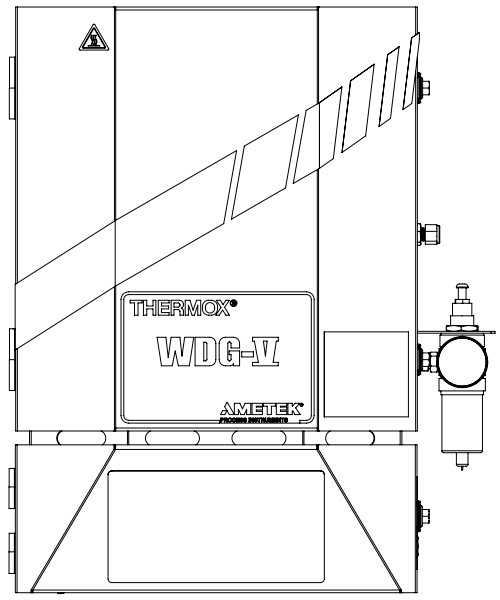
AMETEK®
PROCESS INSTRUMENTS

USER MANUAL

WDG-V, WDG-VC, WDG-VCM, WDG-VM Combustion Analyzer



PN 9000-133-VE, Rev U

To obtain a PDF of this manual, visit our Products page at www.ametekpi.com.

Contents

Safety Notes

WARNINGS, CAUTIONS, and NOTES contained in this manual emphasize critical instructions as follows:

Important information that should not be overlooked.

An operating procedure which, if not strictly observed, may result in personal injury or environmental contamination.

An operating procedure which, if not strictly observed, may result in damage to the equipment.

Burn hazard. Hot surface. Do not touch, allow to cool before servicing.

Electrical Safety

Up to **5 kV** may be present in the analyzer housings. Always shut down power source(s) before performing maintenance or troubleshooting. Only a qualified electrician should make electrical connections and ground checks.

Any use of the equipment in a manner not specified by the manufacturer may impair the safety protection originally provided by the equipment.

Grounding

Instrument grounding is mandatory. Performance specifications and safety protection are void if instrument is operated from an improperly grounded power source.

Verify ground continuity of all equipment before applying power.

Personnel and Equipment Safety Information

This section describes important safety information to avoid personal injury and damage to the equipment while installing, operating, maintaining, or servicing the equipment. All safety regulations, standards, and procedures at the analyzer location must be followed.

All personnel involved with the installation, start-up, operation, maintenance, service, or troubleshooting of the analyzer must review and follow these Warnings and Cautions.

Do Not Operate without Covers
To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Use Caution When Lifting
Use caution when lifting the analyzer from its crate.

Use Proper Attire
Equipment is hot, user should wear protective groves while handling the equipment.

Do Not Operate in Explosive Atmosphere
To avoid injury or fire hazard, do not operate this product in an explosive atmosphere unless you have purchased options that are specifically designed for these environments.

Use Proper Wiring
To avoid fire hazards, use only the wiring specified in the "Installation and Start-Up" chapter of this manual.

Avoid Electrical Overload
To avoid electrical shock or fire hazard, do not apply a voltage to a terminal that is outside the range specified for that terminal.

Ground the Product

Follow the grounding instructions provided in the "Installation and Start-Up" chapter of this manual. Before making connections to the input or output terminals of this product, ensure that the product is properly grounded.

Use Proper Fuse

To avoid fire hazard, use only the fuse type and rating specified for this product.

Use Proper Power Source

Do not operate this product from a power source that applies more than the voltage specified.

Do Not Operate with Suspected Failures

If you suspect there is damage to this product, have it inspected by qualified service personnel.

Important Notice to Users

The following applies to the WDG-V Division 2 Models:

Power, input, and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods [Article 501-4(b) of the National Electric Code, NFPA 70] and in accordance with the authority having jurisdiction.

Explosion hazard – Substitution of components may impair suitability for Class I, Class II, Division 2.

Explosion hazard – When in hazardous locations, turn off power before replacing or wiring modules.

Explosion hazard – Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

This equipment is suitable for use in Class I and Class II, Division 2, Groups A, B, C, D and Groups E, F, G or Nonhazardous locations only.

The maximum ambient temperature for the analyzer is 60 °C (140 °F).

The WDG-V Analyzer and AMEVision Display User Interface is a complex piece of equipment that should only be serviced by a qualified service technician with expertise in instrument technology and electrical systems. AMETEK recommends that all equipment requiring service be sent back to the factory. You should only attempt to repair or service this equipment after receiving training from an AMETEK/P&AI Division training representative. If you decide to service this equipment be aware that high voltages, high temperatures, and other potentially hazardous conditions may arise.

For Class II, Division 2 Hazardous Locations:

1. Where combustible dust has accumulated within the protected enclosure, the protected enclosure shall be opened and the dust removed before pressurizing.

2. Adjacent enclosures connected to the main enclosure shall be permitted to be collectively pressurized to prevent the entrance of dust if there is communication to maintain the specified pressure at all points.

Warning Labels

These symbols may appear on the instrument in order to alert you of existing conditions.

Protective Conductor Terminal
(BORNIER DE L'ECRAN DE PROTECTION)
Schutzerde

Caution – Risk of electric shock
(ATTENTION – RISQUE DE DÉCHARGE ÉLECTRIQUE)
Achtung – Hochspannung Lebensgefahr

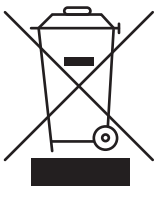
Caution – Refer to accompanying documents
(ATTENTION – SE RÉFERER AUX DOCUMENTS JOINTS)
Achtung – Beachten Sie beiliegende Dokumente

CAUTION – Hot Surface
(ATTENTION – SURFACE CHAUDE)
Achtung – Heiße Oberfläche

Environmental Information – WEEE

This AMETEK product contains materials that can be reclaimed and recycled. In some cases the product may contain materials known to be hazardous to the environment or human health. In order to prevent the release of harmful substances into the environment and to conserve our natural resources, AMETEK recommends that you arrange to recycle this product when it reaches its "end of life."

Waste Electrical and Electronic Equipment (WEEE) should never be disposed of in a municipal waste system (residential trash). The Wheelie Bin marking on this product is a reminder to dispose of the product properly after it has completed its useful life and been removed from service. Metals, plastics, and other components are recyclable and you can do your part by doing one of the following steps:



- When the equipment is ready to be disposed of, take it to your local or regional waste collection administration for recycling.
- In some cases, your "end of life" product may be traded in for credit towards the purchase of new AMETEK instruments. Contact your dealer to see if this program is avail-able in your area.
- If you need further assistance in recycling your AMETEK product, contact us through our Customer Support page at https://www.ametekpi.com/customersupport/requestsupport.

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Overview

Analyzer Operations

Designed for fast response in a wide range of flue gas applications, the analyzer mounts directly on the combustion process to provide continuous measurement of oxygen, or oxygen and combustibles, or oxygen, combustibles, and methane.

A sample is drawn from the process stream by means of an air-operated aspirator and is immediately returned to the process. A portion of this gas rises past the oxygen measuring cell and combustibles detector and returns to the primary loop. All sample wetted parts are heated to 200 °C maintain the sample above the dewpoint of the gas.

Follow these cautions when working on the analyzer:

Do not turn on the aspirator until the analyzer has been turned on and is hot – preferably 24 hours. Also, if you turn off the analyzer or the process is shut down, turn off the aspirator air to avoid plugging problems.

Remove AC power from the analyzer and allow it to cool for at least 90 minutes before performing any maintenance or troubleshooting activities.

The outside of the analyzer cover and all analyzer assembly components are hot during normal operation (up to 260 °C/500 °F inside the cover). Allow analyzer components to cool for at least 90 minutes before working inside the analyzer. Use caution and wear appropriate gloves when handling components or when touching the analyzer cover.

Basic Elements of the Analyzer

The WDG-V series analyzer consists of the following basic systems:

- **Plumbing**
  All inlet and outlet tubing, O_2 cell housing, and the combustibles flow block. Also includes the calibration gas inlet and aspirator assembly, flow sensor, and the aspirator used to pull the sample into the analyzer.

- **Measuring System**
  The oxygen cell, combustibles detector, methane detector, and flow sensor.

- **Temperature System**
  The electrical cell heater (furnace), sensor case heaters, the Type K Thermocouple (maintains cell operating temperature). The sensing cell operates at a constant temperature. The circuit board in the analyzer electronic box switches power to the furnace from the AC mains connected to the analyzer. This board also provides cold junction compensation to the thermocouple circuit.

Analyzer I/O

All required I/O comes with the analyzer. See "About the Analyzer Electronics" for descriptions.

Analyzer Communications

The WDG-V is a complete standalone unit. No separate controller is required.

The analyzer is configured, calibrated and monitored using the MODBUS RTU interface. Communication with the analyzer is provided via the Display User Interface, or the WDG-V Configurator Software via PC (standard with each unit).

How the Oxygen Measuring Cell Works

The sensing element is a closed-end tube made from ceramic zirconium oxide stabilized with an oxide of yttrium or calcium. Porous platinum coatings on the inside and outside serve as both a catalyst and as electrodes. At high temperatures (generally above 650 °C/1200 °F), oxygen molecules coming in contact with the platinum electrodes near the sensor become ionic.

- As long as the oxygen partial pressures on either side of the Cell are equal, the movement is random and no net flow of ions occurs.
- If, however, gases having different oxygen partial pressures are on either side of the Cell, a potentiometric voltage is produced. The magnitude of this voltage is a function of the ratio of the two oxygen partial pressures.
- If the oxygen partial pressure of one gas is known, the voltage produced by the Cell indicates the oxygen content of the other gas. A reference gas, usually air (20.9 % O_2), is used for one of the gases.

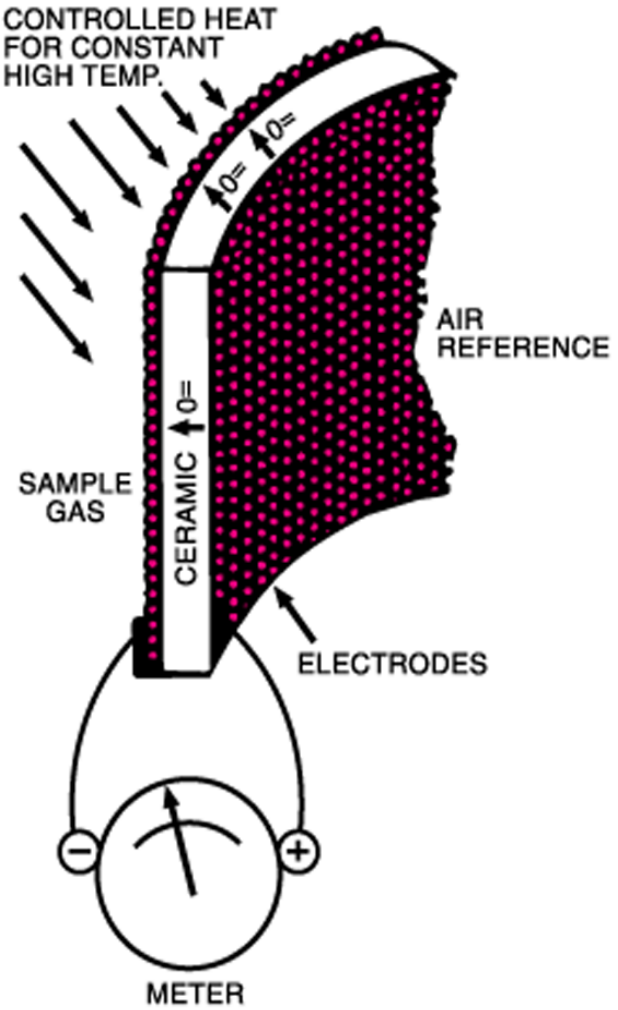


Figure 1-1.
Zirconium Oxide Cell principle of operation.

The voltage of the Cell depends on temperature, and so the Cell is maintained at a constant temperature. The oxygen content is then determined from the Nernst equation:

$$E = \frac{RT}{4F} \ln \frac{O_1}{O_2}$$

where **R** and **F** are constants, **T** is absolute temperature, and $\mathbf{O_1}$ and $\mathbf{O_2}$ are the oxygen partial pressures on either side of the Cell.

Measuring Non-Combustible Gases

For measuring oxygen in non-combustibles gases, the calibration of an analyzer is obtained using the formula:

$$E = A*T*\text{Log} \frac{20.9\%}{O_2\ \text{Unk}\%} \qquad AT = 48.0 \text{ at } 680°C$$

Where **A** is a constant, **T** is the Cell temperature on an absolute scale (°C +273) and $\mathbf{O_2}$ **Unk %** is the unknown oxygen concentration of the gas to be analyzed, and which is calculated by the analyzer.

The Cell produces zero voltage when the same amount of oxygen is on both sides. Voltage increases as the oxygen concentration of the sample decreases. The voltage created by the difference in the sample gas and the reference air is transmitted to the microprocessor control unit and linearized to an output signal.

Because of the high operating temperature of the cell, combustible gases that are present may burn. When this occurs, the cell will generate high millivolts and cause the display to indicate less oxygen than is actually in the gas (net oxygen content).

Hydrocarbons in the Gas Sample

When hydrocarbons are present in the gas sample, a combustion process occurs when this gas sample is exposed to the high temperature of the zirconia cell. An indication that hydrocarbons may be present in the gas sample is that the oxygen reading will be lower than expected. For example, if a calibration gas cylinder has an oxygen value of 20 PPM and 5 PPM of hydrogen (balance nitrogen), the oxygen analyzer will read 17.5 PPM oxygen. The reduction of oxygen is due to the combustion process where 5 PPM of hydrogen will combine with 2.5 PPM of oxygen to form water. Thus, the oxygen analyzer will read 17.5 PPM rather than the actual 20 PPM oxygen.

The amount of oxygen reduction is dependent on the type of hydrocarbons present in the sample gas.

Analyzer Operations – WDG-VCM, Close-Coupled Extractive Flue Gas Analyzer

About the Analyzer Sample System

The WDG-VCM analyzer is ideal for natural gas-fired power boilers or for those using gas during start-up and shut-down. With this analyzer, you can monitor oxygen and combustibles for maximum fuel efficiency. In addition, the methane detector can be used for purge and light off cycles during start-up and shut-down.

WDG-VCM analyzers with a combustibles detector are used for processes that use natural gas for start-up and oil, fuel gas, or coal for primary fuel. Process gas is drawn into the analyzer's primary sample loop by an aspirator and returns to process. Gas enters the split flow block that is separated by a baffle and contacts the hot-wire catalytic combustibles and methane detector. It then passes the Zirconium Oxide cell, where the oxygen concentration is measured, before returning to the main sample loop and then back to the process.

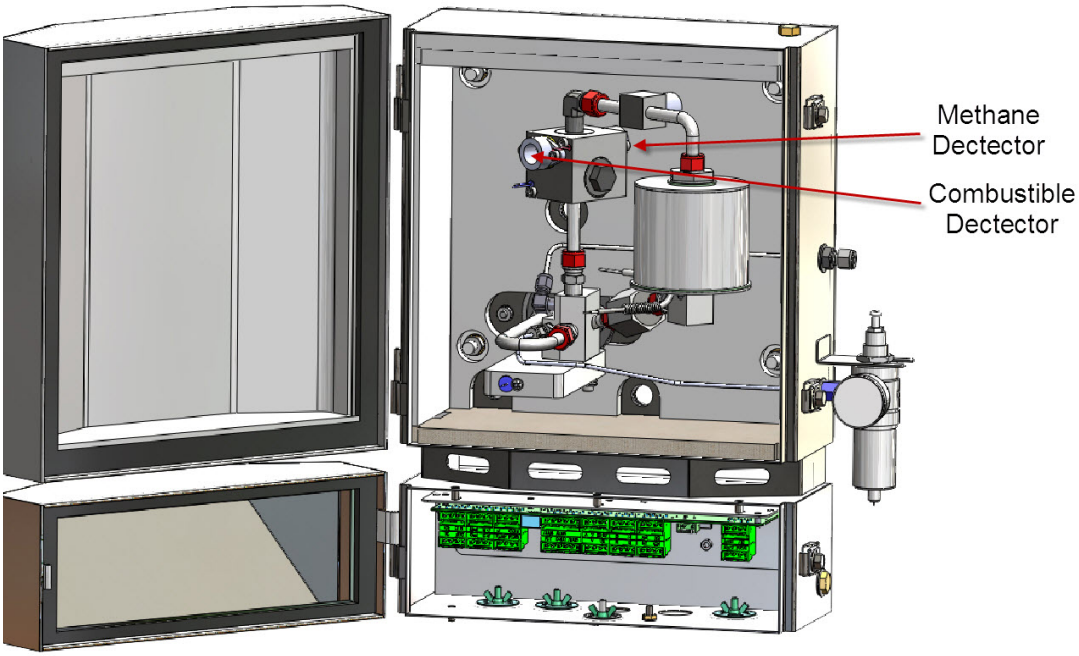


Figure 1-2.
Typical WDG-V Analyzer configuration.

NOTE

Detectors are very delicate and should be handled with care.

Detectors

Component	Function
Combustibles Detector	The Combustibles Detector is a dual element device. The elements differ only in that one is coated with a catalyst. The catalyst causes oxidation to occur at a lower-than-normal temperature. The temperature of the catalyzed element changes as the combustible mixture burns. The temperature change causes the resistance of the catalyzed element to change. The resistance change is interpreted by the microprocessor and the corresponding combustibles reading is displayed. The catalytic combustibles detector will detect combustible gas present in a sample. The sample must, however, contain enough oxygen to fully burn the combustible present. The combustibles detector responds to all unburned combustibles gases. This includes gases such as CO and H_2. You should attempt to match your calibration gas with a mixture of CO and H_2 that most closely matches the combustibles mix in your process. We recommend using an even mixture of CO and H_2 as the combustibles component within your span gas. Examples: • Flue gas containing 1000 PPM CO, 1000 PPM H_2 and 1 % O_2 with an H_2O, CO_2, and N_2 balance will be sensed to contain 2000 PPM combustibles by the catalytic detector (provided the combustibles calibration gas consists of equal parts CO and H_2. • Flue gas containing 1000 PPM CO, 1000 PPM H_2 and 500 PPM O_2 with a H_2O, CO_2, and N_2 balance will be sensed to contain only 1000 PPM combustibles by the catalytic detector, since there is less than stoichiometric oxygen present. In this case, the combustibles detector output will be set to full scale. • If there is little or no other combustible component in the flue gas, the combustibles analyzer can be calibrated on a mixture of CO and air to give a CO measurement.
Methane Detector	The Methane Detector is a dual element device. The elements differ only in that one is coated with a catalyst. The catalyst causes oxidation to occur at a lower-than-normal temperature. The temperature of the catalyzed element changes as the mixture burns. The temperature change causes the resistance of the catalyzed element to change. The resistance change is interpreted by the microprocessor and the corresponding reading is displayed. • The AMETEK catalytic methane detector will detect methane gases present in a sample. The sample must, however, contain enough oxygen to fully burn the methane present. • The methane span gas should be 2 % CH_4 with 8–10 % oxygen present in the mixture.

Flow Sensor

Component	Function
Overview	The aspirator creates a vacuum and pulls the process gas into the analyzer. There are two paths for the gas to take. • Immediately back to the process gas. • Through the sample loop, past the cell and/or combustible detector. Calibrated at the factory, the flow sensor (see Figure 1-3 for location) measures the sample flow through the sample loop. The flow measurement is updated every 90 seconds. This delay is used to allow the analyzer to effectively auto-zero to prevent false alarms.

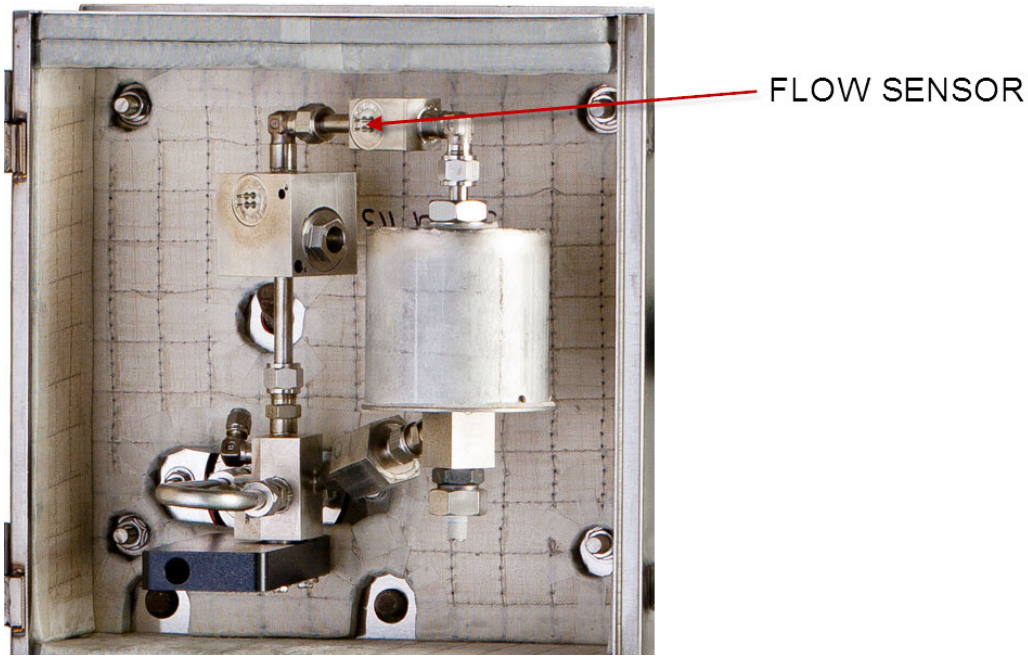


Figure 1-3.
RTD Flow Sensor.

Temperature Sensors

There are two tightly controlled temperature zones in the WDG-V. The Oxygen Cell Temperature and the combustible block temperature (WDG-VCM units only). (On Oxygen-only units the box temperature is controlled with an RTD mounted on the aspirator block.)

Component	Function
Cell Temperature	The Oxygen cell is controlled to 680 °C. The cell temperature is measured by dual, Type K Thermocouples. Dual Thermocouples are used for self check of the cell temperature. The Thermocouples are collocated in a single assembly. There is no distinction between the two Thermocouples as they are effectively at the same location in the assembly.
Combustibles/ Box Temperature	The combustible block/box temperature is controlled to 225 °C. This temperature is measured by 100 ohm platinum RTD. The RTD is embedded in the combustible block. On Oxygen-only units, the RTD is mounted on the aspirator block. All internal plumbing components are maintained above 200 °C.

Heaters

There are two main heaters in the WDG-V, the cell heater and box heater. In WDG-VCM units, an additional heater is used for fine temperature control of the combustible block.

Component	Function
Cell Heater	The Oxygen Cell heater is a 300 W coil heater encompassing the cell housing and providing precision heat to the oxygen cell.
Box Heater	The box heater is a 350 W cartridge heater located in the aluminum heater block at the bottom of the aspirator. This heater provides the heat for the enclosure to maintain all plumbing components above 200 °C. The combustible heater is a 50 W heater used for precise temperature control of the combustible block.

