or maintenance work.
- Release all pressure from the package before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.
- Notify appropriate hospital personnel if repairs or maintenance will affect available compressed air levels.
- Air inlet must be placed in an area free of toxic or hazardous contaminants. It must be kept away from ETO exhaust vents, vacuum exhaust vents, areas close to automotive exhausts, etc., in accordance with NFPA 99.

- Prior to using the Desiccant Dryer System, the medical facility must have a Certifier perform all installation tests as specified in NFPA 99. The medical facility is also responsible for ensuring that the Medical Air meets the minimum requirements as specified in NFPA 99.
- This is a high speed, rotating piece of machinery. Do not attempt to service any part while machine is in operation.
- To prevent automatic starting, disconnect all electrical power before performing any maintenance.
- Make sure that all loose articles, packing material, and tools are clear of the package.
- Never operate a compressor with its isolation (shutoff) valve closed or without its relief valve in place. Damage to the compressor may occur.
- Check all safety devices periodically for proper operation.
- Electrical service must be the same as specified on the control panel nameplate or damage to the equipment may occur.
- Vibration during shipment can loosen electrical terminals, fuse inserts, and mechanical connections. Tighten as necessary.



1.0 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your Z MED Medical Air System. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

All information, specifications and illustrations within this manual are those in effect at the time of printing. The manufacturer reserves the right to change or make improvements without notice and without incurring any obligation to make changes or add improvements to products previously sold.

When requesting information, service, ordering of spare parts, etc., please reference all information supplied on the serial number plate located on the side panel of the Central Control System.

To facilitate maintenance, recommended spare parts for your specific Z MED model are available. Failure to maintain recommended spare parts and filter cartridges might result in expensive and unnecessary downtime for which the manufacturer cannot be responsible. To request a quotation, or place an order for recommended or emergency spare parts, please contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (888-463-3427).

1.1 Modular System Standard Components

System Design

The modular Z MED Medical Air system consists of compressor modules (duplexed or multiplexed), a dryer/control module, and an air receiver module. Each module is fully compliant with NFPA 99.

Compressor Module

The compressor modules are fully enclosed with sound attenuated steel panels with full access doors for maintenance and inspection. Each compressor module includes the compressor, drive motor with starter, oil system, and a compressor control system. The compressor intake is equipped with an air intake filter and integral shutoff/unloading valve. Unloading is carried out by closing the intake valve. Loading or unloading of the unit is controlled by a pressure transducer which will actuate the loading solenoid valve. The air discharge for the compressor module has a pulsation damper, check valve and manual isolation valve. The control system will display the runtime hours, temperature readouts, pressure readouts, service indicators, safety warnings and safety shutdowns for the compressor module.

ZR Compressor Drive and Motor

The compressor is a two-stage, oil-free compressor block, consisting of separate low and high pressure rotary tooth compressor elements flanged to a common step-up gearbox. The high and low compressor elements are supplied with safety relief valves. ZR compressors have a water-cooled oil cooler, intercooler and aftercooler. The first stage air is cooled by an intercooler with moisture trap and automatic drain valve. The second stage air is cooled by an aftercooler with moisture trap with manual and automatic drain valve. The gearbox oil system includes an oil sump, pump, oil filter, bypass valve, drain connection, sight-glass and cooler.

ZT Compressor Drive and Motor

The compressor is a two-stage, oil-free compressor block, consisting of separate low and high pressure rotary tooth compressor elements flanged to a common step-up gearbox. The compressor elements are air cooled. The high and low compressor elements are supplied with safety relief valves. ZT compressors are provided with an air-cooled oil cooler, intercooler and aftercooler. An electric motor-driven fan generates the cooling air. The first stage air is cooled by an intercooler with moisture trap and automatic drain valve. The second stage air is cooled by an aftercooler with moisture trap with manual and automatic drain valve. The gearbox



1.0 General Information

oil system includes an oil sump, pump, oil filter, bypass valve, drain connection, sight-glass and cooler.

Intake Piping

The compressor has a factory piped intake with one "hospital type" inlet air filter with flanged connection for remote air intake. The inlet filter removes dust from the incoming air through cyclonic action and through an element. A stainless steel intake flex connector with flanges ships loose.

Discharge Piping

Each compressor module is equipped with an integral air-cooled aftercooler, complete with moisture separator and timed automatic solenoid drain valve. The compressor discharge line includes an external flex connector, internal safety relief valve and check valve. The external flex connector is braided stainless steel, type 304. For ZR water-cooled systems, a water shut-off valve ships loose.

Isolation System

The compressor and motor shall be fully isolated from the main compressor module base by means of a heavy isolation system for a minimum of 95% isolation efficiency.

Dryer/Control Module

The dryer/control module shall include a central control system to control multiple compressors and a duplexed desiccant drying system with dew point hygrometer/ CO transmitters. Each dryer includes an inlet filter, final line filters and regulators. All of the above shall be factory piped and wired in accordance with NFPA 99 and include valving to allow complete air receiver by-pass, and air sampling port.

Dryer/Filter/Regulator System

Each desiccant dryer must be individually sized for peak calculated demand and capable of producing a -40°F (-40°C) pressure dew point. Dryer purge flow shall be minimized through an integral demand based purge saving control system. The inlet to each dryer shall include a combination particulate and coalescing filter with an automatic drain. The duplexed final line filters consist of a 1 micron particulate filter and one active carbon filter, duplexed final line regulators, single oil indicator and duplexed safety relief valves shall be factory mounted and piped. All filters shall have element change indicators.

Central Control System

The mounted and wired central control system shall be NEMA 12, U.L. labeled and rated for 115V single phase electrical service. The control system shall provide automatic lead/lag sequencing, visual and audible reserve unit alarm with isolated contacts for remote alarm. Automatic alternation of all compressors based on a first-on/first-off principle with provisions for simultaneous operation if required, automatic activation of reserve unit if required, visual and audible alarm indication for high discharge air temperature shutdown with isolated contacts for remote alarm shall be included.

Dew Point / CO Transmitters

The dryer/control module shall incorporate a dew point and a CO transmitter that are mounted, pre-piped, and wired. Dew point and CO conditions will be displayed on the central control system. The dew point transmitter probe shall be the ceramic type sensor. The system accuracy shall be a minimum of \pm 2°C for dew point and \pm 2 ppm (at 10 ppm) for carbon monoxide. Dew point alarm shall be factory set at 36°F (2°C) per NFPA 99, and the CO alarm shall be factory set at 10 ppm. Both set points shall be field adjustable. High CO and high dew point conditions shall be indicated with visual and audible alarms.

<u>Air Receiver Module</u>

The vertical air receiver shall be ASME Coded, National Board Certified, galvanized, rated for a minimum 150 psig design pressure and include a liquid level sight glass, pressure gauge, safety relief valve, manual drain valve an automatic solenoid drain valve and a high level condensate sensor.



2.1 Inspection Upon Receiving

The condition of the Z Med Medical Air system should be carefully inspected upon delivery. Any indication of damage by the carrier should be noted on the delivery receipt, especially if the system will not be immediately uncrated and installed. Z Med modules may remain in their shipping containers until ready for installation. If any of the modules are to be stored prior to installation, they must be protected from the elements to prevent rust and deterioration.

DO NOT REMOVE the protective covers from the inlet and discharge connection ports of the unit until they are ready for connecting to the hospital's pipeline distribution system.

2.2 Handling

WARNING!

Use appropriate load rated lifting equipment and observe safe lifting procedures during all moves.

The Z Med modules can be moved with either a forklift or a standard pallet jack. The compressor can be moved by a forklift using the slots in the frame. Make sure that the forks protrude from the other side of the frame. The compressor can also be lifted after inserting beams in the slots. Make sure that the beams cannot slide and that they protrude from the frame equally. The chains must be parallel to the bodywork by chain spreaders in order not to damage the compressor. The lifting equipment must be placed in such a way that the compressor will be lifted perpendicularly. Lift smoothly and avoid twisting. Keep all packing in place around the dew point/CO transmitters during installation to minimize damaging the transmitters. Walk along the route the unit must travel and note dimensions of doorways and low ceilings. All equipment should be positioned to ensure easy access to all four sides to perform routine maintenance and allow high visibility of indicators and gauges.

2.3 Location

The Z MED system should be installed indoors in a clean, well-ventilated environment. Areas of excessive dust, dirt or other air-borne particulate should be avoided.

Secure the package to a flat, level surface capable of supporting the weight and forces of the unit. Make sure that the main bases are not bowed, twisted, or uneven. No special foundation is required. However, all main bases must be securely bolted using all mounting holes provided in the bases. If a raised concrete pad is used, the bases must not overhang the concrete pad. A method to drain away moisture is necessary. If a gravity drain is not available, a connection to a drain is necessary.

The area should have a minimum ambient temperature of 40°F (4.4°C) and a maximum ambient temperature of 105°F (40°C).

2.4 Space Requirements

Compressor units should be placed to ensure easy access to perform maintenance and high visibility of indicators and gauges. It is recommended that a minimum space of 48" be allowed on all sides of the compressors for maintenance. Dryer and Air Receivers require a minimum of 24" on all sides for maintenance. A vertical distance of 48" is required above all the equipment.

2.5 Piping

2.5.1 System Intake Piping

WARNING!

The air intake must be placed in an area free of toxic or hazardous contaminates; it must be kept away from ETO gas exhaust vents, vacuum exhaust vents, areas close to automotive exhausts, etc., in accordance with NFPA 99.



Each compressor unit is supplied with a 3" flanged inlet connection. The air intake line is typically piped to the outside of the building in accordance with NFPA 99. In this case the outside pipe must be turned down and screened to prevent contamination. To ensure that no restrictions of air flow will occur, size the intake piping according to the chart located on the Piping & Electrical Installation Drawing supplied with the system. All piping must be pre-cleaned for medical gas use. In hot, humid areas, using the building's air-conditioned supply (per NFPA 99) may improve operation conditions of the system.

2.5.2 System Interconnecting Piping

Refer to the Piping & Electrical Installation Drawing for interconnecting piping arrangement between the compressors, desiccant dryer and air receiver. Pipe materials and interconnecting pipe sizes are specified on this drawing. Flex lines are provided for field installation at the discharge point of each compressor units only.

2.5.3 System Discharge Piping

In all cases, the minimum discharge piping size out to the hospital should match or be greater than the dryer discharge connection.

2.6 Wiring

WARNING!

Be sure to disconnect all electrical power from the dryer before performing any electrical procedures.

Refer to the electrical diagram provided with the unit before starting any installation or maintenance work.

Do not operate compressor on a voltage other than the voltage specified on the compressor nameplate. All customer wiring should be in compliance with the National Electrical Code and any other applicable state or local codes.

WARNING!

Electrical power for the central control system must be supplied from the equipment system branch of the essential electrical distribution.

Check the control voltage, phase, and amp ratings before starting the electrical installation, and make sure the voltage supplied by the hospital is the same. The wire size should be able to handle peak motor amp load of all operating units, refer to the full load and compressor system amperes on the wiring diagram.

Check all electrical connections within the Z Med Medical Air System that may have loosened during shipment.

Qualified electricians only should make power connections to the control panel and any interconnecting wiring. The control panel has openings for electrical connections. **Do not drill additional holes in the control panel as this may void the system warranty.**

Ensure that the emergency generation system electrical supply is consistent with the air system's requirements to allow for correct operation of the Z Med Medical Air System at all times. Three-phase power supplied from emergency generator(s) must match that of the normal supply to allow for correct direction of the motor rotation at all times.

2.7 CAN Network Connection

For each compressor a connection channel is provided. Six connection channels can be selected, configured and used to connect compressors to the Central Control System. The connections between the Central Control System and compressors are through a Controller Area Network



(CAN). This network allows all the compressors and controller in a system to be connected to one another using a single 3 core cable, which is daisy chained from one device to the next. The CAN network acts as a universal communication system which can be used for both control and monitoring. (See FIG 2.7)



FIG 2.7 CAN Network Connection Method

2.7.1 CAN Connections

For connections that are connected over CAN, appropriate Node ID addresses must be used.

Only the LAN addresses 1 up to 6 can be used. On each compressor, the correct Node ID must be set depending on the connection channel.

Connection channel 1	Node ID 1
Connection channel 2	Node ID 2
Connection channel 6	Node ID 6
Central Controller	Node ID 30

2.8 CAN Cable Connectors

Two types of connectors are used; normal node and service node (See FIG 2.8. Can Connectors). A service node can be used on the device where a computer can be connected. It allows the connection of another device without disconnecting any other device. There can be as many service points as needed, but only one can be connected to a PC at any time. The recommended location for the service node is in the central controller cabinet.





