SERVOMEX ANALYZERS
HIGH-PERFORMANCE GAS ANALYSIS

MonoExact DF150E / DF310E Gas Analyzers

Quick Start Guide PN: 0800000QSG

IMPORTANT INFORMATION

Continued safe and reliable operation of this equipment is conditional on all installation, operation and maintenance procedures being carried out in accordance with the appropriate manuals, by personnel having appropriate qualifications, experience and training. Failure to observe the requirements of the manual may result in the user being held responsible for the consequences and may invalidate any warranty. Servomex accepts no liability for unauthorized modifications to Servomex supplied equipment.

Servomex has paid particular attention to Health and Safety throughout this guide. Where special precautions need to be taken due to the nature of the equipment or product, an appropriate safety icon and warning message is shown. Special attention should be made to section 2 – Safety, where all such messages are summarized.

In line with our continuous policy of research and development, we reserve the right to amend models and specifications without prior notice therefore the information in this document is subject to change without notice and does not represent a commitment on the part of Servomex Group Limited. This guide is accurate at the date of printing but will be superseded and should be disregarded if specifications or appearance are changed. Check the internet for updates to the full manual. The latest revision of this guide is available in Adobe Acrobat format at www.servomex.com.

The customer agrees that in accepting and using this instrument Servomex's liability arising from or in any way connected with this instrument shall be limited exclusively to performing a new calibration or replacement or repair of the instrument or transducer, at Servomex's sole option, as covered by Servomex's warranty. In no event shall Servomex be liable for any incidental, consequential or special damages of any kind or nature whatsoever, including but not limited to lost profits arising from or in any way connected with this instrument or items hereunder, whether alleged to arise from breach of contract, express or implied warranty, or in tort, including without limitation, negligence, failure to warn or strict liability.

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North America:

Servomex Group Inc.
4 Constitution Way
Woburn MA 01801-1087
United States

t: +1 781 935 4600
t: +1 800 433 2552 (US toll free)
e: americas_sales@servomex.com
w: www.servomex.com

Europe:

Servomex Group Ltd
Jarvis Brook
Crowborough
East Sussex TN6 3FB
United Kingdom

t: + 44 (0) 1892 652 181

e: europe_sales@servomex.com
w: www.servomex.com

Representative:

Contents

Quick Start Guide P/N: 0800000QSG

Revision: 800000QSG/2.2

1 Introduction

1.1 About this Quick Start Guide

1.1.1 Scope of the Quick Start Guide

This guide covers the installation, operation and routine maintenance of the **MonoExact DF310E/DF150E analyzer**. It is intended for those already familiar with the installation, use and maintenance of analytical or process instrumentation.

General information on the analyzer is given in the main body of this guide. Transducer-specific information is contained in the relevant appendix at the rear of the full manual.

A separate Quick Start Guide is also supplied with the analyzer, reference part number 0800000Q. This details software configuration and operation of the analyzer needed to get the MonoExact DF310E/DF150E analyzer up and running. Extra copies may be ordered from Servomex.

1.1.2 Safety information

Read this guide and make sure you fully understand its contents before you attempt to install, use or maintain the analyzer.

The user is solely responsible for implementing appropriate environmental monitoring, ventilation and gas safety controls for flammable and/or toxic gas installations to meet all relevant safety standards including but not limited to those imposed by legal, governmental, statutory, industrial, regulatory and/or corporate requirements.

The following icons are used throughout this guide to identify any potential hazards that could cause serious injury to people. Always follow the safety instructions and be aware of the hazard.

This symbol warns of specific hazards which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to high voltages which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to high temperatures which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to hazardous substances which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to caustic or corrosive substances which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to Flammable Gas Samples which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to Toxic Gas Samples which, if not taken into account, may result in personal injury or death.

This symbol highlights where you must take special care to ensure the analyzer or other equipment or property is not damaged.

1.1.3 Other information provided by the guide

Note: Notes give extra information about the equipment.

Hint: *Hints give helpful tips and highlight information*

1.2 Applicable EU Directives, Standards, Certification

- Low Voltage Directive (2014/35/EU)
- Electromagnetic Compatibility (EMC) Directive (2014/30/EU)
- EN 61010-1:2010
- EN 61326-1:2013 / IEC 61326-1:2012, Class A. Intended for professional measurement and control purposes in industrial process and industrial manufacturing environments or is a component of such equipment. It is not intended for use in domestic applications, the MonoExact DF310E/DF150E does not meet CISPR 11 class B emission limits for residential locations, which are directly connected to low voltage power supply networks.
- Certified to MCERTS (EN15627-3) and (EN14181) QAL 1
- EN15267-3:2007 & QAL 1 as defined in EN 14181: 2014 for O2, SO2, CO and NO
- Certification Number: SIRA MC030013/11
- CLASS – C225206 PROCESS CONTROL EQUIPMENT
- CLASS – C225286 PROCESS CONTROL EQUIPMENT Certified to US Standards

1.3 Product overview

The MonoExact DF150E and DF310E Gas Analyzers are designed to meet the needs of the control and product quality applications of industrial gas producers and users, who require fast, accurate and reliable gas analysis.

The analyzer can support a gas measurement, using coulometric or paramagnetic transducers while also allowing a moisture measurement to be brought in from a custom external probe.

Gas sample measurements are shown on the analyzer display,and can also be output to a serial device connected to the analyzer, or as milliamp (mA) / voltage outputs, or over a selection of digital communications protocols.

Note: The MonoExact DF310E can have RS232 or RS485 communications, but only one can be active at a time. This is specified in the Serial Menu. These options must be specified when the instrument is purchased.

The analyzer conforms to the requirements of the NAMUR (Normenarbeitsgemeinschaft für Mess Und Regeltechnik in der Chemischen Industrie) standards NE43 (4 – 20 mA output) and NA64 (status outputs).

The analyzer is simple to operate, with an intuitive user interface. The analyzer is 193 mm (7.6”) high and is suitable for 19 inch rack, panel or bench mounting.

The analyzer requires little routine maintenance, other than calibration which is essential for the accuracy of sample gas measurements (section 7) and replacement of filter elements (if fitted external to the analyzer).

The maximum dry off power storage time shouldn’t exceed 6 months from date of shipment or the sensor warrantee will be voided.

1.4 General description

The MonoExact DF310E/DF150E analyzer is simple to operate, with an intuitive user interface that will display data from external sources. The chassis accepts up to four gas modules. It provides power, gas connections and other support functions to the gas sensor modules and processes their outputs to provide the sample gas concentrations. Gas measurements are shown on the analyzer display and at the same time are sent out of the analyzer to other devices using serial, milliamp (mA), voltage or digital communications protocols.

Note: 0-25% O_2 gas sensor offered is a paramagnetic.

The analyzer supports up to four external analog input signals that can then be displayed on the screen as measurement signals, and output through the analog and/or the serial outputs or accessed using Modbus or PROFIBUS protocols. These external input signals can be recorded, used to activate relays, or trigger auto-calibration / validation routines or low / high alarms.

Included with each analyzer ordered:

- 4 Relays contacts provided as standard (up to 8 relays per option board, 32 relays max with 4 option boards)

Included with each transducer ordered:

- Each transducer is configured with one option board
- Two alarms are activated (up to 8 alarms per option board, 32 max with 4 option boards)

- OUTPUT: 1 Isolated 4-20mA (1 per option board, 4 max with 4 option boards)

If Auto-Cal is purchased, then the following is included:

- 8 Relays per transducer
- 6^{th}, 7^{th}, 8^{th} relays pre-assigned as Zero, Span, Sample gas per transducer
- Software to allow auto-calibration / validation based upon a timer (gas switching is via user installed externally located valves).

Options available per transducer:

- Additional option boards can be ordered to increase the number of each option
- A further 2 or 6 alarms (making a total of 4 or 8 alarms) per transducer
- OUTPUT: 0 – 10 VDC per transducer (1 per option board, 4 max with 4 option boards)
- INPUT: 2 Digital per transducer (2 per option board, 8 max with 4 option boards)
- INPUT: 1 Isolated 4-20mA per transducer (1 per option board, 4 max with 4 option boards)

Other optional features are available:

- Serial Communications using RS232, RS485, RS232 & RS 485 Combo, Modbus RDU, Profibus.
- Flow meters (floating element rotameter) to monitor and needle valves to control sample gas flow through the instrument – a maximum of two if the dual sample inlet / outlet option is used.
- A sample flow switch to monitor sample flow and alarm when the flow is too low – only one allowed per analyzer.
- Second inlet and outlet gas sample stream if a user provided external NO_2 converter is added.

Note: If a flow switch is ordered and an external NO_2 converter is added (this requires the dual sample inlet / outlet option), then the flow switch is installed on the main Stream #1 as Stream #2 will be isolated for use with the NO transducer after the NO_2 converter.

Note: It is recommended to fit an external 0.01 microns sample filter to protect the gas transducer modules from particulate contamination

Use this guide for:

Installation: To take commissioning to the point where the analyzer is powered and operational. The installer is advised to read this guide and full manual completely before commencing operations.

1.5 Recommended calibration intervals

For optimum performance, it is necessary to routinely check the calibration of all the internal gas transducers within the analyzer. The recommended periods for each transducer type are shown in Section **Error! Reference source not found.**.

This guide provides details of the following:

- the requirements for and configuration of calibration ancillaries (e.g. gases)
- the setup of the auto-calibration / validation routines
- the connection of external solenoid valves (when auto-calibration is used)
- the use of the RS232 output and remote initiation of calibration
- the use of Modbus or PROFIBUS to initiate calibration

If the intended use of this equipment is to monitor process systems critical for Health and Safety purposes, it is the sole responsibility of the installer and operator to see that this instrument is commissioned, maintained and calibrated in a manner consistent with the customer's specific application. Continued safe and reliable operation of this equipment is conditional on all installation, operation and maintenance procedures being carried out in accordance with the appropriate manuals, by personnel having appropriate qualifications, experience and training. Failure to observe the requirements of the manual may result in the user being held responsible for the consequences. In no event shall Servomex be liable for any incidental, consequential or special damages of any kind or nature whatsoever, including but not limited to lost profits arising from or in any way connected with this instruments use.

1.6 Automatic calibration options

Two functions are provided when the optional Auto-Cal feature is ordered: Auto-calibration and auto-validation. These functions are performed on the transducer. Auto-calibration will change the actual calibration curve while auto-validation will only read the value to determine if it is within the specified tolerance. Each transducer can have up to three sequences of auto-calibration or auto-validation attached to it.

Customer supplied solenoid valves for sample, zero and span gases will be controlled by discrete wiring to the relays for each of the transducers (see Section 3.4.3).

The automatic calibration procedure may be started by any of the following:

- A trigger from the internal instrument clock
- An external contact closure
- A Modbus or PROFIBUS command

Note: When the Auto-Cal option has been purchased, the manual calibration process will use the Auto-Cal valves to select the required calibration gas.

1.7 Product identification

Figure 1-1: The MonoExact DF310E Gas Analyzer

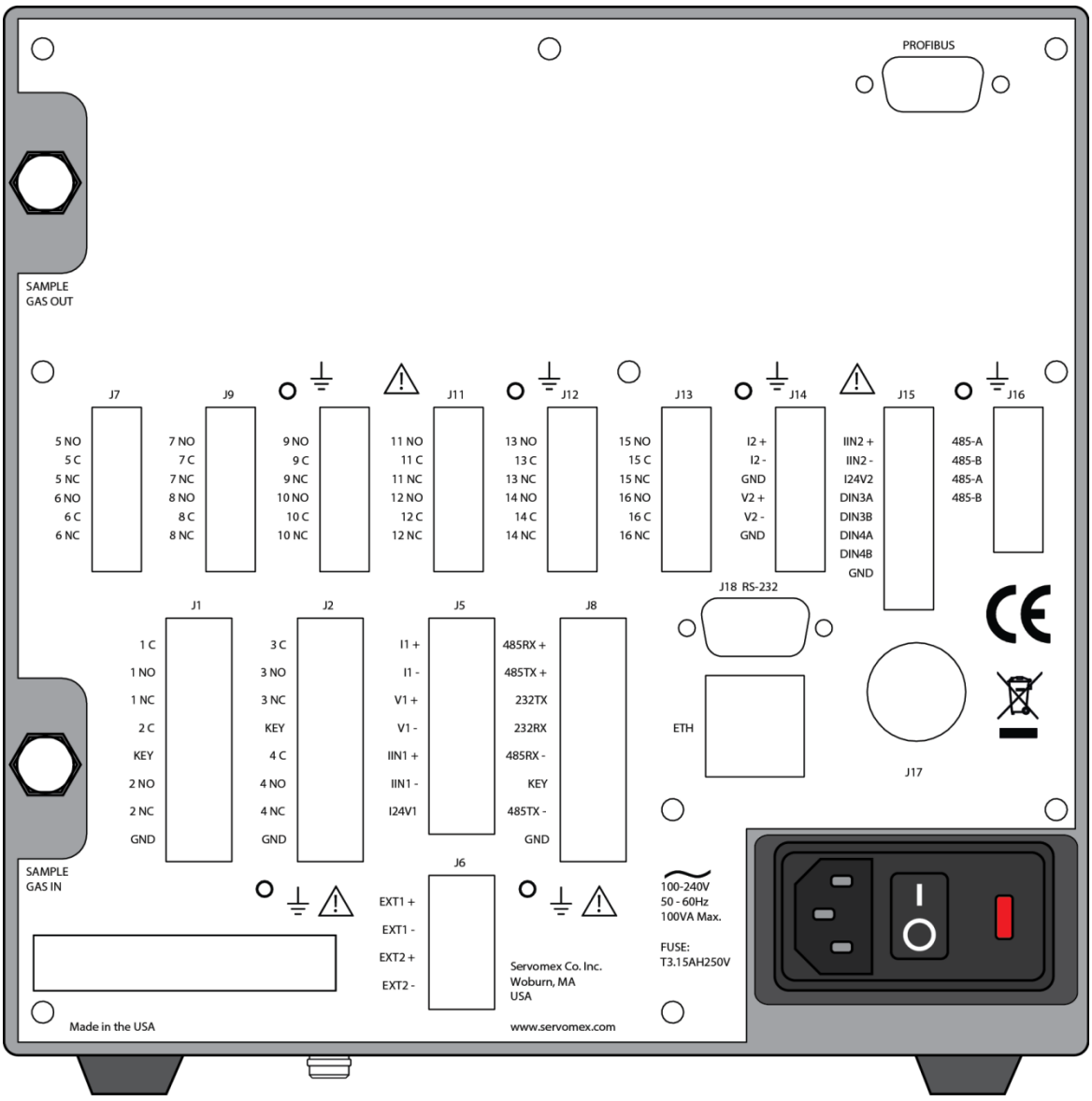


Figure 1-2: Rear of the MonoExact DF310E Gas Analyzer

ID	Description
J1 – J2	Relay I/O connections
J5	4 – 20 mA output / analog inputs *Note: A legacy 4-lead cable can be connected to the top 4 connections labeled I1+, I1-, V1+ and V1-.*
J6	General purpose digital inputs that can be used in future software releases for functions such as closing a relay for pump control or turning a coulometric sensor on or off.
J7	Relay I/O
J8	RS485 / RS232 comms port *(optional)*
J9 – J13	Relay I/O connections
J14	Analog output

