## Installation, Operation and Maintenance Instructions

# Rotary Tooth Air System (ZMED and ZLAB)

*Part number 4107 9029 52*
*Revision 02*
*27 April 2026*

BeaconMedaes

# Installation, Operation and Maintenance Manual
# Rotary Tooth Air Systems W/ Mk5 Touch Central Controller (ZR/ZT Systems)

This unit purchased 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:

**BeaconMedaes**
1059 Paragon Way
Rock Hill, SC 29730

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

**BeaconMedaes reserves the right to make changes and improvements to update products sold previously and support materials without notice or obligation.**

***Part number 4107 9029 52***
***Revision 02***
***27 April 2026***

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## 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 facility personnel if repairs or maintenance will affect available compressed air levels.
- 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.

For ZMED Only:

- 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.

# 1.0 General Information

**CAUTION:** This manual is designed to serve as the operation and maintenance guide for your Rotary Tooth 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 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 **BeaconMedaes** Technical Services department at 1-888-4MEDGAS (888-463-3427).

## 1.1 Modular System Standard Components

### System Design

The modular Rotary Tooth Air system consists of compressor modules (duplexed or multiplexed), a dryer/control module, and an air receiver module. For ZMED systems, 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 - ZMED System Only**
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. For ZMED Systems, all of the above shall be factory piped and wired in accordance with NFPA 99 and include valving to allow complete air receiver bypass, 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**
For ZMED Systems, the dryer/control module shall incorporate a dew point and a CO transmitter that are mounted, pre-piped, and wired. For ZLAB Systems, the dryer/control module shall only incorporate the dew point transmitter. Dew point and CO conditions will be displayed on the central control system. The dew point probe shall be the ceramic type sensor. The system accuracy shall be a minimum of ± 2°C for dew point and ± 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 dew point conditions shall be indicated with visual and audible alarms.

**Air Receiver Module**
The vertical air receiver shall be ASME Coded, National Board Certified, galvanized, rated for a min. 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.

# 2.0 Installation

## 2.1 Inspection Upon Receiving

The condition of the Rotary Tooth 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. System 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 facility's pipeline distribution system.

## 2.2 Handling

**WARNING!**

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

The system 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 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 (ZMED Only)

**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.**

# 2.0 Installation

For ZMED Systems only, 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 precleaned 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 facility 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! (ZMED Only)**

**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 facility 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 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 Rotary Tooth 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

# 2.0 Installation

(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)

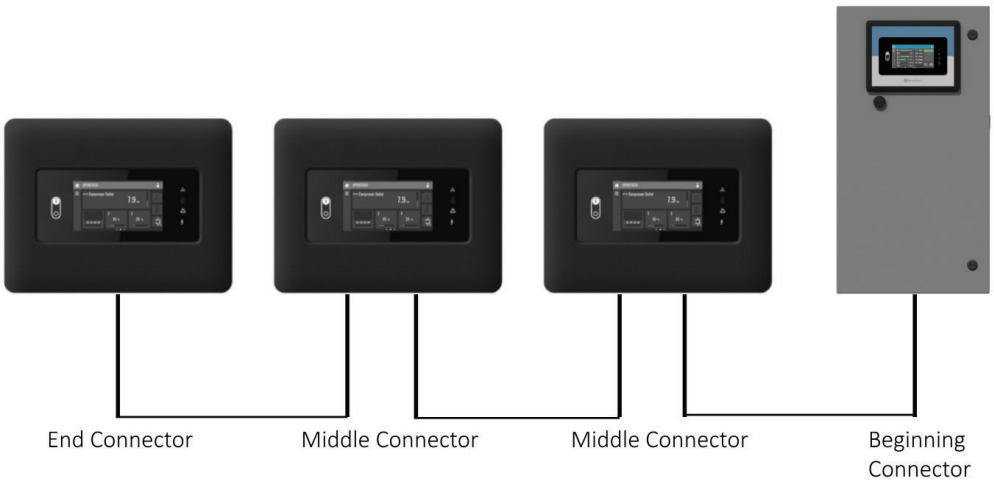



**FIG 2.7 CAN Network Connection Method**

### 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). 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.

### 2.8.1 Cable

# 2.0 Installation

FIG 2.8 CAN Connectors

FIG 2.8a Service CAN Connector

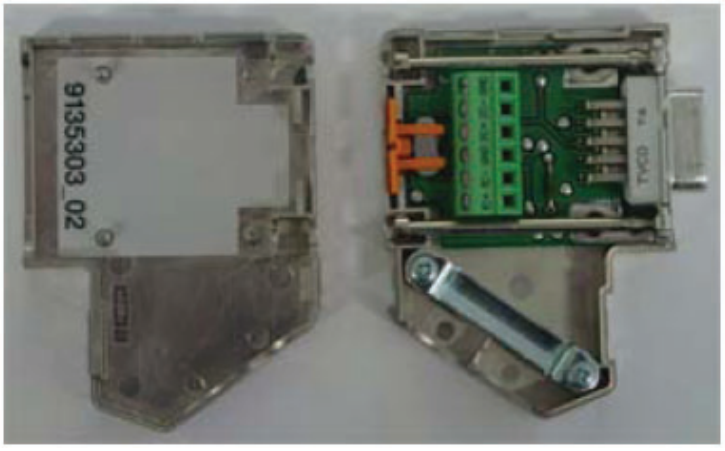



FIG 2.8b Normal CAN Connector

# 2.0 Installation

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 **BeaconMedaes** equipment and as such is the only CAN cable **BeaconMedaes** 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 **BeaconMedaes** 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) 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.

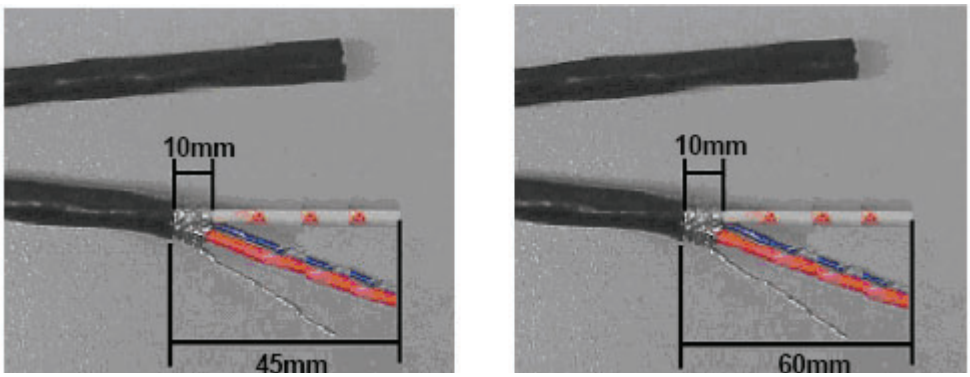



FIG 2.8.2 CAN Cable Preparation

### 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.

### 2.8.4 Node Connector Cabling

# 2.0 Installation

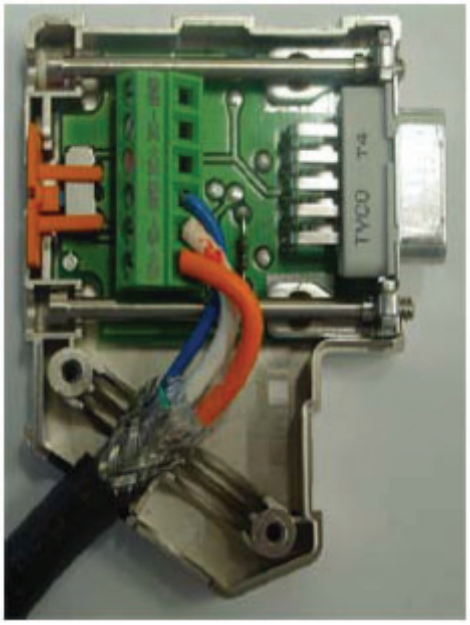


FIG 2.8.3 Beginning/End Wiring Connection

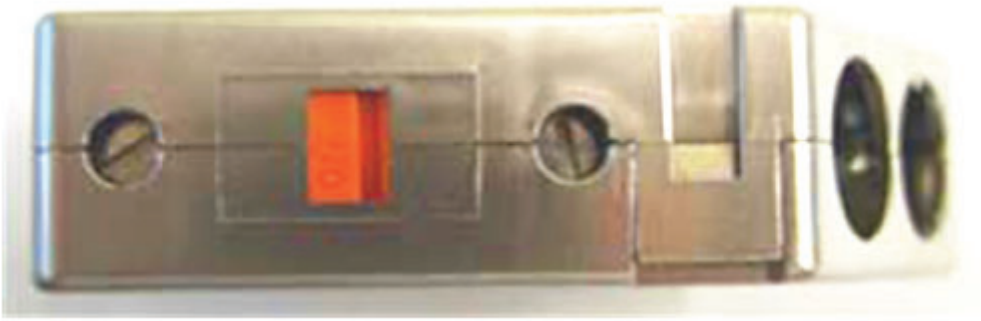


FIG 2.8.3a Connector Switch Setting

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.

# 2.0 Installation

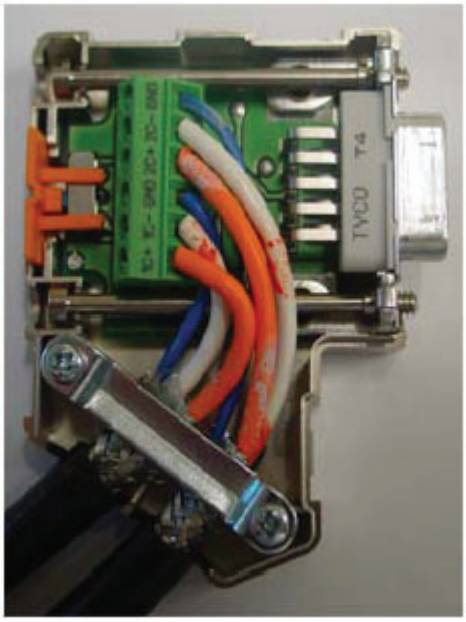



FIG 2.8.4 Middle Wiring Connections

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.

# 2.0 Installation

## 2.9 Parts List

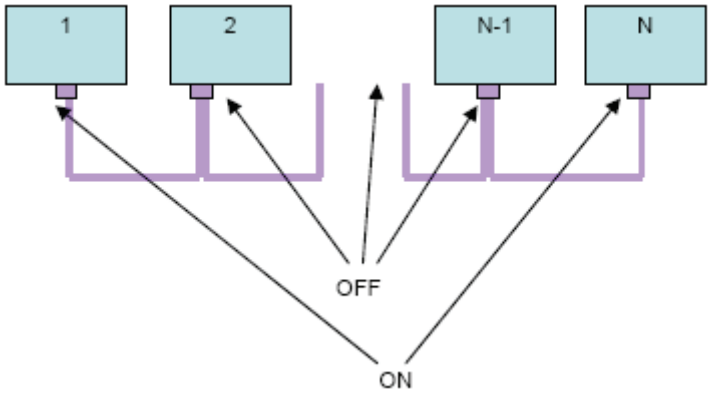



FIG 2.8.5 Connector Switch Setting

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

# 3.0 System Operation

## 3.1 Prestart-Up

The contractor should notify **BeaconMedaes** 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 **BeaconMedaes** 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! (ZMED Only)**

**Prior to putting the ZMED 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 Rotary Tooth 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.