FIG 2.8 CAN Connectors



FIG 2.8a Service CAN Connector



FIG 2.8b Normal CAN Connector



2.8.1 Cable

The CAN cable (1 pair + ground) should be used to connect the machines and controller together. This cable has been fully tested and qualified for use with **BeaconMedæs** equipment and as such is the only CAN cable **BeaconMedæs** recommends.

This cable is in accordance with ISO 11898 and allows network segments of maximum 250 meters. A total network length of 500 meters is possible, but then a repeater has to be used. Contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (1-888-463-3427) for network lengths over 250 meters.

2.8.2 Connector Cabling Procedure

Prepare the end of each cable (See FIG. 2.8.2. CAN Cable Preparation) for the CAN connector by removing either 1-3/4" (45 mm) or 2-3/8" (60 mm) of the cable insulation, depending on whether the cable is incoming or outgoing. Next, remove the plastic foil, leaving 3/8" (10 mm) of cable shielding. Then remove the fill-up material and the white/blue conductor. Finally, remove 3/16" (5 mm) of insulation from the blue, orange and white/orange conductors.



FIG 2.8.2 CAN Cable Preparation

2.8.3 Terminal Connector Cabling

For the connector at the beginning and end of the network, the cable should be connected to the terminals designated 1C-, 1C+ and GND, as shown in FIG 2.8.3 Beginning/End Connector Wiring. Make sure that the wire shielding touches the shielding plate of the connector. Close the connector and set the terminating switch to "ON" (FIG 2.8.3a Connector Switch Setting). The CAN wires should be connected inside the CAN connector as follows:

- Blue wire to terminal GND
- White/Orange wire to terminal 1C-
- Orange wire to terminal 1C+

The switch on the back of the connector should be in the "ON" position for connectors at the beginning and end of the network (See FIG 2.8.5 Connector Switch Setting). Plug the connector into the LAN port on the back of the Elektronikon controller.

Important: Be absolutely sure that the cable is connected to the correct terminals inside the start and end connectors. Failure to do this will prevent the network from functioning properly and the start and/or end machines will not be connected to the network.





FIG 2.8.3 Beginning/End Wiring Connection



FIG 2.8.3a Connector Switch Setting

2.8.4 Node Connector Cabling

For the connectors in the middle of the network, connect the wires as follows (See FIG. 2.8.4 Middle Wiring Connections):

Incoming Wire

- Blue wires to terminal GND
- White/Orange wires to terminal 1C-
- Orange wires to terminal 1C+

Outgoing wire

- Blue wires to terminal GND
- White/Orange wires to terminal 2C-
- Orange wires to terminal 2C+

Make sure that the wire shielding touches the shielding plate of the connector. Close the connectors and set the terminating switch "OFF" (See FIG. 2.8.4a Connector Switch Setting) Plug the connector into the LAN port on the back of the Elektronikon controller.





FIG 2.8.4 Middle Wiring Connections



FIG 2.8.4a Connector Switch Setting

2.8.5 Line Terminations

Correctly "terminating" the CAN network is important for a properly functioning network. This is done by inserting so-called line termination resistors at the beginning and at the end of the network cable. In the connectors as specified in FIG 2.8.5, this termination function is included

and can be set by means of a small terminator switch. Make sure this switch is in the "ON" position for both the first and last device, and in the "OFF" position for all other devices. Both connector types are equipped with this switch.





FIG 2.8.5 Connector Switch Setting

2.9 Parts List

Description	Part No.	Qty Required
Normal Connector	1088001722	Each
Service Connector	1088001727	Each
Cable	0017261013	Per meter

3.1 Prestart-Up

The contractor should notify **BeaconMedæs** two weeks prior to start-up date to schedule an appointment for an authorized technician to review the installation prior to start-up.

CAUTION: Failure to install the unit properly and have a **BeaconMedæs** authorized technician start-up the system can void the manufacturer's warranties.

WARNING!

For Prestart-Up and start-up procedures for the compressor units, refer to the individual manuals supplied separately with those units.

Prestart-up and start-up procedures should be performed for a new installation or when major maintenance has been performed.

WARNING!

Prior to putting the Z MED Medical Air System into use, the medical facility must have a certifier perform all installation tests as specified in NFPA 99. The medical facility responsible is also responsible for ensuring that the system meets the minimum requirements as specified in NFPA 99.

WARNING!

Have more than one person on hand during prestart-up and start-up procedures to ensure operator safety and to facilitate certain checks.

The main power source to the control panel should be "OFF" for the duration of the visual inspection.

Ensure that the equipment is installed on a solid level surface. Walk around the system to ensure that there is enough clearance on all sides to perform operational checks and maintenance.

Check all piping system joints that might have come loose during shipment and installation to ensure they are tight.

Check all of the compressors, dryers, air receiver and control panels for damage.

Check all valves for full open and full close travel. Ensure that the systems valves are positioned for proper operation. (Refer to labeling on valve handles.)

Check the Central Control System cabinet on the Dryer Module.

Verify electrical service. Before starting the Z Med Medical Air System, check to see that voltage, amperage, and wire size are appropriate.

CAUTION: Electrical service must be as specified or damage to equipment may occur. Open the electrical cabinet by loosening the fasteners on the front.

WARNING!

To prevent electrical shock, ensure that "All" electrical power to the system is "Off". Including the disconnect switches. The facility's circuit breaker should also be locked out.

CAUTION: Vibration during shipment and installation can loosen electrical terminals, fuse inserts, and mechanical connections. Tighten as necessary.

Check the electrical cabinet for any broken switches, lights, etc.

Check that all motor starter connections are tight and that there are no loose objects such as terminal lugs, screws, nuts, etc., in the cabinet.



3.2 Initial System Start-Up

Before starting the system for the first time all parameters in the Central Control System on the Dryer module and individual compressor module controllers must be verified/set-up.

- See Appendix A.6 for complete list of parameters for the Central Control System.
- See Appendix B.5 for complete list of parameters for the Compressor Controllers.

3.2.1 Compressor Initial Start-Up (See also ZT/ZR Instruction Book provided with compressor)

- 1. A number of VCI (Volatile Corrosion Inhibitor) foam sheets may be provided inside the bodywork and electrical cabinet to protect the compressor against corrosion. Remove the plates.
- 2. The compressor and motor are secured to the frame, immobilizing the vibration dampers during transport (FIG 3.2.1a). After installing compressor, remove the transport fixations which are painted red. Unscrew bolt (1) and remove transport bushing (5). Six transport fixations are provided: two at the gear

Gear Casing Side (1) / Motor Side (2)



Components

- 1 Bolt
- 2 Nut
- 3 Bolt
- 4 Nut
- 5 Bush
- 6 Motor support or gear casing

FIG 3.2.1a Transport Fixations

casing side, two at the motor side, and two to support the intercooler.

3. Check that the gear casing is filled with oil, the level should be in the middle of the sight-glass. Add oil via the filler plug if necessary. (FIG 3.2.1b)



- 4. Check that the electrical connections correspond to the local codes. The installation must be grounded and protected by fuses in all phases. An isolating switch must be provided.
- 5. Check the connections at the primary sides of transformers (T1 and T2). See the Service Diagram in Electrical Connections section of the ZT/ZR Instruction Book. On aircooled compressors, check the settings of circuit breaker (Q15) and overload relay (F21).
- 6. Close the manual drain valve of the condensate traps.
- On "ZR" Only: Check that the cooling water drain valves (customer installed) in the inlet and outlet lines are closed. Open the water inlet and outlet valves (customer installed). Open the water flow regulating valves (1), (2) , and (3) and check for water flow. (FIG 3.2.1c)
- 8. **On "All" compressors:** Switch on the voltage. Start the compressor and stop it immediately. Check for correct direction of ro-



tation while the motor is coasting to a stop. The arrow on the gear casing indicates the correct rotation direction. If the rotation direction is wrong, switch off the voltage and reverse two incoming electric lines. **On ZT**, check the rotation direction of the fan motor. Cooling air must be blown through the outlet grating on the roof. If the rotation direction is wrong, switch off voltage and reverse two connections at the terminals of circuit breaker (Q15).

- 9. **Oil Cooler on "ZR" compressors:** Read-out following parameters in the Elektronikon at stabilized load condition:
- Water inlet temperature ("Cooling Water In"
- Oil injection temperature ("Oil Injection")

Calculate DtOC = "Oil Injection" – "Cooling Water In"

If DtOC > 20°C (36°F), open ball valve (1) to decrease the oil injection temperature.

If DtOC < 20°C (36°F), close ball valve (1) to increase the oil injection temperature.



Components

- 1 Water flow regulating valve, oil cooler
- 2 Water flow regulating valve, aftercooler
- 3 Water flow regulating valve, intercooler
- Co Oil cooler
- Ca Aftercooler
- Ci Intercooler

FIG 3.2.1c Coolers and Water Valves (ZR)

The oil injection temperature must be set at 20° C + 2° C (38° F + 3.6° F) above water inlet temperature.

- 10. **Intercooler on "ZR" compressors:** Readout following parameters in the Elektronikon at stabilized load condition:
- Water inlet temperature ("Cooling Water In")
- High-pressure element inlet temperature ("Element 2 Inlet")

Calculate DtIC = "Element 2 Inlet" – "Cooling Water In"

If DtIC > 25° C (54° F), open ball valve (3) to decrease the temperature difference and increase the intercooler cooling.

If DtIC < 15°C (27°F), close ball valve (3) to increase the temperature difference and decrease the intercooler cooling.

The high pressure element inlet temperature must be set around 20°C (36°F) above the cooling water inlet temperature.

- 11. **Aftercooler on "ZR" Compressors:** Readout following parameters in the Elektronikon at stabilized load condition:
- Water inlet temperature ("Cooling Water In")
- Compressor outlet temperature ("Compressor Outlet")

Calculate DtAC = "Compressor Outlet" – "Cooling Water In"

If DtAC > 9°C (16.2°F), open ball valve (2) to decrease the temperature difference and increase the aftercooler cooling.

If DtIC < 5°C (9°F), close ball valve (2) to increase the temperature difference and decrease the aftercooler cooling.

The aftercooler outlet temperature must be set at 6-8°C (10.8-14.4°F) above the cooling water inlet temperature.

12. **On "All" compressors:** Run the compressor for a few minutes and check that it operates normally.



13. Stop the compressor. If necessary, top off the gear casing with oil to the middle of the sight glass (FIG 3.2.1b).

3.2.2 Compressor Start-Up

WARNING!

The operator must apply all relevant safety precautions, including those mentioned in the "Operation & Maintenance Manual" supplied with each compressor.

- 1. Check the oil level, which must be in the middle of the sight glass (SG - FIG 3.2.1b) top off, if necessary, with the correct type oil.
- On "ZR", check the setting of the valves (1, 2 & 3 - FIG 3.2.1c) as described in section 3.2.1. This can be overlooked if, after previous operation, the settings of these valves have not been disturbed.
- 3. Close the manual condensate drain.
- 4. Open the air outlet valve (customer installed).
- 5. Switch on the voltage and check that the voltage on LED (5) lights up (FIG 3.2.2).
- 6. Press start button (7). The compressor starts running and automatic operation LED (4) lights up (FIG 3.2.2).



FIG 3.2.2 Compressor Control Panel

WARNING!

When the compressor is stopped and automatic operation LED (4) is on, the compressor may start automatically. If the start/stop timer is active, the compressor may start automatically, even if it was stopped manually. Consult the user manual for Elektronikon Regulator, section "Programming Clock Function" in the "Operation & Maintenance Manual" supplied with each compressor.

3.2.3 Dryer Initial Start-Up

Refer to Section C.4.1 – Initial Start-Up section in Appendix C Desiccant Dryer.

3.3 System Normal Start-Up

- 1. Hospital shut-off valve CLOSED
- 2. Dryer Outlet isolation valve CLOSED
- 3. Receiver bypass valve CLOSED
- 4. Compressor outlet valve OPEN
- 5. One dryer off-line VALVES CLOSED
- 6. One dryer on-line VALVES OPEN
- 7. Main electrical power on to system
- 8. Compressor disconnect switched turned on
- 9. Check that voltage LED light is "ON", each compressor and Central Control System panel on dryer



- 10. Set the appropriate dryer selector switch to "CONTINUOUS PURGE"
- 11. Press start button on Central Control System Panel (See Appendix A.4)
- 12. Air receiver pressure gauge increases to 100 psi (689 kPa)
- 13. Check that each compressor shuts down as it reaches its off-limit pressure
- 14. Check main line regulator on dryer discharge line. Verify it's set for the desired outlet pressure
- 15. Slowly open the dryer outlet isolation valve
- 16. Slowly open the hospital shut-off valve

NOTE: Opening the hospital valve may cause a pressure demand that brings the lag compressors back on-line. This is a normal sequence.