ID	Description
J15	Analog and digital inputs
J16	RS485 (Modbus) *(optional)*
J17	Moisture probe input
J18	RS232 *(optional)*
ETH	Ethernet
	Earth (ground) connection

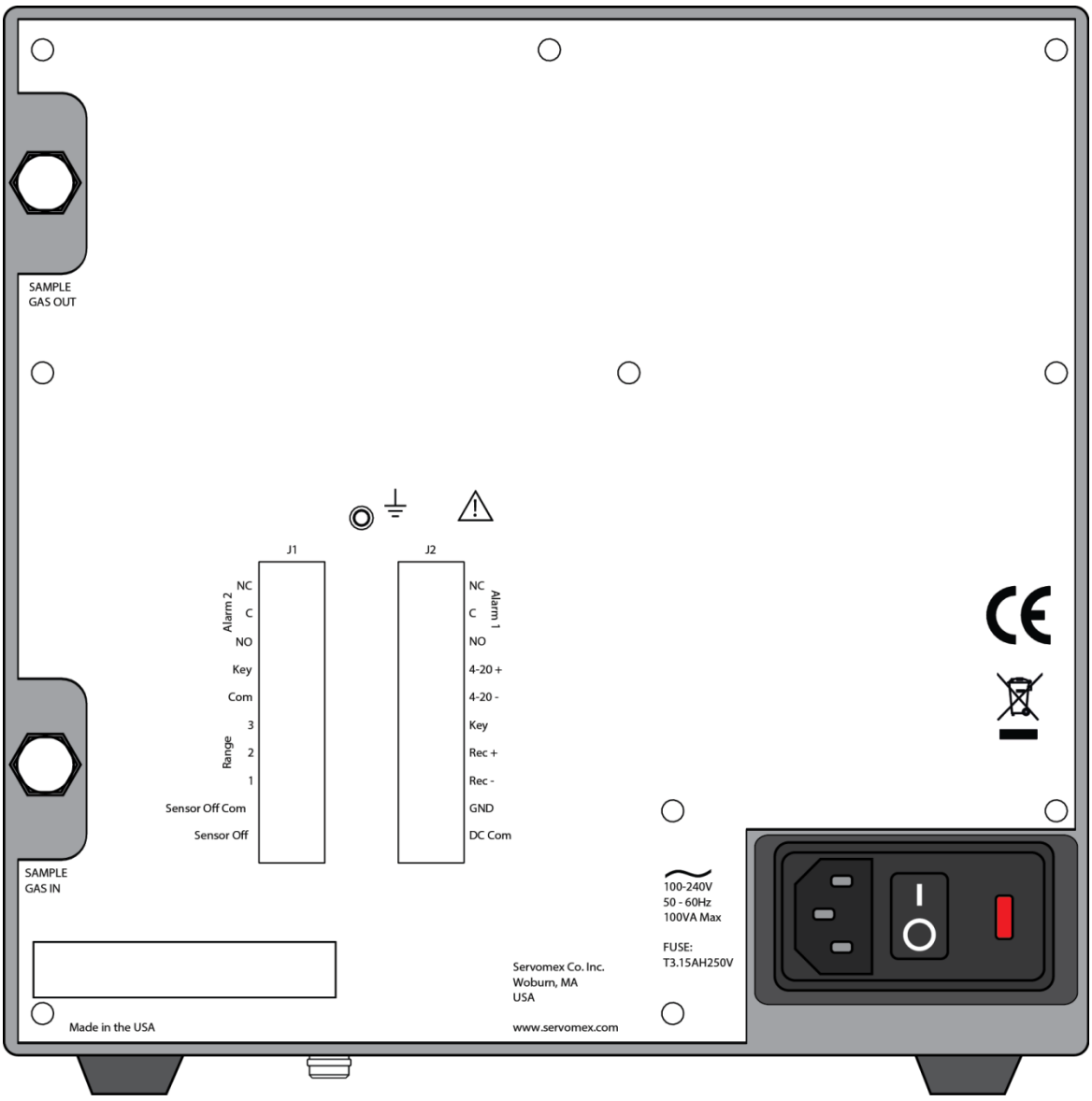


Figure 1-3: Rear of the MonoExact DF150E Gas Analyzer

ID	Description
J1 – J2	Relay I/O connections
⏚	Earth (ground) connection

1.8 Sample requirements

For best performance the flow supplied to the analyzer should be kept constant and the analyzer must be freely vented to atmosphere, for both process sampling and for calibration gas input.

Flow Rate:	Nominal 500 mL/min (Min 250 mL/min, Max 1000 mL/min)
Pressure:	Pressure driven: 172.36-310.26 kPa; 1.72-3.10 bar; 25-45 psig
	Flow driven: 1.4-6.9 kPa; 0.34-1.72 bar; 0.2-1 psig
Temperature:	5 to 45°C / 41 to 113°F
Dew point:	5°C / 9°F below minimum ambient
Condition:	Oil free, non - condensing, filtered to 1µm
Vent:	Connect the outlet of the analyzer to a separate atmospheric vent, free from any back-pressure

This symbol warns of specific hazards due to Flammable Gas Samples which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to Toxic Gas Samples which, if not taken into account, may result in personal injury or death.

Pay particular consideration to the toxicity and asphyxiant nature of the sample gas when selecting a vent location.

Corrosive gases are not intended to be used in these analyzers.

Make sure that if pressurized gases are used to keep the pressure below 310.26 KPa; 3.10 bar or 45 psig on pressure driven models and 6.9 kPa; 0,07 bar or 1 psig on flow driven models.

Do not exceed the rated flow or pressure as transducer damage may result. Best practice is to place a pressure relief valve on the inlet line, venting any gas to a safe exhaust area.

2 Safety

2.1 Appropriate environmental monitoring, ventilation and gas safety controls

The user is solely responsible for implementing appropriate environmental monitoring, ventilation and gas safety controls for flammable and/or toxic gas installations to meet all relevant safety standards including but not limited to those imposed by legal, governmental, statutory, industrial, regulatory and/or corporate requirements.

2.2 General warnings

Before you attempt to install, commission or use the MonoExact DF310E/DF150E analyzer, read the full manual carefully.

Do not attempt to install, commission, maintain or use the MonoExact DF310E/DF150E analyzer unless you are trained and know what you are doing. The analyzer must be maintained by a suitably skilled and competent person.

Do not connect the MonoExact DF310E/DF150E analyzer to a power source until all relays, input/ output signals and plumbing connections are made.

This analyzer must be operated in a manner consistent with its intended use and as specified in the full manual.

The MonoExact DF310E/DF150E analyzer is only suitable for installation in safe areas.

Do not modify the unit, either mechanically or electrically, or the certification and warranty of the instrument will be invalidated, and it may not operate safely.

The MonoExact DF310E/DF150E analyzer includes few user-serviceable parts which, are called out in the spare list in the appendix.

Do not use the MonoExact DF310E/DF150E analyzer as Personal Protective Equipment (PPE).

Make sure that all floors or platforms where you install the MonoExact DF310E/DF150E analyzer are large enough for you to move freely and to change position.

The MonoExact DF310E/DF150E analyzer may be attached to equipment that is hot. Always wear the appropriate PPE to minimize the risk of burns.

This symbol warns of specific hazards due to hazardous substances which, if not taken into account, may result in personal injury or death.

This symbol warns of specific hazards due to caustic or corrosive substances which, if not taken into account, may result in personal injury or death.

2.3 Chemical warnings

Sample and calibration gases may be toxic or asphyxiant:

- **Make sure that the external connections are leak free at full operating pressure before you use sample or calibration gases.**
- **Make sure that the sample/bypass outlet pipes are vented to an area where the gases will not be a hazard to people.**
- **Make sure that the analyzer is used in a sufficiently well-ventilated environment, to prevent the build-up of toxic gases.**
- **Make sure that the pipes that you connect to the analyzer are routed so that they do not present a hazard to people.**
- **Never inspect the inlet filter(s), or service or repair the analyzer while such gases are still connected to it.**
- **If the analyzer is to be serviced or repaired, it is important that all pipework is flushed with an inert gas and the analyzer is allowed to freely vent to local atmosphere.**

Where there is a risk of release of potentially harmful gases into the operating environment, always use suitable monitoring equipment.

The electrolyte is a caustic solution. Review the Material Safety Data Sheet (MSDS) before handling the electrolyte solution.

The sensor is shipped dry and must be charged with electrolyte before it is operated. Do not ship the analyzer with electrolyte – thoroughly drain and rinse sensor before shipping.

2.4 Electrical warnings

Always observe the appropriate electrical safety codes and regulations.

Make sure that the electrical installation of the analyzer conforms with all applicable local and national electrical safety requirements.

Potentially hazardous AC voltages are present within this instrument. Leave all internal servicing to qualified personnel. Disconnect the AC power source before installing or removing any external connections.

Make sure the analyzer is provided with a sound earth connection via the electrical supply plug.

Make sure the electrical supply coupler or plug is easily accessible for disconnection from the electrical supply.

All signal and electrical supply cables must be rated for temperatures of 70°C or higher.

The I/O terminals and connections are separated from the analyzer mains circuits by reinforced insulation. The terminals must only be connected to circuits that are themselves separated from mains voltages by at least reinforced insulation.

Make sure that the cables that you connect to the analyzer are routed so they do not present a trip hazard.

2.5 Electromagnetic Compatibility (EMC) considerations

The MonoExact DF310E/DF150E analyzer meets the essential requirements of the European EMC Directive (2014/30/EU). The transducer and the 4-20 mA loop are electrically connected but are isolated from the analyzer housing and sample cell fitting threads.

The analyzer generates and uses small amounts of radio frequency energy. There is no guarantee that interference from radio or television signals will not occur in a particular installation. If interference is experienced, switch off the analyzer to see if the interference disappears. If it does, try one or more of the following methods to correct the problem:

- Re-orient the receiving antenna.
- Move the instrument with respect to the receiver.
- Place the analyzer and receiver on different AC circuits.

Always consider the following electromagnetic interference issues when installing the MonoExact DF310E/DF150E analyzer:

To provide an acceptable noise environment for the MonoExact DF310E/DF150E analyzer or other digital equipment in the proximity of switching inductive loads, Servomex recommends that you place varistors across the inductors to lessen high voltage spikes that occur during transitions.

Circuitry activated by relay contacts should allow for the contact bounce. One simple method is to place a capacitor across the relay contacts.

Route AC power wiring as far from the analyzer and its wiring as possible.

2.6 Markings

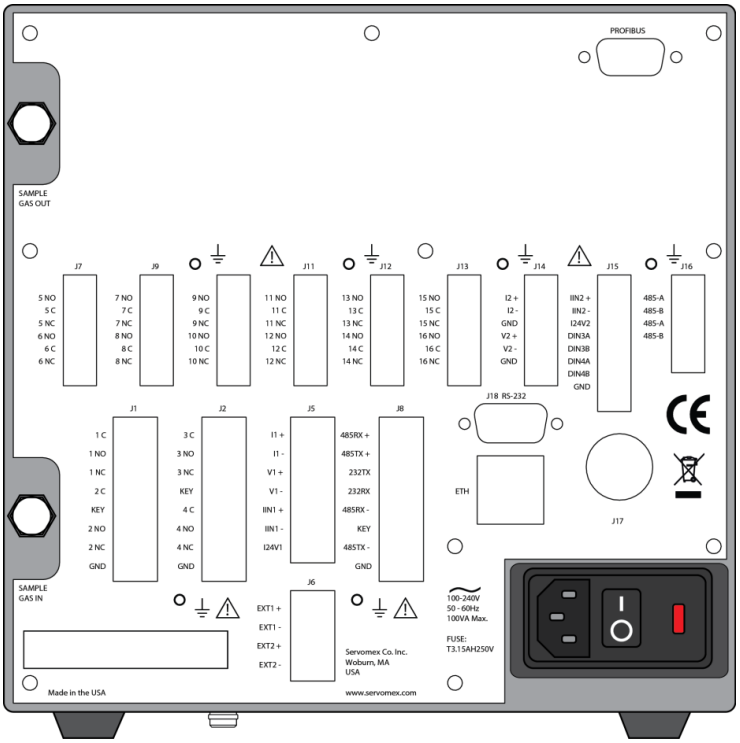


Figure 2-1: Rear of the MonoExact DF310E Gas Analyzer

The MonoExact DF310E/DF150E analyzer include the following external markings on the rear panel.

Do not connect any cables carrying mains voltage or cables that have inadequate insulation between line and mains to any of the I/O connectors.

Earth / ground connections. These are screw terminals used to connect the ground shields of cables plugged into the nearby connectors. Do not connect any voltages to these connections.

This label identifies that: The analyzer is considered to be within the scope of the Waste Electrical and Electronic Equipment (WEEE).

The analyzer is not intended for disposal in a municipal waste stream (such as landfill sites, domestic recycling centers and so on), but must be submitted for material recovery and recycling in accordance with the local regulations which implement the WEEE Directive.