About the Analyzer Electronics

Component	Function
General	• One assembly – mounted to a plate • The electronics/software completely control the analyzer. No external controllers are required. • The configuration/monitoring interface to the electronics is RS-485 MODBUS RTU. • Analyzer wiring and Customer wiring (i.e. power, I/O) are directly connected to the main electronics. - Connections are pluggable. - Both plugs and headers are laser printed for easy matching.
I/O	The WDG-V has the following I/O available: • Three (3) configurable 4–20 mA outputs • Two (2) system alarm relays (Service and Data Valid) • Three (3) configurable process alarm relays • One (1) RS-485, 2 wire, MODBUS RTU interface (57.6 Kbaud) • One (1) contact input (for remote auto calibration trigger) • Valve controls for Remote Calibration Unit (RCU)
Current Outputs	There are three (3) analog outputs in the WDG-V. Each analog output can be configured for Mode, Function, and Span, Zero. Mode options include 0–20 mA, 4–20 mA, and NAMUR. Functions include oxygen, cell millivolts, combustibles*, methane*. The analog outputs can be powered internally or externally. External power must be greater than 26 V. Refer to "Standard Current Outputs" in Chapter 2 for more information. ** For combustible and/or methane units only.*

Alarm Contact Connections

The WDG-V Analyzer has five (5) alarm contacts, one (1) Service alarm, one (1) Data Valid alarm, and three (3) configurable process alarms.

Standard Alarm Connections	
Service Alarm Relay	This relay is used to determine if there is a problem with the analyzer. This relay is normally open. Contacts are closed when in normal mode. The relay will be open when there is a problem with the analyzer or on loss of power.
Data Valid Relay	This relay is used to determine if the output is representative of the process. This relay is normally open. Contacts are closed when in normal mode. Contacts are open when there is a problem with the analyzer, when the analyzer is calibrating, warming up, when the analyzer is in diagnostic mode, or on loss of power.

Remote Calibration Unit (Optional)	
Contact Input	There is one Contact Input peripheral on the WDG-V. An auto calibration can be initiated using the contact input peripheral. (Only with the RCU option). Auto calibration must be selected in the **Configuration** menu.
Remote Calibration Unit Interface	The WDG-V has five solenoid valve drivers that are compatible with AMETEK's Remote Calibration Unit (RCU). See "Remote Calibration Unit Connections" in Chapter 2 for wiring/interface details.

Communicating With the Analyzer

Component	Function
WDG-V PC Configurator Software	The WDG-V is configured, calibrated, and monitored via the MODBUS RTU interface. AMETEK provides two options for communicating with the WDG-V: • Display User Interface (refer to the AMEVision Display User Interface *User Manual*, AMETEK PN 9000-165-VE). • WDG-V Configurator Software via PC, provided with each unit (refer to the AMETEK PC Configurator Software *User Manual*, AMETEK PN 9000-231-VE). The interface is industry standard MODBUS, which allows customized user software. Contact AMETEK Service for the MODBUS register definitions.
Display User Interface	This user interface option consists of a separate, remotely mounted graphical user interface Display Unit with keypad that can be used to communicate with the analyzer. Communication options include MODBUS (RTU), Web Interface (TCP/IP), or a USB Flash Drive. Refer to the AMEVision Display User Interface *User Manual* for a complete description of how to navigate through the software while configuring or calibrating the analyzer, or simply viewing analyzer data.
Communications Interface	There is one communications interface on the WDG-V. RS-485 MODBUS RTU Configuration: - Two wire - 57.6 Kbaud - No parity - One stop bit

Flame Arrestors

Component	Function
Flame Arrestors	The WDG-V Analyzer contains two flame arrestors to prevent it from being an ignition source to the process for short periods of high combustible levels (25 % of LEL – Lower Explosive Limit) in the process. The flame arrestors are not, however, intended to protect the process where the combustibles levels are constantly high.

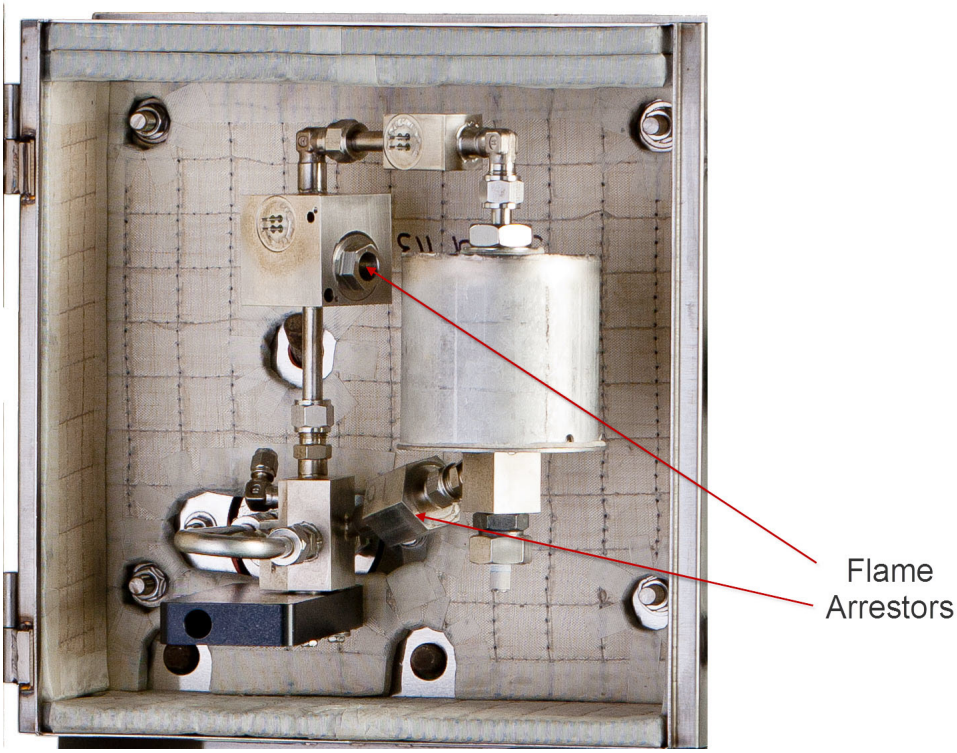


Figure 1-4.
Flame Arrestors.

Working in This Manual

While working in this manual, icons in the page margins represent various kinds of information that serve as reminders or extra information about the topic, or navigation information when working from the systems that use the PC Configurator Software or Display User Interface. See the appropriate manual for more information.

Example:
See "Leak Check" in Chapter 3.

Reminder icon:
These reminders indicate related information about the topic, certain actions that are necessary before continuing with the current procedure, or information that is recommended by AMETEK. See example at left.

Example:
Calibration→Cal Gas Values

User Interface Navigation icon:
While working from the PC Configurator Software or Display User Interface, use these navigational aids to quickly access software screens. See example at left.

Supplemental Information – Where Can I Find It?

Some analyzers are configured with optional equipment or functionality that may require supplementary information. The analyzer *User Manual* and this extra information (which is not part of the main manual) is shipped with all analyzers with optional equipment or functions. This Supplemental Information is contained in a Documentation Package folder shipped with the manual.

This Supplemental Information can consist of self-contained documents called *Manual Supplements* that describe and illustrate installation, operation, and maintenance procedures for optional equipment that make up your sample system. Examples of *Manual Supplements* include a non-standard Measuring Cell, non-standard or optional equipment, analyte-specific applications, or information that is intended to replace similar information in the manual.

Installation and Start-up

This chapter describes how to install the WDG-V Analyzer components and Display User Interface.

If you have an Oxygen-only analyzer without the combustibles option, the combustibles and methane options described in this chapter do not apply. The combustibles and methane sections are clearly identified. Likewise, if you have the combustibles option, but not the methane option, you can skip all sections pertaining to methane.

Safety Considerations

Before beginning the installation of the analyzer and before powering it up, review and follow all safety information following the Table of Contents near the beginning of this manual. This information describes procedures to follow to avoid personal injury and/or damage to the equipment. All regulatory agency and personnel safety procedures for your jurisdiction must be followed.

The installation of the analyzer must be in accordance with all of the customer and local regulatory standards and procedures. There are no operator-serviceable components inside the analyzer. Refer all servicing to qualified personnel.

Do not turn on the aspirator until the analyzer has been turned on and is hot – preferably 24 hours. If you turn off the analyzer or the process is shut down, turn off the aspirator to avoid plugging problems.

Personnel Technical Level Required for Installation

The operations in this section should be performed only by qualified service personnel experienced in electrical safety techniques. Never service the analyzer unless power has been removed from the analyzer, and the analyzer has been allowed to cool for at least 90 minutes. Also, always use gloves when working on the analyzer.

Storage Prior to Installation

If the analyzer is stored for any period of time prior to installation, store the equipment in an environment where it is not subject to dripping or splashing liquids, corrosive gases, high humidity, or excessive heat or cold. Recommended storage conditions include:

Temperature:	0 °C to 50 °C (32 °F to 122 °F)
Relative Humidity:	<90 %

Failure to comply with these storage conditions will void your warranty.

Analyzer Site Preparation

Observe the following guidelines when selecting an analyzer installation location:

- Select a readily accessible position for the analyzer to allow for routine maintenance. Comfort levels for maintenance personnel should be considered in placement of the analyzer and Display User Interface.
- The installation location should be free from excessive vibration and the ambient temperature is required to be within the WDG-V specification limits. If the ambient temperature is outside the specified limits or the vibration is excessive, contact the AMETEK Sales or Service Department to discuss solutions and special options to address ambient temperatures outside the listed specifications.

Unpacking and Inspecting the Equipment

Remove any packing material from the WDG-V Analyzer shipping crate. Check for damage. If equipment is damaged, notify the carrier and contact AMETEK Service (https://www.ametekpi.com/customersupport/requestsupport) immediately if parts are missing or damage is found, and to verify if damaged parts will require replacement prior to safely installing and operating the analyzer/ equipment.

Tools, Equipment, and Supplies Required for Installation

To install the analyzer you need the following tools, equipment, and supplies:

- Set of open-end wrenches for fittings.
- Set of metric hexagonal wrenches.
- Set of ball drivers.
- Wire cutters, strippers, and crimpers.
- Flat blade instrument screwdriver.
- Soft, nonabrasive cloth.
- Wrist strap (for grounding).
- Detergent-based leak detector (Snoop® or another suitable leak detection agent is permissible).

Common Operator Errors

If you follow the steps below, your analyzer will operate with a minimum of maintenance and troubleshooting.

- Connect the air supply to the Aspirator air supply inlet but **do not turn on the air until the analyzer is at operating temperature**. If the analyzer is turned off or the process is shut down, the Aspirator air should be turned off to avoid plugging problems.

- If your process is running and the analyzer is installed on the process, the analyzer must have power applied to it to prevent plugged plumbing and analyzer component damage. The case heaters must be on if the process is running to maintain analyzer plumbing above 200 °C.

- Do not use pipe dope or any other contaminant that gives off combustible vapor on any joints of the sample tubing.

- For O_2 calibration gases, do not use calibration gases to check analyzers if they contain a mixture of oxygen and combustibles. Note, however, that this is acceptable for combustibles span gases (used only if you purchased the combustibles option).

- Always introduce calibration gases at the recommended flow rate of 3.0 SCFH.

- When working on the plumbing inside the analyzer cabinet, turn the power off.

- Use caution if performing maintenance on the analyzer while the process is running. Removing any part of the analyzer can allow process gases and gases of high temperature to escape into the analyzer.

- Do not handle the cell excessively. Do not try to clean the cell except by rinsing. If you need to handle the cell, grasp by touching the seal fitting at the top; never touch the bare part of the cell.

- Do not remove a cell or Type K Thermocouple that you may want to use again when the inside of the furnace is still hot – severe thermal shock can be destructive to either of them.

- Always replace the metal cell o-ring when replacing the oxygen cell.

Installing the Mechanical Components

This section describes how to mount and connect gases to your WDG-V Analyzer.

Installing the Sample Inlet Probe

NOTE

For some applications, you must first connect the sample inlet probe to the analyzer before mounting the analyzer. The same applies if you are installing the probe heater or exhaust tube. Therefore, these subjects are discussed before the sections on how to mount the analyzer to the process.

NOTE

Orient the probe so that the longer side faces the gas flow.

The sample inlet probe transports the sample gas gets to the analyzer. Aspirator air within the analyzer is used to pull process gas from the sample probe into the analyzer. The sample inlet probe is identified by the threads on both ends.

- Figure 2-1 shows how to install the standard 1/8" NPT probe and optional exhaust tube.
- Figure 2-2 shows how to install a ceramic or long probe.
- Figure 2-3 shows port locations on the rear of the analyzer.

You can connect the probe to the analyzer before mounting the analyzer unless the probe is either very long or made of ceramic. In that case you should mount the analyzer first and then install the probe.

Standard 1/8" NPT Probe Installation

To connect a standard 1/8" NPT sample inlet probe to the analyzer:

If your probe is four feet in length or less, simply screw the probe into the back of the sample probe port on the rear of the analyzer, then mount the analyzer (see Figure 2-1).

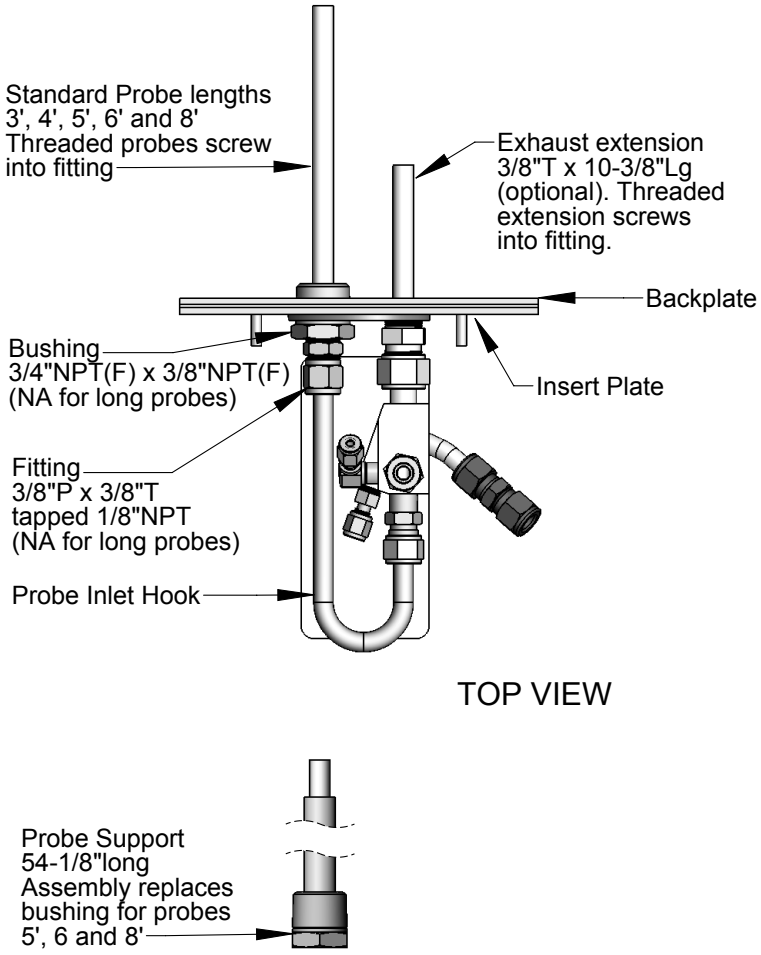


Figure 2-1.
WDG-V Probe installation.

Ceramic Probe or Long Probe Installation

If you ordered a long probe or a ceramic probe, connect the probe to the analyzer as follows:

1. Mount the analyzer. See "Installing the Analyzer" later in this chapter for help. Note that if you are installing the probe heater or exhaust tube, you must connect these items to the analyzer before mounting the analyzer.

2. Remove the Probe Inlet Hook from the analyzer as shown in Figure 2-2. To do this, loosen the fitting connecting the inlet hook to the aspirator block and pull the hook out of the analyzer.

3. Unscrew the bushing that was plugged into the analyzer inlet port and discard. The probe comes with its own bushing and fitting.

4. Thread the probe into the analyzer inlet port on the analyzer backplate. Do not let the probe hit against the provided pipe nipple as you insert the probe into the process. If inserting a ceramic probe, you must slowly insert it into a hot process to prevent the probe from cracking due to thermal shock.

5. Reconnect the Probe Inlet Hook to both the analyzer backplate and the aspirator block and tighten.

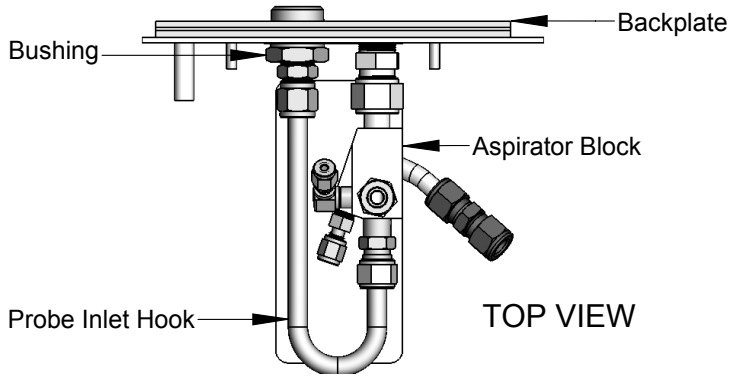


Figure 2-2
WDG-V ceramic probe installation - top view.

Probe Heater Installation (Optional)

Do not install the probe heater if your sample gas contains a potentially explosive mixture of combustibles; the probe heater can heat the flue gas to the point of ignition.

The probe heater must be connected to the analyzer before mounting the analyzer to the process.

For installations where a standard setup allows the sample gas to cool below its acid dewpoint before reaching the analyzer, you can attach the optional probe heater to the Probe Heater Port on the backplate of the analyzer to heat the sample gas (see Figure 2-3). This will prevent plugged plumbing due to condensation of the sample gas. For example, when a fuel containing only a few thousand parts per million of sulfur is burned with a high level of excess oxygen (over 4 %), the resulting sulfuric acid mist may condense at temperatures as high as 175 °C.

The probe heater comes shipped in an envelope, is 8.5" long, has a 3/8" NPT bushing and wires leading out of it.

To install the probe heater:

1. Remove and discard the plug from the Probe Heater Port as shown in Figure 2-3. This port is plugged during shipment and should remain plugged if no probe heater is installed.

2. Screw the probe heater into the 3/8" NPT Probe Heater Port.

3. Route the wires from the probe heater to the electronics enclosure.

4. Remove the electronics box cover and connect the wires to an AC power source.

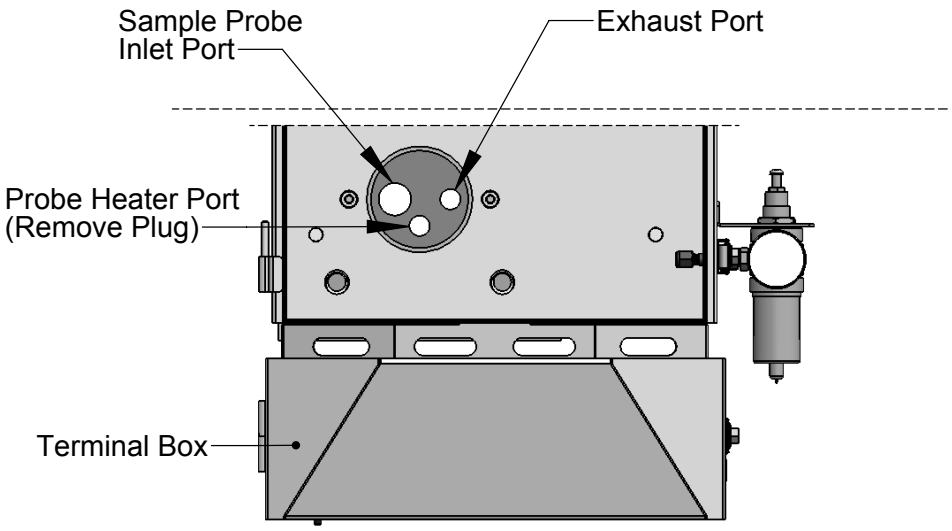


Figure 2-3.
Port locations on rear of analyzer – front view.

Installing the Exhaust Tube (Optional)

If installing an exhaust tube, you must connect it to the analyzer before mounting the analyzer to the process.

An optional stainless steel exhaust tube is available (PN 70619KE), which allows you to extend the aspirator exhaust.

To install the exhaust tube, thread the exhaust tube into the exhaust port on the rear of the analyzer as shown in Figure 2-4.

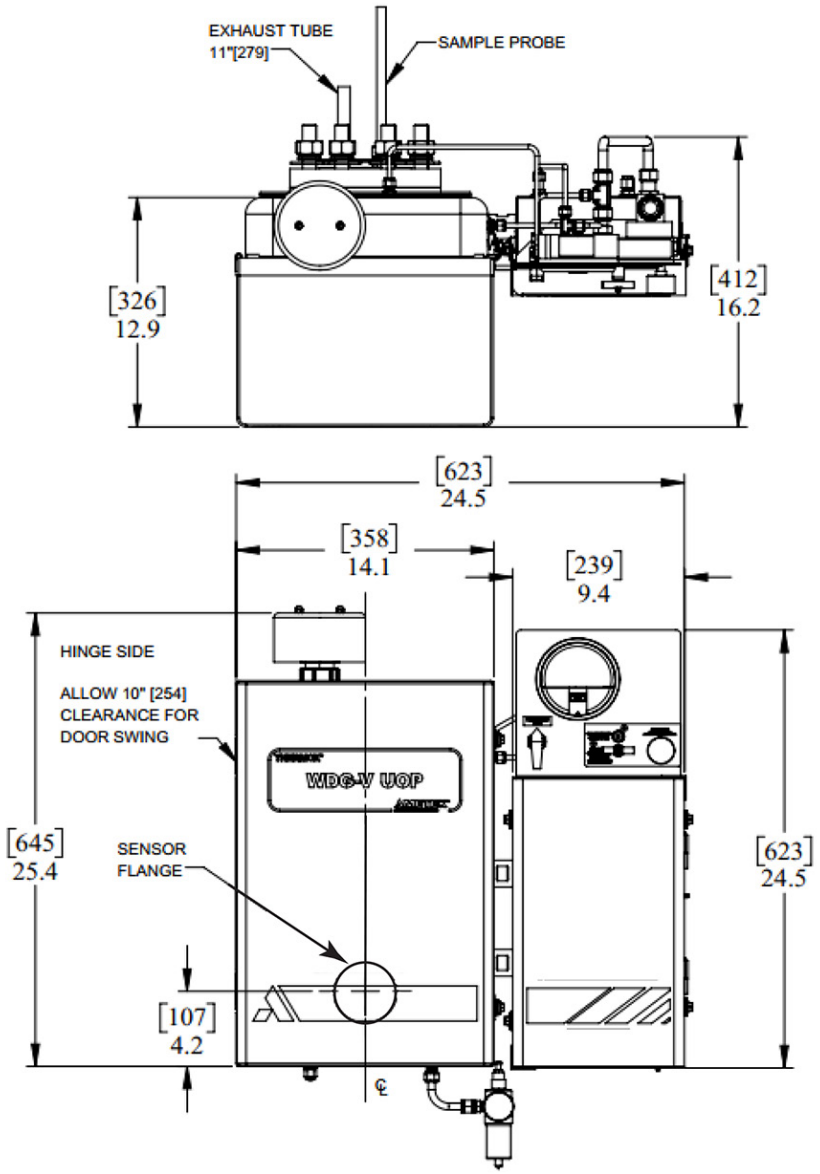


Figure 2-4.
Mounting dimensions – Hinged analyzer.