NOTE: The Medical Air System is now online and in normal Operating Mode (lead/lag operation).

To verify dryer operation, refer to Appendix C for Desiccant Dryers.

3.4 Normal Operation

The Central Control System (CCS) controller is located on the dryer module and controls the Z MED Medical Air System. The CCS regulates the net pressure of the system within the programmable limits by starting, loading, unloading and stopping the compressors connected according to the programmed sequence. It also controls the regeneration cycles of the desiccant dryers while monitoring the dew point and CO levels in the discharge air.

The CCS distributes the run time between multiple compressors connected in the CAN network (see Section 2.0 Installation). The status of each compressor can be checked on the CCS control screen. Operating parameters of the system are accessible via the on screen menu.

- See Appendix A Central Control System for complete Operating Instructions and settings.
- See Appendix B Compressor Controller for complete Operating Instructions and settings.

3.5 Maintenance Shut-Down

WARNING!

Wait until the pressure has been completely vented and the gauges read "0" on the top of the towers before performing any service to the dryer.

WARNING!

To protect the lives of patients, always notify the appropriate medical facility staff before shutting down the Dryer. Medical Air levels may be affected during this shutdown procedure.

3.5.1 Compressor - Stopping

- 1. Press the test button on top of the drains to discharge condensate.
- 2. The compressor must be placed in Local Control before the stop button will functio
- Select the LAN Control image
- Select Local Control
- Select the check in the bottom right corner
- The compressor Stop Button can now be used to turn the machine off
- The Automatic Operation LED light will turn "OFF"
- 3. Close the air outlet valve (customer installed).
- 4. In case of emergency, press the emergency stop button located near the controller to stop the compressor immediately.
- 5. Open the manual condensate drains.
- 6. **On "ZR"**, close the cooling water inlet valve (customer installed).



3.5.2 Compressor - Taking Out of Operation

At the end of the service life of the compressor, proceed as follows:

- 1. Close the air outlet valve and stop the compressor. Press the test button on top of the electronic water drains to depressurize and open the drain valve (FIG 3.2.1c).
- 2. Switch off the voltage and disconnect the compressor from the mains.
- 3. Shut of and depressurize the part of the air net which is connected to the outlet valve.
- 4. Disconnect the compressor air outlet pipe from the air net.
- 5. Drain the oil and condensate circuits.
- 6. Disconnect the compressor condensate piping from the condensate drain net.
- 7. **On "ZR"**, drain the cooling water circuit and disconnect the cooling water pipes from the compressor.

3.5.3 Dryer Maintenance Shut-Down

Refer to Appendix C.4.4 Maintenance Shut-Down for Desiccant Dryer.

WARNING!

Display prominent notices indicating that maintenance is being carried out.



4.0 Troubleshooting

For troubleshooting compressors refer to Problem Solving in the "ZT/ZR Instruction Book" manuals supplied separately with each compressor module.

Problem	Possible Causes	Solution		
Failure to start	Main power disconnected	Turn on main power		
	Power failure	Restore power		
	Main fuse blown	Replace fuse		
	Fuse blown in control circuit	Replace fuse		
	Overload tripped on starter	Reset & check for system overload		
	High temperature switch activated	Allow unit to cool; reset & check for over temperature condition		
	Low Oil Pressure	Check oil level Check oil level switch operation		
	Loose or faulty connection	Check & tighten all wire connections		
Power failure	Main fuse blown	Replace fuse		
	Fuse blown in control circuit	Replace fuse		
Compressor shuts off	Overload tripped on starter	Reset & check for system overload		
unexpectedly	Faulty pressure transducer	Adjust or replace		
	High temperature switch activated	Allow unit to cool; reset switch & check for over temperature condition		
	Low oil pressure	Check oil level Check oil level switch operation		
Compressor capacity or working pressure lower than normal	Air consumption exceeds capacity of compressor	Check pneumatic plant		
	Safety valve leaking	Remove leaking valve, repair or re- place valve		
Oil pressure too low	Oil level to low	Top off oil level to middle of oil level sight glass		
	Oil filter clogged	Replace filter		



Problem	Possible Causes	Solution		
Air temperature above normal	Inlet temperature to high due to bad room ventilation or recircula- tion of cooling air	Improve ventilation of compressor room and avoid cooling air recircula- tion		
	Air filter clogged	Replace filter		
	On "ZR" , insufficient cooling water flow	Check water temperature and in- crease cooling water flow		
	On "ZR" , restriction in cooling water system due to formation of scale or settling down of dirt	Contact BeaconMedæs		
Condensate is not	Discharge flex line clogged	Check and correct as necessary		
discharged from con- densate traps during operation	Electronic water drain malfunc- tioning	Contact BeaconMedæs		
Motor overheating	Low voltage	Check for proper supply voltage		
	Defective motor	Contact BeaconMedæs		
Compressor runs hot	Wrong rotation	Switch motor leads		
	Incorrect pressure setting	Adjust pressure band parameters		
	Faulty compressor valves	Contact BeaconMedæs		
	Intake filter clogged	Clean or replace		
Wrong direction of rotation	Motor wired incorrectly	Switch motor leads		
Low discharge pres-	System piping leaks	Repair leaks		
sure	Defective pressure gauge	Replace gauge		
	Faulty pressure transducer	Adjust or replace		
	Intake filter clogged	Clean or replace		



Problem	Possible Causes	Solution	
Compressor cycles	System undersized	Contact BeaconMedæs	
too often	Incorrect pressure setting	Adjust pressure band parameters	
	Faulty pressure transducer	Replace transducer	
	System piping leaks	Repair leaks	
	Safety valve leaks	Repair or replace valves	
	Both dryers on line	Valve off one dryer	
	Water in air receiver	Drain air receiver	
Compressor won't	Faulty pressure transducer	Adjust or replace	
shut off	System piping leaks	Repair leaks	
High air temperature	Bad room ventilation	Improve room ventilation	
	Air Filter Clogged	Replace filter	
	Insufficient cooling water (ZR)	Check water temperature, increase water flow	
	Formation of scale/dirt	Contact BeaconMedæs	
Dryer not Cycling	Main power disconnected	Turn on main power	
	Dryer power switch off	Turn on power switch	
	Power failure	Restore power	
	Main fuse blown	Replace fuse	
	Fuse blown in control circuit	Replace fuse	
	Solenoid valve failure	Check and replace or repair solenoid valve	
	Smart Relay failure	Check and replace if defective	
	Loose or faulty connection	Check & tighten all wire connections	



Problem	Possible Causes	Solution
Dew point degrada- tion	Incorrect purge gas flow	Check purge orifice for blockage. Clean or replace as required
	Inlet gas temperature to high	Check compressor aftercooler
	Liquid entering the dryer inlet	Inspect pre-filter cartridges. Replace if necessary.
		Inspect Zero-loss drain valves. Re- place if necessary.
	Purge exhaust muffler restricted	Replace muffler
	Desiccant is contaminated	Shutdown and depressurize the dryer. Inspect the desiccant and replace if fouled. Inspect prefilters if fouling is noted.
	Piping component leaks at dryer outlet or downstream of dryer outlet	Soap bubble test the dryer outlet and downstream piping. Repair all leaks noted.
Backpressure on a desiccant chamber during regeneration cycle	Dirty or fouled muffler	Switch off power, remove purge muf- fler and clean or replace.
Maximum Capacity	System undersized	Contact BeaconMedæs
	Incorrect pressure setting	Adjust Pressure band parameters
	Faulty pressure transducer	Replace transducer
	System piping leaks	Repair leaks
	Both dryers on line	Valve off one dryer
High receiver water	Manual isolation valve closed	Open valve
level	Automatic drain valve not func-	Check electrical hookup
	tioning	Service, clean or replace internal parts
		Replace valve assembly



5.0 Maintenance

5.1 Maintenance Schedule

Warning! Before starting any maintenance procedures, disconnect all power to the equipment being serviced.

Release all pressure from the package before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.

Never perform any maintenance functions while the unit is in operation.

Item	Frequency	Action
Check sight glass on filter body for conden- sate levels (Dryer)	Daily	Check auto drain. Clean if neces- sary.
Check reading on display	Daily	Verify no warnings exist
Check condensate drains	Daily	Verify condensate is discharged during loading
Check oil level	Daily	Add oil if necessary
Check flow through dew point sensor	Weekly	Check for flow blockage
Check operation of safety valve	Weekly	Manually release pressure
Check nuts, bolts, fittings, etc.	Monthly	Inspect and tighten
Clean compressor	Every 3 months	Clean if necessary
Check for possible leaks	Every 3 months	Repair or replace components
Check compressor coolers	Every 3 months	Clean if necessary
Calibrate CO sensor	Every 6 months*	Purchase Service Kit See Appendix E
Check dew point sensor accuracy	Every 12 months	Verify dew point sensor accuracy (contact BeaconMedæs)
Replace pre-filters & after-filters	Every 12 months	Replace filter elements
Replace Dryer Desiccant	5 years	Contact BeaconMedæs
Compressor fan motor	Greased for life	Contact BeaconMedæs for re- placement
Compressor Drive motor bearings (ZT15 – ZT22)	Greased for life	Contact BeaconMedæs for re- placement
Compressor Drive motor bearings (ZT/ZR30 – ZT/ZR45)	See Nameplate	Grease drive & non-drive ends



5.0 Maintenance

*Recalibration of the CO transmitter is required prior to 6 months if any of the following conditions exist:

- Last calibration date cannot be verified or is unknown
- Sensor overexposed to target or interfering gases
- Instrument has been subjected to misuse or abuse
- Sensors have been newly replaced or instrument has received any type of servicing
- Whenever sensor response is in question

Recommended Grease: Esso Unirex N3 (never mix greases of different brands or types)

<u>**Oil specification:**</u> Use Atlas Copco Roto-Z oil which has been developed for oil free rotary compressors. This oil has a long service life and ensures optimum lubrication. Never mix oils of different brands or types. See chart for part numbers and available sizes.

Quantity	Part Number
1 Gallon Can	2908 8503 00
20 Liter Can	2908 8501 01

5.2 Spare Parts

For Desiccant Dryer spare parts see Appendix C.6.1 thru C.6.5.

For Compressor spare parts and servicing procedures refer to **"ZT/ZR Instruction Book"** supplied with each compressor unit.



6.0 Maintenance Record

Model Number

Serial Number

Installation Date

Date of Service				
Hours				
Ambient Temp.				
Air Leaks				
Condensate Drains				
Inlet Filter				
Dryer Filters				
Manual Valve Oper.				
Dewpoint Flow				
Oil Level				
Alarms				
Misc.				
Serviced By				

Notes:



6.0 Maintenance Record

Model Number

Serial Number

Installation Date

Date of Service				
Hours				
Ambient Temp.				
Air Leaks				
Condensate Drains				
Inlet Filter				
Dryer Filters				
Manual Valve Oper.				
Dewpoint Flow				
Oil Level				
Alarms				
Misc.				
Serviced By				

Notes:



Appendix A - ECOntrol (ECO) with Mk5 Touch Display

A.1. Safety Precautions

WARNING!

All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

A.1.1. General Precautions

- 1. The operator must employ safe working practices and observe all related local work safety requirements and regulations.
- 2. If any of the following statements does not comply with local legislation, the stricter of the two shall apply.
- 3. Installation, operation, maintenance, repair work must only be performed by authorized, trained, specialized personnel.
- 4. Before carrying out any maintenance, repair work adjustments or any other non-routine checks, stop the device. In addition, the power isolating switch must be opened and locked.
- 5. Use only correct tools for maintenance and repair work.
- Use only genuine BeaconMedæs spare parts. Contact BeaconMedæs Technical Services department at 1-888-4MEDGAS (1-888-463-3427) for technical support or to order spare parts.

A.2. Introduction

The Equalizer is a stand alone Central Control System. The Central Control System regulates the net pressure within programmable limits by starting, loading, unloading and stopping the compressors connected according to the programmed sequence. It also controls the regeneration cycles of the desiccant dryers while monitoring the dew point and CO levels in the discharge air.

The Central Control System distributes the running time between multiple compressors connected in the CAN network (see A.3 CAN Network Connection). The status of each compressor can be checked on the control screen. Operating parameters are accessible via the menu.