Follow the appropriate safety instructions and be aware of any warnings about potential hazards.

3 Installation and set-up

Do not attempt to install, commission, maintain or use the MonoExact DF310E/DF150E analyzer unless you have been trained or are an experienced instrument technician.

The MonoExact DF310E/DF150E analyzer is only suitable for installation in safe areas.

Follow the instructions in this section to safely install the MonoExact DF310E/DF150E analyzer.

Make sure that all floors or platforms where you install the MonoExact DF310E/DF150E analyzer are large enough for you to move freely and to change position.

Do not install the unit in places subject to extreme mechanical vibration, temperature changes or shock. If you do, measurements may not be accurate, or the analyzer may be damaged.

3.1 Unpacking

Read the full manual carefully BEFORE you remove the MonoExact Gas Analyzer from its shipping container, or you attempt to install, commission or use the equipment.

The analyzer is heavy (section 5.1). Take care when handling the instrument. Lift it with hands positioned on either side on the base of the chassis.

1. Remove the analyzer and any other equipment from its packaging.
2. Remove the protective plastic covers from the sample gas inlets and outlets on the rear of the analyzer (**Figure 3-1**).

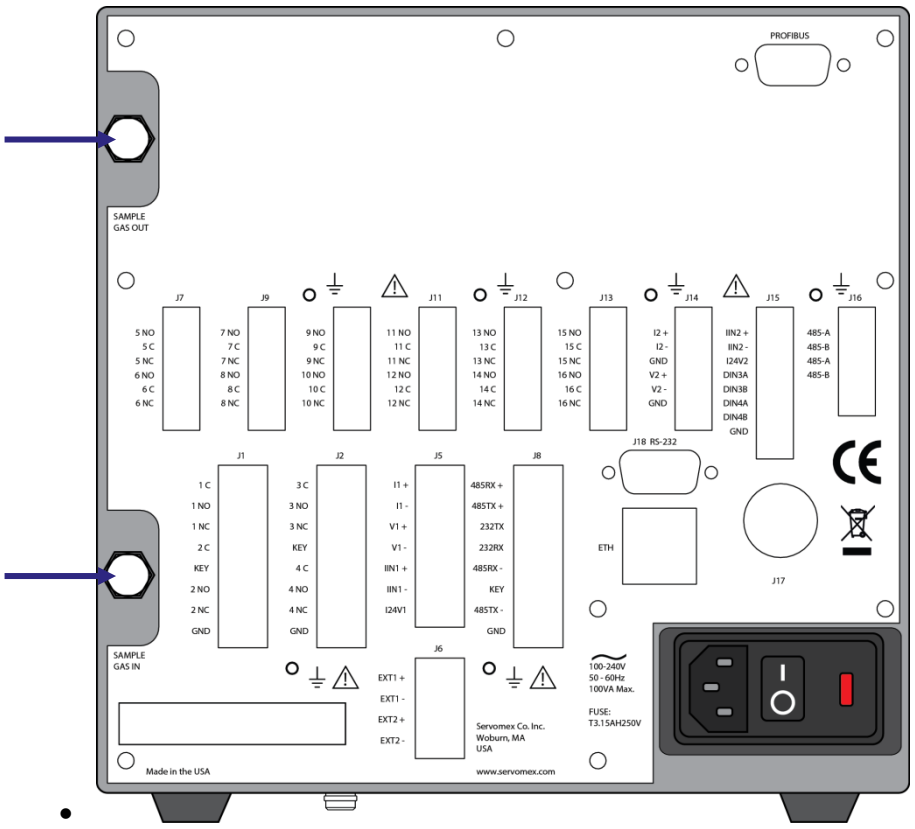


Figure 3-1: Gas inlets and outlets on rear of the analyzer

Hint: *If you do not intend to use the analyzer immediately, replace the protective plastic covers and remove them just before connecting into the process sample pipework fitting.*

3. Inspect the analyzer and the other items supplied, and check that they are not damaged. If any item is damaged, contact Servomex or your local Servomex agent immediately.
4. Check that you have received all of the items that you ordered. If any item is missing, contact Servomex or your local Servomex agent immediately.
5. If you do not intend to use the analyzer immediately:

Refit any protective plastic covers.

Place the analyzer and any other equipment supplied back in its protective packaging.

Store the analyzer as described in section 6.1.

6. If you are using the analyzer straight away, read section 2 – Safety before proceeding.

Hint: *Keep the shipping documentation and packaging for future use, for example when moving the equipment, or returning it for service or repair.*

3.2 Transducer specific installation

3.2.1 Coulometric transducer

Adding electrolyte

The electrolyte is a caustic solution. Review the Material Safety Data Sheet (MSDS) before handling the electrolyte solution.

The sensor is shipped dry and must be charged with electrolyte before it is operated. Do not ship the analyzer with electrolyte – thoroughly drain and rinse sensor with replenishing solution or distilled water before shipping.

Use only Hummingbird Ɛ-lectrolyte Blue. Failure to do so will void warranty. Install one bottle.

Do not apply power before adding electrolyte and thoroughly purging the sample line.

Remove the sensor as follows:

1. Remove four screws and the cover, then open the front door of the analyzer (turn rotary knob to right of the touchscreen display, or turn the key lock latch).
2. Use a ½ inch open-end wrench to disconnect the gas fittings on the left side of the sensor (F1 and F2 in **Figure 3-2**).

Figure 3-2: Disconnect the gas fittings

3. Completely loosen the bracket retaining thumbscrew immediately in front of the sensor (**Figure 3-2**).
4. Slide the sensor assembly back slightly, then upwards to move the sensor to a position just in front of the analyzer.
5. Unscrew the blue sensor cap from the electrolyte reservoir and add the entire contents of one bottle (125 ml) of Ɛ-lectrolyte Blue to the sensor.
6. Replace the cap and hand-tighten securely.
7. Reinstall the sensor by repeating steps 1 through 4 in reverse order.
8. Allow the sensor to sit with electrolyte in it for approximately 60 minutes before flowing gas through the analyzer.

For best performance at initial start or anytime the electrolyte is changed, it is important to allow the sensor to sit with electrolyte in it for 60 minutes before the gas is allowed to flow through the sensor.

3.3 Mechanical Installation

3.3.1 Bench mounting

4 rubber feet beneath the analyzer allow use on a firm level bench or other suitable solid work surface.

3.3.2 Panel mounting

Make sure that an addition support is provided under the base of the analyzer towards the rear of the enclosure (Figure 3-3). Do not support the analyzer by the side mounting brackets alone.

If you do not, the analyzer may be damaged or may fall and damage other equipment.

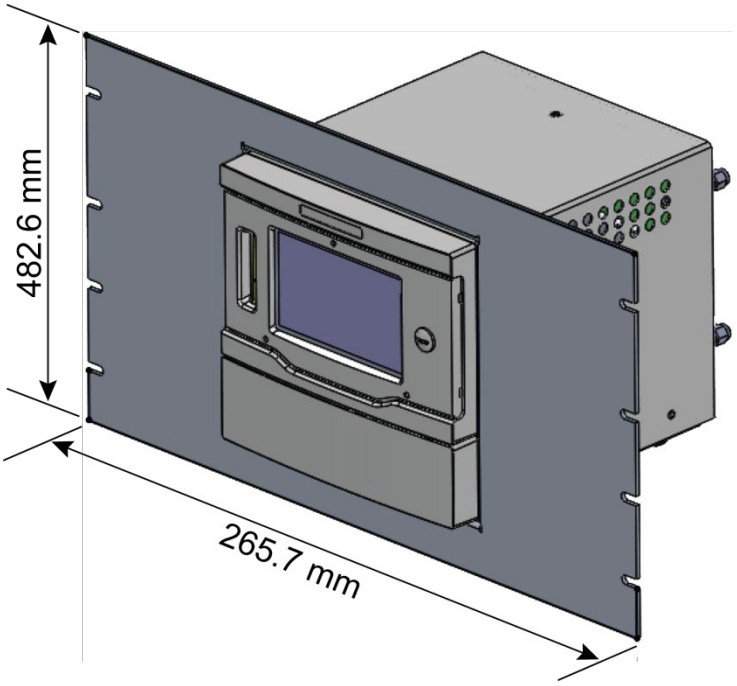


Figure 3-3: Panel installation

1. Refer to **Figure 3-3**. Prepare a cut-out in a suitable panel.
2. Prepare a suitable base support and secure it in your frame or cabinet.
3. If the bolts and washers are supplied separately, use them to fit the left- and right-hand mounting brackets to the analyzer.
4. Fit the analyzer in the panel and secure it in place with nuts and bolts fitted through the holes in the panel and mounting bracket.

3.3.3 Rack mounting

Before installing the analyzer, determine where you will install it in the rack enclosure. The analyzer will occupy 9 rack flange cage nut positions vertically. With the bottom cage nut designated as position 1, you will need to use positions 1, 3, 4 and 7 on both the right-hand and left-hand front and rear rack enclosure flanges.

Note: You do not need to punch out any of the other cage nut positions.

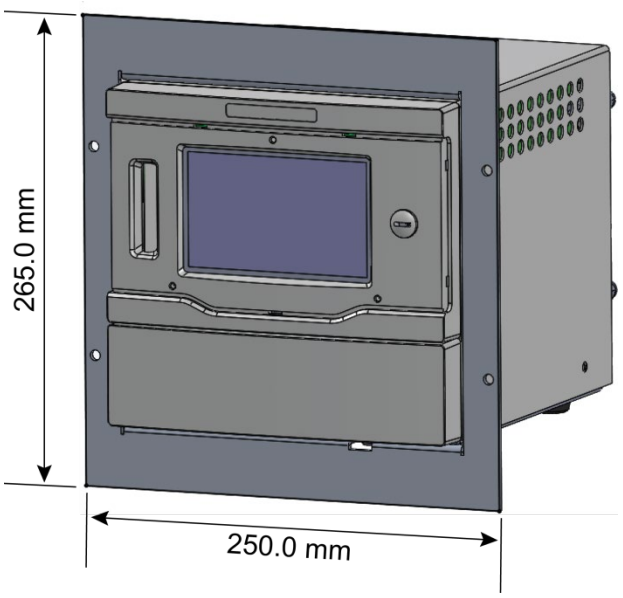


Figure 3-4: Rack installation

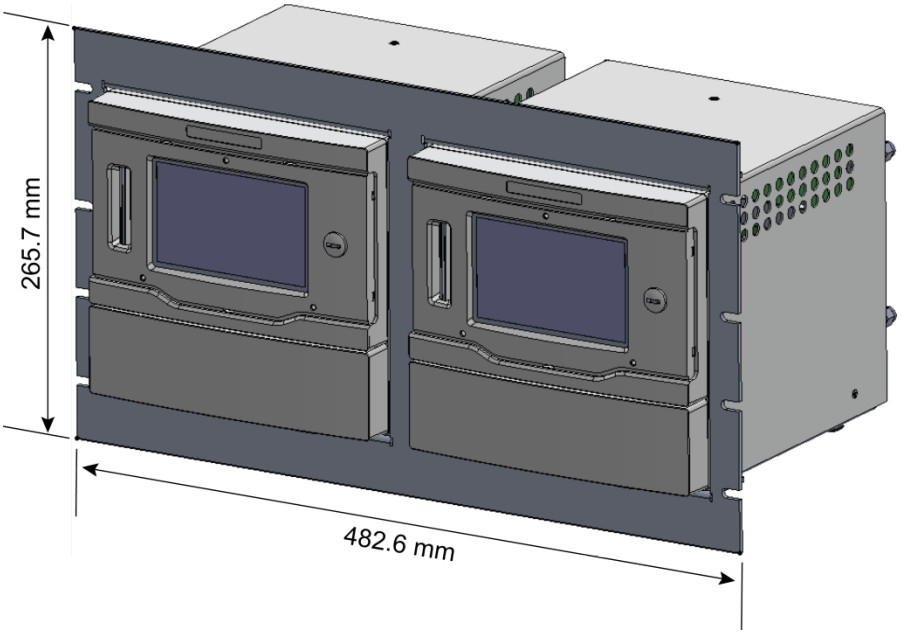


Figure 3-5: Dual rack installation

Refer to **Figure 3-4** or **Figure 3-5** and install the analyzer as follows:

If the rack mounting kit has been supplied as a spare:

1. Remove the two slide inner sections from the two slide outer sections.
2. Use the supplied M5 screws to fit the two slide inner sections to the sides of the analyzer.
3. Determine where the analyzer will be fitted in the rack, then, counting from the bottom cage nut position (position 1):

Install cage nuts in positions 1, 3, 4, and 7 on the left-hand and right-hand front rack enclosure flanges.

Install cage nuts in positions 1 and 4 on the left-hand and right-hand rear rack enclosure flanges.

4. Engage the two M6 waisted screws into the cage nuts in positions 1 and 4 on the left-hand and right-hand front and rear rack enclosure flanges.
5. Fit the right-hand slide support clamps:

   Hold the front slide support clamp in position behind the rack enclosure front flange, and align the fixing holes in the clamp with the cage nuts in positions 1 and 4.

   Engage the two M6 waisted screws in the fixing holes in the clamp. Do not fully tighten the waisted screws.

   Hold the rear slide support clamp in position behind the rack enclosure rear flange, and align the fixing holes in the clamp with the cage nuts in positions 1 and 4.

   Engage the two M5 waisted screws in the fixing holes in the clamp. Do not fully tighten the waisted nuts.
6. Fit the right-hand slide support brackets:

   Fit the front slide support bracket between the cage nuts and the front side support clamp, then fully tighten the two M6 waisted screws to secure the support bracket in position.

   Fit the rear slide support bracket (10) between the cage nuts and the rear slide support clamp then fully tighten the two M6 waisted screws to secure the support in position.
7. Make sure that the slide opening is at the front, then loosely fit the right-hand outer slide section to the front and rear slide support brackets and secure with the four M4 screws, and the nuts and washers.
8. Ensure that the front of the right-hand outer slide section is 35 mm behind the rack enclosure front flange, then fully tighten the nuts to secure the slide section in position.
9. Use the procedure in Steps 4 to 8 to fit the left-hand support clamps, slide support brackets and outer slide section.
10. Align the ends of the left-hand and right-hand slide inner sections in the openings in the front of the left-hand and right-hand slide outer sections and slide the analyzer into the rack enclosure.
11. Use the four M6 pan head screws and plastic cup washers to secure the analyzer in place.