# 3.0 System Operation

## 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.

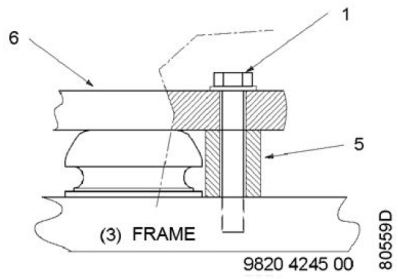
- See Appendix A.6 for complete list of parameters for the Central Control System.
- See Appendix B.5 for complete list of parameters for the Compressor Controllers.

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

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

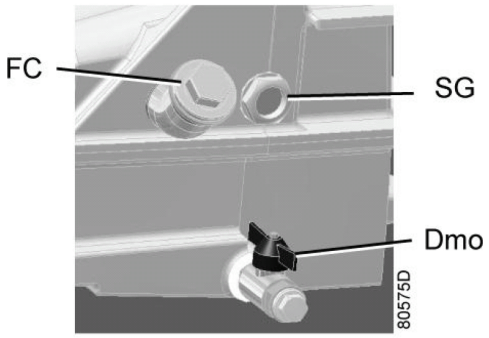



**Components**

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

**FIG 3.2.1a Transport Fixations**

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)




**Components**

| | |
|---|---|
| FC | Filter Plug |
| SG | Sight Glass |
| Dmo | Oil drain valve, gear casing |

**FIG 3.2.1b Oil System Components**

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.
7. **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-

# 3.0 System Operation

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).

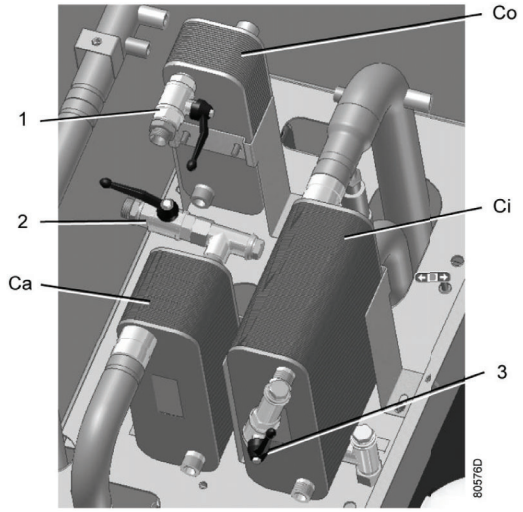
9. **Oil Cooler on "ZR" compressors:** Read-out following parameters in the Elektronikon at stabilized load condition:

- 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:** Read-out 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:** Read-out 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.

# 3.0 System Operation

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.
2. **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).

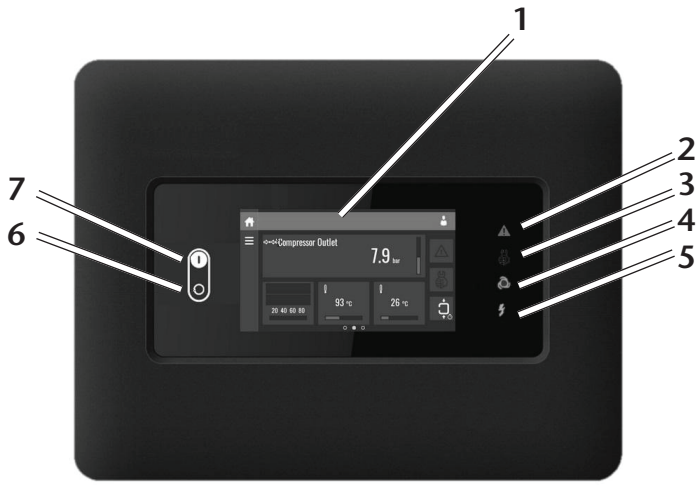



FIG 3.2.2 Compressor Control Panel

**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. Facility 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

# 3.0 System Operation

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

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

**NOTE:** The Rotary Tooth Air System is now on-line 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 Rotary Tooth 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 (ZMED ony) the 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 Shutdown

**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! (ZMED Only)**

**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).

# 3.0 System Operation

### 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 Shutdown

Refer to Appendix C.4.4 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<br>Change power supply phase on incoming 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 |
| | Pressure sensor open | Adjust or replace sensor |
| | 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 unexpectedly | Overload tripped on starter | Reset & check for system overload |
| | 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<br>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 replace 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 recirculation of cooling air | Improve ventilation of compressor room and avoid cooling air recirculation |
| | Air filter clogged | Replace filter |
| | **On "ZR"**, insufficient cooling water flow | Check water temperature and increase cooling water flow |
| | **On "ZR"**, restriction in cooling water system due to formation of scale or settling down of dirt | Contact **BeaconMedaes** |
| Condensate is not discharged from condensate traps during operation | Discharge flex line clogged | Check and correct as necessary |
| | Electronic water drain malfunctioning | Contact **BeaconMedaes** |
| Motor overheating | Low voltage | Check for proper supply voltage |
| | Defective motor | Contact **BeaconMedaes** |
| Compressor runs hot | Wrong rotation | Switch motor leads |
| | Incorrect pressure setting | Adjust pressure band parameters |
| | Faulty compressor valves | Contact **BeaconMedaes** |
| | Intake filter clogged | Clean or replace |
| Wrong direction of rotation | Motor wired incorrectly | Switch motor leads |
| Low discharge pressure | System piping leaks | Repair leaks |
| | Defective pressure gauge | Replace gauge |
| | Faulty pressure transducer | Adjust or replace |
| | Intake filter clogged | Clean or replace |

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

| Problem | Possible Causes | Solution |
|---|---|---|
| Dew point degradation | 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. Replace 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 muffler and clean or replace. |
| Maximum Capacity | System undersized | Contact **BeaconMedaes** |
| | 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 level | Manual isolation valve closed | Open valve |
| | Automatic drain valve not functioning | Check electrical hookup |
| | | 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 condensate levels (Dryer) | Daily | Check auto drain. Clean if necessary. |
| 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 (ZMED Only) | Every 6 months* | Purchase Service Kit<br>See Appendix E |
| Check dew point sensor accuracy | Every 12 months | Verify dew point sensor accuracy (contact **BeaconMedaes**) |
| Replace pre-filters & after-filters | Every 12 months | Replace filter elements |
| Replace Dryer Desiccant | 5 years | Contact **BeaconMedaes** |
| Compressor fan motor | Greased for life | Contact **BeaconMedaes** for replacement |
| Compressor Drive motor bearings (ZT15 – ZT22) | Greased for life | Contact **BeaconMedaes** for replacement |
| Compressor Drive motor bearings (ZT/ZR30 – ZT/ZR45) | See Nameplate | Grease drive & non-drive ends |

# 5.0 Maintenance

*For ZMED Systems only, 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:** Required grease is indicated on motor tag. Refer to motor for correct grease.

**Oil specification:** 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.** | | | | | | | | |
| **Dew Point 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.** | | | | | | | | |
| **Dew Point 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.
6. Use only genuine **BeaconMedaes** spare parts. Contact **BeaconMedaes** 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. Only ZMED Systems are equipped with a CO Transmitter. Software options may differ depending on configuration.

### 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.
**BeaconMedaes** 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.

# Appendix A - EControl (ECO) with Mk5 Touch Display

### 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 2.7**" for network cabling of compressors and cable end connector wiring and assembly.

# Appendix A - EControl (ECO) with Mk5 Touch Display

## 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 Dew point 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.

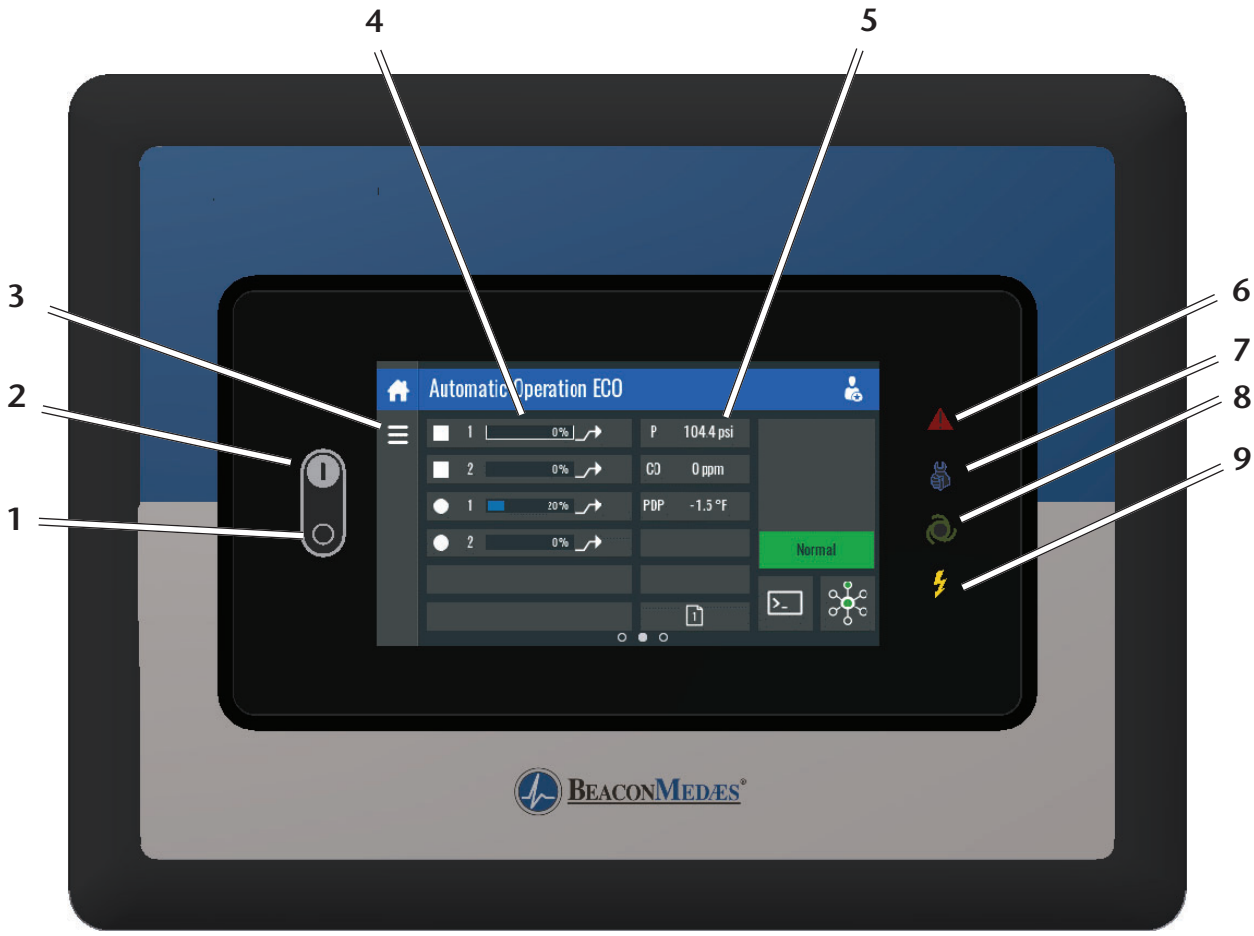



FIG A.4 Dryer Central Control Panel

# Appendix A - EControl (ECO) with Mk5 Touch Display

## A.5. Display Description

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

### A.5.1. Main Screen

The main screen 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.