Installing the Analyzer

- The analyzer ambient temperature range is -25 °C to 65 °C.
- For purged units, the analyzer ambient temperature range is -20 °C to 60 °C.
- When installing a probe heater or exhaust tube along with the analyzer, attach it to the back of the analyzer before mounting the analyzer to the process.

Do not open a Z-purge, hinged-analyzer enclosure door until you first verify that the area has been classified as nonhazardous.

Methods for Mounting the Analyzer

There are three methods for mounting a WDG-V Analyzer to the process. Each method is explained in the following pages. Mounting dimensions for the hinged style enclosure, including the Z-purge option, are provided in Figure 2-5.

If the protection nipple provided by AMETEK extends past the inside of the refractory wall on a process that has a gas temperature over 650 °C (1200 °F), the nipple should be cut down before installation to ensure it remains flush with the inside wall.

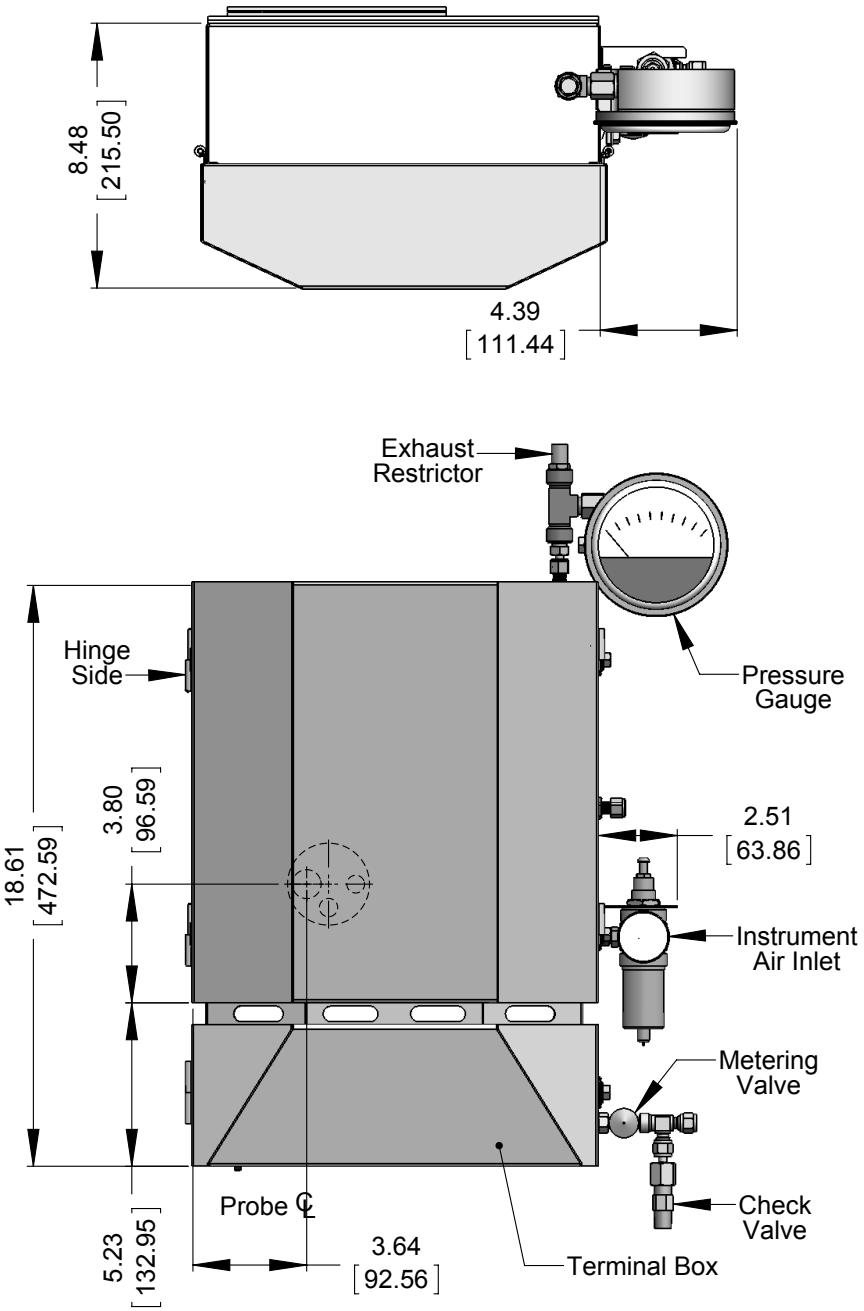


Figure 2-5.
Mounting dimensions and Exhaust tube location.

NOTE

A 7/16" wrench is required to open both analyzer doors.

Analyzer Flush Mounting (Preferred Method)

Weld the 17.78 cm x 19.37 cm (7" x 7 5/8") mounting plate (P/N 70626SE) supplied with the analyzer to the process wall over a 9.52 cm (3 3/4") diameter hole as shown in Figure 2-6. Then bolt the analyzer to the mounting plate.

The flush mount method is preferred because it positions the analyzer as close to the process as possible and minimizes the chances of the sample gas cooling below its dewpoint.

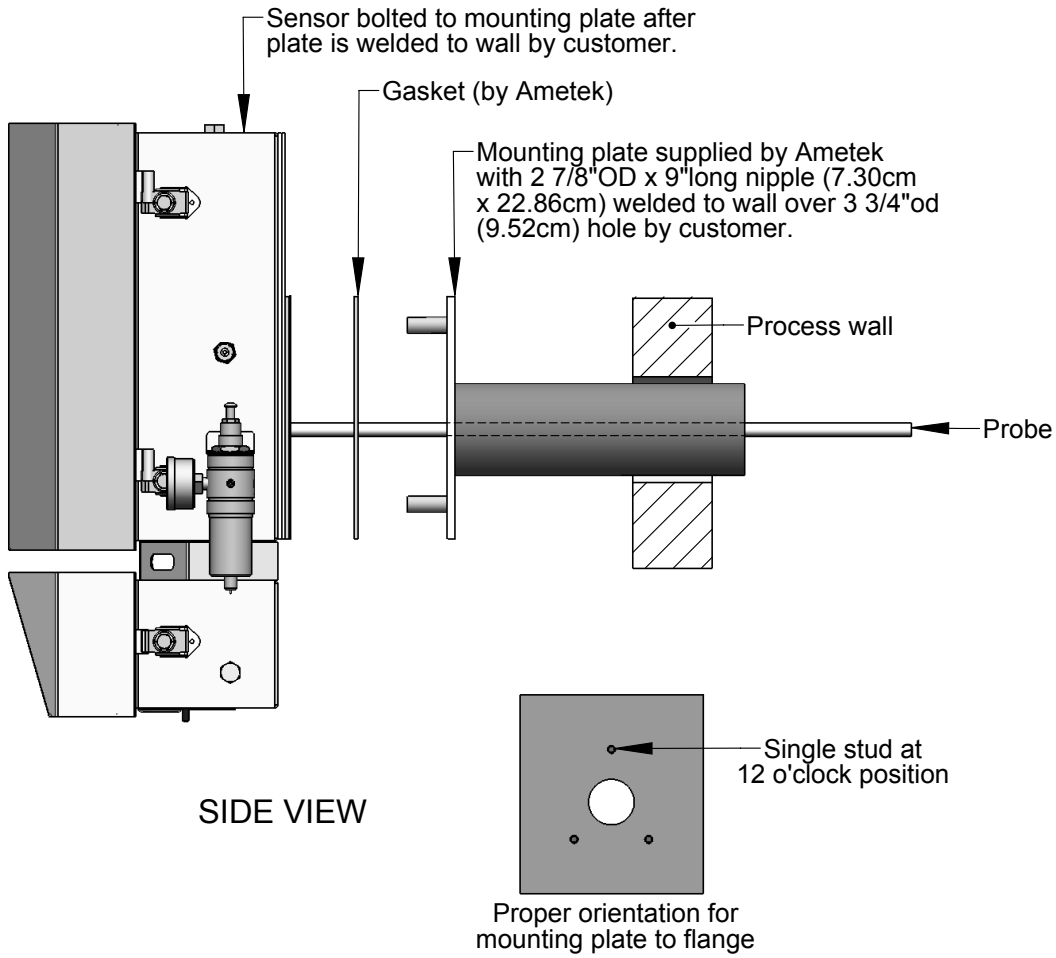


Figure 2-6.
WDG-V Analyzer flush mount (preferred).

Customer-Supplied Pipe Nipple Analyzer Mounting

If you can't mount the analyzer flush with the process as described under "Analyzer Flush Mounting (Preferred Method)" – for example, the process wall is curved sharply, covered with insulation, or obstructed with reinforcing members – you can instead:

1. Weld a short 8.89 cm (3 1/2") diameter pipe nipple to the process wall and make sure to extend the nipple through the skin of the process (see Figure 2-7).

2. Weld the 17.78 cm x 19.37 cm (7" x 7 5/8") supplied plate to the end of the nipple, taking care to center it over the hole.

3. Wrap the nipple with at least 2.54 cm (1") weatherproof insulation and heat trace it.

4. Bolt the analyzer to the plate.

If mounting the analyzer using this method, you can also install the probe heater to minimize the possibility of the sample gas cooling below its dew-point.

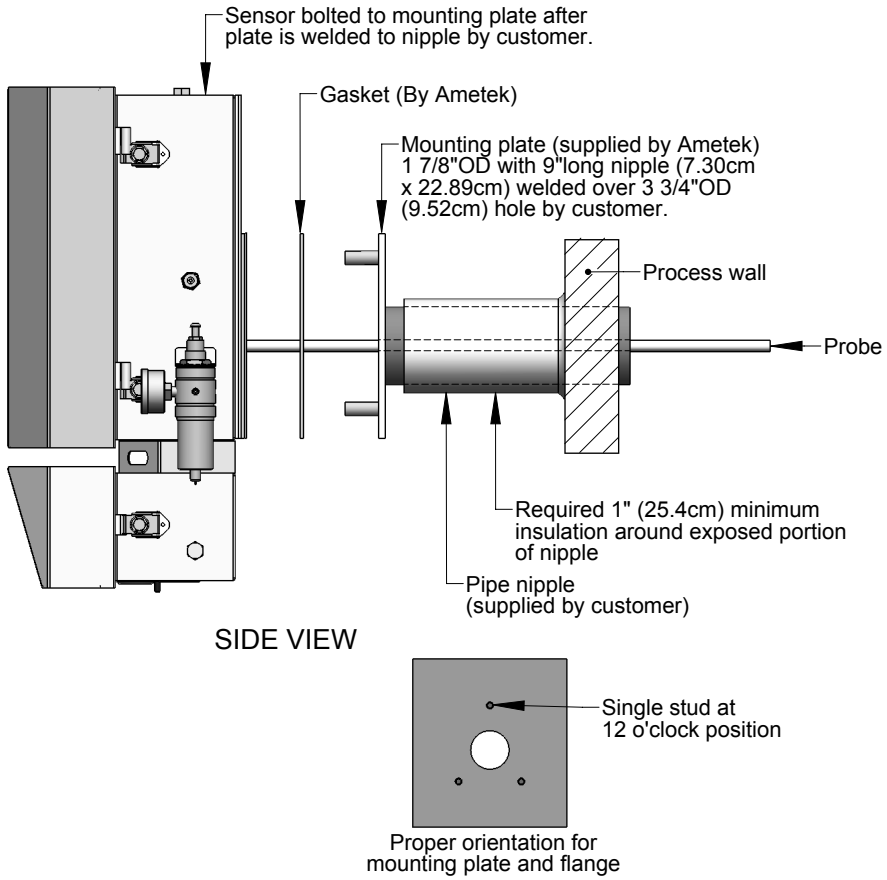


Figure 2-7.
WDG-V Analyzer pipe nipple mount.

Customer-Supplied Flange Analyzer Mounting

If using a 7.62 cm (3") x 300# customer-supplied flange to mount the analyzer, you will not need the AMETEK-supplied mounting plate with attached protective pipe nipple. If you have a different type of flange, AMETEK supplies a number of flange adapters.

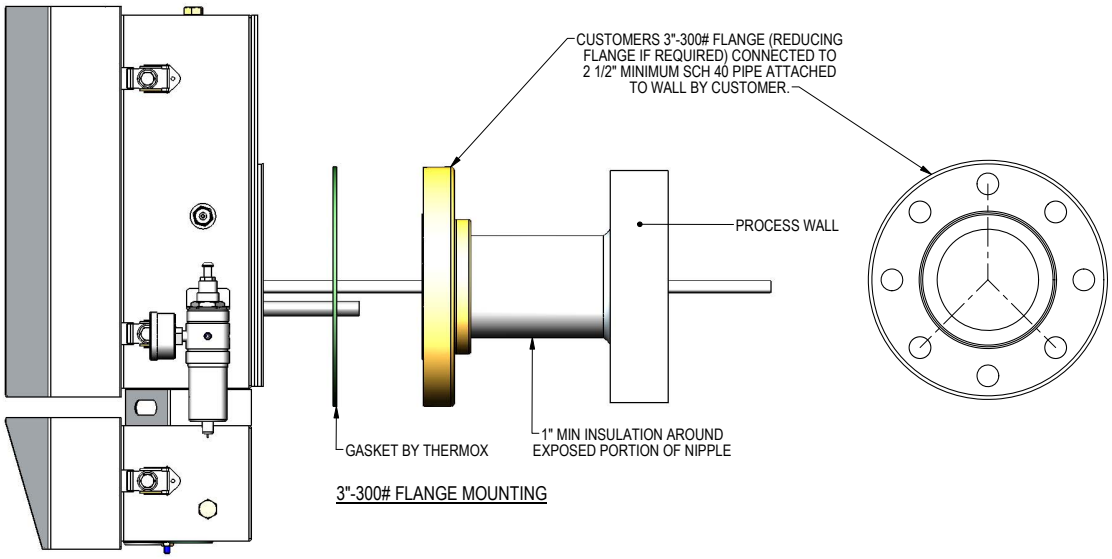


Figure 2-8.
WDG-V Analyzer flange mount.

Installing the Remote Calibration Unit (Optional)

Do not turn on the aspirator until the analyzer has been turned on and is hot – preferably 24 hours. If you turn off the analyzer or the process is shut down, turn off the Aspirator air to avoid plugging problems.

Remote calibration unit (RCU) mechanical installation includes the following:

- Mounting the RCU.
- Plumbing calibration gases to the RCU.
- Plumbing the RCU to the analyzer.

This section describes instructions for *Standard* RCU and *Combustibles* RCU mechanical installation. Follow the section that applies to the type of RCU used in your application.

Standard RCU Installation

Figure 2-9.1 shows mounting dimensions for a Standard RCU. Use two (2) #10 screws to mount the RCU. Note that in Figure 2-9.1 only the top left and lower right holes are used; the other holes secure the RCU to its mounting plate. The ambient temperature range for the RCU is -20 °C to 70 °C. Mount the RCU as close to the analyzer as possible. Shorter calibration plumbing improves response times, reduces calibration gas expense, and reduces the chance of contaminants in the calibration gas plumbing.

To install the RCU:

1. Connect the O_2 span gas, if other than instrument air, to the alternate O_2 span gas inlet.
2. Connect the O_2 zero calibration gas to the O_2 zero gas inlet connection on the RCU.
3. Connect the combustibles span calibration gas to the combustibles span gas inlet on the RCU. For a WDG-V analyzer with RTD-type combustibles detector, the combustibles span calibration gas would also include the methane span calibration concentration.
4. Using appropriate tubing, connect the calibration gas outlet on the right side of the RCU to the calibration gas inlet on the analyzer. See Figure 2-12 for analyzer calibration gas inlet connection.
5. Using appropriate tubing, connect the Aspirator air outlet on the right side of the RCU to the Aspirator air inlet connection on the analyzer.

For information about RCU electrical connections, refer to "Remote Calibration Unit Connections" in this chapter.

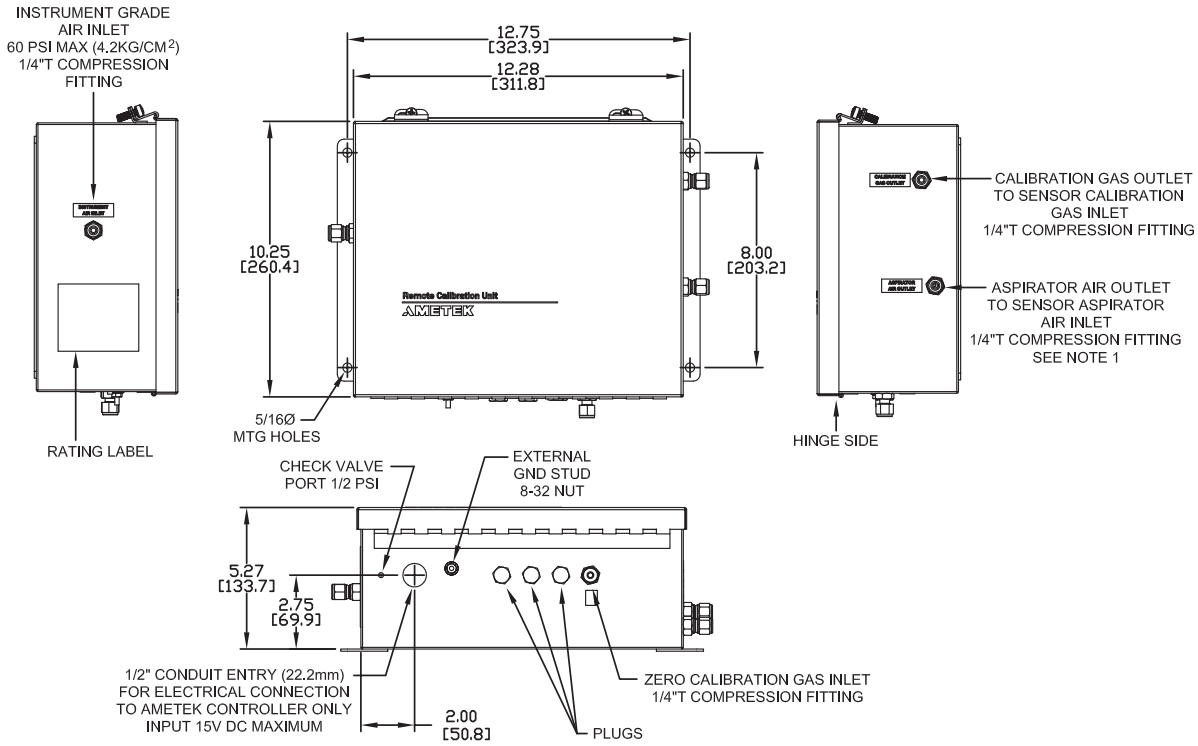


Figure 2-9.1.
RCU mounting dimensions,
Standard (O_2) RCU.

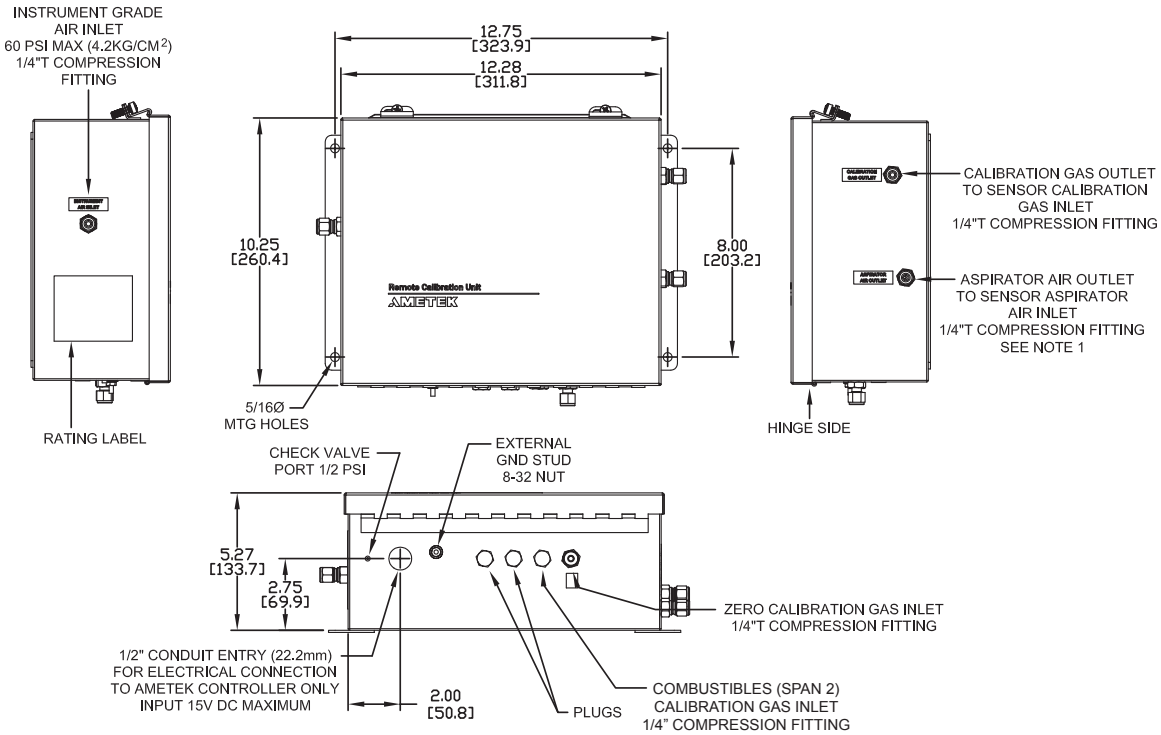


Figure 2-9.2.
RCU mounting dimensions,
Combustibles RCU.

Combustibles RCU Installation

Figure 2-9.2 shows mounting dimensions for the Combustibles RCU. Mount the RCU as close to the analyzer as possible. Shorter calibration plumbing improves response times, reduces calibration gas expense, and reduces the chance of contaminants in the calibration gas plumbing. The ambient temperature range for the combustibles RCU is -20 °C to 70 °C.

Make the following calibration gas connections to the combustibles RCU (see Figures 2-10.1, 2-10.2, and 2-10.3 for various Flow Diagram configurations):

1. Connect the O_2 span gas, if other than instrument air, to the alternate O_2 span gas inlet.

2. Connect the O_2 zero calibration gas to the O_2 zero gas inlet connection on the RCU.

3. Connect the combustibles span calibration gas to the combustibles span gas inlet on the RCU (Figures 2-9.2 and 2-10.2). For a WDG-VCM analyzer with RTD-type combustibles detector, the combustibles span calibration gas would also include the methane span calibration concentration (Figure 2-10.3).

4. Using appropriate tubing, connect the calibration gas outlet on the right side of the RCU to the calibration gas inlet on the analyzer (see Figure 2-12) for analyzer calibration gas inlet connection.