3.4 Electrical installation

3.4.1 Electrical safety

Make sure that the electrical installation of the analyzer conforms with all applicable local and national electrical safety requirements.

Make sure the electrical supply plug is easily accessible for disconnection from the electrical supply.

Make sure the analyzer is provided with a sound earth connection via the electrical supply plug.

All signal and electrical supply cables must be rated for temperatures of 70°C or higher.

Make sure that the cables that you connect to the analyzer are routed so they do not present a trip hazard.

Follow the instructions given below when you install the analyzer. If you do not, the analyzer warranty may be invalidated, the analyzer may not operate correctly, or it may be damaged.

Make sure your electrical supply can provide the necessary maximum power consumption.

Disconnect all cables from the analyzer when you carry out insulation testing.

3.4.2 Analog output signal connections

The analog output terminals are separated from the analyzer mains circuits by reinforced insulation. The terminals must only be connected to circuits that are themselves separated from mains voltages by at least reinforced insulation.

To comply with EMC requirements, screened cables must be used to connect the analog outputs.

DF310E

1. Connect the wires in the cable to the screw terminals on J14 or J5 on the rear panel of the analyzer.

   Note: J5 provides a parallel connection for analog outputs for legacy cables.

   Note: Section 5.2 for information on the rating and size of cable.

2. Connect the cable screen to the ground point on the rear of the analyzer.

3. Connect the wires as shown in **Table 3-1**:

J14 Pin	J5 Pin (O2 sensor #1)	Use

1	1	I +
2	2	I -
3	-	GND
4	3	V +
5	4	V -
6	-	GND

Table 3-1: Analog output interface connector (J14 and J5)

Note: Unless specified differently, an analog Vdc output is provided as standard across pins 1 and 2. (A mA analog output is optional).

Note: If your analyzer is configured to provide voltage outputs, connect the wires to pins 4 – 5 on the terminal strip

DF150E

The analog output is proportional to the oxygen reading of the analyzer and on a three range analyzer will be scaled to the 'selected' range. The analog output is 0 to 10 Vdc.

The minimum load impedance is 10 kΩ. Connections to the analog output should be made through a shielded, twisted pair with the shield tied to the nearest ground stud to the terminals labelled Rec + and Rec -.

1. Connect the wires in the shielded, twisted pair cable to the screw terminals labeled Rec+ and Rec- on J2 on the rear panel of the analyzer.

   Note: Section 5.2 for information on the rating and size of cable.

2. Connect the cable screen to the ground point on the rear of the analyzer nearest to the connectors labeled Rec+ and Rec-.

3.4.3 Relay connections

The relay connections are separated from the analyzer mains circuits by reinforced insulation. The terminals must only be connected to circuits that are themselves separated from mains voltages by at least reinforced insulation.

*Note: The relays do not have default assignments unless Auto-Cal is selected. Users can create alarms and assign them to any relay (Section **Error! Reference source not found.**).*

Note: When Auto-Cal is purchased, the coulometric transducer has 8 relays available with 3 relays preassigned - the 6th assigned to Zero, the 7th to Span and the 8th to the Sample gas. The 1st to the 5th relays can be assigned to any alarm or function even if it is not related to the coulometric measurement.

DF310E

The DF310E analyzer has a number of relays available via the connectors J1, J2, J7, J9, J10, J11, J12 and J13 as shown in **Table 3-3** (J1), **Table 3-4** (J2) and **Table 3-5** (J7, J9, J10 – J13).

The relays correspond to the following connectors:

Relay	Connector	Relay	Connector
1	J1	9	J10
2	J1	10	J10
3	J2	11	J11
4	J2	12	J11
5	J7	13	J12
6	J7	14	J12
7	J9	15	J13
8	J9	16	J13

Table 3-2: MonoExact DF310E relay connections

Note: Relays 9 – 16 are not supported in this release of the product.

Connect the wires in your cable to the screw terminals on the relevant connectors as shown in the following tables:

Note: Section 5.2 for information on the rating and size of cable.

J1 Pin	Use	Relay	J1 Pin	Use	Relay
1	COM	1	5	KEY	-
2	N/O	1	6	N/O	2
3	N/C	1	7	N/C	2
4	COM	2	8	GND	-

Table 3-3: Relay interface connector J1 (DF310E)

J2 Pin	Use	Relay	J2 Pin	Use	Relay

1	COM	3	5	COM	4
2	N/O	3	6	N/O	4
3	N/C	3	7	N/C	4
4	KEY	-	8	GND	-

Table 3-4: Relay interface connector J2 (DF310E)

		Connector					
		J7	J9	J10	J11	J12	J13
Pin	Use	Relay	Relay	Relay	Relay	Relay	Relay
1	N/O	5	7	9	11	13	15
2	COM	5	7	9	11	13	15
3	N/C	5	7	9	11	13	15
4	N/O	6	8	10	12	14	16
5	COM	6	8	10	12	14	16
6	N/C	6	8	10	12	14	16

Table 3-5: Relay interface connector J7, J9, J10 – J13 (DF310E)

DF150E

The DF150E analyzer has a number of relays available via the connectors J1 and J2 as shown in **Table 3-7** (J1) and **Table 3-8** (J2).

The relays correspond to the following connectors:

Relay	Connector
1	J2
2	J1

Table 3-6: MonoExact DF150E relay connections

Alarms 1 and 2 are optional on the DF150E. Typically, the alarms are configured for high and low oxygen set points but they can also be assigned to a low flow condition if the flow switch option has been purchased.

In the ‘No Alarm’ condition the NC contact is connected to the C contact.

In the ‘Alarm’ condition the NO contact is connected to the C contact.

Connect the wires in your cable to the screw terminals on the relevant connectors as shown in the following tables:

Note: Section 5.2 for information on the rating and size of cable.

J1 Pin	Relay	J1 Pin	Relay
N/C	2	RANGE 3	-
COM	2	RANGE 2	-
N/O	2	RANGE 1	-
KEY	-	SENSOR OFF COM	-
COM	-	SENSOR OFF	-

Table 3-7: Relay interface connector J1 (DF150E)

J2 Pin	Relay	J2 Pin	Relay
N/C	1	KEY	-
COM	1	REC +	-
N/O	1	REC -	-
4-20 +	-	GND	-
4-20 -	-	DC COM	-

Table 3-8: Relay interface connector J2 (DF150E)

Remote Range Indicator (Range 1, 2, 3)

The analog output is proportional to the oxygen reading of the analyzer. On three range analyzers the output will be scaled to the currently selected range. If the analyzer has three ranges and the analog output is being sent to a recorder or other remote device, it will be necessary to also send a Range Indicator so the remote reading can be properly scaled.

The Remote Range Indication is a contact closure between a J1 COM connection and the selected range with the lowest range being contact #1 and the highest range being contact #3. The contacts are rated at 24 Vdc, 0.5 Amps.

4 to 20 mA isolated output (4-20+, 4-20-)

The optional 4 to 20 mA output is proportional to the oxygen reading of the analyzer. The output on a three range analyzer will be scaled to the currently selected range.

An output of 4 mA represents an operating analyzer with zero detected oxygen. Outputs ranging from 4 to 20 mA represent oxygen concentrations from zero to the top of the currently selected range.

The 4 to 20 mA output is electrically isolated from all other analyzer outputs and from the chassis (earth) ground. The maximum load resistance is 1 kΩ. The analyzer provides a loop supply of approximately 28 Vdc.

Connections to the 4-20 mA output should be through a shielded, twisted pair with the shield tied to the nearest ground stud.

Note: DF310E: If the concentration exceeds the set range, the analyzer auto ranges to the maximum range. For example if a 0-100ppm analyzer is set to a range 0-10 and the measured value exceeds 10 then the range will automatically be sent to 0-100.

*Note: If a relay is to be to be thrown when a custom range is exceeded and the analyzer goes to full sensor range, you must set the range in the relay assignment menu (section **Error! Reference source not found.**).*

3.4.4 Connect the electrical supply

Make sure that your external electrical supply outlet is isolated and locked-out before you connect the conductors in the electrical supply cable.

Only use the power supply cord provided with the unit.

Make sure the analyzer is suitable for use with your electrical supply voltage and frequency (Section 5). If the analyzer is not suitable, it may not operate correctly, or it may be damaged if you operate it.

The analyzer is supplied with an electrical supply cable and plug, configured for your electrical supply. Connect the electrical supply to the analyzer as follows:

1. Turn the Power Switch on the back of the unit to OFF: press the "**O**" on the On/Off switch shown in Figure 3-6 A.
2. Fit the IEC plug on the end of the electrical supply cable provided to the electrical supply socket on the rear of the analyzer (Figure 3-6 B).

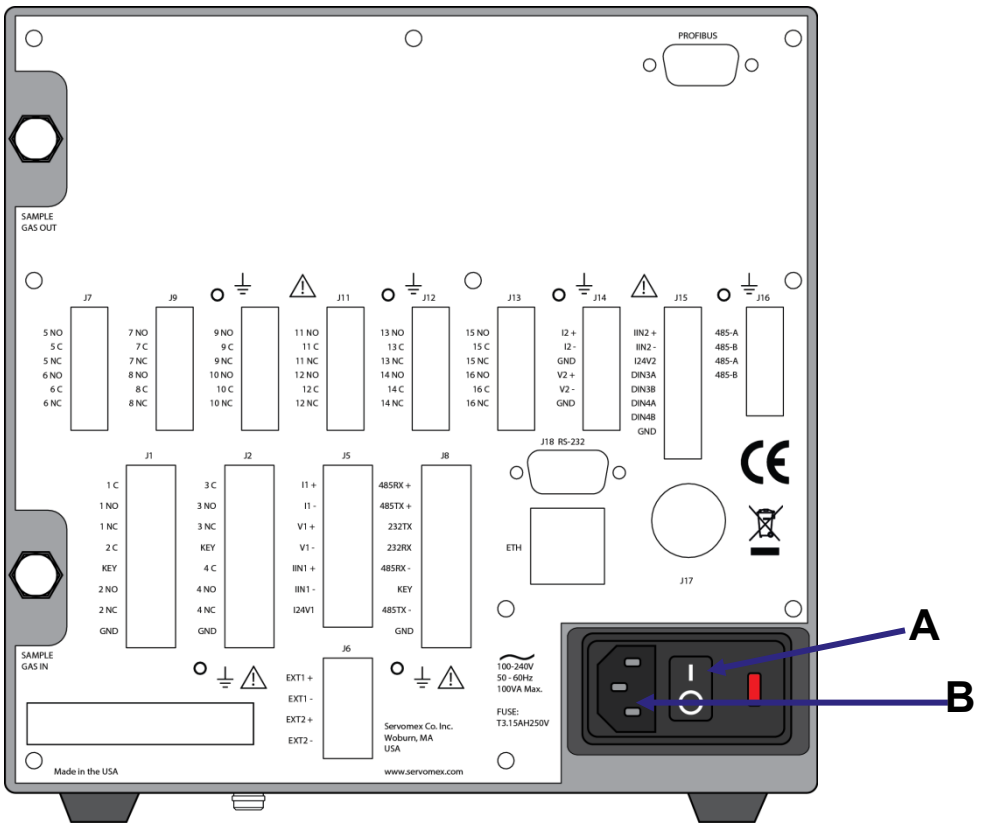


Figure 3-6: Power switch (A) and electrical supply socket (B) on rear of analyzer

3. Plug the other end of the electrical supply cable into your electrical supply outlet.
4. Check the earth (ground) continuity between your electrical supply outlet earth (ground) and the functional earth (ground) terminal on the rear of the analyzer.
5. If a local earth bonding is required, the functional earth stud can be used. The earth ground cable must be kept to less than 3 meters to comply with EMC standards.

This does not replace the earth conductor on the electrical supply socket which must always be connected. Therefore never cut or remove any of the metal pieces from the supplied plug.

3.5 Sample / calibration gas connections

The MonoExact DF310E/DF150E may be used with flammable gases. The user is solely responsible for implementing appropriate environmental monitoring, ventilation and gas safety controls for flammable and/or toxic gas installations to meet all relevant safety standards including but not limited to those imposed by legal, governmental, statutory, industrial, regulatory and/or corporate requirements.

Sample and calibration gases may be toxic or asphyxiant:

- **Make sure that the external connections are leak free at full operating pressure before you use sample or calibration gases.**
- **Make sure that the sample/bypass outlet pipes are vented to an area where the gases will not be a hazard to people.**
- **Make sure that the analyzer is used in a sufficiently well-ventilated environment, to prevent the build-up of toxic gases.**
- **Make sure that the pipes that you connect to the analyzer are routed so that they do not present a hazard to people.**

It is essential that the analyzer is isolated from the sample system until any cleaning solvents are fully purged from the pipelines. Failure to take this precaution may lead to contamination of the transducer, which will be observed as an offset and drift in output.

Over-pressurizing the sensor can result in permanent damage to the sensor. Limit the backpressure to the analyzer to ±1 psig. Be sure the downstream isolation valve (if so equipped) is toggled open before gas flow is started.

When you carry out a leak test, do not exceed a maximum pressure of 34.5 kPa gauge (0.35 bar gauge, 5 psig) and do not introduce a sudden change of pressure into the analyzer. If you do, the analyzer could be damaged.

If the process gas is shut off, make sure the sensor is turned off using the software option. The sensor can be damaged if power to it is on with no gas flowing for several hours.