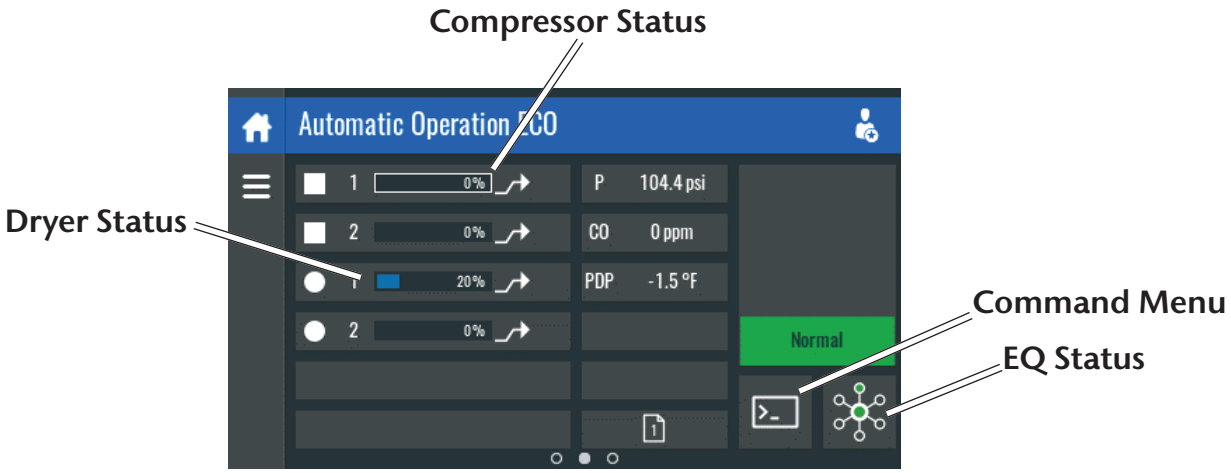



FIG A.5.1 Equalizer Main Screen

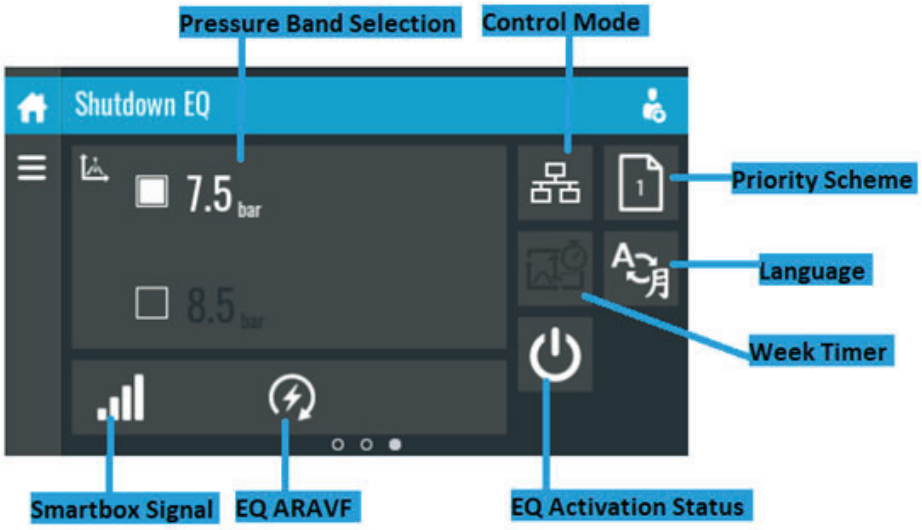


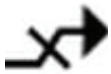

FIG A.5.1.1 Equalizer Main Screen

# Appendix A - EControl (ECO) with Mk5 Touch Display

### 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) |
| | 85271D | ECO in local control mode |
| | 85272D | ECO in remote control mode |
| | 85273D | ECO in LAN control mode |
| | | Active priority scheme (including a number) |
| Automatic restart | 85274D | Automatic Restart After Voltage Failure is active |
| Week timer | 85275D | Week Timer is active |
| Warning | | Warning |
| Service | 85234D | Service required |

# Appendix A - EControl (ECO) with Mk5 Touch Display

| | | |
|---|---|---|
| Language | | Language selection |
| Machine statuses | | No answer (unit doesn't answer EQ command) |
| |  | Compressor is isolated |
| | | No communication |
| | | Minimum stop time is running |
| | | Compressor is running local under EQ control (4A) |
| | | Compressor is local, on his own control (2A) |
| | | Service required on compressor |
| | | Shutdown (red icon) or Warning (yellow icon) on compressor |

# Appendix A - EControl (ECO) with Mk5 Touch Display

### A.5.3. Machine Type Icons

| Icon | Description |
|---|---|
| | Load/unload compressor |
| | Frequency converter driven compressor (VSD) |
| | “Other” Machine Type (e.g. Digital Link) |

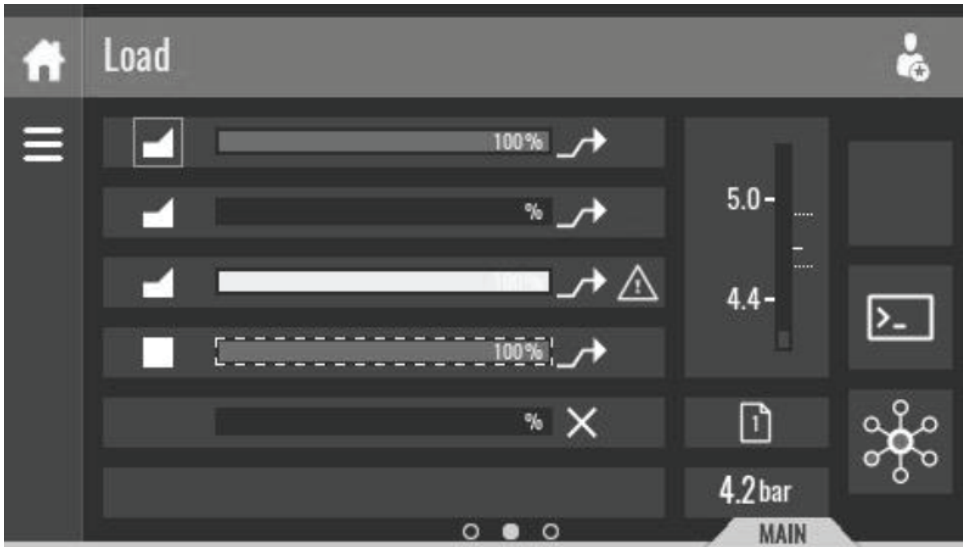



FIG A.5.3 Machine Type Icons

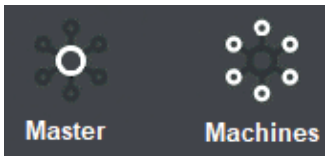
Each line represents a slave compressor. The icon on the left of the bar indicates the machine type. In case of multiple VSD’s, there will only be one regulating to the setpoint (in Equal Wear mode). The square around the machine type icon indicates the regulating VSD.

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.

# Appendix A - EControl (ECO) with Mk5 Touch Display

### 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).

FIG A.5.4 ECO Status Menu

# Appendix A - EControl (ECO) with Mk5 Touch Display

### 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 represetnt a Warning, Service Required, Operation and Voltage.

1. **Warning Sign:** Flashes in case of shutdown, 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

# Appendix A - EControl (ECO) with Mk5 Touch Display

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 dew point at system delivery pressure exceeds:
   ZMED: +2°C (+35°F)
   ZLAB: -30°C (-22°F)
   With a 20 second delay on alarm for each.
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.