5. Using appropriate tubing, connect the Aspirator air outlet on the right side of the RCU to the Aspirator air inlet connection on the analyzer.

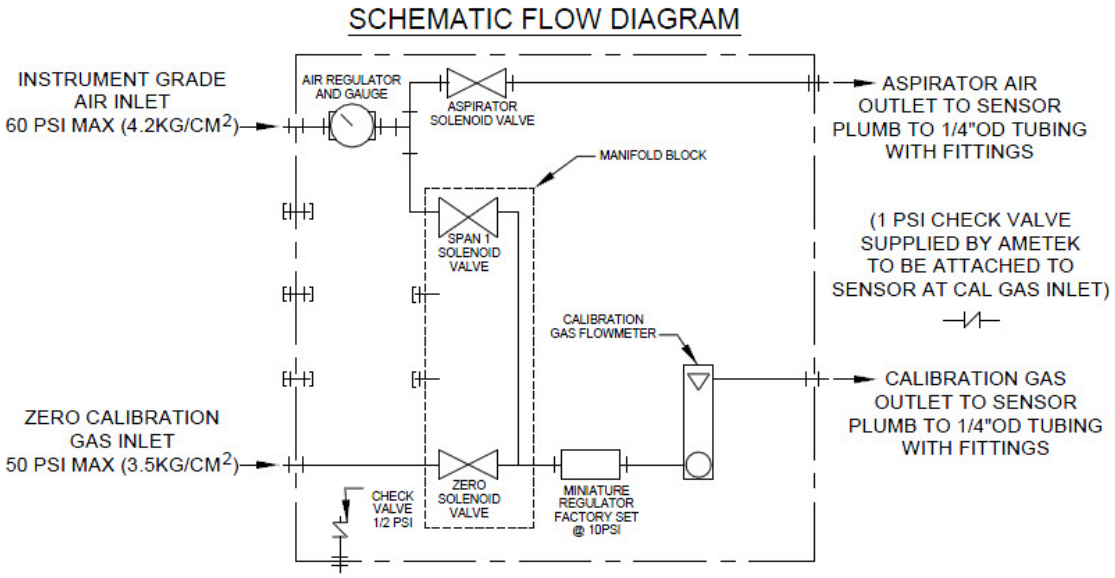


Figure 2-10.1.
RCU flow diagram (Single Span).

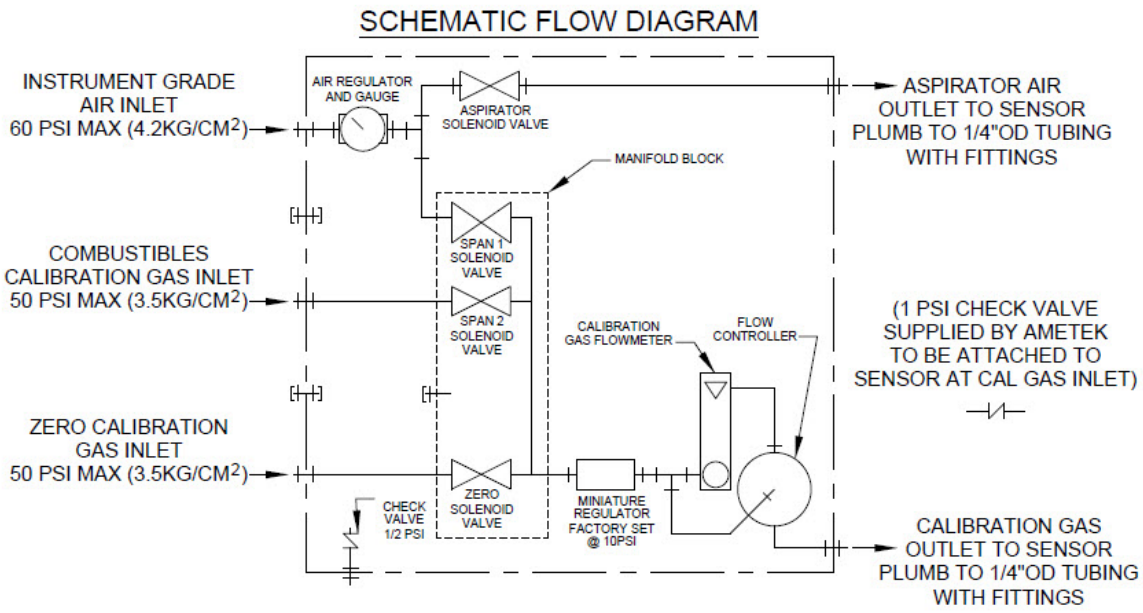


Figure 2-10.2.
RCU flow diagram (2 Span), Combustibles.

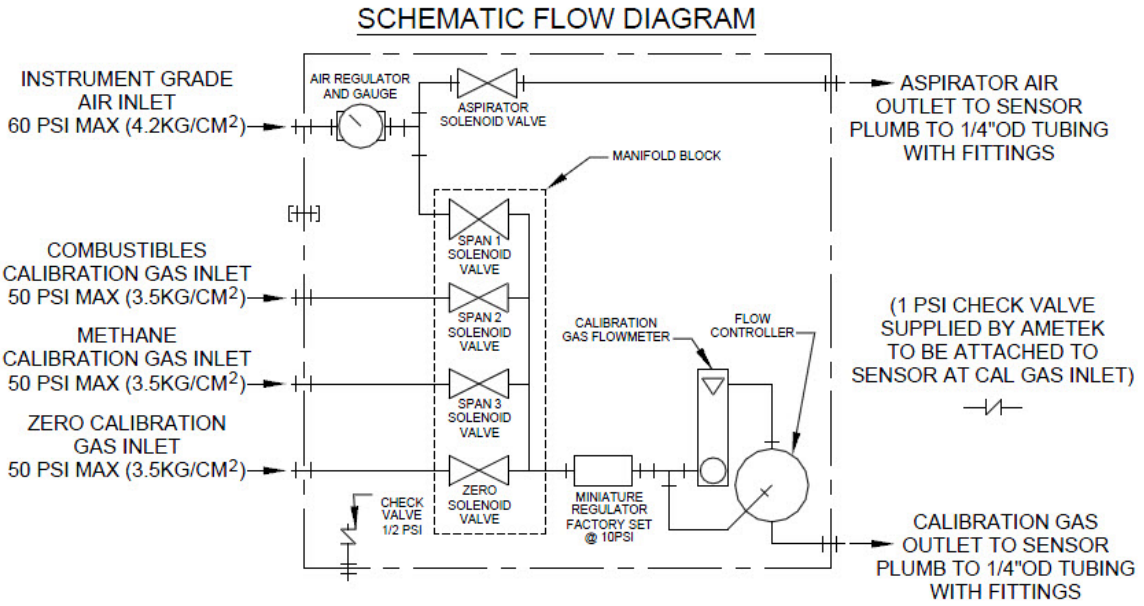


Figure 2-10.3.
RCU flow diagram (3 Span), Combustibles and Methane.

Calibration/Aspirator Air

Required Calibration Gases and Tubing

See Specifications for information on calibration gases. The span gas is the high gas; the zero gas the low gas.

The span gas must be 10 times greater than the zero gas. For example, if the zero gas is 1 % O_2, the span gas must be 10 % O_2 or higher.

- *O_2 Span Gas*
  Instrument air (20.9 %) or from 1.0–100 % O_2.

- *O_2 Zero Gas*
  From 0.1–10 % O_2, balance N_2

- *Combustibles Span Gas*
  If using a WDG-VC analyzer, you must also have a combustibles span gas:

  - 60 to 80 % of the full combustibles operating range in certified mixtures of CO, with an equal amount of O_2, balance N_2.

    For example, if using an operating range of 0 to 2000 PPM combustibles, use 1200 PPM CO, 1 to 2 % O_2, balance N_2.

Methane Span Gas

If using a WDG-VCM analyzer, you also must have a methane span gas:

- 2 % CH_4, 8 to 10 % O_2, balance N_2.

Z-Purge Connections (Optional)

- Connect instrument air to the analyzer Z-purge inlet. Maintain the pressure and flow as directed on the Z-purge warning label.
- You must provide a protective gas supply with an alarm for a loss of pressure indication in order to meet regulatory requirements.
- You must not exceed the maximum temperature rating listed in the specifications.
- Process pressure is assumed to always be subatmospheric (vacuum) unless the High-pressure option is installed.
- The protective gas supply shall be equipped with an alarm to indicate failure of the protective gas supply to maintain the minimum pressurized enclosure pressure.
- The indicator shall be located for convenient viewing.
- The indicator shall indicate the enclosure pressure.
- The sensing point for the indicator shall be located to take into account the most onerous conditions of service.
- There shall be no devices between the pressurized enclosure and the protective gas supply alarm other than an isolating valve and/or a pressure of flow controlling mechanism.
- Any isolating valve shall:
  - Be marked
    WARNING – PROTECTIVE GAS SUPPLY VALVE -
    FOLLOW INSTRUCTIONS BEFORE CLOSING
  - Be capable of being sealed or secured in the open position.
  - Have an indication of whether it is open or closed.
  - Be located immediately adjacent to the pressurized enclosure.
  - Be used only during servicing of the pressurized enclosure.
- Any pressure or flow controlling mechanism, if adjustable, shall require a tool to operate it.
- No filters shall be fitted between the pressurized enclosure and the protective gas system alarm.
- No isolating valve shall be fitted between the indicator and the pressurized enclosure.

- The WDG-V Analyzer contains two flame arrestors to prevent it from being an ignition source to the process for short periods of high combustible levels (25 % of LEL – lower explosive limit) in the process. The flame arrestors are not, however, intended to protect the process where the combustibles levels are always high.

WARNING

Do not install the probe heater if your sample gas contains a potentially explosive mixture of combustibles; the probe heater can heat the flue gas to the point of ignition.

Z-Purge Shut-down Procedure

CAUTION

Hot internal parts are above the ignition temperature of combustible gases. Power must be disconnected from the analyzer for 90 minutes while maintaining purge air flow before the door is opened, unless the area is demonstrated to be nonhazardous. The Z-purge apparatus provided meets NFPA 496.

Power must not be restored after the enclosure has been opened until the enclosure has been purged for 65 minutes at a pressure of 0.4" of water.

Always use tubing that is free of oil and dirt. Stainless steel tubing is recommended.

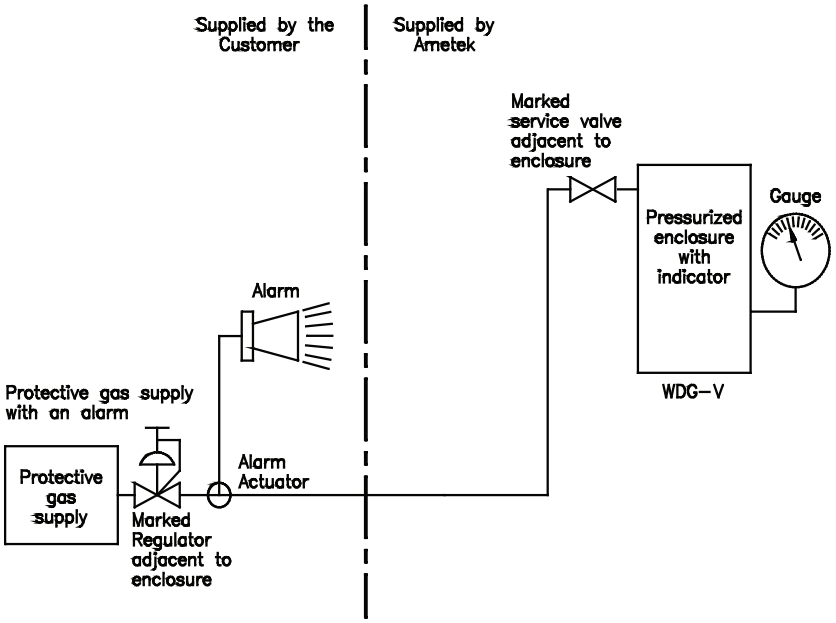


Figure 2-11.
Z-purge setup.

Aspirator and Manual Calibration Connections

NOTE

If you have a remote calibration unit (RCU), skip the remainder of this section and proceed to the section "Installing the Remote Calibration Unit (Optional)."

Aspirator Air Connection

NOTE

If you have a Display User Interface, you can use the flow gauge to set the flow as described under "Setting the Flow" in this chapter.

Aspirator N_2 Connections

Connect Aspirator air to the Aspirator air inlet on the analyzer (Figure 2-12). The recommended initial aspirator pressure setting is 3 PSI. This will vary depending on the pressure/vacuum of the process for which the WDG-V is installed. If your system includes the optional Display User Interface, you can use the Flow Sensor output diagnostic screen to set the flow to the ideal rate. If you do not have a Display User Interface, AMETEK recommends adjusting the aspirator until you get a response from the analyzer, then increase the pressure by 0.25 to 0.5 PSI. Do not turn on the aspirator until the analyzer has been turned on and is hot (preferably 24 hours from a cold start, or one hour after a restart). See "Setting the Flow" in this chapter for more information.

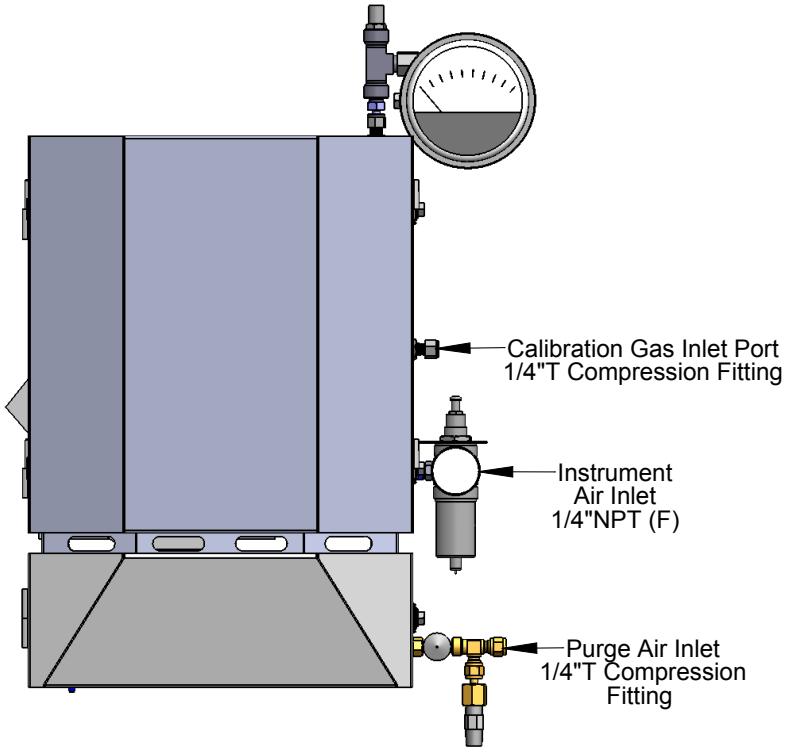


Figure 2-12.
Analyzer inlet connections.

Calibration Gas Connection

A calibration gas inlet port is provided to allow you to calibrate the system as shown in Figure 2-12. During calibration, you turn off the Aspirator air supply and inject your calibration gases into the calibration gas inlet port on the analyzer. During normal operations, the calibration gas inlet port should be plugged.

AC Power and Signal Connections

Remove AC mains power from the controller before performing wiring.

Connections to the analyzer unit are made through the **Wiring** board, which is located on the front-bottom of the analyzer unit.

*Any screw terminals on the **Wiring** board not described in this section are reserved for future use.*

This wiring section shows you how to make the following connections:

- AC mains supply wiring to WDG-V Analyzer
- WDG-V unit to remote calibration unit
- WDG-V unit to alarm devices
- WDG-V unit to current output devices
- WDG-V unit to Display User Interface (RS-485 communications)
- AC mains supply wiring to Display User Interface

This wiring section also provides mandatory EMC grounding, shielding, and noise protection requirements.

General Wiring and Conduit Requirements

This section describes general wiring and conduit requirements.

- Analyzer wiring conductors must be rated at a minimum of 80 °C. All other wiring conductor ratings should be for the minimum temperature required for the equipment being connected to the analyzer, but not less than 60 °C.
- Use only the applicable NEMA-approved conduit fittings or cable fittings to maintain the NEMA rating for the analyzer enclosure or WDG-V. If not using a conduit entry, leave the factory NEMA-approved plugs intact. Never leave any holes unplugged.
- Follow all applicable electrical codes for your location.
- Follow proper grounding, shielding and noise protection practices as described in this section.
- For all analyzer and signal wiring use twisted-pair cable, 18 to 24 AWG (American Wire Gauge) (0.82 mm^2 to 0.33 mm^2), with an overall braided shield, or twisted-pair cable in rigid metal conduit.
- For AC mains supply wiring, use between 12 and 14 AWG or equivalent metric between 3.3 mm^2 and 2.1 mm^2.
- Use the conduit entry point closest to the connections you are making. Do not add any additional conduit entry holes!

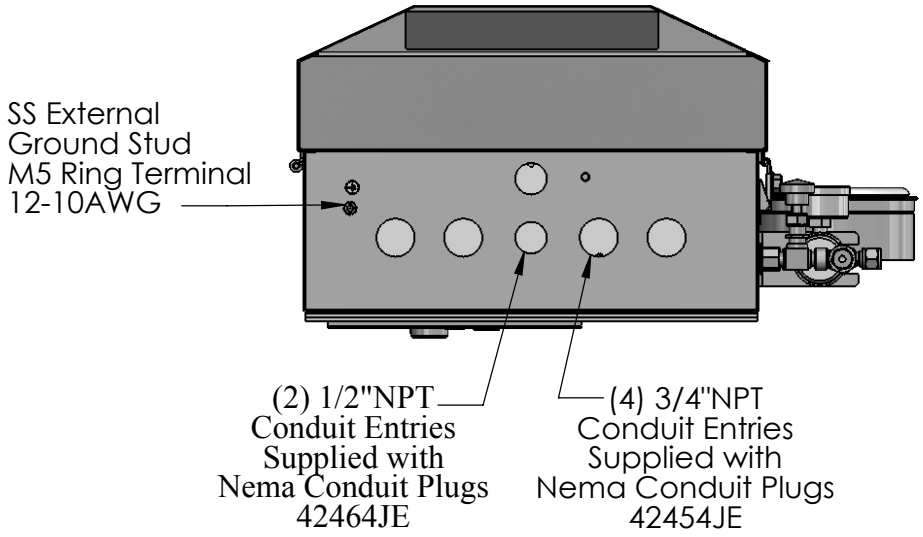


Figure 2-13.
Conduit entry and ground stud locations.

WDG-V Mains Supply Connections

Do not run control unit AC mains supply wiring in the same conduit with other AC line power wires. By keeping this wiring separated, you prevent transient signals from reaching the control unit.

The WDG-V can operate using either 115 VAC, ±10 % or 230 VAC, ±10 %. There is no power switch or circuit breaker on the analyzer, and it must be protected by installing it on a circuit-protected line, maximum 15 amperes, with a switch or circuit breaker in close proximity to the control unit and within easy reach of an operator. Mark the switch or circuit breaker as the control unit disconnecting device.

Mains supply connections to the control unit are:

- L – Line connection
- N – Neutral connection (USA)
- Chassis Stud – Equipment ground (protective conductor)

Use the 1/2" conduit entry hole in the WDG-V for AC mains supply wiring. Use the chassis stud next to the 1/2" conduit entry hole for equipment ground (protective conductor).

AC (**L**) and (**N**) markings are provided by the terminal block for connection of AC power. These markings are for reference purposes only, such as for use on system wiring diagrams, etc. The system/product has or needs no specific **LINE** or **NEUTRAL** connection for any function, safety or otherwise. The (**N**) terminal is not internally grounded, nor needs to be. The system will operate normally regardless of what AC input terminal (**L** or **N**) the **AC Line** or **Neutral** is connected to, or, if there is a Neutral used at all (i.e., 208 VAC US power connection).

EMC Grounding, Shielding and Noise Protection

For EMC purposes, under no circumstances should you leave cable shields disconnected at one end or both ends of the cable (analyzer or control unit, or other device).

You must use twisted-pair cable in rigid metal conduit or use twisted pair cable with an overall braided shield. All cable shields or conduits connecting to the analyzer unit must be chassis grounded.

EMC Grounding Method

- **Shield Ring Method**
  Connect all shields for that conduit entry (other than power) to a supplied shield terminal ring (Figure 2-14.1). This shield ring is a stainless steel ring with a metal tab. Place the shield ring under the conduit nut. Crimp the shields from all cables for that conduit entry to a 1/4" female quick disconnect, then push it onto the tab that sticks out of the conduit shield ring. Keep shields as short as possible.

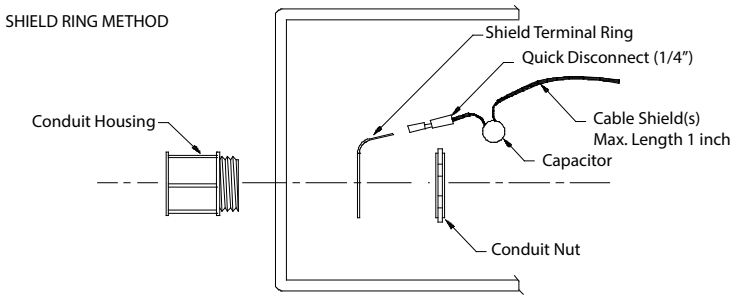


Figure 2-14.1.
EMC Grounding, shield ring method.

- **Ground Stud Method**
  Connect all cable shields for that conduit entry to the grounding stud closest to that conduit entry hole (Figure 2-14.2).

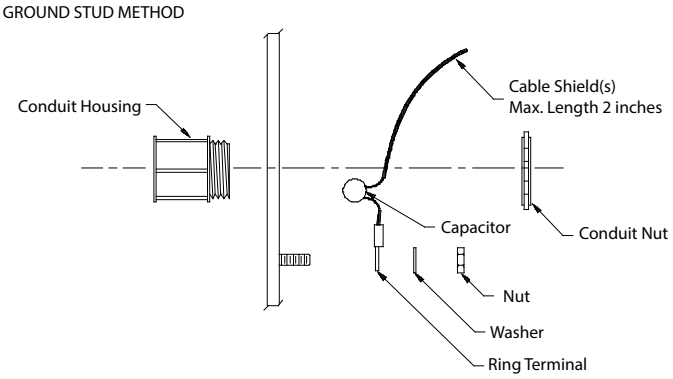


Figure 2-14.2.
EMC Grounding, ground stud method.

Transient and RFI Interference

Transient and RFI interference precautions include:

- Although there are transient and noise protectors on all analyzer unit I/O connections (communications, current outputs, analyzer, etc.), this protection is intended to act as a last line of defense against unwanted transient and RFI interference.
- Proper installation practices to prevent the introduction of transients and noise into the system must be followed. Inductive loads connected to the analyzer unit must have transient suppressors installed at the inductive loads. Be sure to place the transient suppressor as close to the load as possible. Examples of transient suppressors include MOVs, TRANSORBs, and RC snubbers.
- AC mains supply wiring should not be run in the same conduit with mains supply wiring that feeds heavy inductive loads.
- Avoid running signal wiring in the same cable or conduit with wires that power inductive loads unless all the cables within the conduit are shielded, the inductive loads are small, and transient suppressors are used at the loads.
- Do not run signal lines in the same cable or conduit with high voltage lines.
- For optimum noise protection, Display User Interface mains supply wiring should be connected to a circuit separate from any circuit that could introduce transients into the system. As an example, do not run motors, blowers, or air conditioners using the same mains supply circuit or conduit as the analyzer unit's mains supply circuit or conduit.