3.5.1 Sample and Calibration Gas Inlets and Outlets

Hint:	**This section gives simple instructions about connecting the sample and calibration gas pipelines to the analyzer.**

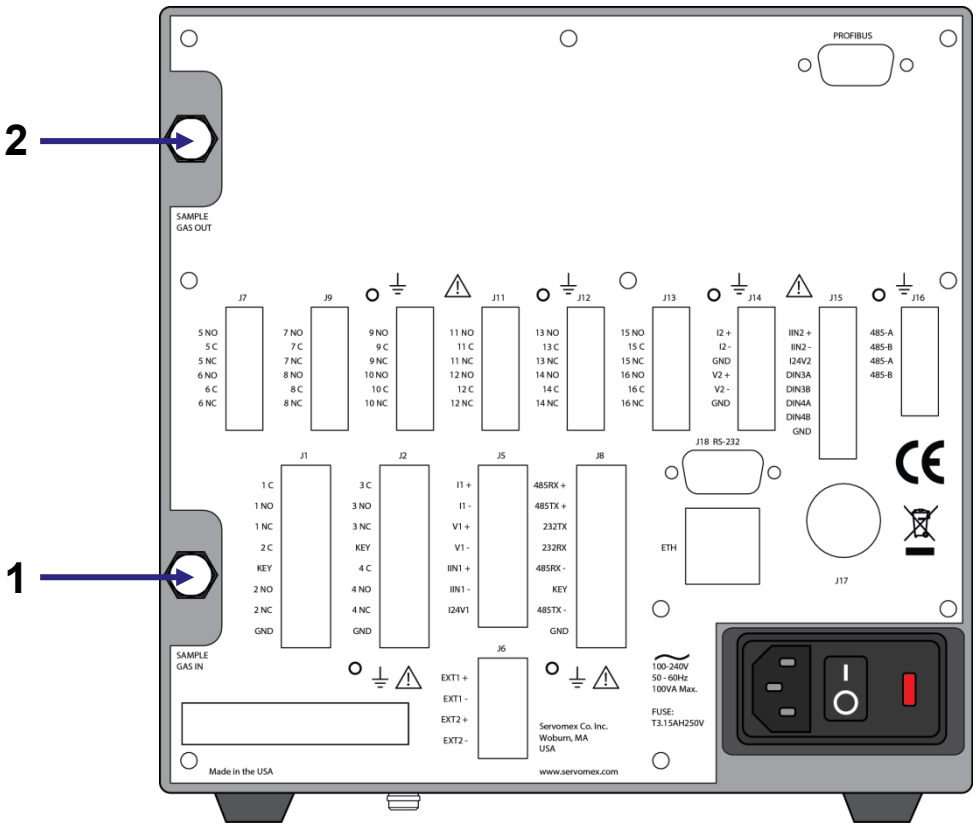


Figure 3-7: Gas inlets and outlets on rear of analyzer

The sample gas inlet and outlet lines at the back of the instrument have stainless steel ⅛ inch compression bulkhead fittings (unless equipped with the optional ¼ inch VCR inlet).

Before connecting any gas line to the analyzer, fully install the supplied gas nut and compression ferrule on your tubing.

Connect your sample/calibration gas inlet and outlet pipelines to the inlet (1 in **Figure 3-7**) and outlet (2 in **Figure 3-7**) on the rear of the analyzer. Do not over-tighten the fittings.

Note: A backup wrench is not needed since anti-torque plates inside the cabinet secure the bulkhead fittings.

Note: The optional external filter should be fitted to the inlet pipe with the compression fittings provided.

*Note: Section **Error! Reference source not found.** lists the sample gas requirements.*

See Section 1.8 for flow/pressure requirements for the sample, zero and calibration gases. If the flow/pressure are outside the ranges specified in Section 1.8, you must regulate the gases externally, before they enter the analyzer.

3.6 View flow levels

The optional flow meters are visible on the front panel and are calibrated for use with air / N_2. The flowmeter should be read at the top of the flow bead. Most other gases have molecular weights within ± 25 percent of air and will produce valid readings. If the molecular weight of the background gas is much different from air / N_2 the flowmeter reading will be less accurate. For example, Helium is a light gas therefore the flow rate should be set to approximately one-third that of air / N_2.

3.7 Switch off the analyser

Figure 3-8: On/off switch on the rear of the analyzer

To switch off the analyser, press the "**O**" on the On/Off switch on the rear of the analyser (Figure 3-8 A).

If you intend to leave the analyzer off for an extended period of time, for example, when carrying out plant maintenance and will not use the analyzer for several days:

- Turn off the analyzer and disconnect the electrical supply cable from the analyzer.
- Purge the transducers with Zero Air or Nitrogen gas to remove any sample gas.
- Close off the sample gas inlet and outlets using a shut off valve or the protective caps supplied with the analyzer.

3.8 Power up

Sample and calibration gases may be toxic or asphyxiant:

- **Make sure that the external connections are leak free at full operating pressure using N_2 or Zero Air before you use sample or calibration gases.**
- **Make sure that the sample/bypass outlet pipes are vented to an area where the gases will not be a hazard to people.**
- **Make sure that the analyzer is used in a sufficiently well-ventilated environment, to prevent the build-up of toxic gases.**
- **Make sure that the pipes that you connect to the analyzer are routed so that they do not present a hazard to people.**

It is essential that the analyzer is isolated from the sample system until any cleaning solvents are fully purged from the pipelines. Failure to take this precaution may lead to contamination of the transducer, which will be observed as an offset and drift in output.

The analyzer can now be powered up.

Hint: *When the electrical supply to the analyzer is switched on, a series of beeps will be heard, the readings are displayed on screen and the clock in the upper right hand corner of the screen starts running.*

To power up the analyser:

1. Make sure that the analyser power cord is connected to the back of the unit.
2. Press the "**I**" on the On/Off switch on the rear of the analyser (Figure 3-9 A) to power on the analyser.

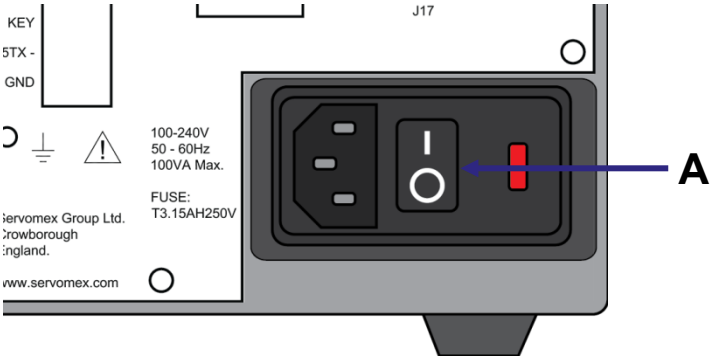


Figure 3-9: On/Off switch on the rear of the analyzer, (A) points to the Power Switch "I" for ON position.

When the analyzer is first switched on, the screen displays a progress bar, followed by the Home screen (**Figure 3-10**).

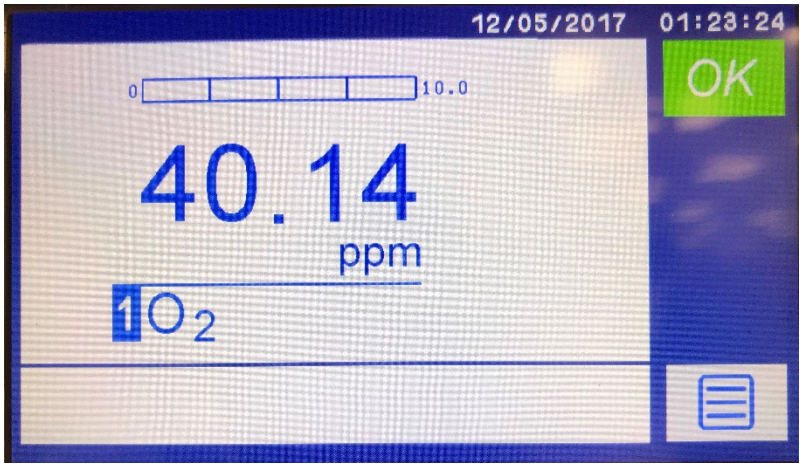


Figure 3-10: Home screen

4 User interface

4.1 User interface overview

Configuration options referred to in this guide (for example, auto-calibrate / validate) must be specified at the time of purchase. The menus and menu options associated with the options not purchased will appear as grey colored icon buttons (as seen in the red box of **Error! Reference source not found.**) and will be unavailable for use.

In The user interface is a touchscreen that displays screens to allow you to operate the MonoExact DF310E/DF150E analyzer.

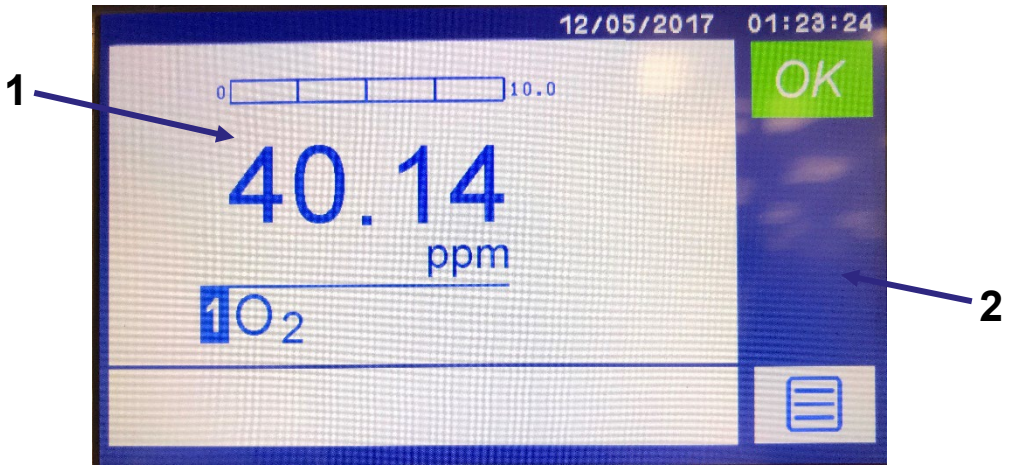


Figure 4-1: The user interface menu screen

The user interface comprises the following:

1	Touchscreen display	Screens are displayed on the touchscreen (section 0 onwards). The function of the active icons depends on the screen currently displayed.
2	Touchscreen icons	The icons displayed depend on the current screen.

Note: If there are no menu interactions for 60 seconds, the display reverts back to this Home screen. This timer can be adjusted in the Settings section.

4.2 General techniques

The general navigation route through the user interface screens is described by a sequence of icons that you must touch to get to the desired screen. A shortened visual description of the sequence of icons to be touched is used in this guide to help you navigate easily to the various screens. The full list of icons, there location and function can be viewed in the firmware version Icon Map and Glossary on the USB provided.

For example, to reach the Alarms screen (a sub-screen of the Measurement branch) you must press the following sequence of icons:

1. Touch the  icon to display the Main Menu screen.
2. Next, touch the  icon to display the Measurement screen.
3. Finally, touch the  icon to display the Alarms screen.

This sequence is shortened in the guide and will appear above the screen page as:

Familiarity of the icons below will allow easier navigation of the menus.

Icon	Meaning	Function
	Home	Returns to the Home screen.
	Main Menu	Displays the Main Menu screen that contains the four main branch icons: Measurement, Diagnostics, Maintenance, and Settings.
	Next	Displays the next set of functions onto the screen. The new list will always appear in a new column to the right of the arrow.
	Return	Returns to the prior screen.
	Accept	Touch this icon to accept any changes made.
	Cancel or Exit	Touch this icon to cancel or reject any changes made or exit a screen.
	Not Active	In several menus this icon is used to deactivate the selection.
	Active	In several menus this icon is used to activate the selection.

4.3 Touchscreen and Navigation overview

Each screen displays active icons that are relevant to that screen's operation. To select an icon, it is best to use the eraser end of a pencil or a stylus to touch the icon on the screen graphic.

Note: Be sure not to press too hard or you will damage the screen; do not use the point of a pen or pencil to touch the screen.

For example, the sequence used to arrive at the screen shown in Figure 4-2 is accessed by touching the Main Menu icon on the Home page then touching the Measurement icon to activate the first set of the Measurement choices.

> >

The Measurement choices available are shown in Figure 4-2 and show up as icons in the column to the right of the Main Menu list. The icon background now turns blue indicating it is the active Main Menu choice as you navigate forward through the various choices.

Note: The Main Menu branch stays visible all the time unless you are in a special screen or the Home page. This allows you to access the other Main Menu choices easily.

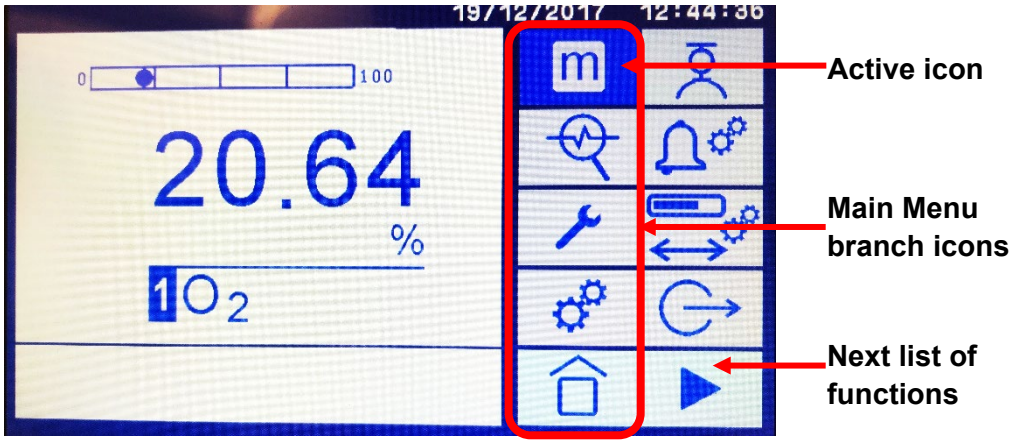


Figure 4-2: The user interface of the Main Menu screen with the Measurement branch active.

When a Main Menu icon is selected further icons associated with that function are displayed as seen in Figure 4-2. New icons associated with that function will appear to the right of the icon just touched or it may transfer you to a new screen.

In the case of the Main Menu Branch icons, if there are more functions associated with the main function activated and they do not all fit onto one screen then the Next List key will be present in the lower right corner or on the bottom of the list. When touched, more functions will appear in a new list to the right of the old list for selection.

The Main Menu Branch will remain visible as the farthest column on the left. Details are shown later in this section.

Figure 4-3 shows a Step Series of Screens that are launched when the Settings Main Menu icon is touched:

- The first series of functional icons that belong to the Settings section are displayed in the column of icons to the right of the Main Menu icons (Figure 4-3 A).