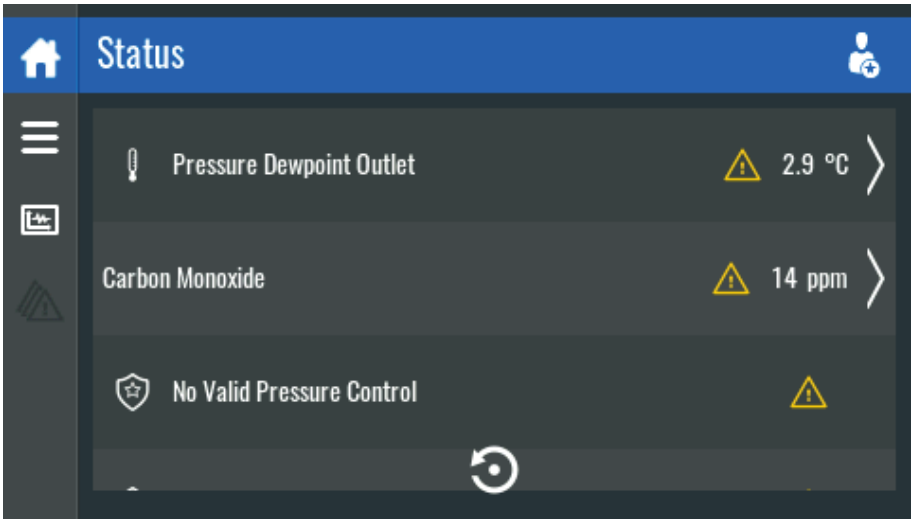


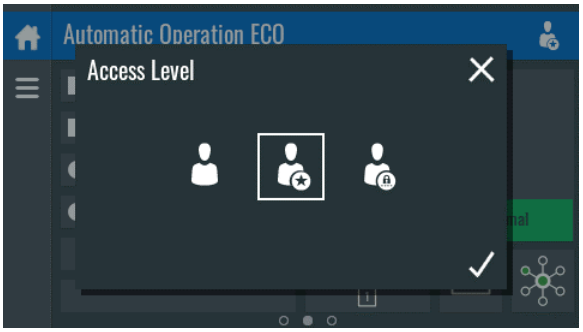

FIG A.5.5.3 Error, Warnings and Alarm Symbols

# Appendix A - EControl (ECO) with Mk5 Touch Display

## A.6. ECO Menus

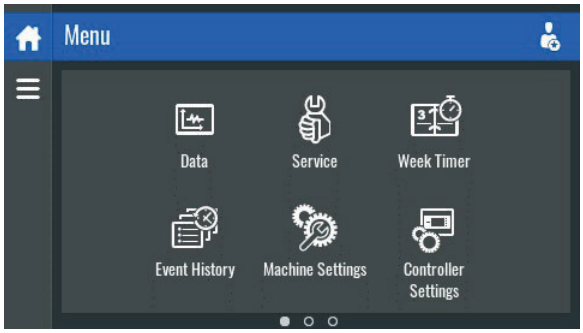
### A.6.1.Menu Access

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

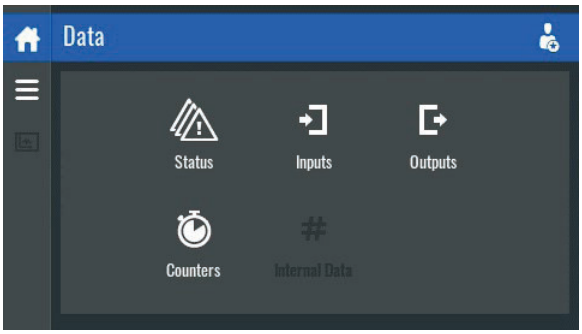
Swiping right or ticking the menu button brings up the menu shown below.




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

### A.6.1.2. Data Menu

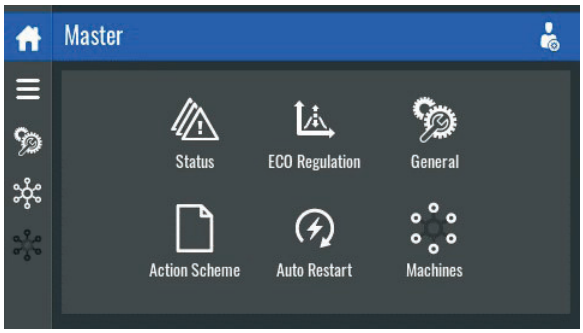
Tap 'Data', the screen shows a number icons shown below. Drill down to the desired sub-menu.




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

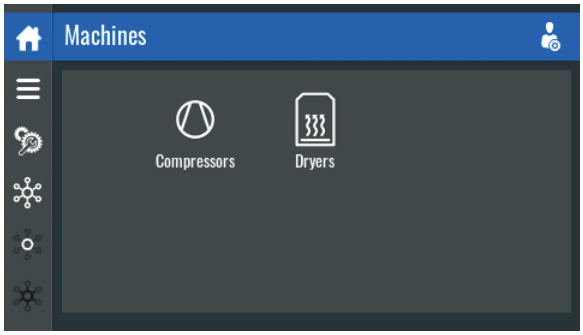
Tap 'Machine Settings', 'ECO', then 'Master', the screen shows a number of icons shown below. Drill down to the desired submenu.



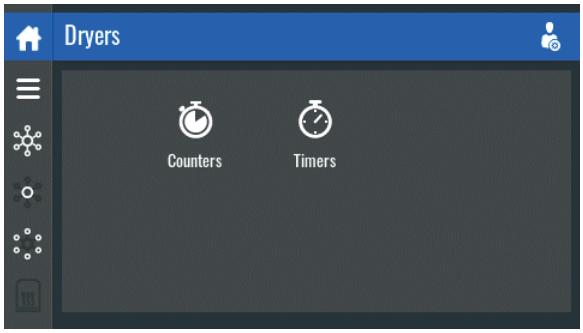

1. **Status Menu:** Here the ECO function is (de) activated and the number of compressors is chosen.
2. **ECO Regulation**: Here pressure bands are defined and selected.

# Appendix A - EControl (ECO) with Mk5 Touch Display

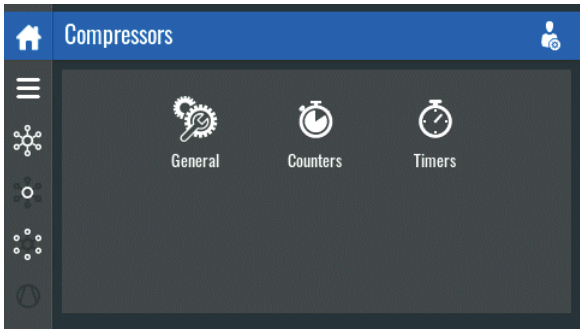
3. **General:** Local Command
4. **Action Scheme**: Not Used
5. **Auto Restart:** System will resume operation after power loss. Set to infinite, Max Power Down Time not used when set to Infinite
6. **Machines:** The following icons are shown under Machines:




**Dryers:** The following icons are shown under Dryers:




**Compressors:** The following icons are shown under Compressors:

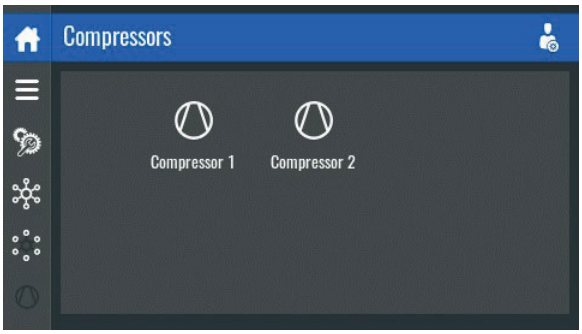



**General:** Here the algorithm can be chosen. Equal wear is the default and recommended value.

**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

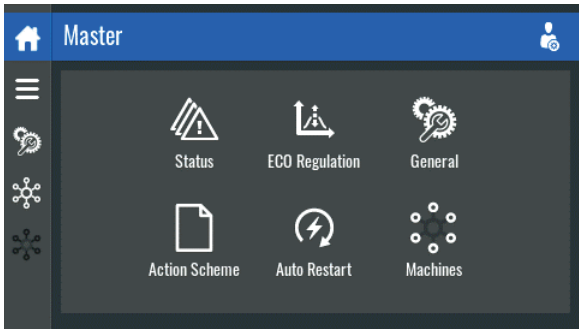
## A.7. Configuration and Start-Up

### 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:

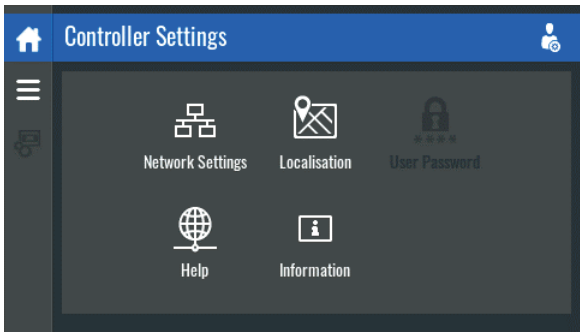


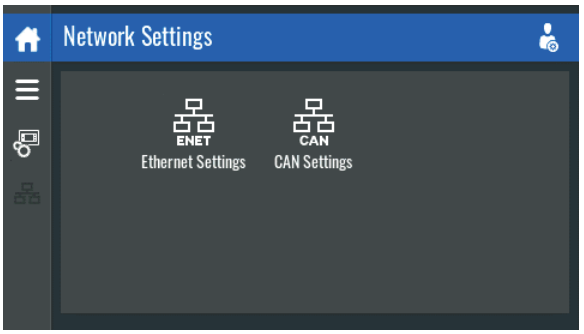

On the Status screen the number of compressors, number of loaded compressors (equal to the number of compressors) and the number of dryers will be entered. After the number of compressors and dryers is entered the ECO

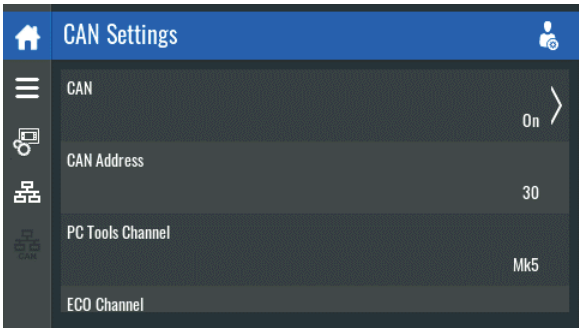
should be turned to ON.

### 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 position

### 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

# Appendix A - EControl (ECO) with Mk5 Touch Display

- 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 **BeaconMedaes** Service Personnel.

**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.**

EQUALIZER is now ready for use.

### 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 shut-down level, the compressor will be stopped. This will be indicated on the control display.

#### A.7.7.1.Shutdown 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.

# Appendix B - Compressor Controller with Mk5 Touch

## 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 **BeaconMedaes** spare parts. Contact **BeaconMedaes** 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.

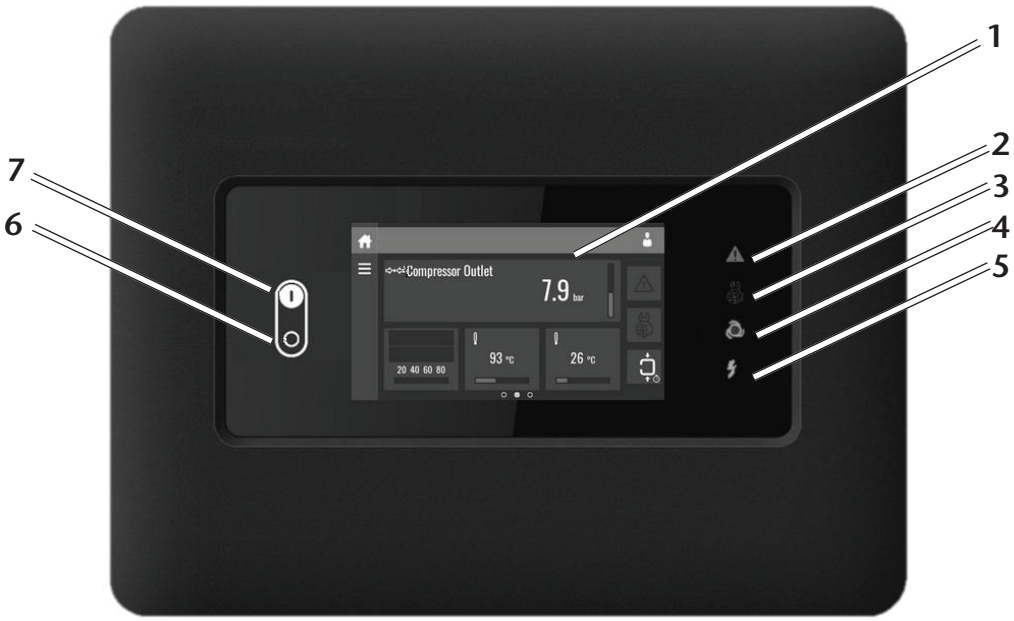



FIG B.1 Compressor Control Panel

# Appendix B - Compressor Controller with Mk5 Touch

## B.3 Icons Used

| Menu | Icon | Menu | Icon | Menu | Icon |
|---|---|---|---|---|---|
| Data | | Status | | | |
| | | Inputs | | | |
| | | Outputs | | | |
| | | Counters | | | |
| | | Aux. Equip-ment Param-eters | | Converters | |