Current Output Connections

Standard Current Outputs

There are three current outputs on the WDG-V Analyzer. The current output connections are labeled as follows on the **Sensor** board terminals:

Analog Output #1 => +I1-
Analog Output #2 => +I2-
Analog Output #3 => +I3-

The current outputs are referenced as Analog Outputs 1, 2, and 3 in the Display User Interface and PC Configurator Software.

Observe the polarity when connecting current output devices to these terminals.

Each current output is capable of driving up to a 1000 ohm load.

The current outputs can be selected for the following ranges:

0–20 mA
4–20 mA
NAMUR

The NAMUR outputs are implemented as follows:

4–20 mA signal	**Analyzer Condition**
0 mA	Analyzer unpowered, or completely failed.
3.5 mA	Critical Alarm – analyzer reading unusable (factory default).
3.8 mA	Reading Under Range (Example: User sets range to 2–10 %.) Current reading is 1.9 %.
4–20 mA	Normal Operation
20.5 mA	Reading Over Range (Example: Range is 0–10 %.) Current reading is 12 %.

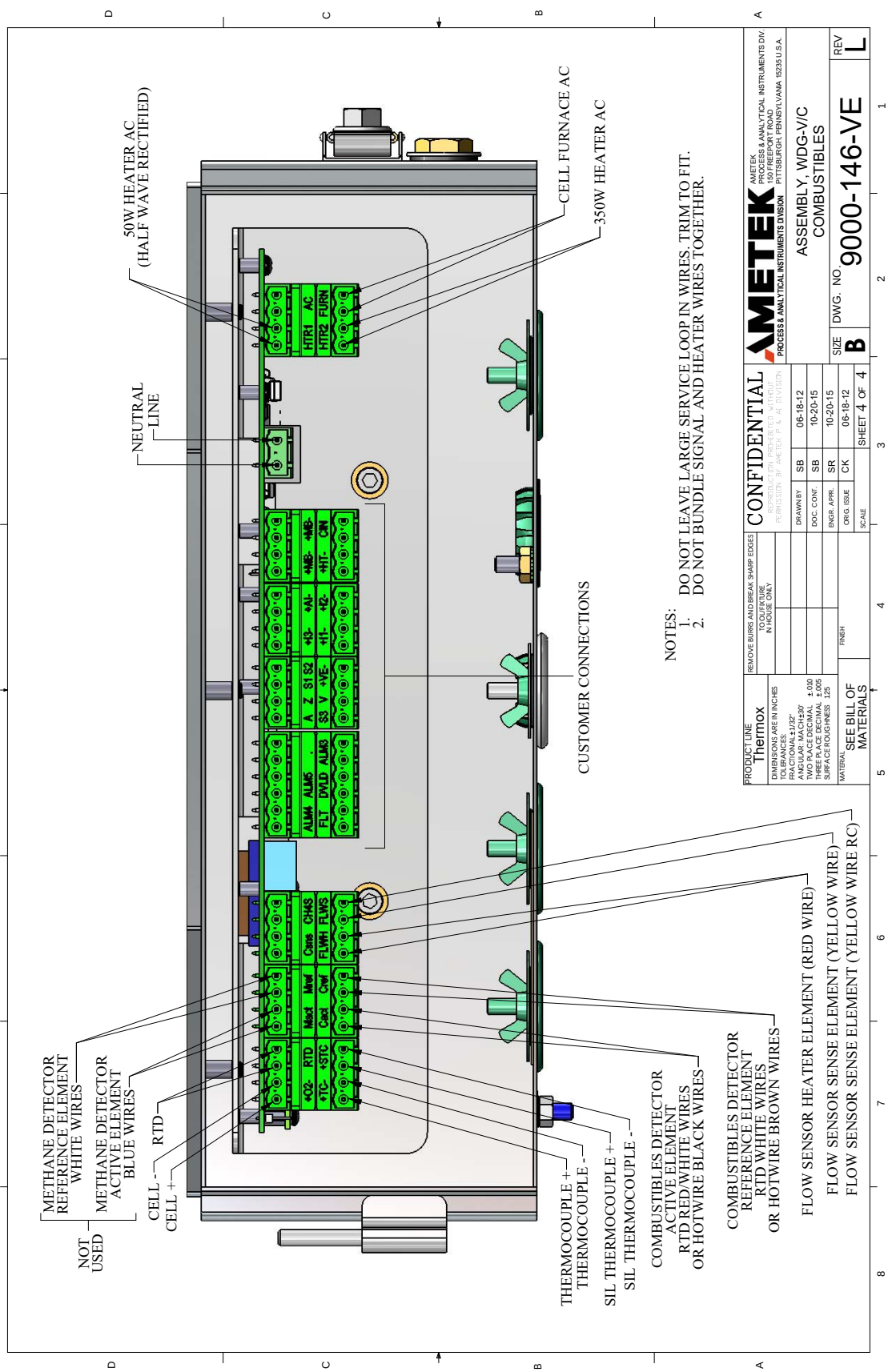


Figure 2-15.
Wiring.

Alarm Contact Connections

This section describes how to make wiring connections for any alarm devices you wish to connect to the control unit.

Standard Alarm Connections

The WDG-V analyzer provides five (5) sets of normally open alarm contacts:

Terminal Block ID		Description
SVC	–	Service Alarm
DV	–	Data Valid Alarm
ALM1	–	Process Alarm 1 (Configurable)
ALM2	–	Process Alarm 2 (Configurable)
ALM3	–	Process Alarm 3 (Configurable)

The process alarms are referenced as Relay 3, Relay 4, and Relay 5.

Relay 3	–	ALM 1
Relay 4	–	ALM 2
Relay 5	–	ALM 3

- **Service Alarm Relay**
  The Service Alarm indicates that a critical alarm exists and the analyzer needs repair. Readings are not valid when this alarm is active. The relay contacts are normally open and are Open (de-energized) when a critical alarm exists, or on loss of power. Contacts are Closed when the analyzer is in Normal mode.

- **Data Valid Relay**
  The Data Valid Alarm indicates if the concentration readings are representative of the process. When this alarm is active, concentration readings may not be representative of the process and should not be used for control/safety. Examples of this alarm include: **Warm-Up** mode, **Calibration** mode, and **Diagnostic** mode. This alarm differs from the **Service Alarm** in that there is not necessarily a problem with the analyzer when this alarm is active. The relay contacts are normally Open and are Open (de-energized) when the concentration readings are not valid, there's a problem with the analyzer, when the analyzer is calibrating, warming up, when the analyzer is in diagnostic mode, or on loss of power.

Remote Calibration Unit Connections (Optional)

This section discusses the electrical connections for the optional Remote Calibration Unit (RCU):

If you don't have the RCU option, skip this section.

Oxygen-Only Remote Calibration Unit Connections

Oxygen-Only Remote Calibration Unit (RCU) connections on the WDG-V **Wiring** board, and their RCU connections, are (see Figure 2-16):

ZERO GAS	WDG-V **Terminal Z** to **Pin 13** on RCU
ASPIRATOR	WDG-V **Terminal A** to **Pin 14** on RCU
O2 SPAN	WDG-V **Terminal S1** to **Pin 15** on RCU
VALVE COMMON	WDG-V **Terminal V** to **Pin 16** on RCU

Combustibles Remote Calibration Unit Connections

If you have the combustibles option (and a combustibles RCU), you must also make the following connection (see Figure 2-16):

COMBUSTIBLE SPAN – WDG-V **Terminal S2** to **Pin 17** on RCU

For a WDG-VCM with hot-wire detector, Remote Calibration Unit connects:

METHANE SPAN – WDG-V **Terminal S3** to **Pin 18** on RCU

Digital Input to Initiate Remote Calibration Unit

The digital input connections on the **Wiring** board allow you to initiate a calibration from a remote location. For this option to work, you must have a remote calibration unit. The system monitors the digital input, and when the switch closes, it sends the system into an automatic calibration. The switch you connect to this digital input must be a normally open switch.

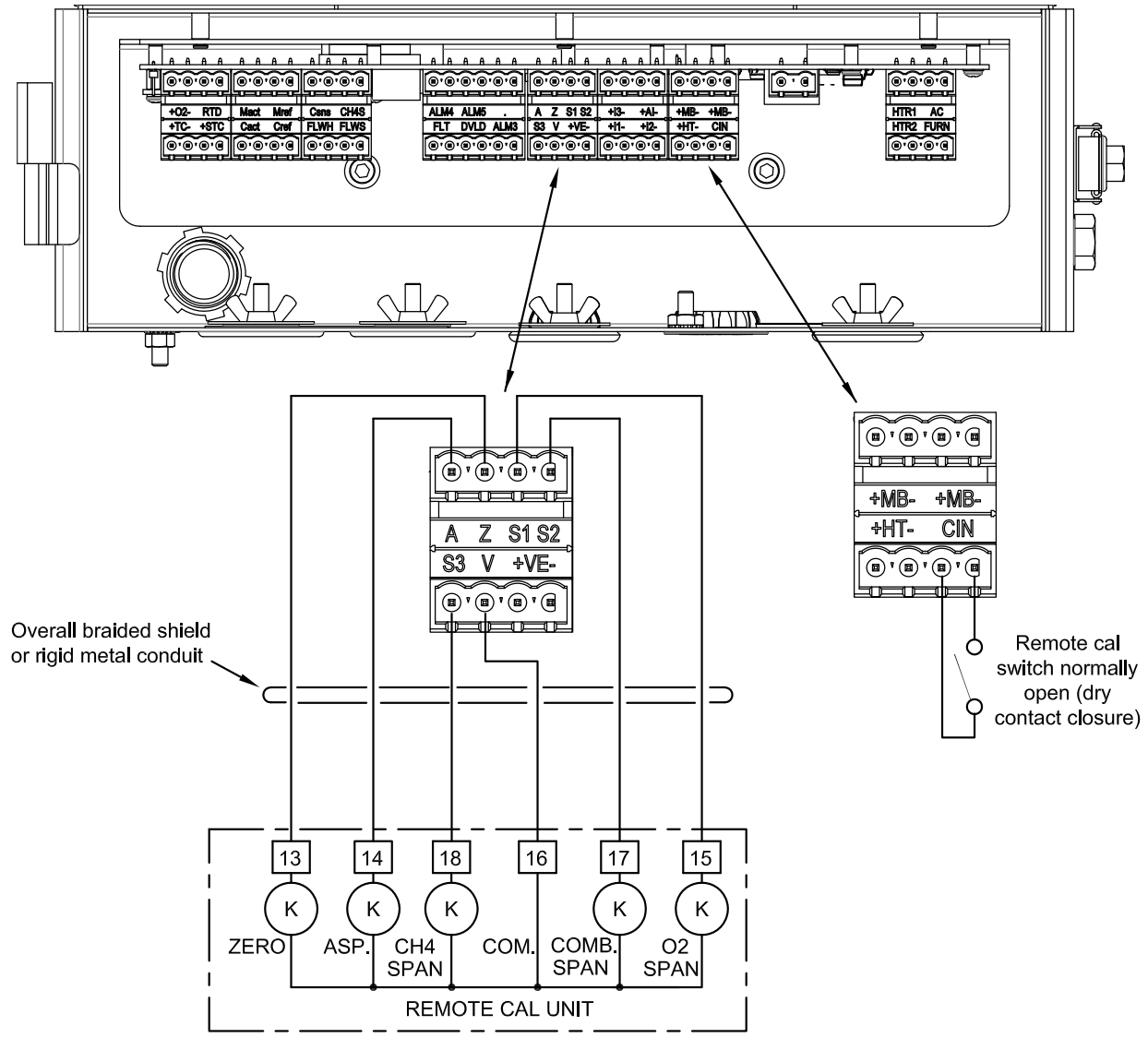


Figure 2-16.
RCU Connections.

Digital Input to Initiate Remote Calibration Unit

The digital input connections on the **Wiring** board allow you to initiate a remote calibration from a remote location. For this option to work, you must have a remote calibration unit. The system monitors the digital input, and when the switch closes, it sends the system into an automatic calibration. **The switch you connect to this digital input must be a normally open switch.**

Digital input connections are labeled as follows on the **Wiring** board:

CIN

Notes About Ducting

Ducting Between Pressurized Enclosure and Inlet
The intake ducting to a compressor should not normally pass through a hazardous area. If the compressor intake line passes through a hazardous area, it should be constructed of non-combustible material and protected against mechanical damage and corrosion. Adequate precautions should be taken to ensure that the ducting is free from leaks in case the internal pressure is below that of the external atmosphere. Additional protective measures (for example, combustible gas detectors) should be considered to ensure that the ducting is free of flammable concentrations of gas vapor.

Additional Purge Time to Account for Ducting
The purge duration should be increased by the time necessary to purge the free volume of those associated ducts which are not part of the equipment by at least five times their volume at the minimum flow rate specified by the manufacturer.

Power for Protective Gas Supply
The electrical power for the protective gas supply (blower, compressor, etc.) should be either taken from a separate power source or taken from the supply side of the electrical isolator for the pressurized enclosure.

Enclosure Maximum Overpressure
The user should limit the pressure as specified by the manufacturer.

Installing the User Interface/Communications Options

The WDG-V Analyzer has two available interface options that can be used to communicate with the analyzer: The *PC Configurator Software* and the *AMEVision Display User Interface*. These interface options cannot be connected to the analyzer at the same time.

Installing the PC Configurator Software (Typical Communication Option)

The WDG-V PC Configurator Software comes standard with the analyzer and provides a convenient way to configure, calibrate, and monitor a single WDG-V Analyzer. The WDG-V is connected to the PC using a two-wire MODBUS RTU interface.

NOTE

If you are using the AMEVision Display User Interface to communicate with the WDG-V Analyzer, skip this section and continue with "Installing the AMEVision Display User Interface (Secondary Communication Option)" later in this chapter.

NOTE

Install the PC Configurator Software on a PC, as instructed in the WDG-V PC Configurator Software User Manual *(AMETEK PN 9000-231VE), and then continue with setting the analyzer address, below.*

Setting the Analyzer Address Using the Dip Switch (to Enable Communications Between the Analyzer and the PC Configurator Software)

The orientation of the dip switch is upside down.

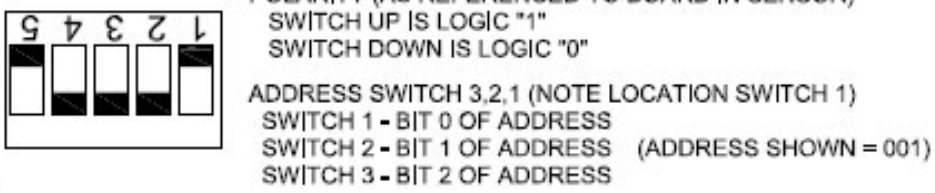


Figure 2-17. Close-up of Dip Switch, Sensor board.

The address on the WDG-V analyzer is set using the dip switch on the front of the **Sensor** board. When connecting a single analyzer, the address is "**1**".

321 Switch	Address
001	1
1 = ON (UP) 0 = OFF (DOWN)	

Connecting the PC to the Analyzer

Use the optional USB-to-RS-485 converter (PN 1000-724-JE) to connect between the analyzer and the PC.

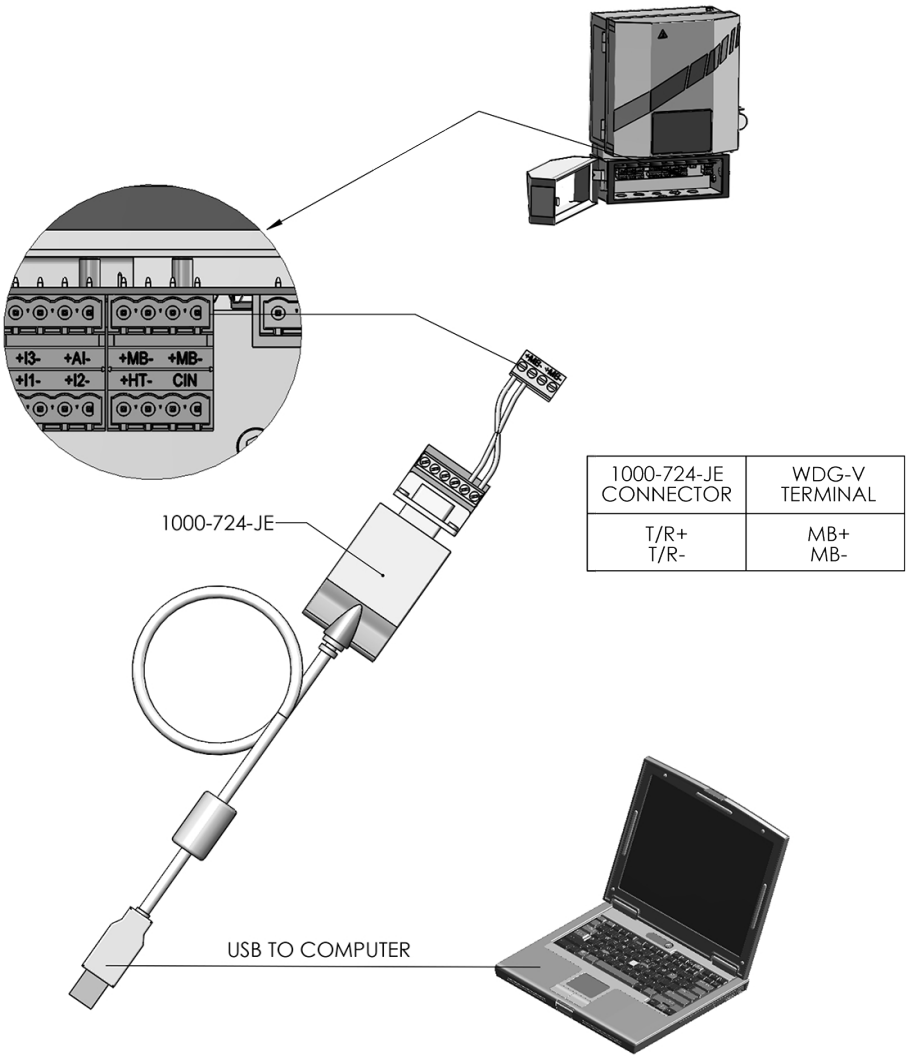
Once the analyzer has been connected to the PC, use the PC Configurator Software to set up parameters and calibrate the unit.

NOTE

For instructions on how to work in the PC Configurator Software to configure and calibrate the analyzer, and to view analyzer status readings, refer to the WDG-V PC Configurator Software User Manual.

NOTE

The PC Configurator Software and the AMEVision Display User Interface cannot be simultaneously connected to the analyzer.



Note: Only one connection can be made to the sensor.
The AmeVision and Configurator cannot be connected simultaneouslt.

Figure 2-18. Connecting analyzer using USB converter and PC Software.

Installing the AMEVision Display User Interface (Secondary Communication Option)

The AMEVision Display User Interface is an intuitive remote, color, graphical user interface and communications link that provides easy configuration, calibration, and monitoring of data for up to four (4) WDG-V Analyzers using a single display unit. The interface between the Display User Interface and the WDG-V Analyzer is two-wire MODBUS RTU. Communication options include:

- MODBUS RTU
- Web Interface (TCP/IP)
- USB (Flash Drive)

NOTE

If you are using the PC Configurator Software to communicate with the WDG-V Analyzer, skip this section and continue with "Installing the PC Configurator Software (Typical Communication Option)" earlier in this chapter.

NOTE

Install the AMEVision Display User Interface Unit as instructed in the AMEVision Display User Interface User Manual *(AMETEK PN 9000-165-VE), and then continue with setting the analyzer address, below.*

Figure 2-19.
Standard AMEVision Display User Interface.

The Control Unit can be mounted to either a panel or a wall. Refer to the AMEVision Display User Interface *User Manual (AMETEK PN 9000-165-VE)* for complete installation and operation details.

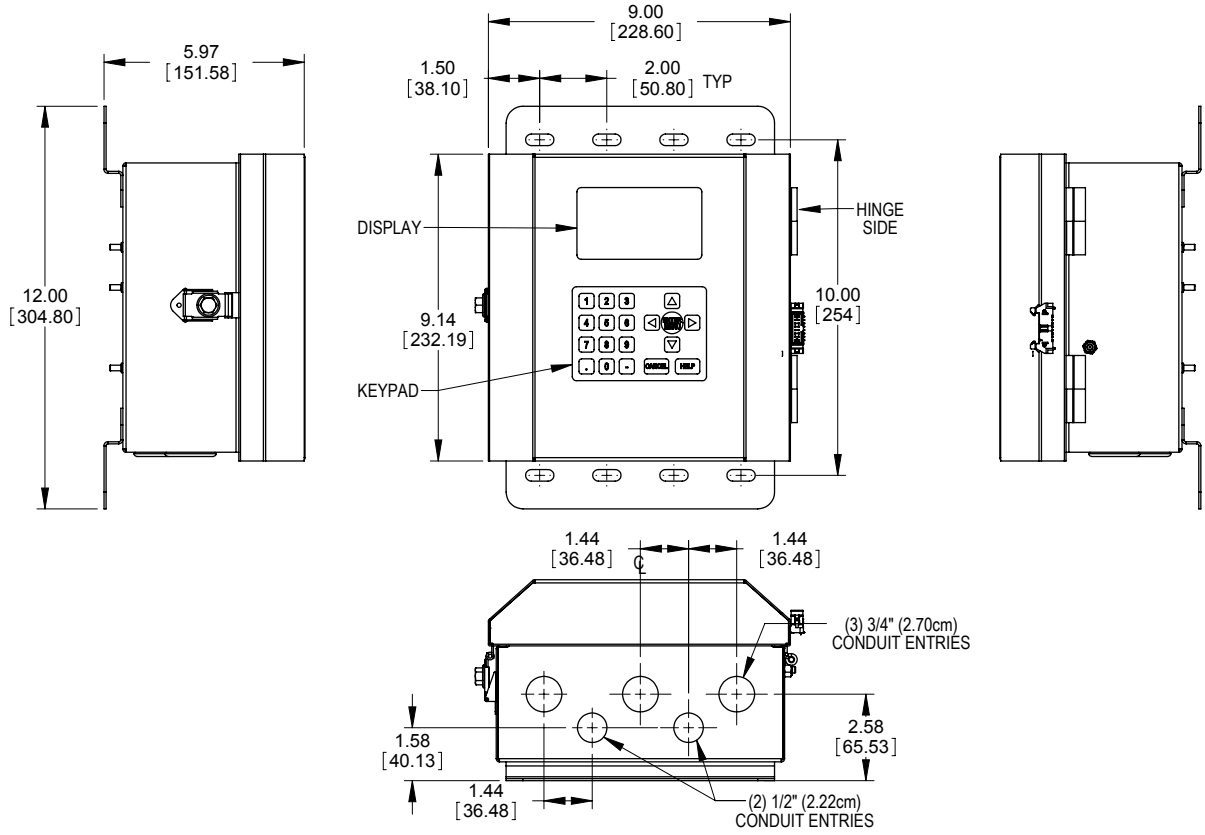


Figure 2-20.
AMEVision dimension, installation.