- To display the next set of functions touch  which brings up the second set of Setting functions (Figure 4-3 C) to the right of the first set (Figure 4-3 A). Note that  is activated as the background color is now blue (Figure 4-3 B).

- To get the third and final set of functions touch  at the bottom of the list of the last column (Figure 4-3 C) and the third set of icons will replace the second set in the final column position (Figure 4-3 D).

- To return the second set of features touch the Return icon  at the top of the last column and the middle screen in Figure 4-3 will be returned.

Note: When the Return icon is touched the Main Menu icon no longer has a blue "activated" background. The icons displayed are still associated with the original main menu icon selected, but the Return button removes the Main Menu background on some of the icons.

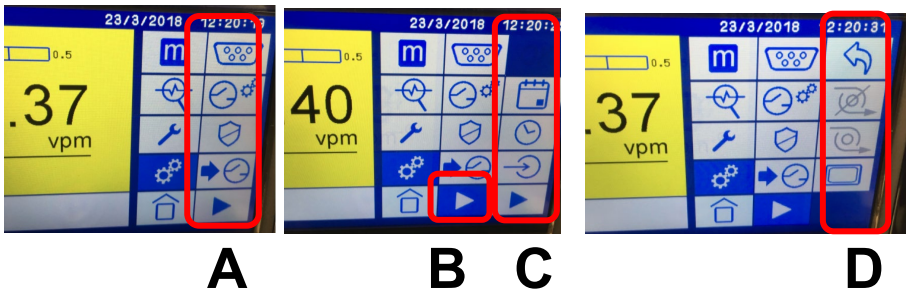


Figure 4-3: The User Interface Menu screen with the Settings branch activated

Note: The Main Menu branch stays visible all the time even while navigating through the three sets of functional icons of the Settings branch. In this case, the first set of icons also remain visible and only the third colum of icons is replaced when the Next List icon is touched.

4.4 Home screen

The Home screen (Figure 4-4) displays the current measurement and system status.

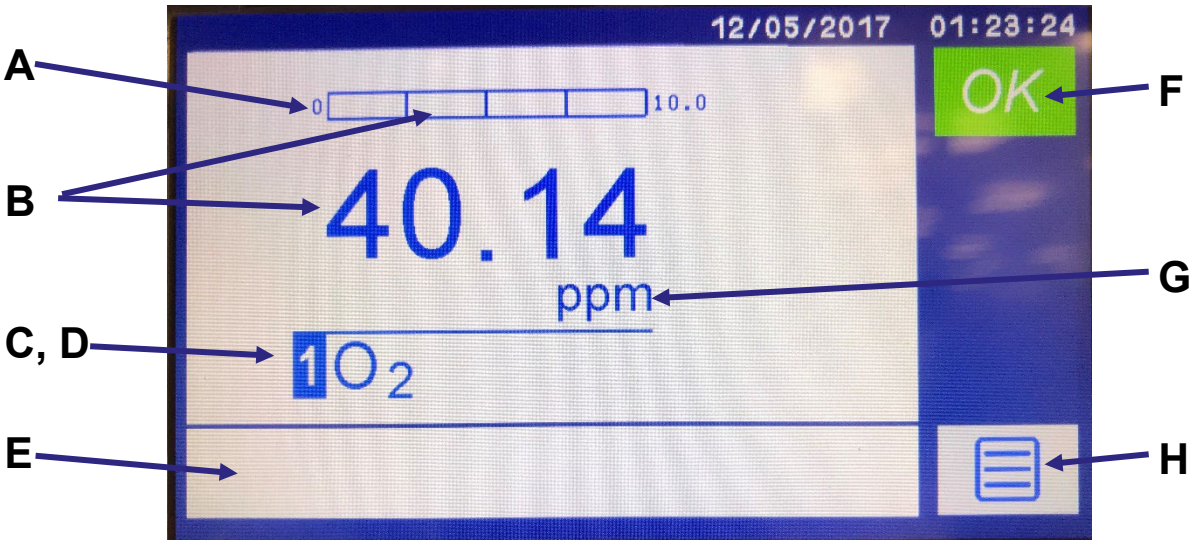


Figure 4-4: Single Gas Home screen components

A	Bar graph showing the operable measurement range boundaries, current measurement and relative to alarm set points	E	Information area where messages such as error codes, IP address, and diagnostic information are displayed.
B	Current measurement	F	System status
C	Transducer number *Note: 1 is always shown.*	G	Measurement units
D	Analyte being measured	H	Menu icon

> ***Hint:*** *If no icon is pressed for 1 minute in any other menu branch, Home screen is automatically displayed. You will also then have to re-enter your password to access any password-protected screens. The "Home screen return" value can be increased in the Settings Menu from 1 to 3 or 5 minutes.*

4.5 Main Menu screen icons

Main Menu Icon

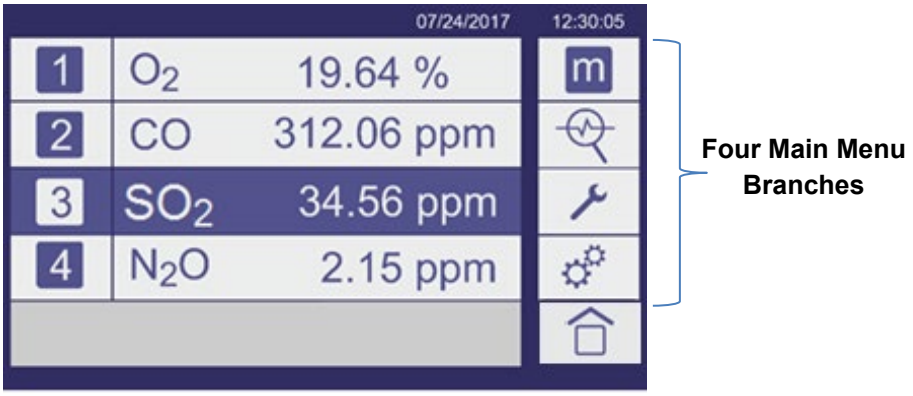


Figure 5-11: Menu screen

The Main Menu icons are listed below:

Icon	Meaning	Function
m	Measurement	Displays the Measurement screen where measurement, calibration / validation and alarm settings can be adjusted for each transducer installed (Section 6).
	Diagnostics	Displays the Diagnostics screen where system-wide diagnostic tools can be found (Section 7).
	Maintenance	Displays the Maintenance screen where system-wide maintenance actions can be initiated (Section 8).
	Settings	Displays the Settings screen where system-wide parameters can be defined (Section 9).
	Home	Touch this icon to return to the Home screen (Section 5).

Note: The first column of icons on each menu screen is the same for all analyzers. Once one of the four menu branches are selected that relevant icon background changes blue to show which menu screen is active (see Figure 6-1 below).

4.5.1 Frequently Used Touchscreen icons

The following table shows touchscreen icons that frequently appear on different screens. The Main Menu Icons are highlighted as bold text under the “Meaning” column below.

Table 4-1: Frequently Used Touchscreen icons:

Icon	Meaning	Function
	Menu	Located on the Home screen (**Error! Reference source not found.**) displays the Menu screen of the four branches when touched.
	**Measurement**	Displays the first set of functional icons associated with the Measurement activities (Figure 4-2).
	**Diagnostics**	Displays the first set of functional icons associated with the system-wide Diagnostics tools that can be activated.
	**Maintenance**	Displays the first set of functional icons associated with the system-wide Maintenance operations that can be activated.
	**Settings**	Displays the first set of functional icons associated with configuring the system-wide parameters Settings including the Relays.
	Calibrate	Displays the first set of functional icons associated with configuring the various Calibrate functions and activities.
	Alarm settings	Displays the first set of functional icons associated with configuring the system-wide Alarm parameters and actions.
	Home	This icon is used to return back to the Home screen showing the gas transducer concentration values.
	Accept	Touch this icon to accept any changes made.
	Cancel or Exit	Touch this icon to cancel or reject any changes made or exit a screen.
	Next List	Touch this icon to display the next set of functional icons onto the screen.
	Return	Touch this icon to return to the prior screen.

*Note: The four main menu branches are shown in **bold** in Table 4-1.*

4.6 System and measurement status icons and notices

The Status icon is located at the top right corner of the Home screen. If the system is operating correctly the green OK icon is displayed (Figure 4-5).

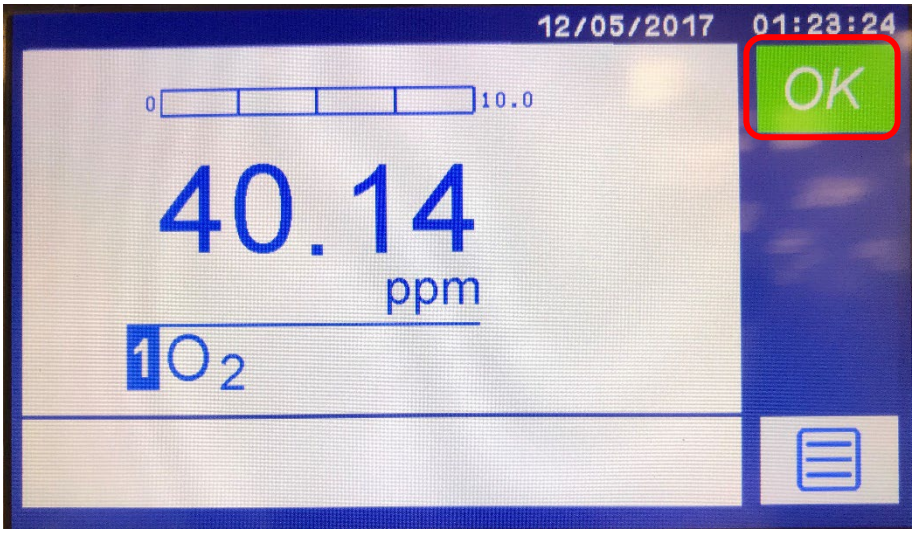


Figure 4-5: Home screen (three gas transducers)

Note: If you touch the green OK icon it will display the date and time when the analyzer was last started.

If a problem occurs with the system, the Status icon changes to one of the symbols shown in the table below.

Icon	Meaning	Meaning
	Alarm	Indicates that there is an alarm on the system. Touch the icon to display the Alarm Selection screen. An example is shown in Figure 4-6.
	Faults	Indicates a fault with the transducer or analyzer: a communication failure with the transducer, an over-temperature condition, or out of specification where the measured value is out of the maximum range for the transducer (see Figure 4-7). Touch the icon to display a message in the text bar describing the fault.

Figure 4-6: Home screen showing O_2 alarm

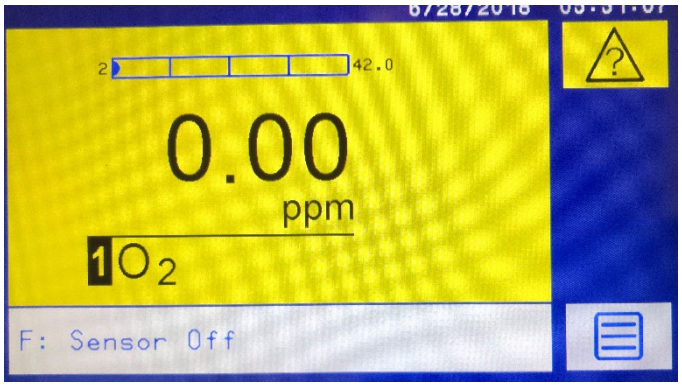


Figure 4-7: Home screen, showing warning screen with fault description

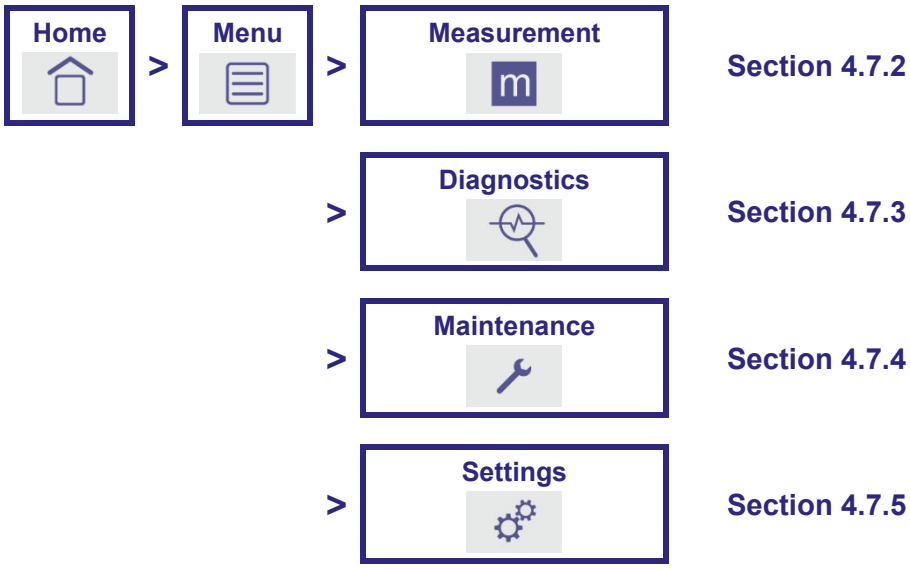
Note: In Figure 4-7 the fault icon  *was touched and "C: COMMS fault" was displayed in the message area bottom of screen Analyzer Menu Branch Structure*

4.7 Menu branch structure

Section 4.7.1 describes the top-level Main Menu structure and directs you to the subsections that show the buttons available under each of the main menu branches.

The tables in Sections 0 to 4.7.5 show the substructure buttons available for each of the Main Branches. For example, once you navigate to one of the Main Branches (Measurement, Diagnostics, Maintenance, or Settings) press the Level 1 button to display the associated Level 2 buttons; press a Level 2 button to display the associated Level 3 buttons, etc. Levels beyond 4 are provided in the detailed sections of the full manual only. Shaded areas show that there are no available buttons at that level.