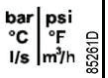
# Appendix B - Compressor Controller with Mk5 Touch

<table>
<tr><th>Menu</th><th>Icon</th><th>Menu</th><th>Icon</th><th>Menu</th><th>Icon</th></tr>
<tr><td rowspan="5">Service</td><td rowspan="5"> </td><td>Service</td><td rowspan="3"></td><td>Overview</td><td> </td></tr>
<tr><td></td><td>Service Plan</td><td> </td></tr>
<tr><td></td><td>Service History</td><td> </td></tr>
<tr><td>Service func-tions</td><td> </td><td colspan="2"></td></tr>
<tr><td>Clean Screen</td><td> </td><td colspan="2"></td></tr>
<tr><td>Week Timer</td><td> </td><td colspan="2">Remaining Running Time</td><td>Week</td><td> </td></tr>
<tr><td></td><td> </td><td></td></tr>
<tr><td>Event History</td><td> </td><td>Saved Data</td><td> </td><td colspan="2"></td></tr>
</table>

# Appendix B - Compressor Controller with Mk5 Touch

| Menu | Icon | Menu | Icon | Menu | Icon |
|---|---|---|---|---|---|
| Machine Settings | | Alarms | | | |
| | | Regulation | | | |
| | | Control Parameters | | | |
| | | Aux. Equipment Parameters | | Converter(s) | |
| | | | | Fan | |
| | | | | Internal Smart-Box | |
| | | Auto Restart | | | |

# Appendix B - Compressor Controller with Mk5 Touch

| Menu | Icon | Menu | Icon | Menu | Icon |
|---|---|---|---|---|---|
| Controller Settings | | Network Settings | | Ethernet Settings | |
| | | | | CAN Settings | |
| | | Localisation | | Language | |
| | | | | Date/Time | |
| | | | | Units |  |
| | | User Password | | | |
| | | Help | | | |
| | | Information | | | |

# Appendix B - Compressor Controller with Mk5 Touch

### Status icons

| Icon | Description |
|---|---|
| | Motor Stopped |
| | Motor Stopped Wait |
| | Running Unloaded |
| | Manual Unload |
| | Running Unloaded Wait |
| | Running Loaded |
| | Failed to Load |
| | Running Loaded Wait |

| Icon | Description |
|---|---|
| | Manual Stop |
| | Machine Control Mode, Local |
| | Machine Control Mode, Remote |
| | Machine Control Mode, LAN |
| | Automatic Restart After Voltage Failure |
| | Week Timer Active |

# Appendix B - Compressor Controller with Mk5 Touch

### System icons

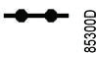
| Icon | Description |
|---|---|
| | Basic User |
| | Advanced User |
| | Service User |
| | Antenna 25% |
| | Antenna 50% |
| | Antenna 75% |
| | Antenna 100% |
| | Change between screens (indication) |

| Icon | Description |
|---|---|
| | Energy recovery |
| | Dryer |
| | Element |
| | Drain(s) |
| | Analogue Output |
| | Menu |
| | Reset |
| | Auto Restart |

# Appendix B - Compressor Controller with Mk5 Touch

| Icon | Description |
|---|---|
| | Filter(s) |
| | Cooler |
| | Valve(s) |
| | Power Meter |

**Input icons**

| Icon | Description |
|---|---|
| | Pressure |
| | Temperature |
| | Special Protection |
| | Open |
|  | Closed |

# Appendix B - Compressor Controller with Mk5 Touch

## 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.

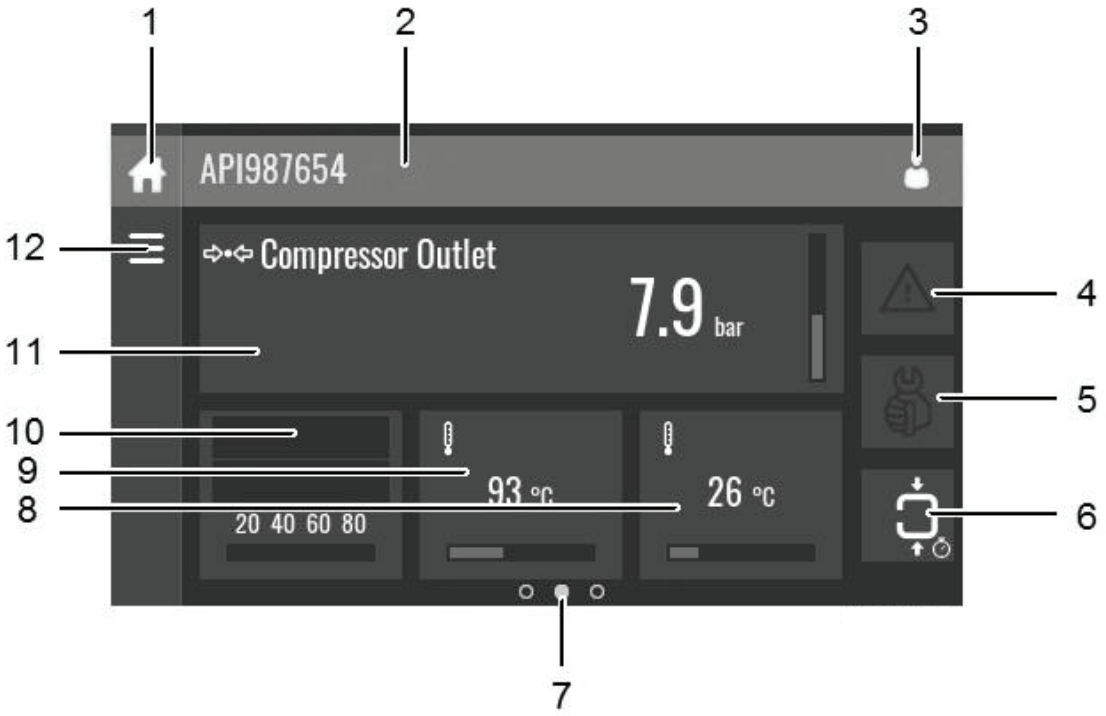
5. **Service Button:** The service button can be tapped to show the service information.

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.



# Appendix B - Compressor Controller with Mk5 Touch

## 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 (ZMED) | BeaconMedaes Value (ZLAB) |
|---|---|---|---|---|
| Unloading Pressure 1 | High pressure level of Pressure band 1 | ZMED: 8 bar<br>ZLAB: 10 bar | 105 psi[1] | 145 psi[1] |
| Loading Pressure 1 | Low pressure level of Pressure band 1 | ZMED: 6.4 bar<br>ZLAB: 8 bar | 96 psi[1] | 130 psi[1] |
| 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 | 1 |
| Pressure Selection Band | | Off | Off | Off |
| Automatic Restart[2] | | Not activated | Infinite[2] | Infinite[2] |
| Maximum Power Down | | 15 seconds | 15 seconds | 15 seconds |
| Restart | | 0 seconds | 0 seconds | 0 seconds |
| Ethernet | | On | On | On |
| CAN[3] | CAN must be off to change CAN address and communication profile | Off | On[3] | On[3] |
| CAN Address | | 31 | Node ID | Node ID |
| Communication Profile | | Mk5 | 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
3. CAN must be off to change CAN address and communication profile.

# Appendix B - Compressor Controller with Mk5 Touch

### 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 password | 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 |

# Appendix B - Compressor Controller with Mk5 Touch

## 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 (ZMED) | BeaconMedaes Value (ZLAB) |
|---|---|---|---|---|
| Reduced Setpoint | | 102 psi[1] | 95 psi[1] | 130 psi[1] |
| Setpoint 1 | | 102 psi[1] | 95 psi[1] | 130 psi[1] |
| Indirect Stop Level 1 | | 116 psi[1] | 116 psi[1] | 144 psi[1] |
| Direct Stop Level 1 | | 123 psi[1] | 123 psi[1] | 151 psi[1] |
| Setpoint 2 | | | | |
| Indirect Stop Level 2 | | | | |
| Direct Stop Level 2 | | | | |
| Setpoint Used | | Set Point 1 | Set Point 1 | Set Point 1 |
| Digital Pressure Band Selection | Requires password | Off | 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 address 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.

# Appendix B - Compressor Controller with Mk5 Touch

### 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 power 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
2. Requires password to change parameters and configuration

# Appendix C - Desiccant Dryer

## 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)

# Appendix C - Desiccant Dryer

## 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 dew point 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.