A.2.1. Single Point Pressure Measurement

The Equalizer controls the system pressure by means of a pressure transmitter. Depending on the reading of the pressure transmitter the controller will start and stop the compressors in the network in order to keep the pressure within the limits of the pressure band.

A.2.2. Sequence Management

In order to maintain the system pressure, the Equalizer has the following control functions:

- 1. Position of the measured pressure to the pressure band
- 2. Priority scheme check
- 3. Equal wear check
- 4. Compressor availability check

Depending on the status of these functions the Equalizer will determine the sequence of starting and stopping of the connected compressors.

A.2.3. Priority Selection

Two priority schemes are available. **BeaconMedæs** recommends setting all compressors to Level 1.

A.2.4. Equalized Running Hours

Within a group of compressors that have the same priority, the compressor with the least running hours will be started first, compressors with the most running hours will be stopped first.


A.2.5. Compressor Availability

Before a compressor in a group is started, an availability check is performed. This means that only the compressors that are running in unloaded condition or are ready to be started will be taken into account.

A compressor can be unavailable due to:

- Minimum stop time
- Shut-down condition
- Emergency stop pressed
- No communication

A.2.6. Automatic Restart After Voltage Failure

The controller has a function for automatic restart after voltage failure. For controllers leaving the factory, this function is made active. After power restoring, the controller restarts regulation and returns to the condition experienced before the power failure. Programmed delay times and simultaneous start prevention will be taken into account.

A.3. CAN Network Connection

See "Section 2.0 Installation, Section 2.7" for network cabling of compressors and cable end connector wiring and assembly.



A.4. Central Control Panel Parts and Functions (FIG A.4)

- **1. Stop Button:** Button to stop the Central Control Panel is programmed to be inactive so accidental system shut down will not happen.
- **2. Start Button:** Button to start the Central Control Panel is programmed to be inactive so accidental system start-up will not happen.
- **3. Menu:** Shows the Menu screen options, also accessible by swiping right.
- **4. Compressor/Dryer Status:** Shows status of compressors and dryers (running, offline, drying, etc.).

- **5. System Information:** Shows system pressure, CO level and Dewpoint level of system.
- **6. Warning Sign:** Flashes in case of shut-down, is lit in case of warning condition.
- 7. Service Sign: Is lit when service is needed.
- 8. Operation Sign: Is lit when unit is running in automatic operation.
- **9. Voltage Sign:** Indicates that the voltage is switched on.

A.4.1. Equalizer Status

The status of the Equalizer is indicated on the right of the display (See 8 in FIG A.4). The following pages give an overview of all icons, statuses and corresponding descriptions.



FIG A.4 Dryer Central Control Panel



A.5. Display Descriptions

The main display gives an overview of different states, conditions, alarms, etc.

A.5.1. Mainscreen

The mainscreen of the Equalizer shows the statuses of the compressors, net pressure, and

ECO status. It also provides a Command button and quick button to Regulation Settings.

Since the Equalizer is a standalone controller and not installed on the compressor, the start/ stop buttons are deactivated.



FIG A.5.1 Equalizer Mainscreen







A.5.2. Status Icons

Name	Icon	Description
Master Statuses	÷	When ECO is controlling the connected units, the icon is rotating
	÷	ECO is in local operation
	÷	ECO has stopped all connected units (central stop)
	852710	ECO in local control mode
	B5272D	ECO in remote control mode
		ECO in LAN control mode
	\square	Active priority scheme (including a number)
Automatic restart	85274D	Automatic Restart After Voltage Failure is active
Week timer		Week Timer is active
Warning	\wedge	Warning
Service		Service required



Language	Ac Base	Language selection
Machine statuses	Y	No answer (unit doesn't answer EQ command)
	*	Compressor is isolated
	×	No communication
	Ō	Minimum stop time is running
	*	Compressor is running local under EQ control (4A)
	B5271D	Compressor is local, on his own control (2A)
	8524D	Service required on compressor
	\wedge	Shutdown (red icon) or Warning (yellow icon) on compressor



A.5.3. Machine Type Icons

lcon	Description
	Load/unload compressor
-	Frequency converter driven compressor (VSD)
•	"Other" Machine Type (e.g. Digital Link)



FIG A.5.3 Machine Type Icons

Each line represents a slave compressor. The icon on the left of the bar indicates the machine type. In case of multiple VSD's, there will only be one regulating to the setpoint (in Equal Wear mode). The square around the machine type icon indicates the regulating VSD.

The first icon on the right side of the bar indicates the integration status. The second icon on the right side is reserved for machine status (warning, shutdown, ...).

The bars represent machine flow. Full and dashed borders around the flow bars indicate the next machine to start or unload/stop, respectively.



A.5.4. EQ Master and ECO Machines

The EQ Menu is divided into the ECO Master and Machines menus. Global EQ Settings will be found in the EQ Master menu while individual compressor slave settings related to EQ control will be found in the Machines menu.







In order to be able to start central control, it is necessary to enable the ECO functionality. In the same menu, it is also possible to set the number of compressors. These settings can be found in the ECO Master Status menu (FIG A.5.4).

f	Status	k
≡	ECO	
ଦ୍ୱଲ		On
Zinte	Number of Compressors	
ఫో		2
ိုင်	Max Nr Of Loaded Compressors	
		2
	Number Of Dryers	

FIG A.5.4 ECO Status Menu



A.5.5. Errors, Warnings and Alarm Status

Different errors, warnings or alarms can be shown on the Equalizer (See FIG A.5.5.1). To the right of the touch screen ther are 4 lighted symbols which represent a Warning, Service Required, Operation and Voltage.

- **1. Warning Sign:** Flashes in case of shut-down, is lit in case of warning condition.
- 2. Service Sign: Is lit when service is needed.
- **3. Operation Sign:** Is lit when unit is running in automatic operation.
- **4. Voltage Sign:** Indicates that the voltage is switched on.



FIG A.5.5.1 Error, Warnings and Alarm Symbols



If an alarm is active, the alarm type will show on the right of the screen flashing in red (FIG A.5.5.2). The four alarms shown below are Lag Alarm, Carbon Monoxide, Dew Point and General Fault.

- **1. Lag Alarm**: Will be active if the backup compressor is online.
- 2. CO Alarm: Will be active when the CO level exceeeds 10ppm (30 second delay on alarm)
- **3. PDP Alarm**: Will be active when the de point at system delivery pressure exceeds +2°C (+35°F), 30 second delay on alarm.
- **4. General Fault:** Will be active if the Lag Alarm, CO, PDP, High Water Level, No Valid Pressure Control and other alarms from the connected air compressors are active.



FIG A.5.5.2 Error, Warnings and Alarm Symbols

More information about active alarms can be found by touching the active alarm on the main screen. The secondary alarm screen (FIG A.5.5.3) will show more details of each active alarm. Alarms can also be reset on this screen by touching the circle at the bottom of the menu. This will also silence any active horn due to the alarm.



FIG A.5.5.3 Error, Warnings and Alarm Symbols



Appendix A - ECOntrol (ECO) with Mk5 Touch Display A.6. ECO Menus A.6.1.2. Data Menu

A.6.1.Menu Access

The touch controller uses Service Access Levels to access certain parameters. The Service Access Menu is found on the main screen by pressing the Service Man symbol in the upper right hand corner. There are Basic, Advanced (default) and BeaconMedaes Service levels. The BeaconMedaes level is for factory service only and password protected.



A.6.1.1.Main Menu

Swiping right or ticking the menu button brings up the menu shown below.





- 1. Data
- 2. Service
- 3. Week Timer
- 4. Event History
- 5. Machine Settings
- 6. Controller Settings

Tap 'Data', the screen shows a number icons shown below. Drill down to the desired submenu.



- **1. Status Menu:** Shows warnings or shut-downs, if any are active.
- 2. Inputs Menu: List of all inputs
- 3. Outputs Menu: List of all outputs
- **4. Counters Menu**: All counters are listed, i.e. running hours of the module.

A.6.1.3.Machine Settings Menu

Tap 'Machine Settings', 'ECO', then 'Master', the screen shows a number of icons shown below. Drill down to the desired submenu.



- **1. Status Menu:** Here the ECO function is (de) activated and the number of compressors is chosen.
- **2. ECO Regulation**: Here pressure bands are defined and selected.



- 3. General: Local Command
- 4. Action Scheme: Not Used
- **5. Auto Restart:** System will resume operation after power loss. Set to infinite, Max Power Down Time not used when set to Infinite
- **6. Machines:** The following icons are shown under Machines:



Dryers: The following icons are shown under Dryers:



Compressors: The following icons are shown under Compressors:



General: Here the algorithm can be chosen. Equal wear is the default and recommended value. **Counters:** Here all running hours of each meachine module are listed.

Timers: Here the Action timers defined. How long it takes to start/load or unload/load times, etc..

A.6.1.4. ECO Machine Settings

From the Main Menu, Tap 'Machine Settings', 'ECO', then 'Machines', 'Compressors' the screen shows a number of icons shown below.



Select a machine to modify the settings for that particular machine. The following menu appears:



1. Priority: Here the priorities for the different priority schemes (1-4) are set Default setting is all compressors at 1.

2. General: Here the compressor can be isolated for service.

3. Timers: These are reaction timers for the control of the compressors, they are factory set and only adjusted by a BeaconMedaes technician.

4. VSD Settings: Here the specific settings for a VSD compressor are located. they are factory set and only adjusted by a BeaconMedaes technician.



Appendix A - ECOntrol (ECO) with Mk5 Touch Display A.7. Configuration and Start-Up

A.7.1. System Configuration

After call physical connections are made, a number of selections still have to be made in order to perform a system setup. This can be done via the display or via special software, available to the Aftermarket organization.

A.7.2. ECO Setup

For the setup via the display, follow the steps listed below. From the Master screen select Status:



On the Status screen the number of compressors, number of loaded compressors (equal to the number of compressors) and the number of dryers will be entered. After the number of compressors and dryers is entered the ECO should be turned to ON.



A.7.3. CAN Network Setup

To setup the CAN network select Controller Settings and then Network Settings and CAN Settings.







Turn the CAN to the OFF position, set the Node ID to 30 and then set the CAN to the ON positiion

A.7.4. Dryer DIN Controller Setup

If equipped with Dryer DIN Controllers located on the door of the controller the following settings need to as follows:

- Set the Node ID's:
- Dryer 1 = 11
- Dryer 2 = 12
- Turn CAN on
- Set operation mode to LAN Control



A.7.5. Preparations for Initial Start-Up

- Stick labels near the control panels of the compressors connected to the EQUALIZER as well as on an obvious place inside these compressors, warning the operator that the compressor is remotely started and stopped by a remote controller. These labels must also warn the operator that, after voltage failure, the controller can remotely start and stop the compressors, depending on the air demand and programmed values.
- Connect the power supply cables of the EQUALIZER controller to an appropriate single phase voltage.
- Switch on the voltage
- Have the network configured (commissioned) by **BeaconMedæs** Service Personnel.

EQUALIZER is now ready for use.

WARNING!

If ARAVF feature is active, compressors may automatically start. Please ensure that all compressors are in Local Control before Energizing the ECO Controller for the first time.

A.7.6. Compressor Control

A.7.6.1.Controlling the Compressor

The Equalizer maintains the net pressure between programmable limits by automatically loading and unloading the compressor depending on the air consumption. The regulator takes into account a number of programmable settings, such as:

- The unload pressure
- The loading pressure
- The minimum stop time
- The maximum number of motor starts

The Equalizer stops the compressor whenever possible (when the expected unloading period exceeds a programmed value) to reduce the power consumption and restarts it automatically when the net pressure decreases. In case the expected unloading period is below a programmed value, the Equalizer keeps the compressor running to prevent too-short standstill periods.

When the compressor has stopped automatically and the net pressure decreases, the Equalizer will start the compressor before the net pressure has dropped to the loading pressure to prevent the net pressure from falling under the programmed minimum level.

When stopping the compressor manually, the regulator will unload the compressor for a programmed time and then stop the compressor.

A.7.7. Protecting the Compressor

Several temperature and pressure sensors are provided on the compressor. If one of these measurements exceeds the programmed shutdown level, the compressor will be stopped. This will be indicated on the control display.

A.7.7.1.Shut-Down Warning

If the Equalizer detects a temperature or pressure just below the programmed shut-down level, this will be indicated on the control panel to warn the operator before the shut-down level is reached. The message disappears as soon as the warning condition disappears.

A.7.7.2.Service Warning

A number of service operations are grouped in plans (called service plan A, B, C...). Each service plan has a programmed time interval. If a time interval is exceeded, a message will appear on the display to warn the operator to carry out the service actions belonging to that plan.



B.1 Safety Precautions

WARNING!