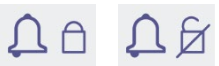
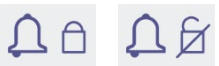
4.7.1 Top level structure



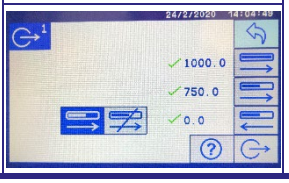
4.7.2 Measurement

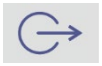
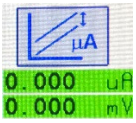
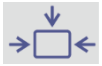
Note: Each Alarm and Relay have their own settings. Only one set is shown here as example.

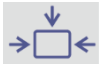
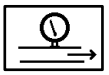
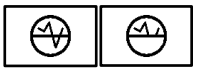
Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
Manual Calibration	Span Setup	Set & Run Span Calibration	
	Zero / Low Span Set-up	Set & Run Zero / Low Calibration	
	Restore Factory Settings	*Coulometric and AquaXact sensors*	
	Span Ref	*Coulometric sensor only*	Zero Ref Left # Span Ref Right #

Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
Alarms 	Meas. Value alarm 	Meas. Value High 	
		Meas. Value Low 	
		Meas. Alarm Value Threshold 	Numeric Keypad
		Meas. Alarm Value Hysteresis 	Numeric Keypad
		Audible Alarm On / Off 	
		Alarm Following On / Off 	*Alarm active during calibrations*
		Alarm Latching On / Off 	*Alarm stays active even if threshold returns*
		Alarm Off 	
	Flow Alarm 	Audible Alarm On / Off 	
		Alarm Following On / Off 	*Alarm active during calibrations*
		Alarm Latching On / Off 	*Alarm stays active even if threshold returns*
		Alarm Off 	

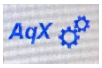
Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
	Transducer Temp Alarm 	Transducer Temp Value High 	
		Transducer Temp Value Low 	
		Transducer Temp Alarm Value Threshold 	Numeric Keypad
		Transducer Temp Alarm Value Hysteresis 	Numeric Keypad
Alarms *(cont.)* 	Transducer Temp Alarm *(cont.)* 	Audible Alarm On / Off 	
		Alarm Following On / Off 	*Alarm active during calibrations*
		Alarm Latching On / Off 	*Alarm stays active even if threshold returns*
		Alarm Off 	
	Span Reference Alarm 	Span Ref Value High 	
		Span Ref Value Low 	
		Span Ref Alarm Value Threshold 	Numeric Keypad

Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
	Span Reference Alarm (cont.)	Span Ref Alarm Value Hysteresis	Numeric Keypad
		Audible Alarm On / Off	
		Alarm Following On / Off	*Alarm active during calibrations*
Alarms *(cont.)*	Span Reference Alarm *(cont.)*	Alarm Latching On / Off	*Alarm stays active even if threshold returns*
		Alarm Off	
Range Settings	Analog Output Range Setting	Expanded User Range	Numeric Keypad
		User High Range Value	Numeric Keypad
		User Low Range Value	Numeric Keypad
		Auto Range On / Off	
		Validate Range Settings	All operable ranges will need a green check mark for proper range set up

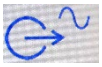
Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
Analog Output Settings 	Follow Meas. Value During Cal On / Off 		
	Output Adjustment 	Numeric Keypad for µA and 0-10 mVDC micro adjustments	
Analog Output Settings *(cont.)* 	Jam Condition Zero 		
	Jam Condition 21.5 mA 		
	Jam Condition 2.0 mA 		
	Jam Condition None 	No mA jam output	
Show Transducer Temp 	Sensor temp reading bottom of home screen		
Measurement Record 	Choose Time interval 	Numeric Keypad	
	Trash Data 		
AquaXact Pressure Compensation 	AquaXact Sensor Pressure 	Numeric Keypad	

Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
AquaXact Pressure Comp 	**Process Stream Pressure** 	**Numeric Keypad**	
	Pressure Comp On/Off 		
GSF 	**Enter Offset Integer**	*Coulometric sensor option*	
GSF Advance 	**Select Gas Mix = 100%**	*Coulometric sensor option*	
Data Filtering 	**Filter Type 1** 	*Moving Average 8 samples*	
	Filter Type 2 	*Moving Average 16 samples*	
	Filter Type 3 	*Moving Average 32 samples*	
	Filter Type 4 	*Exponential 8 samples*	
	Filter Type 5 	*Exponential 16 samples*	
	Filter Type 6 	*Exponential 32 samples*	
	Filtering Off 		
Suppress Neg Readings 	**Suppress Neg Readings On / Off** 		
Coulometric On / Off 	**Coulometric On / Off** 		

Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
Coulometric On / Off 	**External Input 1 or 2** EXT1 EXT2	*Use external input 1 or 2 to turn sensor on / off*	*Use external input 1 or 2 to turn pump on / off*
Change AquaXact Units units	**Dew Point Celsius** Dp °C		
	Dew Point Fahrenheit Dp °F		
	Part Per Million ppm	*Calculated value without pressure*	
AquaXact Tip Change 	**Numeric Keypad to enter tip serial number**		
Transducer Firmware Rev 	*Information at bottom of measurement screen*		
Transducer Serial Number 	*Information at bottom of measurement screen*		
Scheduled Event Settings 	**Transducer Sequence Selection (#1, #2, #3)** 	**Auto-Validation Setup** 	**Run Auto-Validation Now** 
			Abort Auto-Validation 
			Set Auto-Validation Date / Time / Repeats 

Measurement Level 1 Button	Measurement Level 2 Button	Measurement Level 3 Button	Measurement Level 4 Button
Scheduled Event Settings *(cont.)* 	**Transducer Sequence Selection (#1, #2, #3)** 	**Auto-Calibration Setup** 	**Run Auto-Calibration Now** 
			Abort Auto-Calibration 
			Set Auto-Calibration Date / Time / Repeats 
	Electrolyte Replenishment 	**Number of days**	**Numeric Keypad**
Flat Line Alarm On / Off 	*Feature activates an alarm that monitors sensor response at 0 ppm level*		
AquaXact Settings 	**Analog Output Range Setting** 	**Set 4 -20 mA output range of transducer**	*ME DF-310E Only*
	Analog Output Enabled / Disabled 	**Turn on the probe mA output to use the new setting**	
Transducer Diagnostics 	*Screen displays a snapshot of diags more data in sys txt file*		

4.7.3 Diagnostics

Diagnostics Level 1 Button	Diagnostics Level 2 Button	Diagnostics Level 3 Button	Diagnostics Level 4 Button
Software revision 	Screen displays operating system version		
Analyzer Chassis Temp 	Temperature sensor is located on the display PCB		
Analyzer SN 	Serial number of analyzer		
System File Save 	Save analyzer settings to a USB memory stick		
Test Outputs 	Relay Test 	Open / Close Relay 	Temporary activation of any specific relay
	Test Analog Out 	*Set analog out to 0, 25, 50, 75, 100% of range* 	
Display System Log 	Screen displays chronological system history		
Display Calibration Log 	Screen displays chronological calibration history		
Fault Inquiry 	Screen informs operator to see system log for details		

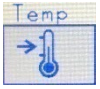
4.7.4 Maintenance

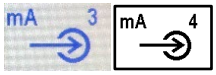
Maintenance Level 1 Button	Maintenance Level 2 Button	Maintenance Level 3 Button	Maintenance Level 4 Button
Update Firmware 	**System updates firmware to version on USB memory stick**	*Only one firmware code version per USB*	*Firmware code in top USB directory*
Disk Space 	**Disk space used, available and % full**	**Screen Indicator for 50% Used YELLOW, 75% Used RED**	Option to discard sys, cal, record key, meas, log files
Upload System Settings Files 	**Upload system setting from instrument of identical configuration**		
System Reset 	**Soft Reboot** 	**Recycle the analyzer power**	
	Restore from USB 	**If a crucial file has been corrupted, you can recover from USB**	
	Reconfigure from USB 	**Add a missing or purchase a new option/feature remotely, please contact your sales or service rep to learn more**	
Clear Errors 	**Clears USB Upgrading Errors**		

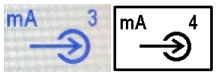
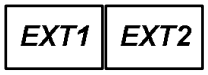
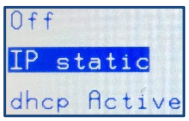
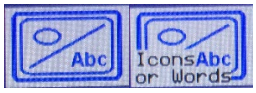
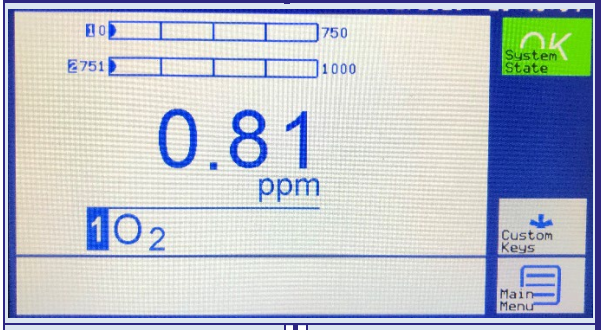
4.7.5 Settings

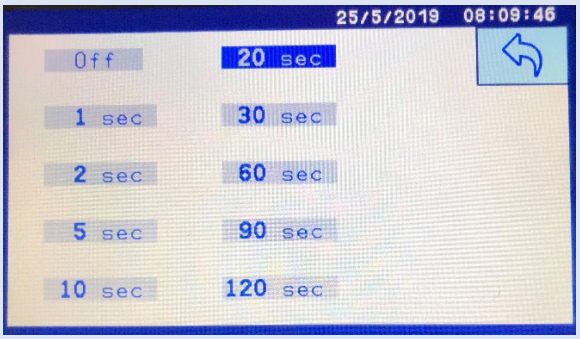
Settings Level 1 Button	Settings Level 2 Button	Settings Level 3 Button	Settings Level 4 Button
Serial Port Setup 	**RS232** 		
	RS485		

Settings Level 1 Button	Settings Level 2 Button	Settings Level 3 Button	Settings Level 4 Button
Serial Port Setup (cont.) 	**Full Duplex** *Full Duplex*		
	Half Duplex *Half Duplex*	*RS485 only*	
	1 Stop Bit *1 Stop Bit*		
	2 Stop Bits *2 Stop Bits*		
	Baud Rate Setting *BAUD*	**1200, 1800, 2400, 4800, 9600, 19200, 38400, 76800, 115200**	
	Parity *Parity*	**None** **Even** **Odd**	
	Serial ID 	**Numeric Keypad**	
	RS485 Functions 	**Delta F Legacy 485** *DF L-485*	**System sets RS485 to protocol of legacy Delta F Analyzers**
		Modbus *Modbus*	**Activate Modbus Communication**
		Off 	**Communications off**
		Streaming 	**Communications set to streaming or push**
		Output Frequency 	**Time interval to stream or push data**

Settings Level 1 Button	Settings Level 2 Button	Settings Level 3 Button	Settings Level 4 Button
Serial Port Setup (cont.) 	**RS485 Functions** (cont.) 	**Modbus Word Swapping: On / OFF** 	*Mirror image of Modbus communications*
Relay Assignment 	**Alarm Assignment** 	**Select Transducer Measurement #1, #2, etc.**	
		Transducer Alarm 	
		"Service in Progress" 	
		Transducer Fault 	
		Range Change 	
		System Relay 	**Internal Temp Fault** 
			Disk 75% Full Alarm 
		Electrolyte Replenishment Reminder 	*Set # of days to check electrolyte level*
Password Setup 	**Master** 	**Alphanumeric Keypad**	
	Operator 	**Alphanumeric Keypad**	

Settings Level 1 Button	Settings Level 2 Button	Settings Level 3 Button	Settings Level 4 Button
Password Setup (cont.)	**Keystroke Recording On / Off** 	**Records every icon button touched in sequential order**	
Manual Relay Override	**Normal Operation – Relay ON** 	**Icon background blue**	
	Normal Operation – Relay OFF 	**Icon background white**	
	Forced ON Operation – Relay ON 	**Icon background black**	
	Forced OFF Operation – Relay OFF 	**Icon greyed out**	
Analyzer Date	**DD, MM, YYYY**		
Analyzer Time	**HH:MM:SS**		
Digital Inputs	**Choose Digital Input #3 or #4 for assignment** 	**Choose Transducer 1** *(left side)*	
		Start Auto-Cal 	
		Stop Auto-Cal 	
		Start Low / Zero Cal 	

Settings Level 1 Button	Settings Level 2 Button	Settings Level 3 Button	Settings Level 4 Button
Digital Inputs (cont.)	**Choose Digital Input #3 or #4 for assignment** 	**Start Span Cal**	
		Disable Digital Input	
Pump On / Off	**Pump On / Off**	*MEDF-310E and MEDF-150E*	
	External Input 1 or 2 	*Use external input 1 or 2 to turn pump on / off*	
Modbus TCP/IP	**Off, IP Static, DHCP Active** 	**Off / IP Static / DHCP Active**	
	1 Client	**2 Clients**	**3 Clients**
Screen View	**Text & Icon On / Off** 		
	Single / Split Screens		
	Increase / Decrease Screen Brightness		
	Screen Dim Timer *1, 3, 5 min*		
	Favorite Page	**Favorite Page On/OFF**	

Settings Level 1 Button	Settings Level 2 Button	Settings Level 3 Button	Settings Level 4 Button
	Adjust Decimal Places 	Reduce the number of decimal places to the limit of the sensor	
Block Time Measurement Averaging 	Averages measurements over a selected period of time		

5 Technical specification

The protection, accuracy, operation and condition of the equipment may be impaired if the analyzer is not installed in accordance with the requirements of this and other sections of the manual.