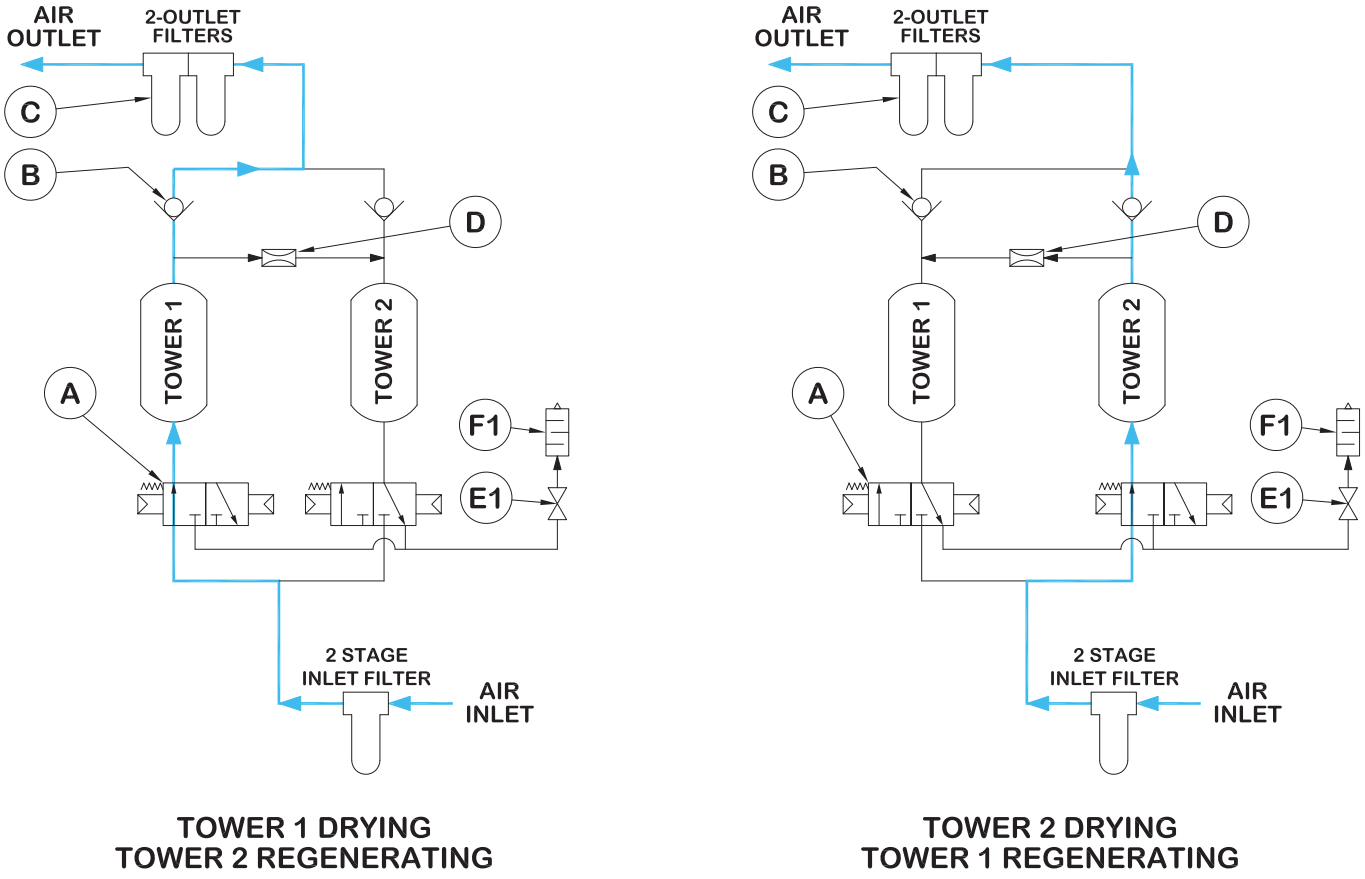



FIG C.2 CD35 - CD65 Flow Schematic

# Appendix C - Desiccant Dryer

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

| 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 |

The working sequence is the following:
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.

# Appendix C - Desiccant Dryer

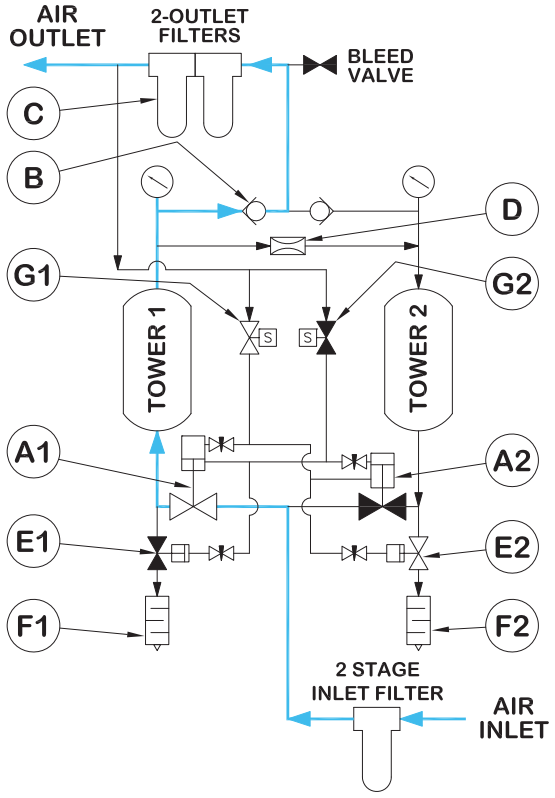
## C.3 Basic Dryer Operation CD100 - CD300 (See FIG C.3)

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.

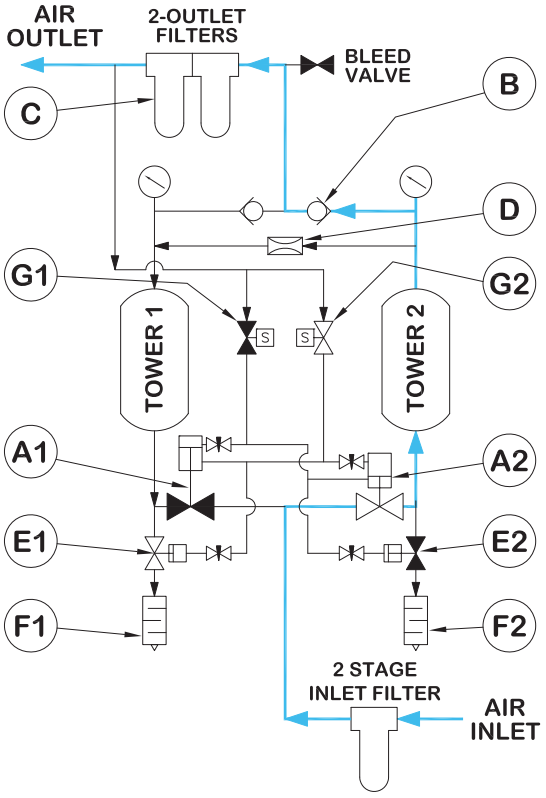
The regenerating air is then exhausted through a purge valve (E2) and exhaust muffler (F2) to atmosphere.

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 1 DRYING
TOWER 2 REGENERATING




TOWER 2 DRYING
TOWER 1 REGENERATING

**CD100-300 FLOW SCHEMATIC**

FIG C.3 CD100 - CD300 Flow Schematic

# Appendix C - Desiccant Dryer

## C.4 Operation

### C.4.1 Initial Start-Up

1. If installed, open the bypass valves of the dryer.

2. Close the air supply towards the pressure dew point (PDP) sensor. (If applicable)

3. Close off the air supply from the compressor towards the dryer by closing the external inlet

valve (if installed).

4. If installed, close the outlet valve.

5. Start the compressor and wait for pressure.

6. Slowly open the inlet valve.

7. Check the connections of the dryer for air leaks and remedy if necessary.

8. Switch on the dryer by pushing the Start button on the controller.

9. Let the dryer operate for several hours with the external outlet valve closed.

10. Gradually open the external outlet valve.

11. If applicable, close the bypass valves of the dryer.

12. Open the air supply towards the pressure dew point (PDP) sensor. (If applicable)

### C.4.2 Procedure to Switch Off the Dryer

1. If installed and if necessary, open the bypass valves of the dryer so that the application still receives compressed air.

2. Close the external inlet valve between the compressor and the dryer and the external outlet valve between the dryer and the dry air consumer.

3. Let the dryer operate for a period without consumption to depressurize the vessels.

4. Switch off the dryer

**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

If the dryer has not been used for more than 3 months, see section Initial start-up. In all other cases, proceed as follows:
1. Cut off the air supply from the compressor towards the dryer by closing the external inlet valve.
2. Close the air supply towards the PDP sensor.
3. If installed, close the external outlet valve between the dryer and the dry air consumer.
4. Start the compressor and slowly open the external inlet valve.
5. Switch on the dryer.
6. Gradually open the air outlet valve.
7. If applicable, close the bypass valves of the dryer.
8. Open the air supply towards the PDP sensor.

**WARNING: Close the external inlet valve in case the compressor needs to be restarted. The high air speed in the start-up phase of the compressor may damage the desiccant**

### C.4.4 Maintenance Shutdown

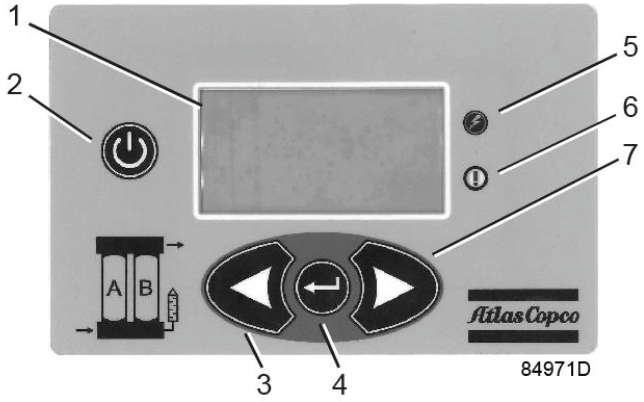
1. CLOSE the dryer outlet isolation valve.
2. CLOSE the dryer inlet isolation valve.
3. Allow the dryer to continue to cycle until the purge exhaust fully depressurizes both chambers.
4. Switch off electrical power to the dryer by removing the fuse.

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

# Appendix C - Desiccant Dryer

### 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/Stops the dryer | | | | | |
| LEFT | No action | No action | Moves the cursor upwards cyclically | Displays the previous alarm cyclically | - Selects the parameter<br>- Decrements the data value | No action |
| RIGHT | No action | No action | Moves the cursor downwards cyclically | Displays the next alarm cyclically | - Selects the parameter<br>- 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<br>- Cancels the service alarm if pressed for 5 seconds | - Starts the parameter editing<br>- Selects the numerical data digits<br>- Confirms the modified value Pressed for at least 2 seconds, returns to the selection menu | Returns to the selection menu |

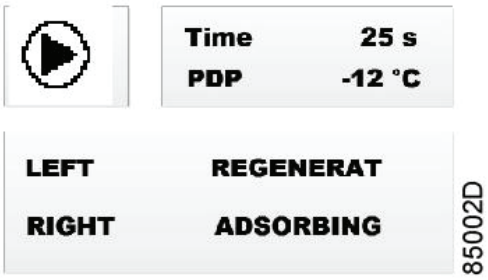
**LED Functions**

| 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 |

# Appendix C - Desiccant Dryer

### 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:

| Icon | Description |
|---|---|
| 85005D | Rotating arrow<br>Active when the dryer is in its working phases |
| 85004D | Still vertical bars<br>Visualized when the dryer is in the FREEZE status |
| 85003D | Still square<br>Visualized when the dryer is stopped |

- In the upper right area, the current working phase countdown and the measured dew point are visualized.
  - When the PDP (pressure dew point) sensor is not enabled, the dew point is not displayed.
  - Dew point Transmitter is controlled at the Central Control Panel (CCP).