All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

B.1.1 General Precautions

1. The operator must employ safe working practices and observe all related local work safety requirements and regulations.

2. If any of the following statements does not comply with local legislation, the stricter of the two shall apply.

3. Installation, operation, maintenance, repair work must only be performed by authorized, trained, specialized personnel.

4. Before carrying out any maintenance, repair work adjustments or any other non-routine

checks, stop the device. In addition, the power isolating switch must be opened and locked.

5. Use only correct tools for maintenance and repair work.

6. Use only genuine **BeaconMedæs** spare parts. Contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (1-888-463-3427) for technical support or to order spare parts.

B.2 Compressor Control Panel Parts and Functions (Mk5 Touch)

- **1. Touchscreen:** Shows the unit operating condition and a number of icons to navigate through the menu.
- **2. Warning Sign:** Flashses in case of a shutdown, is lit in case of a warning condition.
- **3. Service Sign**: Is lit when service is needed.
- **4. Operation Sign:** Is lit when the unit is running in automatic operation.
- **5. Voltage Sign:** Indicates that the voltage is switched on.
- 6. **Stop Button:** This button stops the unit.
- 7. Start Button: This button starts the unit.



FIG B.1 Compressor Control Panel



B.3 Icons Used

Menu	lcon	Menu	lcon	Menu	lcon
Data	1	Status			
		Inputs	1 85240D		
		Outputs	5 241D		
		Counters	G 85242D		
		Aux. Equip- ment Param- eters	اللل المراجع 18243D	Converters	85251D



Menu	lcon	Menu	lcon	Menu	lcon
Service	SS24D	Service		Overview	³²⁵²⁵⁰
				Service Plan	
				Service History	
		Service func- tions	5244D		
		Clean Screen	ES302D		
Week Timer		Remaining Runi	ning Time	Week	
Event History	000000 0000000000000000000000000000000	Saved Data	85245D		



Menu	lcon	Menu	lcon	Menu	lcon
Machine Settings	Solution of the second	Alarms			
		Regulation	L		
		Control Pa- rameters	Search and a		
		Aux. Equip- ment Param- eters		Converter(s)	6152561D
			55430 55430	Fan	362 852550
				Internal Smart- Box	I
		Auto Restart	G 100 000000000000000000000000000000000		



Menu	lcon	Menu	lcon	Menu	lcon
Controller Settings		Network Set- tings	P	Ethernet Set- tings	
				CAN Settings	
		Localisation		Language	Ac 月 Sec
			85410	Date/Time	
				Units	bər psi °C °F I/s m³/h ‱
		User Pass- word	85248D		
		Help	007750 007750		
		Information	1 0005558		



Status icons

lcon	Description]	Icon	Description
	Motor Stopped		62770 822700	Manual Stop
	Motor Stopped Wait		85271D	Machine Control Mode, Local
₽ ₽	Running Unloaded		852.72D	Machine Control Mode, Remote
	Manual Unload		品 ""	Machine Control Mode, LAN
	Running Unloaded Wait		852740	Automatic Restart After Voltage Failure
	Running Loaded		1	Week Timer Active
	Failed to Load			
	Running Loaded Wait			



System icons

lcon	Description
85276D	Basic User
8 2277D	Advanced User
85278D	Service User
■000 082788	Antenna 25%
	Antenna 50%
BS28ED	Antenna 75%
	Antenna 100%
0 0 0 882589	Change between screens (indication)

lcon	Description
	Energy recovery
85286D	Dryer
	Element
	Drain(s)
4-20mA	Analogue Output
082289D	Menu
	Reset
	Auto Restart



lcon	Description
11 026258	Filter(s)
85293D	Cooler
	Valve(s)
65286D	Power Meter

Input icons

lcon	Description
↔• ◆	Pressure
85297D	Temperature
65296D	Special Protection
	Open
000288	Closed



B.4 Main Screen

The main screen is shown when the voltage is switched on. It is switched off automatically after a few minutes when there is no input.

- **1. Home Button:** The home button is always shown and can be tapped to return to the main screen.
- **2. Screen Information:** On the main screen, the screen information bar shows the serial number of the machine.
- 3. Access Level Button: Is always shown and can be tapped to change the current user acess level.
- **4. Alarm Button:** The alarm button can be tapped to show the current alarms.

5. Service Button: The service button can be tapped to show the service information.

6. Status: This icon shows the current status of the unit.

7. Page Indicator: Indicates which page you currently see.

8, 9, 10, 11: History Chart, Input or Counter: Tap the field to view the type of measurement (Ambient Temp, Outlet, Running Hours, Loaded Hours, etc.)

12. Menu Button: The menu button is always shown and can be tapped to go to the menu.





B.5 Parameters – Fixed Speed Compressor

The compressor parameters are separated into the two following sections: B.5.1 Regulation and B.5.2 General. The two sections are located under "Settings" on the compressor controller.

B.5.1 Regulation

Name	Description	Controller Default Value	BeaconMedaes Value
Unloading Pressure 1	High pressure level of Pressure band 1	8 bar	105 psi ¹
Loading Pressure 1	Low pressure level of Pressure band 1	6.4 bar	96 psi¹
Unloading Pressure 2	High pressure level of Pressure band 1		
Loading Pressure 2	Low pressure level of Pressure band 1		
Pressure Band Used		1	1
Pressure Selection Band		Off	Off
Automatic Restart ²		Not activated	Infinite ²
Maximum Power Down		15 seconds	15 seconds
Restart		0 seconds	0 seconds
Ethernet		On	On
CAN ³	CAN must be off to change CAN ad- dress and communication profile	Off	On³
CAN Address		31	Node ID
Communication Profile		Mk5	Mk5

1. Typical settings shown for lead compressor. Lower these settings by 5 psi for each remaining compressor so that all compressors have a different local set point.

2. Password required to set "Auto Restart" parameter to infinite (4735)

3. CAN must be off to change CAN address and communication profile.



B.5.2 General

Name	Description	Controller Default Value	BeaconMedaes Value
Language in use	Language used	English	English
Time	Clock function	Local	Local
Date		Date	Date
Date Format		DD/MM/YY	MM/DD/YY
Password	This feature allows the parameters to be protected by a user defined pass- word	Not activated	Activated
Pressure Units		Bar	Bar
Temperature Units		°F	°F
Vibration Unit		Mils	Mils
Level Unit		Inch	Inch
Flow Units		CFM	CFM
Volume Unit		Gallon	Gallon
Display Timeout		5 min	5 min
Access Level		User	User
Compressor Control Modes (CCM)	ES-6 Control Mode (Local, Remote, LAN)	Local	LAN



B.6 Parameters - Variable Speed Compressor (VSD)

The compressor parameters are under settings and are separated into the three following sections: B.6.1 Regulation, and B.6.2 Network, and B.6.3 General. All three sections are located under "Menu" on the compressor controller.

B.6.1 Regulation

Name	Description	Controller Default Value	BeaconMedaes Value
Reduced Setpoint		102 psi ¹	95 psi ¹
Setpoint 1		102 psi ¹	95 psi ¹
Indirect Stop Level 1		116 psi ¹	116 psi ¹
Direct Stop Level 1		123 psi ¹	123 psi ¹
Setpoint 2			
Indirect Stop Level 2			
Direct Stop Level 2			
Setpoint Used		Set Point 1	Set Point 1
Digital Pressure Band Selection	Requires password to activate (4735)	Off	Off

1. Typical settings shown for lead compressor. Lower these settings by 5 psi for each remaining compressor so that all compressors have a different local set point.

B.6.2 Network

Name	Description	Controller Default Value	BeaconMedaes Value
CAN		Ethernet	CAN
CAN ¹	CAN must be off to modify ad- dress or profile.	Off	Indefinite ¹
CAN Address		1	Node ID
Communication Profile		Mk5	Mk5

1. CAN must be off to change CAN address and communication profile.



B.6.3 General

Name	Description	Controller Default Value	BeaconMedaes Value	
Language in use	Language used	English	English	
Time	Clock function	Local	Local	
Date		Date	Date	
Date Format		DD/MM/YY	MM/DD/YY	
Pressure Units		Bar	PSI	
Temperature Units		°C	°F	
Vibration Unit		MM	MM	
Flow Units		LPS	CFM	
Volume Unit		Liter	Gallon	
Display Timeout		5 min	5 min	
Automatic Restart	Allows the machine to restart after pow- er failure	Not activated	Infinite ¹	
Password	This feature allows the parameters to be protected by a user defined password	Not activated	Activated ²	
Compressor Control Modes (CCM)	ES-6 Control Mode (Local, Remote, LAN)	Local	LAN	

1. Requires pass code to activate (pass code = 4735)

2. Requires password to change parameters and configuration (password = 201)

C.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your dryer. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

All information, specifications, and illustrations within this manual are those in effect at the time of printing. The manufacturer reserves the right to change or make improvements without notice and without incurring any obligation to make changes or add improvements to products previously sold.

When requesting information, service, ordering of spare parts, etc., please reference all information supplied on the serial number plate located inside the dryer control panel.

To facilitate maintenance, recommended spare parts for your specific dryer model are available. Failure to maintain recommended spare parts and filter cartridges might result in expensive and unnecessary downtime for which the manufacturer cannot be responsible. To request a quotation of, or place an order for, recommended or emergency spare parts, please contact your local distributor.

C.1.1 Drying Cycles

This fully automatic, heatless type dryer alternately cycles the compressed, process gas flow through two desiccant charged towers where the entrained, vaporous moisture content of the gas is adsorbed. One desiccant tower is always on-line in a drying cycle throughout normal dryer operation. The opposite, off-line tower is in a regeneration cycle for removal of the previously adsorbed moisture content. (See C.2 and C.3 for Basic Dryer operation)

C.1.2 Continuous Purge Mode

When the dryer selector switch on the Central Control System (CCS) panel is in the "continuous purge" position, the dryer will shift towers based on a factory pre-set time interval regardless of dew point reading. This time interval setting will vary based on dryer size. At normal operating conditions, one tower will be at the system pressure while the other tower is at "0" psi. During tower changeover, the second tower will go through a re-pressurization cycle to equalize the pressure between the two towers and then switch to the second tower. The first tower will then be exhausted, and then the tower goes through the regenerating (purge) cycle.

C.1.3 Controlled Purge Mode

When the dryer selector switch on the Central Control System (CCS) panel is in the "controlled purge" position, the dew point monitor controls the dryer tower switching based on the dew point condition. When the dew point reading is above the setpoint of -10°C (14°F), the dryer will function normally (one tower at system pressure, one tower at "0" psi.). When the dew point is below the setpoint of -10°C (14°F) on the dew point monitor, the dryer will continue to use the first tower until it can no longer maintain the dew point setting. At this time the dryer will go through the process of switching to the second tower and regenerate (purge) tower one. The dryer will continue to flow gas through the second tower until tower two can no longer hold the set dew point and then switch back to the first tower.



C.2 Basic Dryer Operation CD35 - CD65 (See FIG C.2)

The construction of the air dryer is simple, reliable and easy to service. A dryer module basically consists of two towers, containing the adsorption material or desiccant. The desiccant is a very porous grain material, able to adsorb large amounts of water vapor.

The operation cycle of the dryer is repetitive and is controlled by a factory set timer in the controller or by the PDP sensor (pressure dewpoint sensor), which is optionally available. While the desiccant in one tower dries the compressed air, the desiccant in the second tower is being regenerated. Regeneration of the desiccant is achieved by means of purge air from the drying tower.

The compressed air entering the dryer is led to one of the towers by means of one of the two 3–2 valves. The position of the 3–2 valves is controlled by the solenoid valves. As the air flows upwards through the tower, the desiccant adsorbs the water vapor and the compressed air is dried. The dried air leaves the dryer via the outlet check valve.

A small portion of the dried air passes a nozzle, expands to atmospheric pressure and flows



FIG C.2 CD35 - CD65 Flow Schematic



downwards through the other tower, regenerating (drying) the desiccant. A nozzle for operation of the dryer at 7 bar is installed as standard. The regeneration air is released via the corresponding solenoid valve and the silencer. The solenoid valves are controlled by the timer.

After a preset period, (or when triggered by the PDP sensor), the function of the towers is reversed. The fully regenerated tower will now dry

the air, while the desiccant in the other tower will be regenerated.

By default, the regeneration timer will restart from the beginning of the cycle in case of a power failure during operation or in case the dryer was switched off.