Setting the Analyzer Address Using the Dip Switch (to Enable Communications Between the Analyzer and the AMEVision Display User Interface Unit)

The orientation of the dip switch is upside down.

The connection between the AMEVision Display User Interface and the WDG-V Analyzer is a two-wire MODBUS RTU.Up to four WDG-V Analyzers can be connected to a single Display User Interface unit. Each connected analyzer must have a unique address. The address on the WDG-V Analyzer is set using the dip switch on the front of the **Sensor** board. See Figure 2-17 (and 2-21 for the dip switch).

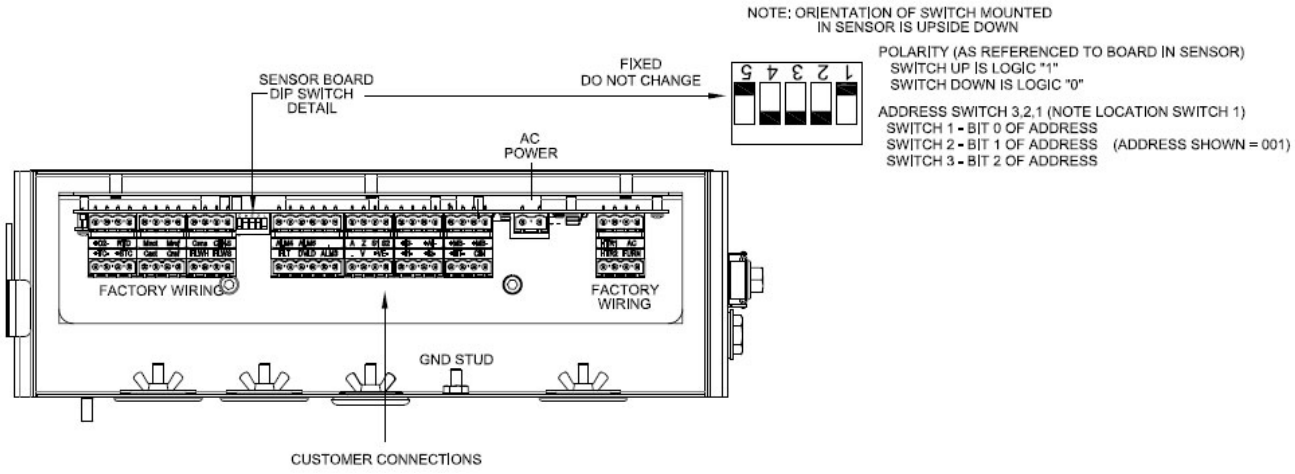


Figure 2-21.
Close-up of Dip Switch, Sensor board.

321 Switch	Address
001	1
010	2
011	3
100	4
1 = ON (UP) 0 = OFF (DOWN)	

Connecting Analyzers to the AMEVision Display Unit

Connecting a Single Analyzer

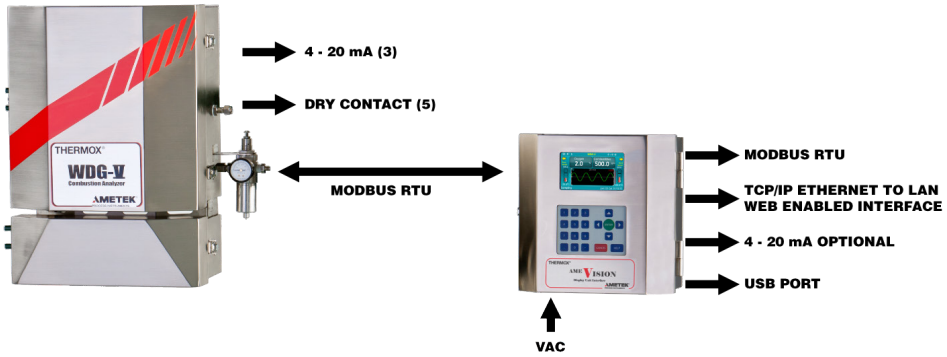


Figure 2-22..1
Single WDG-V Analyzer to the Display User Interface.

NOTE

When only one analyzer is connected, set the address to "1".

Connecting Multiple Analyzers

Up to four (4) analyzers can be connected to a single AMEVision Display User Interface. The WDG-V Analyzer has extra terminal connections for daisy-chain connections.

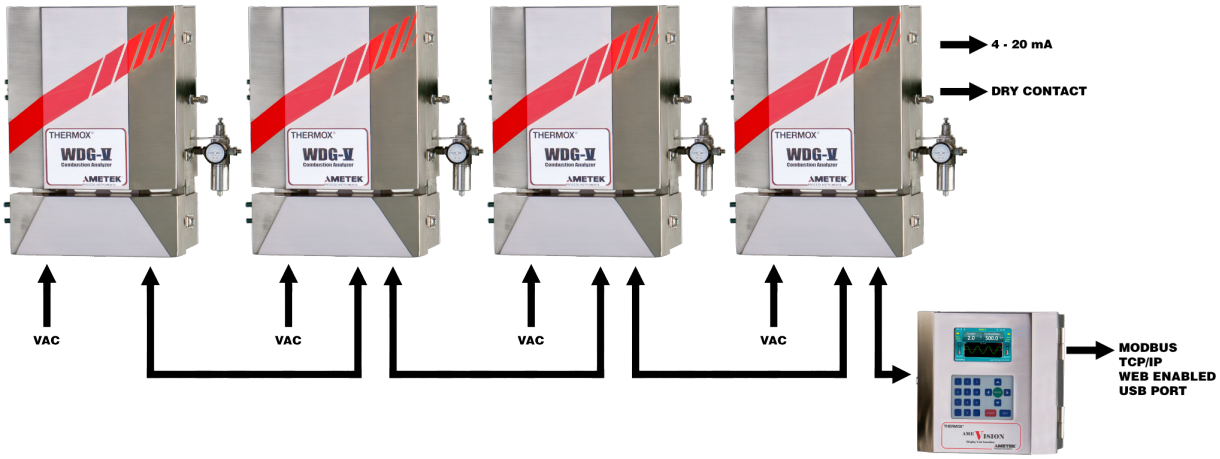


Figure 2-22..2
Multiple WDG-V Analyzers to the Display User Interface.

NOTE

Each analyzer must have a unique address. See "Setting the Analyzer Address Using the Dip Switch."

Final Daisy Chain Connection Configuration Setting

When connecting multiple analyzers in a daisy chain configuration, enable the communication termination resistor (Dip Switch **SW-5**) on the last analyzer in the chain (farthest from the Display User Interface). **SW-5** is located on the front of the **User Interface** board.

- SW-5 ON: Termination Enabled
- SW-5 OFF: Termination Disabled

The maximum distance between the AMEVision Display User Interface and the analyzer is 1219.2 meters (4000 feet).

For instructions on how to work from the AMEVision Display User Interface to configure and calibrate the analyzer, and to view analyzer status readings, refer to the AMEVision Display User Interface User Manual *(AMETEK PN 9000-165-VE).*

Customer I/O Connections

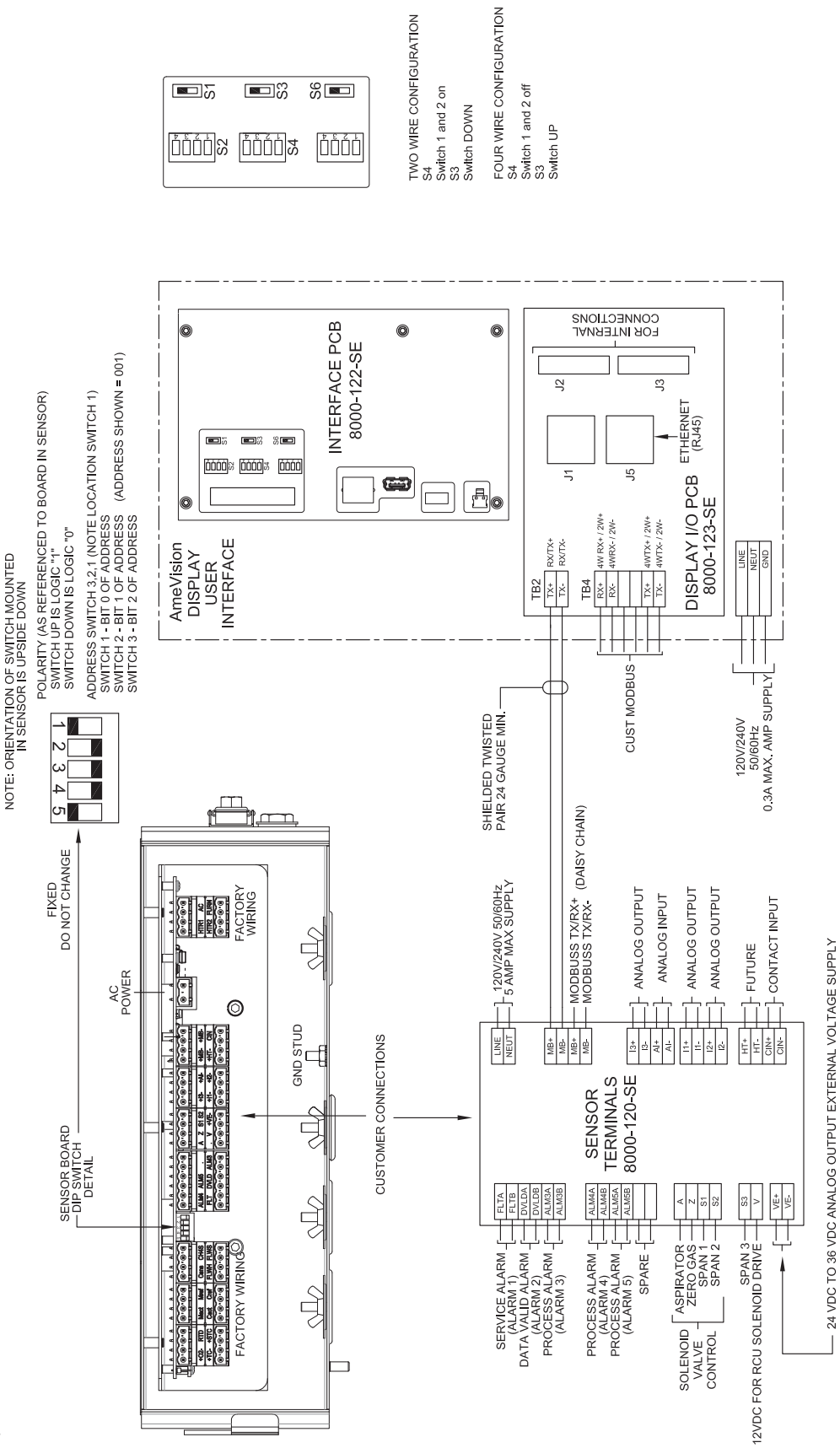


Figure 2-23.
Customer I/O Connections.

Communication Troubleshooting Checks

No Communications

Possible Cause	Corrective Action
Polarity reversed	Check the wiring for proper polarity. Review associated wiring diagrams. Correct the wiring.
Address not set correctly	From the Display, check the Address setting. On the **User Interface** board, check the dip switch settings. Refer to "Setting the Analyzer Address" in this section for more information.
Maximum distance between devices exceeded	If the distance between the Display Unit and the analyzer (furthest analyzer in a daisy-chain configuration) exceeds 1219.2 meters (4000 ft), the devices must be moved closer together.
Broken connection	Check cables and wiring for damaged or broken connections. Replace or fix the connections as needed.

Intermittent Communications

Possible Cause	Corrective Action
Poor wiring (i.e., lack of shielded twisted pair)	Check the wiring to ensure it meets proper specifications for this installation. Replace the wiring if necessary.
Termination enabled on more than one unit (on multi-unit systems)	Check the communication termination resistors (dip switch **SW-5**) on each analyzer in the daisy-chain. This switch is located on the front of the **Sensor** board. Only the dip switch on the last analyzer (farthest from the Display Unit should be Enabled. Ensure all others are Disabled.
Termination not enabled (on multi-unit systems)	
Maximum distance between devices exceeded	If the distance between the Display Unit and the analyzer (furthest analyzer in a daisy-chain configuration) is close to exceeding, or does exceed, the maximum required distance (1219.2 meters/4000 ft), the devices may need to be moved closer together.

Setting the Flow

The recommended initial aspirator pressure setting is 3 PSI. This will vary depending on the pressure/vacuum of the process for which the WDG-V is installed. If you purchased the AMEVision Display User Interface, you can use the Flow Sensor output diagnostic screen to set the flow to the ideal rate. If you do not have the AMEVision Display User Interface, it is recommended to adjust the aspirator until you get a response from the analyzer, then increase the pressure by 0.25 to 0.5 PSI.

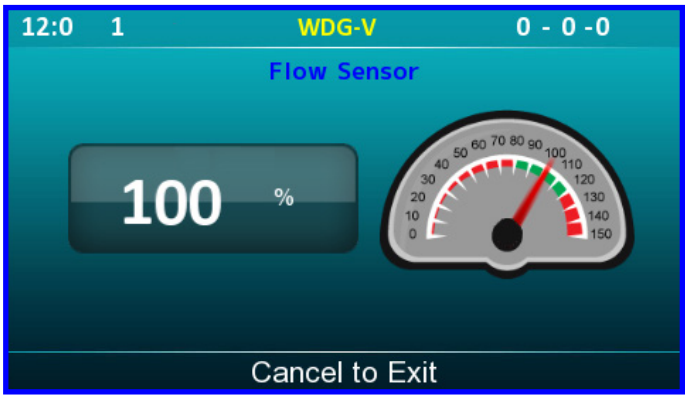


Figure 2-24.
Flow Sensor screen.

Setting the Flow Using the Display User Interface Flow Sensor Diagnostic

The internal flow sensor output is displayed is percent to ideal sample loop flow. For example, a reading of 100 % indicates ideal flow whereas a reading of 50 % indicates half the ideal flow rate. The update interval for the flow sensor is 90 seconds, so you must wait at least 90 seconds for the flow output value to change. It is recommended to operate the sensor between 80 % and 120 %. A low flow alarm is generated when the flow is 45 % or lower.

To set the flow, first adjust the aspirator pressure regulator until you get a response from the analyzer. Wait 90 seconds and check the flow sensor output. Adjust the aspirator as necessary until the flow sensor reads approximately 100 %. Small increments of 0.25 PSI are recommended.

LED Status Indicator

Main Status LED (Light Pipe Visible From the Front)

OFF – Power is off.

NOTE

The status LED is NOT directly connected to the WDG-V power supply. In the unlikely event of an error condition, it is possible for the analyzer to be energized with dangerous voltages even though the status LED is off. Always verify power has been removed before servicing the instrument.

GREEN – Analyzer is in normal operating mode.

YELLOW – Analyzer is in warm-up state or diagnostic state.

RED – Analyzer has a service alarm and is in need of attention.

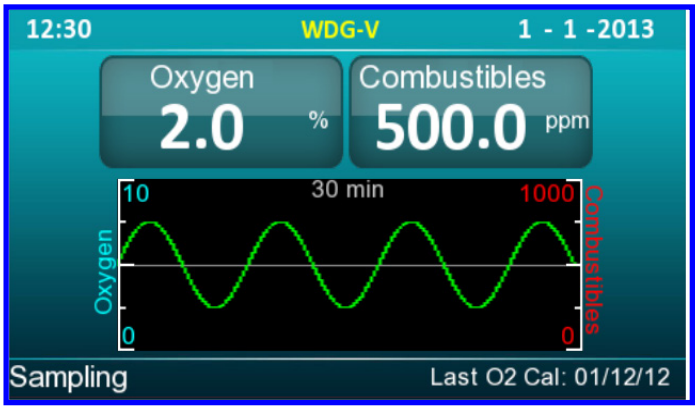


Figure 2-25. Analyzer is in normal operating mode.

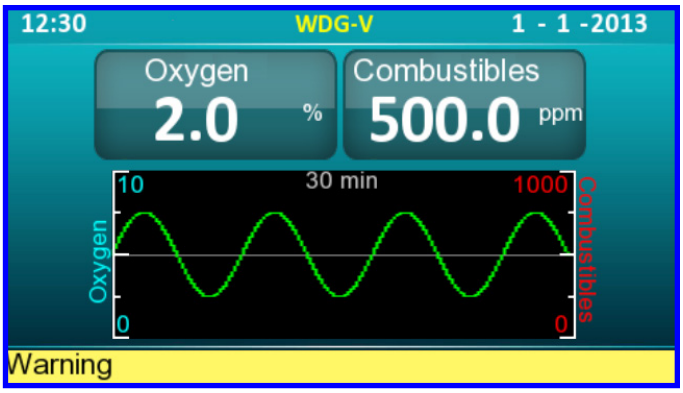


Figure 2-26.
Analyzer is in warm-up state or diagnostic state.

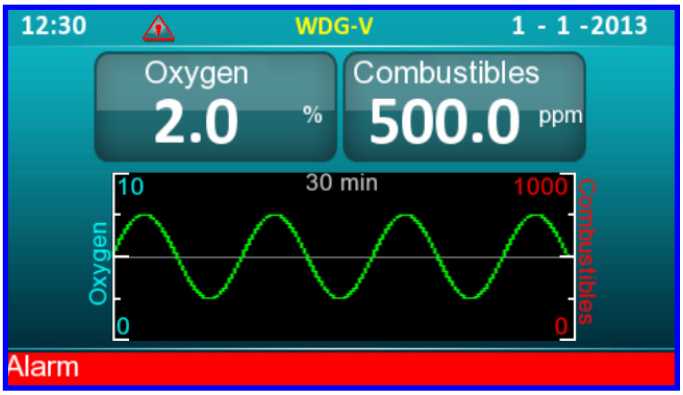


Figure 2-27.
Analyzer has a service alarm and is in need of attention.

Printed Circuit Board (PCB) Status LEDs

There are two small, surface-mount green LEDs on the PCB located on the back left corner of the PCB (when looking at the analyzer). You must look up into the electronics enclosure to view these LEDs, they are not visible when looking directly at the analyzer.

REAR LED – Heart Beat LED. Blinks once a second indicating the analyzer software is operating. If off or not blinking this indicates the power is off or the electronics are not functional.

FORWARD LED – Modbus Communications LED. Toggles upon receipt of a valid Modbus message. This LED will blink rapidly in short bursts when communicating properly to the Display User Interface.

Maintenance and Troubleshooting

Remove AC power from the analyzer and allow it to cool for at least 90 minutes before performing any maintenance or troubleshooting activities.

Always use gloves when working on the analyzer.

This chapter describes Display User Interface and error messages. It also provides troubleshooting assistance. System and error messages scroll on the bottom line of the display at three-second intervals until the condition is corrected or has ended.

The operations in this chapter should be performed only by qualified service personnel experienced in electrical safety techniques.

System or error messages will not appear on the display when you are navigating the menus. However a system alarm will appear in the top left hand corner of the screen.

Aftermarket Excellence and Long-Term Commitment to Safety and Quality

Safety is a core value at AMETEK Process Instruments and is our primary consideration in every decision. We believe all accidents, injuries, and occupational illnesses are preventable. We adhere to the highest design and safety standards with a full understanding of the process and site installation so that our customers, channel partners, employees, and communities are safe from potential hazards. AMETEK Process Instruments designs, tests, and selects components that are meant to work safely and properly together. Sourcing substitute parts from unauthorized dealers carries significant risk, especially in safety sensitive environments.

We understand the importance of maintaining your budget and keeping costs low. At AMETEK Process Instruments, we pride ourselves in the value we add to your organization by providing you with Best in Class analyzers, genuine parts, engineered solutions, and World Class global support that provide valuable OPEX cost savings by maximizing uptime. Safety incidents, unplanned releases, unplanned down situations, and running analyzers to failure come at a much higher cost.

Our customer commitment continues well beyond the start-up and commissioning of analyzers. Together with our channel partners, WE ARE ONE Aftermarket team of factory-trained personnel here to support our customers' needs globally, on site, or remotely with virtual tools – for the entire product life cycle. Moreover, we offer a wide variety of customized services and service plans to meet their needs.

From pre-commissioning to end-user handoff, service training, pre-RATA checks, turnaround support, in-house repair, expedited support, web-to-case support, and extended remote support sessions we are here to support. Please contact us if you need help identifying your local channel partner for support.

Our Aftermarket team also offers consultative service plans which are fully customized for the process needs of the individual site. Service plans establish a preventative maintenance routine and/or training program that is designed to deliver optimal results by maximizing analyzer uptime and controlling maintenance costs. We are fully committed to being our customers' preferred partner in helping them achieve their goals.

Requesting Technical Support

To request service support, a call back, or product information we encourage you to use our Web-to-Case online tool, so we are instantly aware of your request no matter the time zone or day of the week. To do this, follow the link below.

https://www.ametekpi.com/customersupport/requestsupport

To request training, visit our main **Customer Support** page and choose **Analyzer Training**.

Requesting Authorization to Return Equipment

Before returning equipment for repair, please obtain a Return Material Authorization. To do this, follow the link below or click the **Return Authorization** link on our main **Customer Support** page. Complete the form and click **Submit**.

https://www.ametekpi.com/customersupport/return-authorization

Spare Parts List

WDG-V Analyzer Spare Parts

Description	AMETEK Part No.	Figure
Assy, Furnace, WDG-V, 120 VAC	7000-719-SE	3-7
Assy, Furnace, WDG-V, 240 VAC	7000-720-SE	3-7
Kit, WDG-V Replacement Thermocouple For O_2 Cell Furnace	7000-839-TE	3-4
Combustibles Detector Kit - RTD Detector	7000-815-TE *	3-5
Combustibles Detector Kit - Hot Wire Detector	7000-816-TE **	3-5
Methane Detector Kit	7000-814-TE	3-5
WDG-V Analyzer Main Processor Board For RTD Combustibles Detector	8000-119-SE	
WDG-V Analyzer Main Processor Board For Hot Wire Combustibles Detector	8000-148-SE	
Assy, WDG-V Boards and Plate For RTD Combustibles Detector	7000-845-SE ***	
Assy, WDG-V Boards and Plate For Hot Wire Combustibles Detector	7001-214-SE ***	
Kit, Combustibles Block w/Nut and Ferrules	7001-226-TE****	3-9
Kit, Combustibles/Methane Block w/Nut and Ferrules	7001-227-TE****	3-9
Kit, Flow Sensor, WDG-V	7000-817-TE	3-6
Cell O-Ring Metal	42005JE	3-3
Kalrez O-Ring, Combustibles/Methane Detector Housing	3000-337-JE	3-5
Standard Zirconia Cell	7000-568-SE	3-3
Severe Service Zirconia Cell - Consult Factory For Application	7000-733-SE	
Kit, WDG-V Aspirator w/Nut and Ferrules	7001-216-TE	2-12.2
Flashback Assy, 1" Element	71212SE	
Kit, Convection Loop w/ Nut and Ferrules, O_2 Only (long tube for use without flame arresters)	7001-224-TE	
Kit, Flame Arrester Convection Loop w/ Nut and Ferrules (short tube for use with flame arresters)	7001-225-TE	
Cell Clip Assembly - Inside	72329SE	3-3
Cell Clip Assembly - Outside	72328SE	3-3
Assy, WDG-V, Box Heater, 120 VAC	7000-843-SE *****	3-8
Assy, WDG-V, Box Heater, 240 VAC	7000-844-SE *****	3-8
Heater Plate WDG-V	7000-405-KE	
Kit, Cartridge Heater 350 W, 120 V, Includes Heater and Push Nut	7000-846-TE	
Kit, Cartridge Heater 50 W, 120 V, Includes Heater and Screw	7000-848-TE	
Kit, Cartridge Heater 350 W, 240 V, Includes Heater and Push Nut	7000-847-TE	
Kit, Cartridge Heater 50 W, 240 V , Includes Heater and Screw	7000-849-TE	
Kit, WDG-V Replacement 115 VAC Heater Coil and Push Nut	7000-840-TE	
Kit, WDG-V Replacement 240 VAC Heater Coil and Push Nut	7000-841-TE	
RTD, Box Temp Control – 100 Ohm (O_2 Only)	25384JE	
RTD, Box Temp Control – 100 Ohm (Comb/Methane)	1000-630-JE	
Threaded Exhaust Tube	70619KE	2-1
Sample Probe	by serial number	2-1

WDG-V Analyzer Spare Parts

Description	AMETEK Part No.	Figure
0–60 PSI External Air Regulator	39004JE	2-12.1
0–60 Regulator Gauge	37018JE	
Aspirator Air Solenoid Valve (normally open)	36090JE	2-12.1
Calibration Gas Solenoid Valve (normally closed)	36088JE	2-12.1
Flow Meter	37020JE	2-12.1
0–15 PSI Internal Regulator	37070JE	2-12.1

* The RTD detector is the standard detector for most applications. Requires analyzer Main Processor board 8000-119-SE.