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

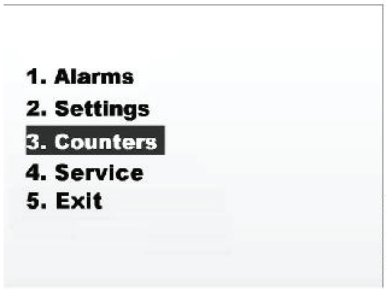
| Phase | Text displayed on screen | Translation |
|---|---|---|
| Stop | STOPPED | STOPPED |
| Shifting | SHIFTING | SHIFTING |
| Adsorbing | ADSORBING | ADSORBING |
| Pressure relief | DEPRESS | DEPRESS |
| Regeneration | REGENERAT | REGENERAT |
| Pressure equalize | EQUALIZE | EQUALIZE |
| Freeze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

# Appendix C - Desiccant Dryer

The possible working phases are:

### 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:

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

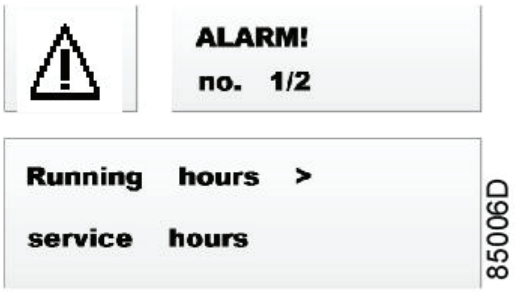
| | Selection | Translation | It shows... |
|---|---|---|---|
| **1** | Alarms | Alarms | the alarms browser |
| **2** | Settings | Settings | the parameters list |
| **3** | Counters | Counters | the counters status |
| **4** | Service | Service | the service counters status |
| **5** | Exit | Exit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

button to select.

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.

# Appendix C - Desiccant Dryer

**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 maintenance (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 supplier if the fault persists | Lit continuously |

The icon in the upper left area blinks.

### C.4.5.5 Editing Parameters

During parameters editing (Section C.4.5.3, menu item 2 "Settings"), the display shows an

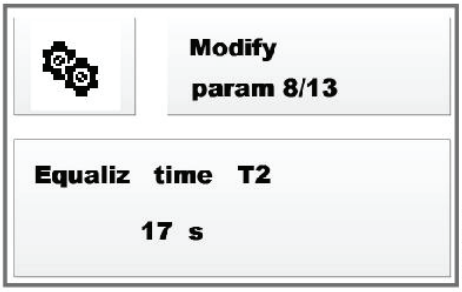



image similar to the following:
In the upper right area, the current parameter number and the total modifiable parameters number are visualized.

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 parameter<br>• Decrements the value |
| RIGHT | • Selects the next parameter<br>• Increments the value |
| ENTER | • Starts the parameter editing<br>• Selects the numerical data digits<br>• Confirms the modified value |

# Appendix C - Desiccant Dryer

**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<br>• If the parameters is a selection value (e.g. a language) or a boolean value (On or Off), go to step 3<br>• If the parameters is a numerical value, press the ENTER button repeatedly as required |
| **3** | RIGHT or LEFT | Modifies the selected parameter<br>• If the parameter is a selection value (e.g. a language), pressing RIGHT increments and pressing LEFT decrements the selection within the allowed range.<br>• If the parameter is a boolean value (On or Off), RIGHT forces the data to ON, LEFT to OFF.<br>• 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<br>• 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 **BeaconMedaes** 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.

# Appendix C - Desiccant Dryer

**WARNING! (ZMED Only)**

**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.**

**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.**

## C.5 Troubleshooting

**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

**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 cycling | Main power disconnected | Main power disconnected |
| | 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 |

# Appendix C - Desiccant Dryer

| Problem | Possible Causes | Solution |
|---|---|---|
| Dew point degradation | Incorrect purge air flow | Check purge orifice for blockage. Clean or replace as required. |
| | 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 appear discolored and dirty if contamination 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 pressure on a desiccant chamber during regeneration cycle.* | Dirty or fouled purge muffler | Switch off power and remove purge muffler and clean using an air nozzle, or replace. |
| | Outlet check valve leaking | Replace check valve |

point from -40ºF to -10ºF at a distance of forty or more feet downstream of the leak.

***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.

# Appendix C - Desiccant Dryer

## C.6 Maintenance

**WARNING! (ZMED Only)**

**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.**

**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.**

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.

# Appendix C - Desiccant Dryer

### C.6.1 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.6.2 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 | After-filter (PDp+) Part No. | Qty |
|---|---|---|---|---|---|---|---|---|---|---|
| **CD35** | 45 | 2901 2079 53 | 2 | 45 | 2901 2079 73 | 2 | 2901 2080 33 | 2 | 2901 2080 13 | 2 |
| **CD65** | 75 | 2901 2079 54 | 2 | 75 | 2901 2079 74 | 2 | 2901 2080 34 | 2 | 2901 2080 14 | 2 |
| **CD110** | 110 | 2901 2079 55 | 2 | 110 | 2901 2079 75 | 2 | 2901 2080 35 | 2 | 2901 2080 15 | 2 |
| **CD150** | 180 | 2901 2079 57 | 2 | 180 | 2901 2079 77 | 2 | 2901 2080 37 | 2 | 2901 2080 17 | 2 |
| **CD185** | 180 | 2901 2079 57 | 2 | 180 | 2901 2079 77 | 2 | 2901 2080 37 | 2 | 2901 2080 17 | 2 |
| **CD250** | 300 | 2901 2079 59 | 2 | 300 | 2901 2079 79 | 2 | 2901 2080 39 | 2 | 2901 2080 19 | 2 |
| **CD300** | 300 | 2901 2079 59 | 2 | 300 | 2901 2079 79 | 2 | 2901 2080 39 | 2 | 2901 2080 19 | 2 |

### C.6.3 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 |

**Note:**

Next Gen FIlters can be identified by an off set gauge / off set popup indicator on the filter body. These filters should use the kits listed above. If uncertain, please reference the service kit part number listed in the Maintenance section of the control panel of the system.

# Appendix C - Desiccant Dryer

### C.6.4 Drain Valve Kits (Next Gen Filters)

(Automatic Drain on UD & PDp 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 | After-filter (PDp+) Part No. | Qty |
|---|---|---|---|---|---|---|---|---|---|---|
| **CD35** | 45 | 1629 4035 00 | 2 | 50 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |
| **CD65** | 60 | 1629 4035 00 | 2 | 70 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |
| **CD110** | 140 | 1629 4035 00 | 2 | 130 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |
| **CD150** | 180 | 1629 4035 00 | 2 | 170 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |
| **CD185** | 220 | 1629 4035 00 | 2 | 210 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |
| **CD250** | 310 | 1629 4035 00 | 2 | 310 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |
| **CD300** | 310 | 1629 4035 00 | 2 | 310 | 1629 4035 10 | 2 | 1629 4035 10 | 2 | 1629 4035 10 | 2 |

### C.6.5 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 | After-filter (PDp+) Part No. | Qty |
|---|---|---|---|---|---|---|---|---|---|---|
| **CD35** | 45 | 0663 2110 26 | 2 | 50 | 0663 2110 26 | 2 | 0663 2110 26 | 2 | 0663 2111 80 | 2 |
| **CD65** | 60 | 0663 2110 26 | 2 | 70 | 0663 2110 26 | 2 | 0663 2110 26 | 2 | 0663 2111 80 | 2 |
| **CD110** | 140 | 0663 2104 75 | 2 | 130 | 0663 2104 75 | 2 | 0663 2104 75 | 2 | 0663 2114 55 | 2 |
| **CD150** | 180 | 0663 2104 75 | 2 | 170 | 0663 2104 75 | 2 | 0663 2104 75 | 2 | 0663 2114 55 | 2 |
| **CD185** | 220 | 0663 2104 75 | 2 | 210 | 0663 2104 75 | 2 | 0663 2104 75 | 2 | 0663 2114 55 | 2 |
| **CD250** | 310 | 0663 2104 98 | 2 | 310 | 0663 2104 98 | 2 | 0663 2104 98 | 2 | 0663 2111 63 | 2 |
| **CD300** | 310 | 0663 2104 98 | 2 | 310 | 0663 2104 98 | 2 | 0663 2104 98 | 2 | 0663 2111 63 | 2 |

# Appendix C - Desiccant Dryer

### C.6.6 Purge Silencer

| Dryer Size | Part No. | Qty |
|---|---|---|
| **CD35** | 1629 2141 25 | 2 |
| **CD65** | 1629 2141 26 | 2 |
| **CD110** | 1629 2141 29 | 2 |
| **CD150** | | 2 |
| **CD185** | 1629 2141 27 | 2 |
| **CD250** | | 2 |
| **CD300** | | 2 |

### C.6.7 Desiccant

| Dryer Size | Part No. | Qty |
|---|---|---|
| **CD35** | 1629 2042 83<br>1837 0039 86 | 2<br>1 |
| **CD65** | 1629 2042 83<br>1837 0039 86 | 4<br>2 |
| **CD110** | 0017 6010 01 | AR* |
| **CD150** | 0017 6010 01 | AR* |
| **CD185** | 0017 6010 01 | AR* |
| **CD250** | 0017 6010 01 | AR* |
| **CD300** | 0017 6010 01 | AR* |

*Desiccant amount is As Required, amount depends on unit serial number

## C.7 Systems Specifications

| Type | Desiccant Heatless |
|---|---|
| Design Pressure | 160 psig |
| Operating Pressure (ZMED Only) | 100 psig |
| Operating Pressure (ZLAB Only) | 130.5 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 - Dew Point Transmitter

## D.1 General Information

**CAUTION:** This manual is designed to serve as the operation and maintenance guide for your Dew Point 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 gas line connections, make sure the system is depressurized in order to avoid personal injury.**
**Before removing the dew point transmitter, verify that the source of line pressure has been closed and the line pressure reduced to atmospheric pressure.**
**An alarm condition on dew point indicates a dew point level exceeding the maximum setpoint, or a faulty dew point transmitter. Immediate action should be taken to reduce the possibility of high dew point in the air line.**

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

## D.2 Introduction

The dew point transmitter is a continuous, on-line instrument that measures the absolute moisture content in the final air line. The transmitter measures dew point 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. Dew Point Temperature: -100° to 20°C (-148° to 68°F)

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

3. Dew Point 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 - Dew Point Transmitter

## D.5 Alarms

Dew points 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 dew point 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 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 **BeaconMedaes** 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 BeaconMedaes. 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 dew point sensor accuracy (contact **BeaconMedaes**) |
| Recalibration | Every 2 years | See Section D.8 |
| Replace sensor | Every 5 years | See Section D.9 |

# Appendix D - Dew Point Transmitter

## D.7 Troubleshooting

**WARNING!**

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

Before servicing the dew point transmitter, do the following:

1. Close dew point 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.

**Note:** Remote alarms will be activated

| 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 **BeaconMedaes** |
| High Dew Point | Air is not being dried<br><br>Faulty sensor | Verify that the dryer is not being bypassed.<br>Check flow.<br>Replace sensor |

## D.8 Dew Point Sensor Calibration

The dew point 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 Dew Point Sensor Replacement

Check the response time of the sensor by removing it from the sensor chamber and covering the probe with your hand. The dew point reading should rise rapidly. If the dew point 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 dew point sensor chamber, replace sensor and reassemble.

| Description | Part No. | Qty Required |
|---|---|---|
| Sensor | 4107 6575 66 | 1 |
| Cable | 1617 9619 00 | 1 |

# Appendix E - CO Transmitter

## E.1 General Information

This appendix only applies to ZMED Systems

**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 state-of-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 **BeaconMedaes** 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.