The working sequence of the controller is the following:

Status	Left Vessel	Right Vessel	V1	V2	V3	V4
0	Stopped	Stopped	0	0	0	0
1	Adsorbing	Adsorbing	0	0	0	0
2	Shifting	Adsorbing	1	0	0	0
3	Depressurizing	Adsorbing	1	0	1	0
4	Regenerating	Adsorbing	1	0	1	1
5	Equalizing	Adsorbing	1	0	0	0
6	Freeze (compressor synchronization)	Adsorbing	1	0	0	0
7	Standby	Adsorbing	1	0	0	0
8	Adsorbing	Adsorbing	0	0	0	0
9	Adsorbing	Shifting	0	1	0	0
10	Adsorbing	Depressurizing	0	1	1	0
11	Adsorbing	Regenerating	0	1	1	1
12	Adsorbing	Equalizing	0	1	0	0
13	Adsorbing	Freeze (compressor synchronization)	0	1	0	0
14	Adsorbing	Standby	0	1	0	0

When the ON/OFF push-button is pressed during operation, the controller jumps automatically to status 5 or 12 (equalization phase). After that, the Stop status (0) will be reached. The following start command will restart the sequence from the state 2 or 9. The same happens when the power is switched off.

On dryers equipped with the DC1 controller when dryer is in purge saving mode, the controller jumps automatically to status 5 or 12 (equalization phase). When the purge saving mode is deactivated, the cycle will restart from status 2 or 9.



C.3 Basic Dryer Operation CD100 - CD300 (See FIG C.3)

Compressed air enters the dryer through the inlet filter and is directed to TOWER 1 through a three-way valve (A). The air enters the bottom of the tower and the dried air exits the tower at the top and passes through a non-return valve (B) and after filter (C). A small portion of dried air is used to regenerate TOWER 2, the dried air passes through a small orifice (D) into TOWER 2 and is expands to atmospheric pressure. This extremely dry, low pressure air flows downward through the tower regenerating the desiccant.

2-OUTLET FILTERS AIR OUTLET С В D (G1 **G**2 2 TOWER **TOWER** Xs S 7#K-(A1 **A2** (E1 **E**2 **F1 F**2 2 STAGE INLET FILTER AIR INLET

TOWER 1 DRYING TOWER 2 REGENERATING

The regenerating air is then exhausted through a purge valve (E2) and exhaust muffler (F2) to atmosphere.

After a set time, the "SMART relay" closes the purge/exhaust valve (E2) allowing TOWER 2 to repressurize slowly.

At the end of 3 minutes (when operating on a 6 minute cycle), the three-way valve (A) switches and the purge/exhaust valve (E1) opens to begin the purge cycle on TOWER 1. The main air flow is now dried by TOWER 2 while TOWER 1 is regenerated.



TOWER 2 DRYING TOWER 1 REGENERATING

CD100-300 FLOW SCHEMATIC

FIG C.3 CD100 - CD300 Flow Schematic



C.4 Operation

C.4.1 Initial Start-Up

- 1. Close the dryer source isolation valve.
- 2. Switch on the electrical supply to the dryer.
- 3. CLOSE the dryer isolation valves. (2 inlet valves, 2 outlet valves)
- 4. Check that the compressed air supply is <u>on</u>. Let the system come up to pressure
- 5. Slowly OPEN the two dryer inlet isolation valves.
- 6. Rotate the dryer selector switch to the "continuous purge" position. The dryer will now begin to cycle.
- 7. Check that purge air is flowing from the purge muffler.
- Slowly OPEN the two dryer outlet isolation valves. (Do Not Open Dryer Source Isolation Valve)
- 9. Open the dew point and CO sensor (if supplied) isolation valves.
- 10. Check for airflow at the dew point sensor orifice.
- 11. Adjust CO regulator (if supplied) to obtain a flow rate of .5-.9 SCFM.
- 12. Operate the dryer for five to ten minutes with the source isolation valve <u>closed</u>.
- 13. During the conditioning run (see 11 above) test all joints to check for any leaks. Tighten or repair any leaks and retest.

NOTE: Any small leaks on the dryer outlet side will cause a deterioration of the dew point.

- 14. Rotate the dryer selector switch to the "controlled purge" position. Verify proper operation as described in C.2 or C.3.
- 15. On the completion of the conditioning run, <u>slowly open</u> the source isolation valve. The dryer will now be fully operational.

C.4.2 Procedure to Switch Off the Dryer

- 1. Put second dryer on line by repeating steps 4 thru 7 above.
- 2. CLOSE the dryer outlet isolation valve.
- 3. SWITCH OFF the electrical supply to the dryer.
- 4. CLOSE the dryer inlet isolation valve. Dryer should de-pressurize

WARNING: Wait at least 2 minutes for pressure in the dryer to decay before performing any service to the dryer.

C.4.3 Normal Start-Up

This procedure is to be followed when the dryer has been shut down for a short period during which time the desiccant has not been exposed to wet gas.

- 1. Start up the compressor if shut down.
- 2. Set the appropriate dryer selector switch to controlled purge.
- 3. Slowly OPEN the dryer inlet isolation valve.
- 4. Slowly OPEN the dryer outlet isolation valve.
- 5. Check operation of the dryer.

C.4.4 Maintenance Shut-Down

- 1. CLOSE the dryer outlet isolation valve.
- 2. CLOSE the dryer inlet isolation valve.
- 3. Allow the dryer to continue to cycle until the purge exhaust fully depressurizes both chambers.
- 4. Switch off electrical power to the dryer by removing the fuse.

WARNING: Display prominent notices indicating that maintenance is being carried out.

C.4.5 DC1 Controller for CD35 - CD65

C.4.5.1 Control Panel



1	Display
2	ON/OFF button
3	LEFT button
4	ENTER button
5	Power On LED
6	Alarm LED
7	RIGHT button

Button Functions

Button	Normal Operation	Alarm Status	Selection Menu	Alarms Browser	Parameters Editing	Counters and Service Menu
ON/OFF			Starts/S	tops the dryer		
LEFT	No action	No action	Moves the cursor upwards cyclically	Displays the previous alarm cyclically	- Selects the parameter - Decrements the data value	No action
RIGHT	No action	No action	Moves the cursor downwards cyclically	Displays the next alarm cyclically	- Selects the parameter - Increments the data value	No action
ENTER	Displays the selection menu	Cancels the displayed alarm for one minute (alarm acknowledgment)	Selects the pointed menu and activates it	- Returns to the selection menu - Cancels the service alarm if pressed for 5 seconds	 Starts the parameter editing Selects the numerical data digits Confirms the modi- fied value Pressed for at least 2 sec- onds, returns to the selection menu 	Returns to the selection menu

LED Functions

LED	Color	Indicates
Power ON	Green	Power is applied to the controller
Alarm	Blinking red	The controller is in alarm condition
	Fixed red	The controller needs technical assistance



C.4.5.2 Main Screen

When working in normal operation the display shows the following image:



• In the upper left area of the screen, an animated icon is present: In the upper right area, the current working phase countdown and the measured dew point are visualized.

- When the PDP (pressure dewpoint) sensor is not enabled, the dewpoint is not displayed.

- Dewpoint Transmitter is controlled at the Central Control Panel (CCP).

• In the lower area, the current working phase of each vessel is displayed.

lcon	Description
	Rotating arrow Active when the dryer is in its working phases
	Still vertical bars Visualized when the dryer is in the FREEZE status
€ E E E E	Still square Visualized when the dryer is stopped

The possible working phases are:

Phase	Text displayed on screen	Translation
Stop	STOPPED	STOPPED
Shifting	SHIFTING	SHIFTING
Adsorbing	ADSORBING	ADSORBING
Pressure relief	DEPRESS	DEPRESS
Regeneration	REGENERAT	REGENERAT
Pressure equalize	EQUALIZE	EQUALIZE
Freeze	FREEZE	FREEZE
Standby	STANDBY	STANDBY
Blowing off	BLOW OFF	BLOW OFF



C.4.5.3 Selection Menu

When the ENTER button is pressed in the normal operation main screen (not during alarm!), following selection menu is shown:

Q
20
50

Press the LEFT or RIGHT button to navigate to the required menu item and press the ENTER button to select.

	Selection	Translation	lt shows
1	Alarms	Alarms	the alarms browser
2	Settings	Settings	the parameters list
3	Counters	Counters	the counters status
4	Service	Service	the service counters status
5	Exit	Exit	back to the main display

Select item 5 (Exit) to return to the Main screen or wait approximately 30 seconds.

C.4.5.4 Alarm Screen

When an alarm arises, the display shows the following image:



When one or more alarms are active, the alarm screen overrides the main screen.

In the upper right area, the current alarm number and the total active alarms number are visualized.

In the lower area, the current alarm description is displayed.

If more than one alarm is active, the fault descriptors are cyclically displayed for about 2 seconds each.

Pressing the ENTER button acknowledges the currently displayed alarm.

If all the alarms have been cleared, the display returns automatically to the main visualization.

After one minute, if the acknowledged alarm is still active, the alarm display is shown again.

The icon in the upper left area blinks.



Possible alarm causes:

Module Involved	Cause	Message on the Display	How to Clear the Alarm	Alarm LED Status
Service	Running hours > programmed service hours A, B or C	Running hours > service hours X (X = A, B or C)	Perform the requested mainte- nance (A, B, or C). Next, enter the Alarm menu, select Service Alarm, press the ENTER button and keep it pressed during minimum 5 seconds	Blinking
24V supply	Supply voltage < 18V	24V supply is in fault	Contact your supplier	Blinking
Controller	Controller hardware fault	Internal error	Reset all settings to the default value. Switch off the controller and switch it on again. Call your sup- plier if the fault persists	Lit con- tinuously

C.4.5.5 Editing Parameters

During parameters editing (Section C.4.5.3, menu item 2 "Settings"), the display shows an image similar to the following:

9 ₀	Modify param 8/13	
Equaliz	time T2	
17 s		350120

In the upper right area, the current parameter number and the total modifiable parameters number are visualized.

In the lower area, the current parameter description and value are displayed. **Only the unprotected parameters** can be displayed and modified! Example of settings that are accessible to the end user are language and the display time-out.

Pressing the ENTER button for at least 2 seconds ends the editing procedure. The display will return to the selection menu.

Editor button functions:

Button	Function	
LEFT	Selects the previous parameterDecrements the value	
RIGHT	Selects the next parameterIncrements the value	
ENTER	 Starts the parameter editing Selects the numerical data digits Confirms the modified value 	

How to modify a parameter:

Step	Button Involved	Action
1	RIGHT or LEFT	To select the parameter to be modified
2	ENTER	 Starts the modification procedure If the parameters is a selection value (e.g. a language) or a boolean value (On or Off), go to step 3 If the parameters is a numerical value, press the ENTER button repeatedly as required
3	RIGHT or LEFT	 Modifies the selected parameter If the parameter is a selection value (e.g. a language), pressing RIGHT increments and pressing LEFT decrements the selection within the allowed range. If the parameter is a boolean value (On or Off), RIGHT forces the data to ON, LEFT to OFF. If the parameters is a numerical value, RIGHT increments and LEFT decrements the selected digit
4	ENTER	 For numerical data, ENTER moves the cursor to the upper digit (see step 2). If the digit is the last one, ENTER closes the editing phase For selection or Boolean values, ENTER closes the editing phase

Modifiable parameters Following parameters can be modified without password:

Parameter Name	Description	Controller Default Value	Beacon Medaes Value
** ARAVF (Automatic Restart After Voltage Failure)	Selects if the controller will restart automatically or not in case of power failure	Off	On; 0 seconds
Language	Selects the language of the displayed messages	English	English, French, Spanish, Italian, Portuguese, German, Russian
Display timeout		5 minutes	1 — 999 minutes

All other parameters are protected by a password.

**** NOTE:** Parameter that needs modifying if dryer or dryer controller is replaced. Please contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (888-463-3427) for assistance.

Press the Enter button for at least 2 seconds to return to the selection menu.


C.5 Troubleshooting

WARNING!

To protect the lives of patients, always notify the appropriate medical facility staff before performing any maintenance or service procedures on the air system. Compressed air levels may be affected during maintenance or service procedures.

CAUTION: Each component has been selected to compliment the performance of the other components of the system. Therefore, use of unauthorized parts or improper operation will degrade system performance.

IMPORTANT: Water molecules can diffuse through a pinhole size leak even though pressure inside the piping is several hundred PSIG. It is not at all uncommon to have a minute pinhole leak in a gas line cause an increase in dew point from -40°F to -10°F at a distance of forty or more feet downstream of the leak.

WARNING!

Some of the following trouble-shooting checks are conducted while the dryer's electrical power supply is energized. THEREFORE, A POTENTIAL ELECTRICAL SHOCK HAZARD EXISTS. A qualified electrical technician should conduct these checks. The dryer's electrical power supply must be deenergized before any electrical maintenance or repair work is conducted.