** The Hotwire detector is the severe service detector. Consult factory for applications. Requires analyzer Main Processor board 8000-148-SE.

*** Sensor assembly includes I/O Connection board, Main Processor board, and mounting plate.

**** The block heater, RTD, and detector are not included.

***** Includes heat plate, heater, push nut, and dowel pin.

When ordering, provide the serial number of your analyzer to ensure proper parts are ordered:

Diagnostics Flowcharts

This section describes how to check different analyzer areas for possible problems. See also "Alarm and Warning Messages" in this chapter for help on what checks you should perform based on the error message displayed. If no error messages are displayed, but the readings do not appear to be accurate, review the section "General Troubleshooting" in this chapter.

AMETEK recommends monitoring the Thermocouple millivolts and Cell millivolts displayed during troubleshooting as a troubleshooting aid. This information will be helpful should you need to contact the factory for assistance. Be sure to always include your analyzer model and serial number when contacting AMETEK for technical support.

Exercise care when working on the analyzer. Turn off power, allow the unit to cool, and wear gloves.

Thermocouple Checks

Problem/Possible Cause	Corrective Action
Open Thermocouple	Remove power to the analyzer. Measure across terminals **+TC-** on the **Sensor** board with an ohm meter. If an open circuit is measured, replace the Thermocouple.
Shorted/Failed Thermocouple	Check that the Thermocouple leads are not shorted to chassis ground by using an Ohm meter to measure between terminal **TC+** on the **Sensor** board and chassis ground, and between terminal **TC-** on the **Sensor** board and chassis ground. If shorted, replace the Thermocouple. To verify the operation of the Thermocouple itself, remove the Thermocouple from the analyzer and heat its ceramic tip to a known temperature. Measure the millivolt output with a proper temperature indicating meter (Type K Thermocouple). If the Thermocouple reads inaccurately, replace it.
Reversed Thermocouple Wires	First, view the Cell temperature via the **HOME** screen or **Diagnostic** screen. If the Thermocouple leads are reversed, the displayed temperature will be decreasing as the analyzer warms up (this will usually happen at start-up or after you replace a Thermocouple). This indicates that the Thermocouple wiring is reversed. If you just replaced a Thermocouple, check the leads from the Thermocouple to the **Sensor** board: Yellow wire connects to terminal **TC (+)**, Red wire connects to terminal **TC (-)**.

Calibration/Aspirator Air Setup Checks

If performing a manual calibration, wait for the reading to stabilize on the display before switching to the next calibration gas.

Calibration→Cal Gas Values

Problem/Possible Cause	Corrective Action
Calibration Gas Check	**To check Calibration gas values:** From the **Calibration Gas Values** screen (User Interface), check the **Calibration** gas values entered to ensure they match the analyzed concentration of the cylinders. • Check that the correct calibration gas values have been entered into the analyzer. • Check that the calibration gas cylinders are turned on and are not empty. • *Check for the proper flow rate and proper delivery pressure of calibration gases when the remote calibration unit has been activated (see the Inject Gas Diagnostic option in the Display User Interface* User Manual *for more information.).*
Calibration Line Check	The best calibration gas to use for this check is an O_2 zero calibration gas. Ensure that your calibration line is not contaminated with such things as pipe dope, cutting fluid, oil, or solvents. All these contaminants produce hydrocarbon vapors that interfere with the proper calibration of your analyzer, resulting in lower than expected oxygen readings. To test for contaminated lines, you must temporarily bypass your current calibration line with a clean calibration line (directly from cylinder to the analyzer calibration inlet port, using a flow meter to set the proper flow) and compare the response with that from the possibly contaminated line.
Remote Calibration Unit (RCU) Problem	The RCU contains one normally open solenoid (Aspirator air solenoid). All other solenoids are normally closed. Problems with the RCU are usually as follows:
	Plumbing Leak: To check for plumbing leaks, disconnect power from the RCU and pressurize the inlets. Apply a leak detecting liquid along the base of the solenoids and any plumbing fittings. Repair any leaks found.
	Solenoid Not Energizing: The solenoid drive signal is a 12 VDC signal. This is used to close the aspirator solenoid and open the appropriate calibration gas solenoid. To test a solenoid valve, select **Inject Cal Gas** from the **Calibrate** menu to energize that solenoid. Verify that the solenoid drive signal is present. The Aspirator air solenoid is closed when the drive signal is applied. Other solenoids are open when the drive signal is applied (Cal Gas flowing). With the drive signal present, verify the proper flow. If no signal is present, check the interconnecting wiring between the control unit and the RCU. If wiring is correct, replace the **Sensor** board. If the solenoid drive signal is present, it indicates a problem with one of the solenoid valves. Replace the solenoid valve, being sure that the solenoid o-ring seals are properly positioned.

Problem/Possible Cause	Corrective Action
	Calibration gas solenoid stuck open: To check if a calibration gas solenoid is stuck open, verify that no drive signal is present and check for flow on the RCU flow meter. If flow is indicated when no solenoids are energized, a solenoid is stuck open. Shut off your calibration gases (one at a time) until the flow drops to zero. This identifies the defective solenoid valve (replace the solenoid valve, being sure that the solenoid o-ring seals are properly positioned).
	Calibration Gas Time Inadequate: If you are having problems running an auto calibration, you may not have allowed the calibration gases enough time to flow through the analyzer and stabilize. To correct this problem, select **Inject Cal Gas** from the **Diagnostic** menu. Turn on each calibration gas and determine how long it takes for each gas to stabilize on the control unit display. Then add a one minute buffer to each of these times. Also make sure the cylinder regulators are set to the correct pressure. See the "Flow Section" of the *System Interconnect Drawing* for the system flow and pressure requirements. This drawing is included with your installation package. Select **Cal Gas Duration** from the **Calibration** menu to set calibration gas times.

AC Power Checks

Problem/Possible Cause	Corrective Action
Loss/Inadequate AC Voltage to the Analyzer	Measure the AC voltage to the **Sensor** board at terminals **L** and **N**. Ensure that this voltage is sufficient. Check the measurement technique used by the Volt meter (for example, RMS, average, peak, etc.). Specifications are based on RMS measurements.

Furnace Checks

Problem/Possible Cause	Corrective Action
Open Furnace	Disconnect power to the control unit and the analyzer. With Ohm meter, measure across Terminals **FURN** on the connector. At room temperature, the resistance should be: **115 VAC furnace coil: 49 ohms** **230 VAC furnace coil: 177 ohms** If the furnace resistance is open, replace the furnace.
Loss of AC Power to the Furnace	Verify the correct line voltage at **L** and **N** of the **Sensor** board. With line voltage present, check the voltage at terminals **FURN** on the **Sensor** board. If voltage is present and the system is not heating, remove power and check the furnace resistance. If no voltage is present at terminals **FURN** on the **Sensor** board, replace the **Sensor** board.

Process Pressure Checks (only if above 2 PSIG)

Problem/Possible Cause	Corrective Action
Process Pressure set incorrectly	To check that you entered the process pressure correctly, select **Process Pressure** from the **Configuration** menu. Also ensure that the calibration process pressure equals normal operating process pressure. Calibration should only be performed under these conditions for highest accuracy.

Cell Checks

Problem/Possible Cause	Corrective Action
If the Cell fails when you first begin to use the analyzer:	It is likely that there is a leak in the analyzer plumbing or an improper calibration gas setup, and there is not a problem with the Cell itself (see "Leak Check" in this chapter for help on how to check for leaks; see "Calibration/Aspirator Air Setup Checks" in this chapter for help on checking your calibration gas setup).
If the analyzer has been operating for some time and you feel the oxygen reading is inaccurate:	First check by running a known calibration gas to verify the analyzer's response. If the analyzer responds to the calibration gas correctly, it indicates either leaking or plugged plumbing.
If your analyzer doesn't respond properly to the calibration gas:	This may indicate a problem with the Cell. Before replacing the Cell, check for leaks or plugged plumbing.

Flow Sensor Alarm Limits Checks

The flow sensor reports flow as relative to ideal (i.e., 100 % is ideal flow, 50 % is half of flow). An alarm is generated when the sample flow is less than 45 % ideal.

The flow measurement is directional, with reverse flow generating an alarm.

Problem/Possible Cause	Corrective Action
Flow Sensor Failure alarm generated	One or both of the two resistive elements within the Flow Sensor has failed (open). Each element should be approximately 8–10 Ω. *Note:* *A Flow Sensor failed alarm will be generated if either element is Open.* To measure the resistive elements: 1. Take all necessary safety precautions and power down the WDG-V Analyzer. 2. Measure the resistance of each element (Flow Heater, Flow Sensor) at the terminals inside the electronics enclosure. 3. If resistance is much lower or higher than 8–10 Ω, replace the Flow Sensor.

Figure 3-1.
RTD Flow Sensor.

Maintenance

Calibration

Check calibration and/or recalibrate the analyzer every 90 days.

Safety Considerations

Before working on the analyzer, read the entire procedure you will be performing to learn how to safely perform maintenance on and troubleshoot the WDG-V Analyzer.

Before performing any maintenance, service, or troubleshooting on the analyzer, review and follow all safety information under "Personnel and Equipment Safety Information" following the Table of Contents near the beginning of this manual. This information describes procedures to follow to avoid personal injury and/or damage to the equipment. ***All regulatory agency and personnel safety procedures for your jurisdiction must be followed.***

Personnel should be thoroughly familiar with the operation of the WDG-V Analyzer before performing the maintenance and troubleshooting procedures described in this section.

Preventing leaks in the sample system is critical to proper analyzer operation. Most leaks are preventable with regular cleaning and replacement of wetted parts.

Leak check the analyzer's sample system whenever it has been dismantled for maintenance.

If you turn off the analyzer or the process is shut down, turn off the aspirator air to avoid plugging problems.

When working on analyzer plumbing, always use a backup wrench to prevent damage to welds and distortion to analyzer plumbing.

Never use pipe dope or any other contaminant that gives off a combustible vapor on any joints of the sample tubing. Combustible vapor in the sample tubing can lead to erroneous readings.

The outside of the analyzer cover and all analyzer assembly components are hot during normal operation (up to 260 °C/500 °F inside the cover), even after a considerable period following shut-down. Allow analyzer components to cool for at least 90 minutes before working inside the analyzer. Use caution and wear appropriate gloves when handling components or when touching the analyzer cover.

Be extremely careful when performing maintenance on the analyzer while the process is running, especially if the process is under significant positive pressure. Removing any part of the analyzer plumbing can allow process gases and gases of high temperature to escape into the analyzer.

General Troubleshooting

Your system may pass calibrations, yet still seem to be reading incorrect oxygen levels. If this is the case, you may want to check the following:

Aspirator Air Not Pulling Sample From Process

The aspirator will need cleaned or replaced. To clean the restriction try blowing it out with high pressure instrument air. If this doesn't work try soaking the aspirator overnight in 20 % horticulture vinegar. Otherwise the aspirator will have to be replaced.

Leak Check

Leaks can lead to inaccurate readings, especially if operating under a significant pressure or vacuum.

- Check that all compression fitting and pipe thread connections are leak tight.
- Be sure that the mounting plate or mounting flange gasket on the rear of the analyzer is in place (see "Installing the Analyzer" in Chapter 2 for details on the placement of the gasket).

Sniffing for Leaks

For processes under vacuum, you can check for leaks by sniffing the fittings with another gas (for example, nitrogen or pure oxygen), being sure to avoid the area over the top of the cell.

1. Use a piece of tygon or plastic tubing with a 1/8" stainless steel nozzle to apply the gas from a cylinder (using stainless steel prevents any problems that might occur with plastic melting the nozzle on hot analyzer components).

2. Monitor the response from the cell. When the cell millivolt reading changes, it indicates a leak in that area of the plumbing (the vacuum of the process pulls in the gas).

3. If not convenient to view the display, you can also apply a voltmeter to the Cell terminals on the **Sensor** board labeled (**+O_2-**) to see if the cell millivolts change, indicating a leak.

Pressurizing for Leaks

1. Remove the analyzer from the process (after allowing analyzer to cool) and pressurize it with 5 lb of air, plugging any exiting ports, the inlet probe, and exhaust tube holes. Then go over the analyzer fittings with a leak detector fluid.

2. If you see bubbles, it indicates a leak. If using this method be sure to prevent the liquid from reaching the furnace. If the furnace does get wet, allow it sufficient time to thoroughly dry.

Plugged Plumbing Check

Exercise care when working on the analyzer. Allow the unit to cool and wear gloves.

1. Examine the inlet and exhaust for plugging problems. When possible, rod out the probe and exhaust.

2. If this doesn't solve the problem, disassemble the analyzer to locate the plug. Clean the plumbing using hot water and a bottle brush.

3. When assembly is complete, check for leaks using a leak detecting liquid.

Internal Wiring Diagram, Standard Analyzer

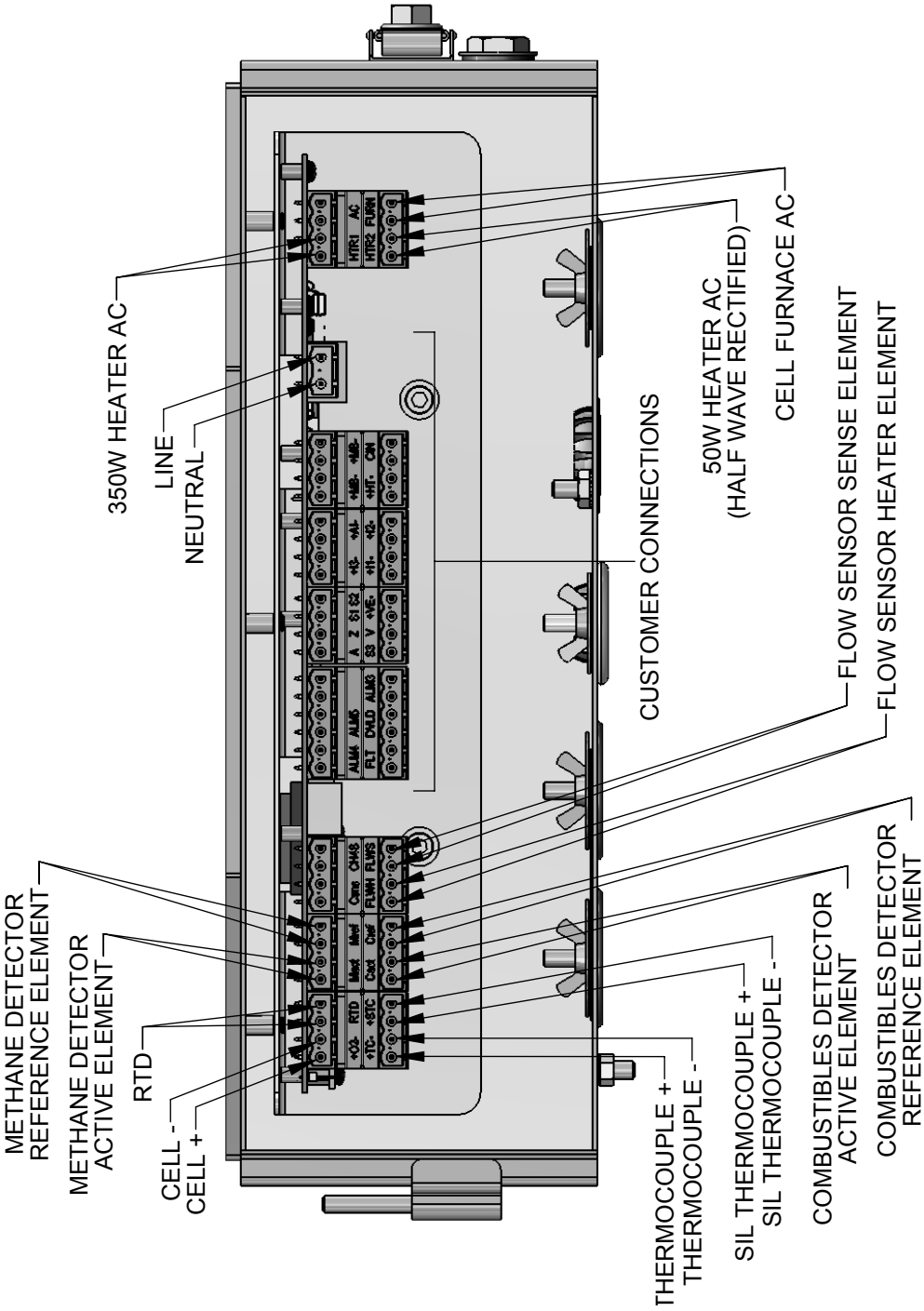


Figure 3-2.1.
Internal Wiring diagram for standard analyzer.

Customer Connections Wiring Diagram, Standard Analyzer

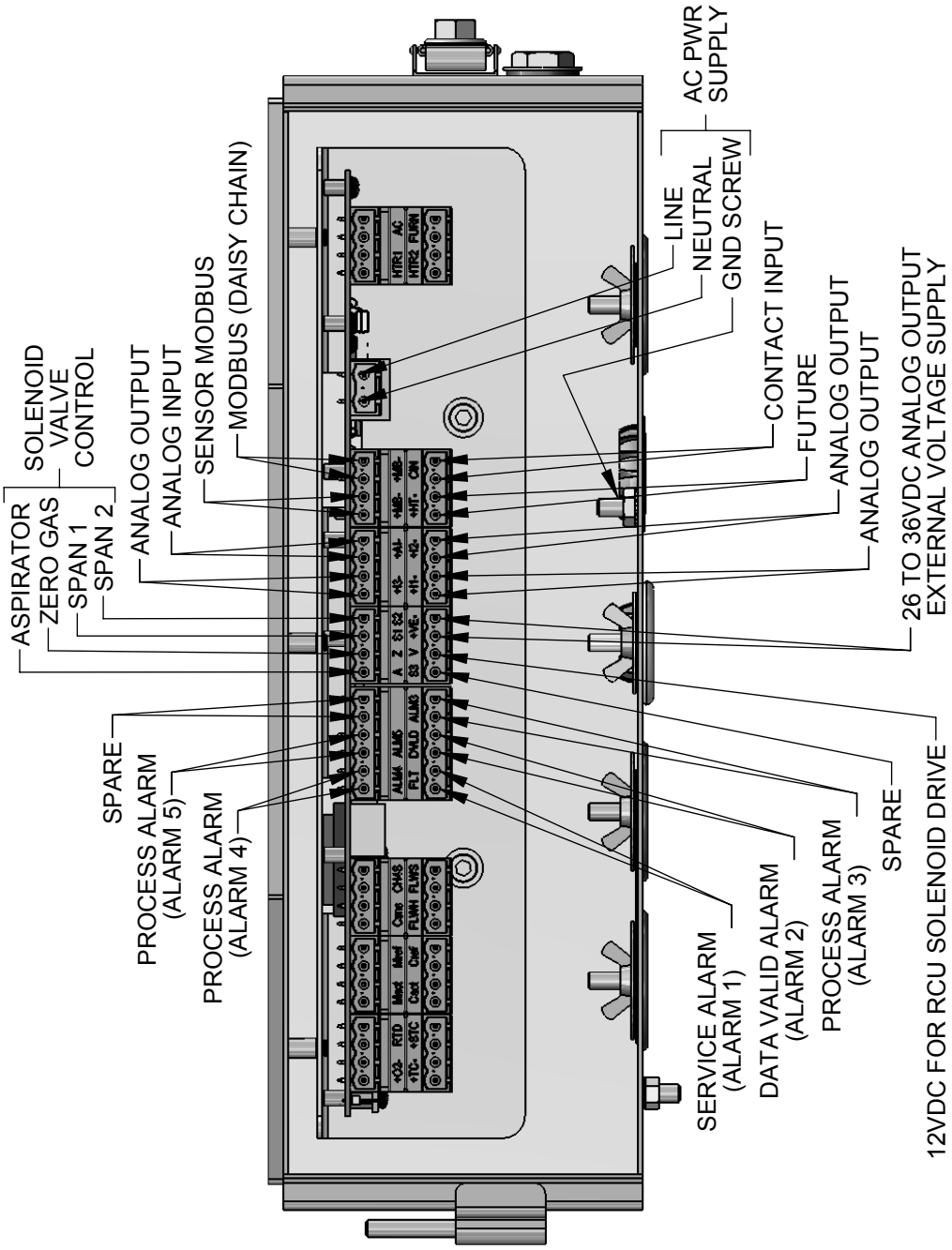


Figure 3-2.2. Customer Connections wiring diagram for standard analyzer.

Cleaning and Replacing Parts

The following sections discuss main analyzer components that can be cleaned or have their parts replaced.

Cleaning the Analyzer Enclosure

You can clean the outside of the analyzer using normal household or commercial general purpose cleaners, cloths, or sponges. You can also use water. **Always turn off power before cleaning the enclosure.**

Cleaning and Replacing Parts in the Measuring Cell

Disconnect power from the analyzer and control unit and allow it to cool before replacing its parts.

To clean and replace parts in the Measuring Cell (Figure 3-3):

1. Open the analyzer cover to expose analyzer components.
2. Close the isolation valves on the inlet and outlet of the process. Shutoff levers should be in the vertical position.
3. Remove the Cell clips.
4. While holding the top of the Cell housing with a backup wrench, loosen the lower hex nut (not the top hex nut), then remove the entire Cell assembly (see Figure 3-3).