# Appendix E - CO Transmitter

## 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 **BeaconMedaes**. Test the unit after installation of replacement parts to make certain that it complies with the published specifications. Contact **BeaconMedaes** 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.
3. 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-

# Appendix E - CO Transmitter

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.
3. 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).
5. Locate the dark blue pot (marked “C”) and adjust the pot until the meter reads 0.051 VDC. Turning the adjusting screw counter-clockwise 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.

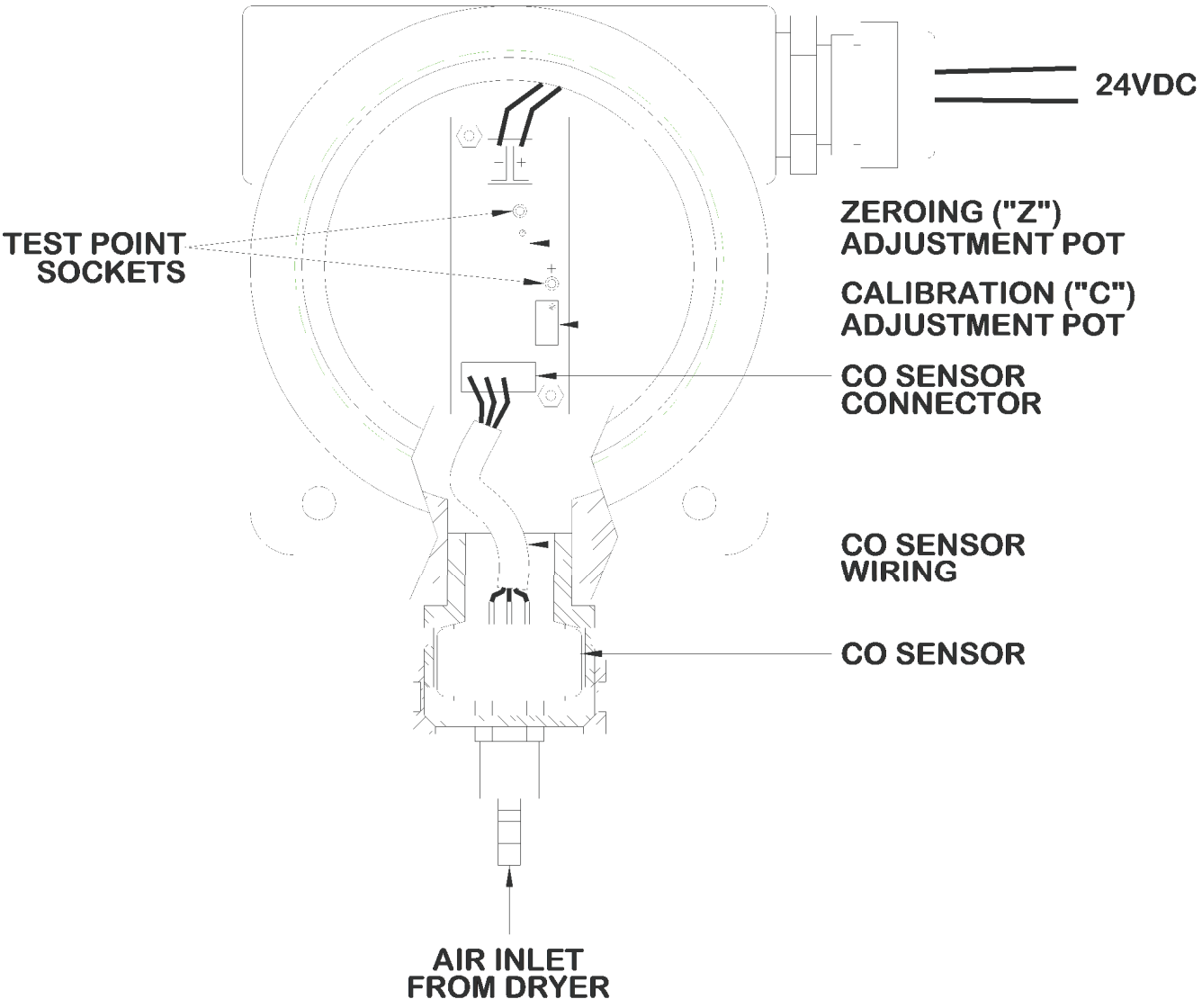



FIG E.9.1 CO Transmitter Assembly

# Appendix E - CO Transmitter

## 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 **BeaconMedaes** 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 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 ± 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.**

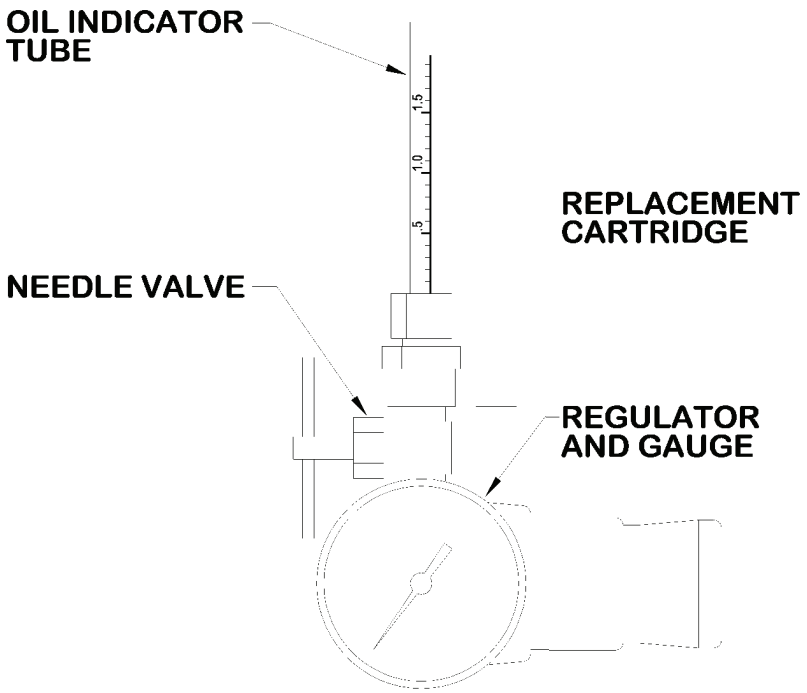



FIG F.1 Oil Indicator Assembly

# Appendix F - Oil Indicator

## F.3 Operation

When the needle valve of the oil indicator is open, filtered 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 Oil Concentration Determination

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

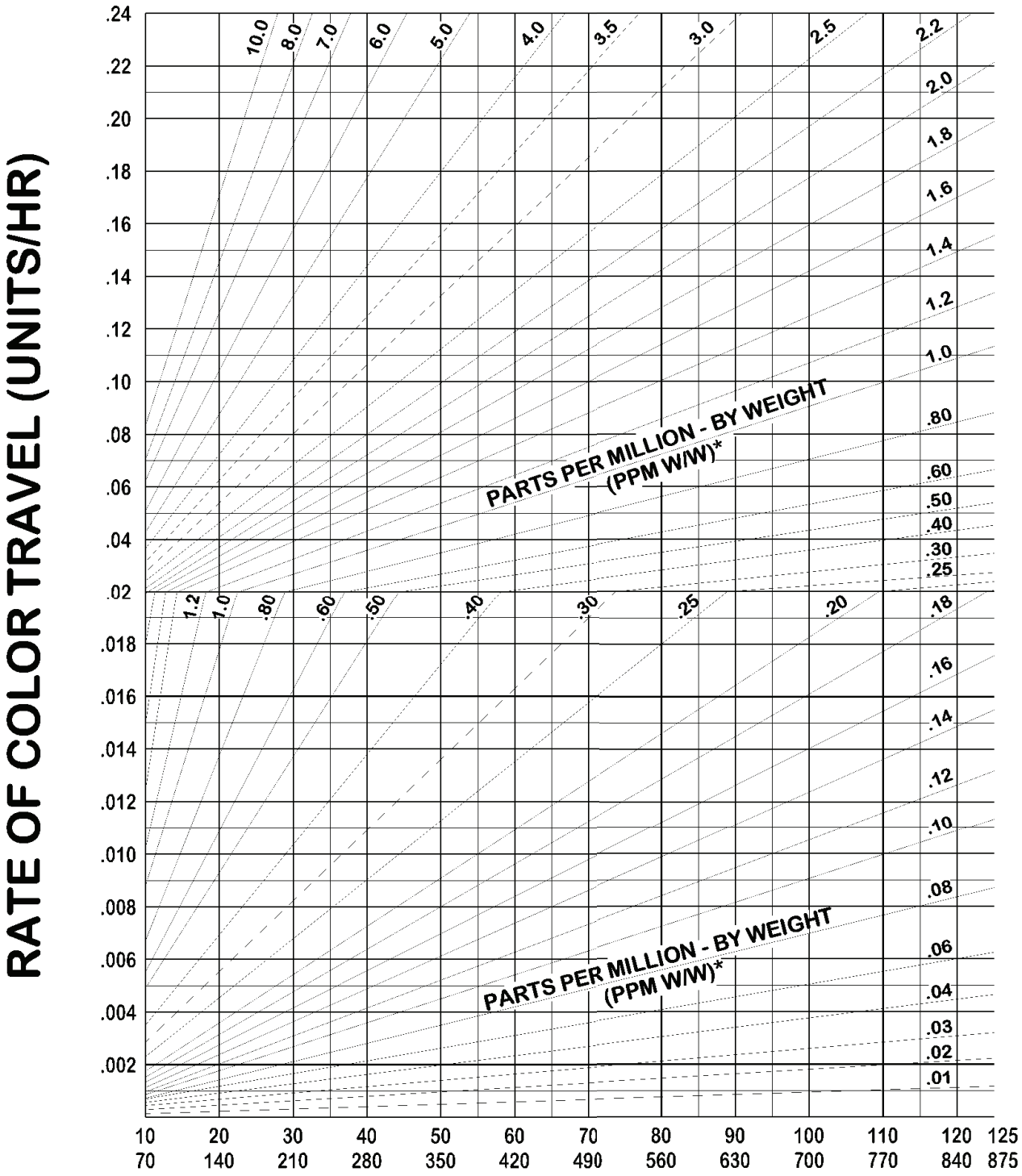



FIG F.2 Conversion Chart for Oil Indication

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