WARNING!

Ensure that the dryer and associated pre-filter(s) and afterfilter(s) are valve isolated and fully depressurized before attempting to remove or disassemble any subassemblies or components. Failure to do so may result in serious personal injury and/or equipment damage.

Problem	Possible Causes	Solution
Dryer not	Main power disconnected	Main power disconnected
cycling	Power failure	Power failure
	Main fuse blown	Main fuse blown
	Fuse blown in control circuit	Fuse blown in control circuit
	Timer failure	Timer failure
	Dryer selector switch in off position	Dryer selector switch in off position
	Loose or faulty connection	Loose or faulty connection
	Switching valve failure	Switching valve failure



Problem	Possible Causes	Solution
Dewpoint	Incorrect purge air flow	Check purge orifice for blockage. Clean or replace as required.
degrada- tion	Excessive system flow rate	Reduce inlet flow rate and/or increase operating pressure.
	Inlet air temperature is above the dryer's design inlet working temperature	Check the compressor aftercooler and cooling system. Adjust as necessary to bring the dryer inlet temperature to less than the maximum design working temperature of 43°C (110°F).
	Liquids entering the dryer inlet	Isolate and depressurize the pre-filter assembly. Inspect pre-filter cartridges and end seals for loosening and/or damage. Tighten or replace as necessary.
		Inspect the pre-filter automatic drain valve. Ensure that it is not clogged, and is draining properly. Repair or replace as necessary, if a problem is noted.
	Purge muffler restricted	Replace muffler
	Desiccant is contaminated. The "white" desiccant beads may ap- pear discolored and dirty if con- tamination has occurred	Shutdown and depressurize the dryer. Inspect the desiccant and replace if fouled. Inspect any existing pre-filter if fouling is noted.
	Union or other piping/component leaks at dryer outlet manifold or downstream of dryer outlet	Soap test the dryer outlet manifold and piping downstream of dryer. Repair all leaks noted.
Back pres- sure on a desiccant	Dirty or fouled purge muffler	Switch off power and remove purge muffler and clean using an air nozzle, or replace.
chamber during regen- eration cycle.*	Outlet check valve leaking	Replace check valve

***NOTE:** The presence of backpressure will result in insufficient regeneration followed by dew point degradation. An off-line chamber's pressure MUST be less than 3 psig throughout all regeneration cycles.



C.6 Maintenance

WARNING!

To protect the lives of patients, always notify the appropriate medical facility staff before performing any maintenance or service procedures on the air system. Compressed air levels may be affected during maintenance or service procedures.

A compressed air dryer should give long and trouble free operation if the recommended preventative maintenance program is carried out.

The following is a recommended schedule:

- 1. Quarterly procedure Clean the auto drain in the coalescing filter. Monitor the backpressure on the purging tower. If the gauge reads more than 0 psig (when purging), check the purge muffler for blockage and replace if necessary.
- 2. Annual procedure Replace all filter cartridges and purge muffler(s). Check the automatic drain function in the coalescing filter. Refer to chart located in Section C.6.1 thru C.6.5 for correct system size and part numbers. Contact your local distributor for parts.
- **3.** Five-year procedure Change all annual parts. Change desiccant, check valves, and purge valve(s) See chart in Section C.6.1 thru C.6.5 for correct system size and part numbers.

WARNING!

Compressed air can be dangerous unless safety precautions are observed in the use of compressed air and compressed air equipment. Completely vent the internal air pressure to the atmosphere before disassembling any subassemblies or components and before doing any work on compressed air equipment. To vent internal air pressure, follow the maintenance shutdown instructions.



C.6.1.0 Replacement Filter Element Kits

(Includes element, element O-rings, bowl O-ring and drain valve O-ring)

Dryer Size	Filter Type	Pre-filter (UD) Part No.	Qty	Filter Type	After-filter (DDp) Part No.	Qty	After-filter (QD) Part No.	Qty
CD35	45	2901 2072 03	2	50	2901 2003 03	2	2901 2005 03	2
CD65	60	2901 2072 04	2	70	2901 2003 04	2	2901 2005 04	2
CD110	140	2901 2072 06	2	130	2901 2003 05	2	2901 2005 05	2
CD150	180	2901 2072 07	2	170	2901 2003 06	2	2901 2005 06	2
CD185	220	2901 2072 08	2	210	2901 2003 07	2	2901 2005 07	2
CD250	310	2901 2072 09	2	310	2901 2003 08	2	2901 2005 08	2
CD300	310	2901 2072 09	2	310	2901 2003 08	2	2901 2005 08	2

C.6.1.1 Replacement Filter Element Kits (Next Gen)

(Includes element, element O-rings, bowl O-ring and drain valve O-ring)

Dryer Size	Filter Type	Pre-filter (UD) Part No.	Qty	Filter Type	After-filter (DDp) Part No.	Qty	After-filter (QD) Part No.	Qty
CD35	45	2901 2079 53	2	45	2901 2079 73	2	2901 2080 33	2
CD65	75	2901 2079 54	2	75	2901 2079 74	2	2901 2080 34	2
CD110	110	2901 2079 55	2	110	2901 2079 75	2	2901 2080 35	2
CD150	180	2901 2079 57	2	180	2901 2079 77	2	2901 2080 37	2
CD185	180	2901 2079 57	2	180	2901 2079 77	2	2901 2080 37	2
CD250	300	2901 2079 59	2	300	2901 2079 79	2	2901 2080 39	2
CD300	300	2901 2079 59	2	300	2901 2079 79	2	2901 2080 39	2

C.6.2.0 Drain Valve Kits

(Automatic Drain on UD Filters, Manual Drain on DDp & QD Filters)

Dryer Size	Filter Type	Pre-filter (UD) Part No.	Qty	Filter Type	After-filter (DDp) Part No.	Qty	After-filter (QD) Part No.	Qty
CD35	45	2901 0563 00	2	50	2901 0611 00	2	2901 0611 00	2
CD65	60	2901 0563 00	2	70	2901 0611 00	2	2901 0611 00	2
CD110	140	2901 0563 00	2	130	2901 0611 00	2	2901 0611 00	2
CD150	180	2901 0563 00	2	170	2901 0611 00	2	2901 0611 00	2
CD185	220	2901 0563 00	2	210	2901 0611 00	2	2901 0611 00	2
CD250	310	2901 0563 00	2	310	2901 0611 00	2	2901 0611 00	2
CD300	310	2901 0563 00	2	310	2901 0611 00	2	2901 0611 00	2

C.6.2.1 Drain Valve Kits (Next Gen Filters)

(Automatic Drain on UD Filters, Manual Drain on DDp & QD Filters)

Dryer Size	Filter Type	Pre-filter (UD) Part No.	Qty	Filter Type	After-filter (DDp) Part No.	Qty	After-filter (QD) Part No.	Qty
CD35	45	1629 4035 00	2	50	1629 4035 10	2	1629 4035 10	2
CD65	60	1629 4035 00	2	70	1629 4035 10	2	1629 4035 10	2
CD110	140	1629 4035 00	2	130	1629 4035 10	2	1629 4035 10	2
CD150	180	1629 4035 00	2	170	1629 4035 10	2	1629 4035 10	2
CD185	220	1629 4035 00	2	210	1629 4035 10	2	1629 4035 10	2
CD250	310	1629 4035 00	2	310	1629 4035 10	2	1629 4035 10	2
CD300	310	1629 4035 00	2	310	1629 4035 10	2	1629 4035 10	2

C.6.3 Flange/Head O-Ring

Dryer Size	Filter Type	Pre-filter (UD) Part No.	Qty	Filter Type	After-filter (DDp) Part No.	Qty	After-filter (QD) Part No.	Qty
CD35	45	0663 2110 26	2	50	0663 2110 26	2	0663 2110 26	2
CD65	60	0663 2110 26	2	70	0663 2110 26	2	0663 2110 26	2
CD110	140	0663 2104 75	2	130	0663 2104 75	2	0663 2104 75	2
CD150	180	0663 2104 75	2	170	0663 2104 75	2	0663 2104 75	2
CD185	220	0663 2104 75	2	210	0663 2104 75	2	0663 2104 75	2
CD250	310	0663 2104 98	2	310	0663 2104 98	2	0663 2104 98	2
CD300	310	0663 2104 98	2	310	0663 2104 98	2	0663 2104 98	2



C.6.4 Purge Silencer

Dryer Size	Part No.	Qty
CD35	1617 6164 01	2
CD65	1617 6164 02	2
CD110	1617 6164 02	2
CD150	1017 0104 03	2
CD185		2
CD250	1617 6164 04	2
CD300		2

C.6.5 Desiccant

Dryer Size	Part No.	Qty
CD35	1310 2565 01	2
CD65	1310 2565 01	2
CD110	1310 2565 01	2
CD150	1310 2565 01	2
CD185	1310 2565 01	2
CD250	1310 2565 01	2
CD300	1310 2565 01	2

C.7 Systems Specifications

Туре	Desiccant Heatless
Design Pressure	160 psig
Operating Pressure	100 psig
Max. Ambient Temperature	105°F (40°C)
Pressure Dew Point Capability @ 100 psig	-40°F (-40°C)
Desiccant	Activated Alumina
Power	115V



Appendix D - Dewpoint Transmitter

D.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your Dewpoint Transmitter. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

WARNING!

Before starting any installation, maintenance or service procedure, disconnect ALL power to the system to prevent electrical shock. Before making or breaking any medical gas line connections, make sure the system is depressurized in order to avoid personal injury. Before removing the dewpoint transmitter, verify that the source of line pressure has been closed and the line pressure reduced to atmospheric pressure. An alarm condition on dewpoint indicates a dewpoint level exceeding the

cates a dewpoint level exceeding the maximum setpoint, or a faulty dew point transmitter. Immediate action should be taken to reduce the possibility of high dewpoint in the Medical Air line.

If the dewpoint transmitter flowmeter becomes clogged, dewpoint readings may be inaccurate, allowing moisture to accumulate undetected.

D.2 Introduction

The dewpoint transmitter is a continuous, on-line instrument that measures the absolute moisture content in the final air line. The transmitter measures dewpoint with excellent long term stability. The Advanced Ceramic Moisture sensor is durable and has been designed for ruggedness and simplicity. The transmitter is fully calibrated at the factory prior to shipment.

D.3 Specifications

1. Dewpoint Temperature: -100° to 20°C (-148° to 68°F)

2. Operating Temperature: 0° to 60°C (32° to 140°F)

- 3. Dewpoint accuracy: ±2°C (±3.6°F)
- 4. Air Consumption: 0.75 LPM (1.6 SCFH)

D.3.1 Output

1. Analog output: 4 - 20 mA.

D.3.2 General

- 1. Operation Voltage: 12 28 VDC
- 2. Probe material: Stainless Steel (316)
- 3. Sensor protection: Ceramic

D.4 Operation

Although the correct operation of the transmitter is not sample flow dependent, it is important that flow velocity through the sample source to the sample block is high enough to avoid long lead time lags in response to changes in moisture at the sample source. A flowmeter has been installed and set at 1.0 - 2.0 SCFH to ensure proper flow velocity. This flowmeter should be checked weekly to see if it has any blockages.



Appendix D - Dewpoint Transmitter

D.5 Alarms

Dewpoints that exceed setpoints shall cause an alarm condition at the Central Control Panel (CCP). When the dew point exceeds the alarm set point, the CCP contacts are de-energized. The alarm remains de-energized until the alarm condition is cleared by the operator.

WARNING!

Respond to alarm conditions immediately. An alarm condition on the dewpoint indicates a dew point level exceeding the maximum set point. Immediate action to correct the problem should be taken. Prolonged exposure to condensing moisture can damage the Medical Air equipment.

D.6 Maintenance

D.6.1 Repair Policy

Do not use a unit that is not functioning properly until all necessary repairs have been made and the unit has been tested to determine that it is functioning in accordance with the manufacturer's published specifications. Contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (888-463-3427) for assistance.

D.6.2 Maintenance Schedule

Note: To ensure full reliability, have all maintenance and testing done by a qualified technician. If this cannot be done, maintenance and testing of those parts discussed in this manual may be undertaken by a competent, trained individual having experience in the repair of devices of this nature.

CAUTION: No maintenance and testing should ever be undertaken or attempted by anyone not having general experience in the repair of devices of this nature. Also, to avoid damaging the unit or any of its components, no maintenance and testing should be undertaken by qualified individuals who are not familiar with the procedures in this manual.