5.1 Mechanical specification

Dimensions:	*(Length x Height x Width)*
Rack mountable analyzer:	
Without 19-inch rack mounting brackets:	236 x 193 x 205 mm 9.3 x 7.6 x 8.1 inches
With 19-inch rack mounting brackets fitted:	236 x 266 x 483 mm 8 x 5.2 x 19 inches
Bench mounted analyzer:	240 x 193 x 205 mm 9.5 x 7.6 x 8.1 inches *(including feet and handle)*
Mass:	< 5 kg

5.2 Electrical specification

Electrical supply:	
Voltage:	100 to 240 Vac, 50 to 60 Hz *(± 10% maximum fluctuation)*
Supply fuse rating / type:	T3.15 AH / 250V. Size 20 x 5 mm
Maximum power consumption:	100 VA
Interface signal relay ratings	30 V (dc or ac) / 1A *Note: The relay output signals are volt-free signals*
mA output (active):	
Maximum load resistance:	1 kΩ
Isolation voltage (to earth):	500 V (dc or ac)
Output range:	
Normal sample measurement:	4 to 20 mA
Fault condition:	0 mA, 2 mA. User selectable

Voltage output (active):

Minimum load resistance:	100 kΩ
Isolation voltage (to earth):	250 V (dc or ac)
Output range:	
Normal sample measurement:	0 to 10 V
Fault condition:	Fault condition selected as an option at the time of purchase.
Under range:	Not applicable

Signal / voltage / mA / RS485 output terminals suitable for:

Flexible conductors:	0.5 to 1.5 mm^2 (20 to 16 AWG)
Solid conductors:	0.5 to 1.0 mm^2 (20 to 18 AWG)

5.3 Maximum voltage ratings

Common mode compared to chassis ground reference:

Signals:	Maximum voltage rating:
I1+, I1-, I2+, I2-, V1+, V1-, V2+, V2-, IIN1+, IIN1-, IIN2+, IIN2-, DIN3A, DIN3B, DIN4A, DIN4B J17(ALL)	250 Vac
All relays C, NC, NO	40 Vac
J6 (ALL) J8(ALL) J18 (ALL)	15 Vdc

Differential mode between pairs:

Signals:	Maximum voltage rating:
All relays C, NC,NO	30 Vac, dc
IIN1+, IIN- or IIN2+, IIN2-	40 Vdc wrt V1-, V2-
DIN3A, DIN3B or DIN4A,DIN4B	24 Vdc
RS485TX+, RS485TX-	15 Vdc
RS485RX+, RS485RX-	15 Vdc
RS232TX, RS232RX	15 Vdc
J17 pin to pin	9 Vdc

Signals:	Maximum voltage rating:

5.4 Environmental limits

The equipment is suitable for indoor use only.

Ambient temperature range:

Operation:	5 to 45 °C
Storage:	0 to 50 °C
Operating ambient pressure range:	101.3 kPa ± 10% (1.013 bar ± 10%)
Operating ambient humidity range:	10 to 90% RH, non-condensing
Operating altitude range:	-500 metres (below sea level) to 2000 metres (above sea level)
Ingress protection:	IP20

5.5 Sample gas

The sample gases must be clean, non-corrosive, free from oil and condensates and compatible with the materials listed in Error! Reference source not found..

Coulometric transducer (trace O_2)	**sample gases may be flammable**
Flow rate:	300 to 700 ml min^{-1}
Temperature:	5 to 45 °C
Particulate size:	< 2 µm (2 micron)
Pressure Driven Option (critical orifice):	172.36-310.26 kPa; 1.72-3.10 bar; 25-45 psig
Flow Driven Option:	1.4-6.9 kPa; 0.34-1.72 bar; 0.2-1 psig

Paramagnetic transducer (% O_2)	**sample gases must be non-flammable**
Paramagnetic transducer (% O_2)	**sample gases must be non-flammable**
Flow rate:	100 to 250 ml min^{-1}
Dewpoint:	5 °C below ambient temperature (minimum)
Temperature:	5 to 45 °C
Particulate size:	< 2 µm (2 micron)
Pressure Driven Option (critical orifice):	14-56 kPa; 0.14-0.55 bar; 2-8 psig

6 Storage and disposal

6.1 Storage

Refit any protective plastic covers and place the analyzer and any associated equipment in its original packaging before storage. Alternatively, seal it inside a waterproof plastic bag, sack, or storage box.

Store the analyzer and any associated equipment in a clean, dry area. Do not subject it to excessively hot, cold, or humid conditions.

6.2 Disposal

Dispose of the analyzer and any associated equipment safely, and in accordance with all of your local and national safety and environmental requirements.

> ***Hint:*** *If you send the analyzer to Servomex or your local Servomex agent for disposal, it must be accompanied by a correctly completed decontamination certificate and a Return Authorization Number (RAN) (**Error! Reference source not found.**).*

6.2.1 Disposal in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive

The label shown in Figure 6-1 is fitted to the analyzer.

Figure 6-1: The WEEE label

This label identifies that:

- The analyzer is considered to be within the scope of the Waste Electrical and Electronic Equipment (WEEE).
- The analyzer is not intended for disposal in a municipal waste stream (such as landfill sites, domestic recycling centers and so on), but must be submitted for material recovery and recycling in accordance with the local regulations which implement the WEEE Directive.

For additional information and advice on the disposal of the analyzer in accordance with the requirements of the WEEE Directive, contact Servomex or your local Servomex agent.

F.1 Applicable EU Directives

Low Voltage Directive: 2014/35/EU

Electromagnetic Compatibility (EMC) Directive: 2014/30/EU

F.2 Applicable standards

EN 61010-1:2010

EN 61326-1:2013 / IEC 61326-1:2012

EN15267-3:2007 MCERTS Performance Standards for CEMS

CLASS – C225206 PROCESS CONTROL EQUIPMENT

CLASS – C225286 PROCESS CONTROL EQUIPMENT Certified to US Standards

Material Safety Data Sheet

Identification of the substance

Trade name	ElectrolyteSolution, *Ɛ-lectrolyte* Gold, *Ɛ-lectrolyte* Blue, *Ɛ-lectrolyte* Black, DF-E05, DF-E06, DF-E07, DF-E09
Manufacturer	Servomex, Inc. Boston Technical Center 4 Constitution Way, Woburn, MA 01801-1087, USA, Tel + 1-781-935-4600
Emergency contact	ChemTel Expert Assistance Hotline USA: 1-800-255-3924 International: +01-813-248-0585

Composition

CAS #	Component	EC Code/class	Concentration	Risk Phrase	Risk Description
7732-18-5	Water and non-hazardous salts	231-791-2	95.7% w/w	Not Applicable	None
1310-58-3	Potassium Hydroxide in aqueous solution	215-181-3 C	0.77N: 4.3% w/w	R35	Causes severe burns

Hazards identification

Main Hazard

Corrosive. Causes severe burns on contact with skin, eyes and mucous membrane.

CERCLA Ratings (scale 0-3)	Health = 3	Fire = 0	Reactivity = 1	Persistence = 0
NFPA Ratings (scale 0-4)	Health = 3	Fire = 0	Reactivity = 1	

Potential Health Effects:

Eye Contact

Causes severe eye burns. May cause irreversible eye injury. Contact may cause ulceration of the conjunctiva and cornea. Eye damage may be delayed.

Skin Contact	Causes skin burns. May cause deep, penetrating ulcers of the skin.
Ingestion	May cause circulatory system failure. May cause perforation of the digestive tract. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death.
Inhalation	Inhalation under normal use would not be expected as this product is supplied as an aqueous solution and no hazardous vapors are emitted. Effects of inhalation are irritation that may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.
Chronic	Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis.

First-Aid measures

Skin Contact	In case of skin contact, remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water for at least 15 minutes. Obtain medical attention immediately.
Eye Contact	If the substance has entered the eyes, wash out with plenty of water for at least 15 - 20 minutes, occasionally lifting the upper and lower lids. Obtain medical attention immediately.
Ingestion	If the chemical has been confined to the mouth, give large quantities of water as a mouthwash. Ensure the mouthwash has not been swallowed. If the chemical has been swallowed, do NOT induce vomiting. Give 470 - 950ml (2 - 4 cups) of water or milk. Never give anything by mouth to an unconscious person. Obtain medical attention immediately.
Inhalation	Inhalation under normal use would not be expected as this product is supplied as an aqueous solution and no hazardous vapors are emitted; however, if inhalation should somehow occur, remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical aid immediately.

Fire-fighting measures

Special Exposure Hazard	Not applicable
Extinguishing Media	Not Combustible. Select extinguishing media appropriate to the surrounding fire conditions.
Protective Equipment	Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products.

Accidental release measures

Personal Protection	Use proper personal protective equipment as indicated in Section 8.
Leaks and Spills	Absorb spill with inert material (e.g., dry sand or earth), then place into a chemical waste container. Neutralize spill with a weak acid such as vinegar or acetic acid.
Clean-up Procedures	Wash the spillage site with large amounts of water.

Handling and storage

Handling Precautions	Complete eye and face protection, protective clothing, and appropriate gloves must be used. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not ingest or inhale.
Storage Precautions	Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from strong acids.

Exposure controls / personal protection

Personal Protection

Eyes	Wear appropriate protective chemical safety goggles and face shield as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin	Wear appropriate gloves to prevent skin exposure.
Clothing	Wear appropriate protective clothing to prevent skin exposure.

Respirators	Not Applicable. Inhalation under normal use would not be expected as this product is supplied as an aqueous solution and no hazardous vapors are emitted.
Airborne Exposure	This material is supplied as an aqueous solution and will not be present in the atmosphere in normal use.
Exposure Limits	Potassium Hydroxide UK EH40, OEL (8hr TWA) 2mg/m^3 NIOSH, (8hr TWA) 2mg/m^3 ACGIH, Ceiling 2mg/m^3 OSHA, not listed

Physical and chemical properties

Molecular Formula	KOH Mixture
Physical State	.77N aqueous solution. Colorless, odorless
pH	Alkaline
Solubility	Completely soluble in water
Boiling Point	104.5°C
Melting Point	-3.5°C
Flash Point	Not applicable
Flammability	Not flammable
Explosion Limits	Not applicable
Specific Gravity	1.15
Vapor Pressure	16.1 mm Hg @ 20°C

Stability and reactivity

Chemical Stability	Stable
Conditions/Materials to Avoid	Incompatible materials, acids and metals
Incompatibilities with other Materials	Reacts with chlorine dioxide, nitrobenzene, nitromethane, nitrogen trichloride, peroxidized tetrahydrofuran, 2,4,6-trinitrotoluene, bromoform+ crown ethers, acids alcohols, sugars, germanium cyclopentadiene, maleic dicarbide. Corrosive to metals such as aluminum, tin, and zinc to cause formation of flammable hydrogen gas.

Hazardous Decomposition Products	Oxides of potassium
Hazardous Polymerization	Has not been reported

Toxological information

RTECS#	CAS# 7732-18-5	ZC0110000
	CAS# 1310-58-3	TT2100000
LD50/ LC50	CAS# 7732-18-5	Oral, ret:LD50 = >90 ml/kg
	CAS# 1310-58-3	Draize test, rabbit, skin: 50 mg/24H Severe Oral, rat: LD50 = 273 mg/kg
Carcinogen Status	CAS# 7732-18-5	Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA
	CAS# 1310-58-3	Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA

Potassium Hydroxide Solution is a severe eye, mucus membrane, and skin irritant.

Ecological information

Mobility	Completely soluble in water
Degradability	Will degrade by reaction with carbon dioxide from the atmosphere to produce a non-hazardous product.
Accumulation	No
Ecotoxicity	Information not available. No long-term effects expected due to degradation. The preparation is already in dilute solution and adverse aquatic effects are not expected due to further dilution. The preparation is corrosive, and direct contact with fauna will cause burns.

Disposal considerations

Waste Disposal	Dispose of in a manner consistent with federal, state, and local regulations.

Transportation information

	Shipping Name	Hazard Class	UN Number	Packaging Group
US DOT	Potassium Hydroxide Solution	8	UN1814	II
IATA	Potassium Hydroxide Solution	8	UN1814	II
ADR/RID	Potassium Hydroxide Solution	8	UN1814	II
IMDG Code	Potassium Hydroxide Solution	8	UN1814	II
Canadian TDG	Potassium Hydroxide Solution	8(9.2)	UN1814	Not available

Regulatory information

US Federal

TSCA	CAS# 7732-18-5	**Listed on TSCA Inventory**
	CAS# 1310-58-3	**Listed on TSCA Inventory**
Health & Safety Reporting List		None of the chemicals on Health & Safety Reporting List
Chemical Test Rules		None of the chemicals are under Chemical Test Rule
Section 12b		None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule		None of the chemicals have a SNUR under TSCA
CERCLA Hazardous Substances and corresponding RQ's	CAS# 1310-58-3	1000 lb final RQ; 454kg final RQ
SARA Section 302 Extremely Hazardous Substances		None of the chemicals have a TQP
SARA Codes	CAS# 1310-58-3	Immediate, Reactive
Section 313		No chemicals are reportable under Section 313
Clean Air Act		Does not contain any hazardous air pollutants

		Does not contain any Class 1 Ozone depletors
		Does not contain any Class 2 Ozone depletors
Clean Water Act	CAS# 1310-58-3	Listed as a Hazardous Substance under the CWA
		None of the chemicals are listed as Priority Pollutants under the CWA
		None of the chemicals are listed as Toxic Pollutants under the CWA
OSHA		None of the chemicals are considered highly hazardous by OSHA
STATE	CAS# 7732-18-5	Not present on state lists from CA, PA, MN, MA, or NJ.
	CAS# 1310-58-3	Can be found on the following state right to know lists; CA, NJ, PA, MN, MA.
California Prop 65		California No Significant Risk Level: None of the chemicals are listed.

European/International Regulations

European Labelling in Accordance with EC Directives

Classification	Corrosive	
Hazard Symbol	C	
EC Number	215-181-3	
Risk Phrases	R35	Causes severe burns.
	R22	Harmful if swallowed
Safety Phrases	S1/2	Keep locked up and out of reach of children.
	S26	In case of contact with the eyes, rinse immediately with plenty of water and seek medical advice.
	S36	Wear suitable protective clothing.
	S37/39	Wear suitable gloves and eye/face protection.

	S45	In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
WGK (Water Danger/Protection)	CAS# 7732-18-5	No information available
	CAS# 1310-58-3	1
Canada – DSL/ NDSL	CAS# 7732-18-5	Listed on Canada's DSL List
	CAS# 1310-58-3	Listed on Canada's DSL List
Canada - WHMIS	Classification E, D1B	Classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List	CAS# 1310-58-3	Listed on the Canadian Ingredient Disclosure List

Other information

MSDS Creation Date: 09/30/94 MSDS Revised: December 10, 2010

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