Replace damaged parts with components from BeaconMedæs. Test the unit after installation of replacement parts to make certain that it complies with the published specifications.

WARNING!

* Electrical shock hazard *

No repair should ever be attempted by anyone not having experience in the repair of devices of this nature. Failure to follow proper repair procedures can result in serious injury.

Maintenance	Frequency	Action	
Check flow through flowmeter	Weekly	Check for proper flow (1.0 - 2.0 SCFH)	
Check Transmitter accuracy	Every 12 months	Verify dewpoint sensor accuracy (contact BeaconMedæs)	
Recalibration	Every 2 years	See Section D.8	
Replace sensor	Every 5 years	See Section D.9	



Appendix D - Dewpoint Transmitter

D.7 Troubleshooting

WARNING!

Before removing the dewpoint transmitter, verify that line pressure has been valved off or reduced to atmospheric pressure.

Before servicing the dewpoint transmitter, do the following:

- 1. Close dewpoint transmitter isolation valve.
- 2. Allow transmitter piping to depressurize through the flowmeter until it reduces to atmospheric pressure.
- 3. Disconnect sensor cable and remove transmitter from piping.

Problem Possible Cause		Solution
Slow system response	Insufficient flow through dew point sensor	Check flow
No power	No incoming power	Verify line power is being supplied
Erratic Display Unit defect		Contact BeaconMedæs
High Dew Point	Air is not being dried Faulty sensor	Verify that the dryer is not being bypassed. Check flow. Replace sensor

Note: Remote alarms will be activated

D.8 Dewpoint Sensor Calibration

The dewpoint sensor is shipped to you pre-calibrated, no user calibration is required. Contact **BeaconMedaes** to check accuracy and/or external calibration of the sensor.

D.9 Dewpoint Sensor Replacement

Check the response time of the sensor by removing it from the sensor chamber and covering the probe with your hand. The dewpoint reading should rise rapidly. If the dewpoint does not rise or is slow to respond, it is time to replace the sensor. To replace, disconnect the power to the instrument, unplug and remove the sensor from the dewpoint sensor chamber, replace sensor and reassemble.

Description	Part No.	Qty Required
Sensor	4107 6554 19	1
Cable	4107 6510 89	1

E.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your CO Transmitter. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

WARNING!

Before starting any installation, maintenance or service procedure, disconnect ALL power to the system to prevent electrical shock. Before making or breaking any medical gas line connections, make sure the system is depressurized in order to avoid personal injury. An alarm condition on the Central Control Panel indicates a CO level exceeding the maximum setpoint, or a faulty CO sensor. Immediate action should be taken to reduce the possibility of CO in the Medical Air line.

E.2 Introduction

The CO transmitter is a continuous, on-line instrument that measures the carbon monoxide level in the final product line. The instrument's electronics are enclosed in a NEMA-4 corrosion resistant case. The unit operates on 24 VDC power supplied from the central control panel and sends a 4-20 mA signal to the Central Control Panel monitor. The transmitter uses a stateof-the-art electrochemical cell for detecting carbon monoxide. The sensor has a life expectancy of approximately two years. It is easily replaced and should be periodically calibrated as its output diminishes during its life especially during the final months. Contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (1-888-463-3427) for technical support or to order spare parts.

E.3 Specifications

- 1. Analog output: 4-20 mA
- 2. Operation Voltage: 24 VDC
- 3. Sensor body material: Aluminum
- 4. Air Consumption: Minimum 0.5 to 0.9 CFH (14 to 25 lph)

E.4 Power Connection

This is a two wire transmitter. Connect to 24 VDC power supply only (See FIG E.9.1).

E.5 Alarms

CO levels that exceed 10 ppm setpoint shall cause an alarm condition at the Central Control Panel (CCP) When the CO level exceeds the set point, the CCP contacts are de-energized. The alarm remains de-energized until the alarm condition is cleared by the operator.

E.6 Operation

CAUTION: At initial startup, if the unit is reading a gas level, do not make any adjustments for a few hours until the unit has a chance to settle in and stabilize.

If gas readings remain high or below zero (-0), re-calibration may be needed. We also recommend checking the compressor's air intake first.



E.7 Maintenance

WARNING!

Electrical shock hazard

No repair should ever be attempted by anyone not having experience in the repair of devices of this nature. Failure to follow proper repair procedures can result in serious injury.

Replace damaged parts with components from **BeaconMedæs**. Test the unit after installation of replacement parts to make certain that it complies with the published specifications. Contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (1-888-463-3427) for technical support or to order spare parts.

E.7.1 Maintenance Schedule

Maintenance	Frequency	Action
Re-calibration	Every 6 months*	See Section E.9
Replace Sensor	Every 2 years	See Section E.8

*Recalibration of the CO transmitter is required prior to 6 months if any of the following conditions exist:

- Last calibration date cannot be verified or is uknown.
- Sensor overexposed to target or interfering gases.
- Instrument has been subjected to misuse or abuse.
- Sensor has been newly replaced or instrument has received any type of servicing.
- Whenever sensor response is in question.

E.8 Sensor Checkout and Replacement

To check a sensor's response, test gas has to be placed on the sensor. When it fails to show a gas response during calibration, a new sensor is required. Most sensors will last from one and one-half years to two and one-half years.

To replace the sensor (see FIG E.9.1), disconnect the power to the unit, disconnect the inlet air connection and unscrew the cover to access the inside of the transmitter. Next, unplug the CO sensor from the bottom of the internal PC board. Then remove the cap on the bottom of the transmitter and remove the CO sensor and wiring. Unplug the wiring from the sensor and replace it with a new one. Reinstall the sensor in the reverse order. Once the sensor is installed go through steps E.9.1 and E.9.2 to calibrate and verify the proper operation of the CO sensor.

E.9 Calibration

E.9.1 Zeroing Transmitter

The following procedure should be used for zeroing the transmitter. (See E.11 Accessories and Replacement Parts for zero gas part numbers):

- 1. Turn on the power and allow the transmitter to warm up for several hours to stabilize.
- 2. Disconnect the inlet air line to the transmitter and connect the air line from the zero gas cylinder.
- Allow the calibration gas from the cylinder to flow across the sensor for approximately 3 minutes to stabilize the sensor.
- 4. Remove the cover from the transmitter housing and locate the two test point sockets (See FIG E.9.1)
- 5. Connect voltage meter leads to the two test point sockets and set the meter to VDC.
- 6. Locate the blue pot (marked "Z") and adjust the pot until the meter reads 0.04 VDC. Turning the adjusting screw counterclockwise will reduce the voltage output. Turning it clockwise will raise the voltage output.
- 7. Proceed to E.9.2 for calibrating the transmitter.

E.9.2 Transmitter Calibration

The following procedure should be used to cali-



brating the transmitter. (See E.11 Accessories and Replacement Parts for calibration kit part numbers):

- 1. Zero the transmitter prior to calibration, see E.9.1 for zeroing procedure.
- 2. Disconnect the zero gas cylinder from the transmitter and connect the air line from the 20 ppm CO gas cylinder.
- Allow the calibration gas from the cylinder to flow across the sensor for approximately 3 minutes to stabilize the sensor.
- 4. Connect voltage meter leads to the two test

point sockets and set the meter to VDC (See FIG E.9.1).

- Locate the dark blue pot (marked "C") and adjust the pot until the meter reads 0.051 VDC. Turning the adjusting screw counterclockwise will reduce the voltage output. Turning it clockwise will raise the voltage output.
- 6. Repeat the zeroing procedure and calibration procedure once more to ensure the transmitter is set properly.
- 7. Reinstall the cover on the transmitter.
- 8. Reconnect the inlet air line from the dryer.



FIG E.9.1 CO Transmitter Assembly



E.10 Troubleshooting

WARNING!

Before removing the CO sensor, verify that line pressure has been valved off or reduced to atmospheric pressure.

Before servicing the CO sensor, do the following:

- 1. Unplug sensor(s) or turn off monitor.
- 2. Depressurize the CO sensor.

Note: Remote alarms will be activated.

Problem	Possible Causes	Solution
CO Alarm - 10 ppm or above	Inlet air to the medical air system is contaminated	Move air inlet location or remove source of CO contamination
Monitor will not calibrate	Sensor depleted	Replace sensor
CO Alarm - CO reading erratic	Incoming power feed to control panel adjacent to CO signal wires	Separate incoming power feed from CO signal wires

E.11 Accessories and Replacement Parts

Description	Part Number	Qty Required
CO Sensor	4107 6530 69	1
Calibration Kit *	4107 4004 63	1
20 ppm Carbon Monoxide	4107 6525 14	1
Impurity Free Air (Zero Gas)	4107 6525 13	1

(*) Kit includes calibration connector, 20 ppm test gas, and 0 ppm test gas in carrying case.



Appendix F - Oil Indicator

F.1 General Information

CAUTION: This manual is designed to serve as the operation and maintenance guide for your Oil Entrainment Indicator. The contents of this manual should be carefully read BEFORE attempting any phase of operation or maintenance. Failure to follow the operating and maintenance procedures of the instruction manual could result in personal injury or property damage.

All information, specifications and illustrations within this manual are those in effect at the time of printing. The manufacturer reserves the right to change or make improvements without notice and without incurring any obligation to make changes or add improvements to products previously sold.

To facilitate maintenance, recommended spare parts for Oil Indicator are available. Failure to maintain recommended spare parts might result in expensive and unnecessary downtime for which the manufacturer cannot be responsible. To request a quotation of, or place an order for, recommended or emergency spare parts, please contact **BeaconMedæs** Technical Services department at 1-888-4MEDGAS (888-463-3427).

F.2 Function

The Oil Indicator is a calibrated measuring instrument used to detect aerosol mist levels of oil entrainment that may be present in the medical air system. Sensitivity of the indicator is limited only by the total number of hours it is allowed to remain on the air supply system. The indicator is sensitive enough to measure a concentration of oil entrainment as low as .01 ppm (.012 mg/ m3) in a compressed air system. It can be used in systems with line pressures between 10 and 125 psig (70 and 875 kPa). Inline pressure regulator for oil indicator factory set at 50 psig. NFPA requires a 0.05 ppm \pm 0.03 ppm reading or better in the air stream.

WARNING!

If the pressure exceeds 125 psig or the retaining nut is loosened, the oil indicator tube could blow out of the compression fitting, creating a hazardous condition.



FIG F.1 Oil Indicator Assembly



Appendix F - Oil Indicator

F.3 Operation

When the needle valve of the oil indicator is open, filtered medical air will flow through the calibrated plastic tube. Any oil present in the air will then carry a red oil soluble dye up the tube, coloring a white material in the tube. The rate of color travel will be proportional to the amount of oil present. The parts per million (ppm) value of oil entrained in the air can be determined using the conversion chart below (FIG F.2). After use the needle valve should be closed and left in line and the cartridge removed. At the time of the next test, a replacement cartridge will need to be installed on the needle valve fitting.

F.4 Reading and Measurements

- 1. Before taking a measurement, fill out the record tag furnished with the oil indicator. Record the line pressure.
- 2. Fully rotate the needle valve handle counterclockwise to open and record the time start time. Slide the record tag over the oil indicator to avoid misplacing it.
- 3. When checking for oil entrainment, visually inspect the oil indicator after 40 hours and measure only to the top of the dark red column, not light pink area if present. If dark red column is not visible, discontinue test, there is no measurable amount of oil present in the air stream.
- 4. If dark red column is visible, record the actual time and unit mark on the indicator and close the needle valve.

F.5 OilConcentrationDetermination

- 1. To find the Rate of Color travel, divide the units traveled by the total number of hours.
- 2. Using the chart in FIG F.2, find the Rate of Color travel on the left side of the chart and the pressure on the bottom. The point where Rate and Pressure intersect is the parts per million of oil concentration.

F.6 Oil Indicator Replacement Cartridge

NOTE: The oil indicator tube must be replaced with a new cartridge after each test.

- 1. Before removing cartridge close the needle valve and leave the valve in place.
- 2. Remove the old cartridge by unscrewing the fitting holding the indicator tube. The new cartridge comes with a new fitting with the tube installed.
- 3. Install the new cartridge on the needle valve and only open the valve when a new test begins.

WARNING!

Do not disturb the factory adjusted torque on the retaining nut that holds the indicator plastic tube in place. Tampering with the nut can cause serious personal injury or property damage.

Part Number	Qty Required	
GAG08-002	1	



Appendix F - Oil Indicator

RATE OF COLOR TRAVEL (UNITS/HR)



PRESSURE ON OIL INDICATOR **PSIG** kPa

FIG F.2 Conversion Chart for Oil Indication



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