Loosening the Cell may require an exceptional amount of torque.

5. If *cleaning the Cell*, wash with water or alcohol. Dry the Cell thoroughly before reinstalling. Always use a new Cell o-ring.

   If *replacing the Cell*, discard the old Cell and Cell o-ring and retrieve the new Cell with supplied Cell o-ring. Avoid touching the bare Cell. Instead, hold the Cell by one of its hex nuts.

6. Place the Cell o-ring on the base of the Cell as shown in Figure 3-3.

7. Insert the new Cell into the Cell housing. Do not touch the bare Cell when reinserting. Tighten the Cell into the Cell housing using the lower hex nut (the upper hex nut is pre-tightened at the factory). The Cell o-ring provides a seal for the system. Ensure the o-ring is properly aligned in its o-ring groove and apply even pressure when tightening the Cell.

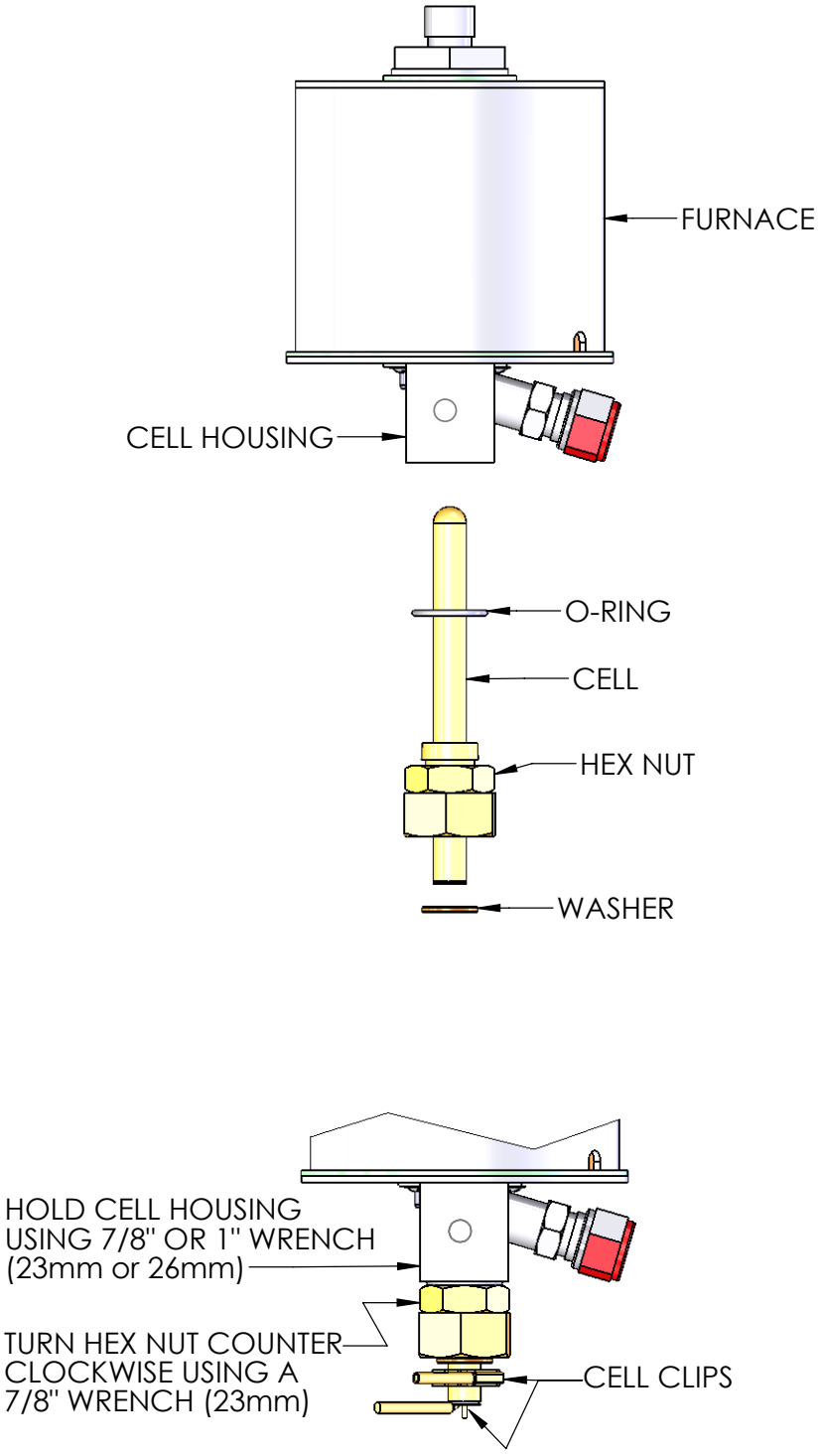


Figure 3-3.
Cell replacement.

Replacing the Thermocouple

The tip of the Thermocouple is positioned in the furnace so that it is near, but not touching, the Cell Housing or the furnace heater coil.

To replace the Thermocouple:

1. Open the analyzer door to expose analyzer components (Figure 3-4).
2. Close the isolation valves on the inlet and the outlet of the process. The shutoff levers should be in the vertical position.
3. Disconnect Thermocouple wires from terminals **+TC-** on the **Sensor** board.
4. Remove the two (2) speed clips from the Thermocouple mounting tabs. Use needle-nose pliers to remove the clips.
5. Pull the Thermocouple straight down and remove it from the furnace.
6. Insert the new Thermocouple aligning the tab with the two posts on the bottom plate.

Take care to avoid damaging the ceramic tip while inserting the assembly.

7. Attach one new speed nut to each post.
8. Attach the Thermocouple wires to the **+TC-** terminals on the **Sensor** board (Yellow wire is positive (**+**)).
9. Perform an oxygen calibration.

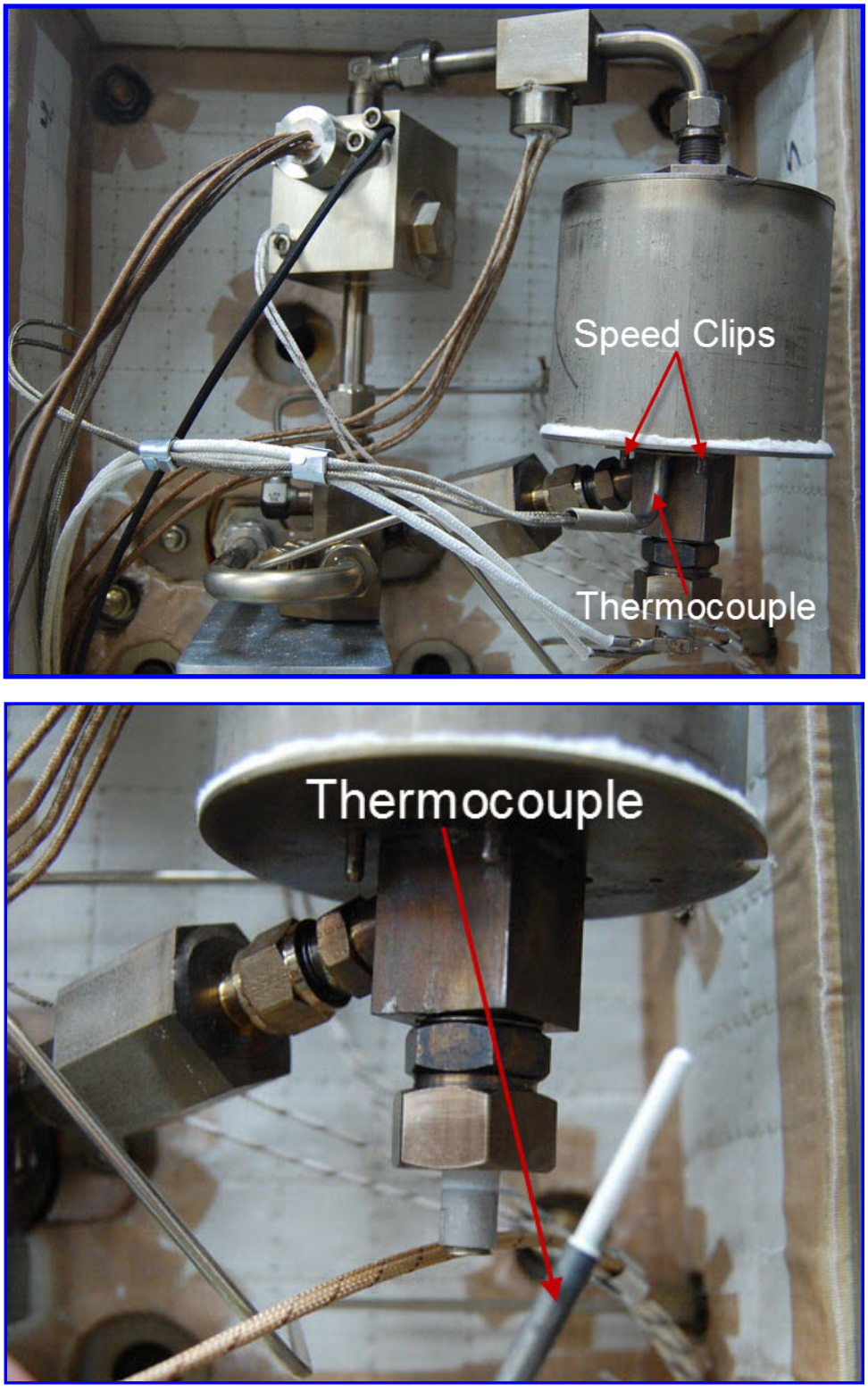


Figure 3-4.
Thermocouple replacement.

Replacing the Combustibles / Methane Detectors

The Combustibles Detector will always face outward, and the Methane detector will always face inward from the factory.

Combustibles Detector

To replace the Combustibles Detector (Figure 3-5):

1. On the **Sensor** board, disconnect the Combustibles Detector wires from the terminal block labeled **Cact** and **Cref**.

   For RTD Combustibles Detectors, the White with Red stripe wire goes to **Cact** and the plain White wire goes to **Cref**.

   For Hotwire Combustibles Detectors, the Black wires go to **Cact** and the Brown wires go to **Cref**.

2. Loosen the two (2) 4.0 mm hex screws that hold the Combustibles Detector in place and remove the detector from its housing. Save the screws from the detector to use when installing the new Combustibles Detector.

3. Always use a new o-ring when the Combustibles Detector has been removed.

4. Install the new Combustibles Detector in place, aligning the two s (2) crews on the Heater Block. Be careful not to damage the detector element ends while inserting the assembly. Tighten screws until face is flush with the block and gasket is fully compressed.

5. Reconnect the detector leads to the **Sensor** board.

Methane Detector

To replace the Methane Detector (Figure 3-5):

1. You must remove the Heater Block in order to access and replace the Methane Detector.

2. Disconnect the Methane Detector (Blue and White) wires on the **Sensor** board.

3. Loosen the two (2) 4.0 mm hex screws that holds the Methane Detector in place and remove the detector from its housing. Save the screws from the detector to use when installing the new combustibles detector.

4. Always use a new o-ring when the Methane Detector has been removed.

5. Install the new Methane detector in place, aligning the two screws on the block. Be careful not to damage the detector element ends while inserting the assembly. Tighten screws until face is flush with the block and gasket is fully compressed.

6. Reinstall the block.

7. Reconnect the detector leads to the **Sensor** board.

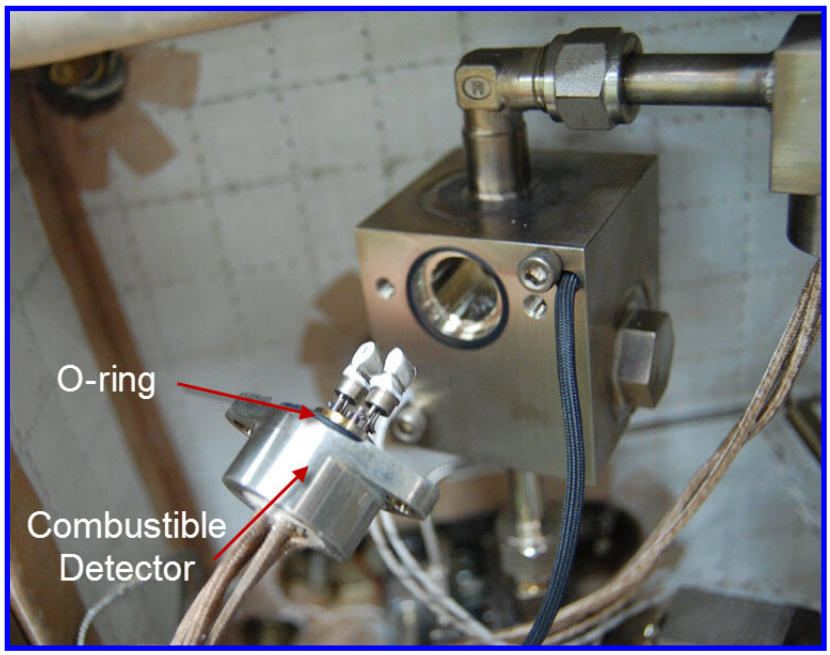


Figure 3-5. Combustibles Detector replacement.

Replacing the Flow Sensor

To replace the Flow Sensor (Figure 3-6):

1. Open the analyzer and electronics enclosure door and expose the analyzer components and electronics.

2. Close the isolations valves on the inlet and outlet of the process. Shutoff levers should be in the vertical position.

3. Disconnect the RTD flow sensor wires from the **Sensor** board at Terminal **Cact**.

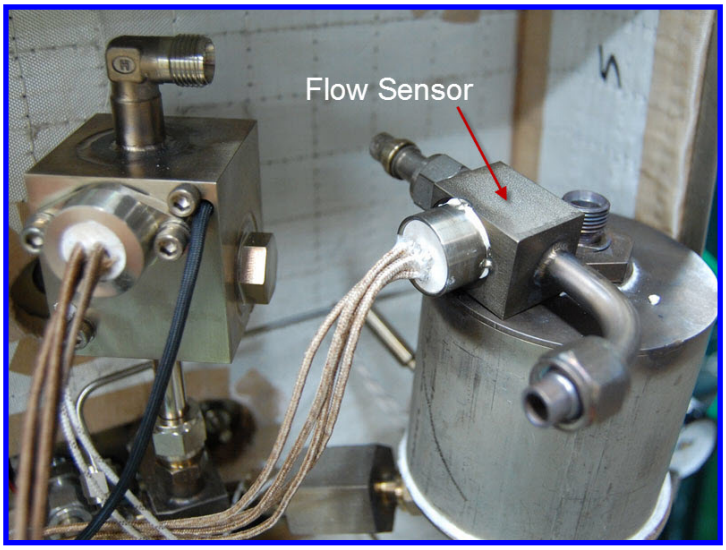
4. Disconnect the RTD flow sensor from the J-hook by unscrewing the Swagelok nut indicated in the image below.

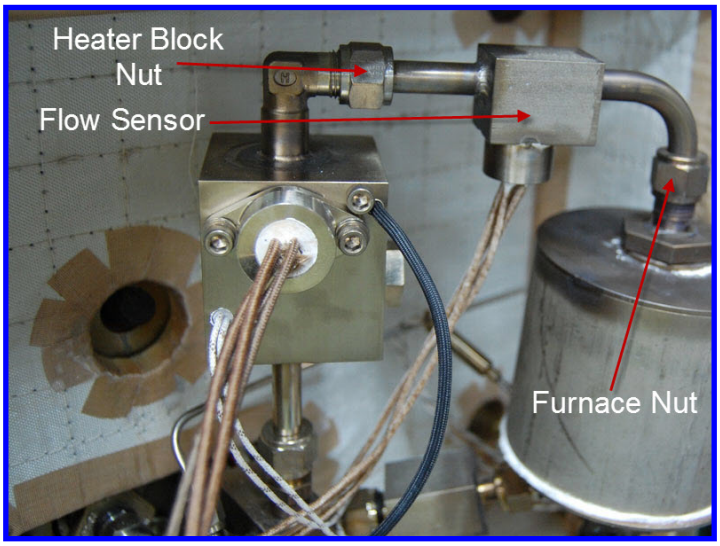
5. Install the new RTD flow sensor into the J-hook. Make sure to properly swage the nut to avoid any leaks.

6. Route the wires through the top conduit back to the electronics enclosure.

7. Connect the new wires to the **Cact** terminals.

8. Reopen the process valves and close the enclosure doors.





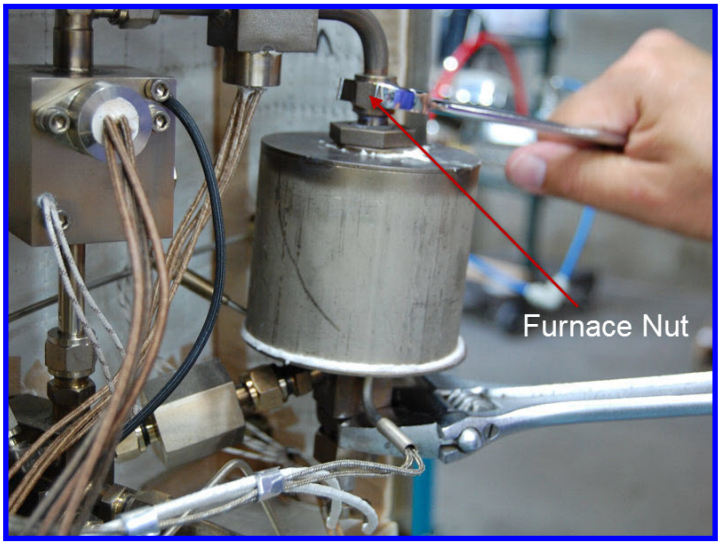


Figure 3-6.
Flow sensor replacement.

Replacing the Furnace

To replace the Furnace (Figure 3-7):

1. Open the analyzer and expose the analyzer components.
2. Close the isolation valves on the inlet and outlet of the process. Shutoff levers should be in the vertical position.
3. Disconnect Cell furnace wires.
4. Remove the Thermocouple assembly from the furnace.
5. Remove the Cell.
6. Remove the Flow Sensor.
7. Loosen the Swagelok nut at the bottom of the furnace. Loosen the Swagelok nut below the flow sensor.
8. Remove the Furnace assembly.
9. Install the new Furnace assembly in place.
10. Reinstall the Thermocouple, Flow Sensor, and Cell.
11. Reconnect the wires on the **Sensor** board.

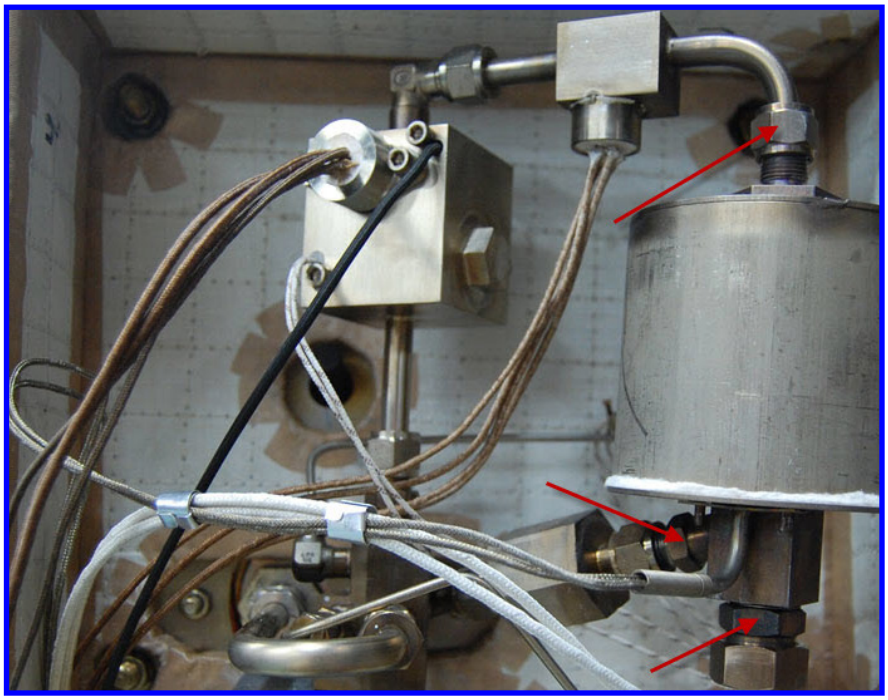


Figure 3-7.
Furnace Assembly.

Replacing the Box Heater

NOTE

There is only one heater in the O_2 version. There are two heaters in the Combustibles/Methane version of the WDG-V.

To replace the Box Heater (Figure 3-8):

1. Disconnect heater wires.
2. Remove the speed clip from the mounting tab. Use needle-nose pliers to remove the clip.
3. Remove the box heater by sliding it out.
4. Replace the box heater
5. Attach a new speed nut to the post.
6. Reconnect the wires on the **Sensor** board.

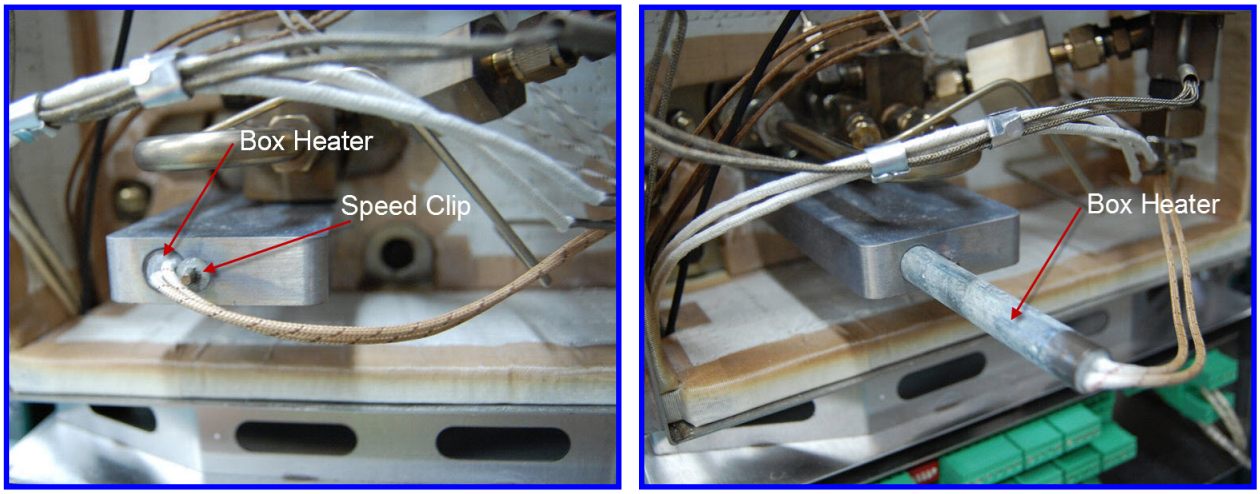


Figure 3-8.
Box Heater Replacement.

Replacing the Combustibles Block Heater (Only on Combustibles/Methane Units)

To replace the Combustibles Block Heater (Figure 3-9):

1. Disconnect heater wires.
2. Loosen the 4.0 mm hex screw.
3. Remove the Combustibles Block Heater by sliding it out.
4. Replace the Block Heater.
5. Tighten the hex screw into place.
6. Reconnect the wires on the **Sensor** board.

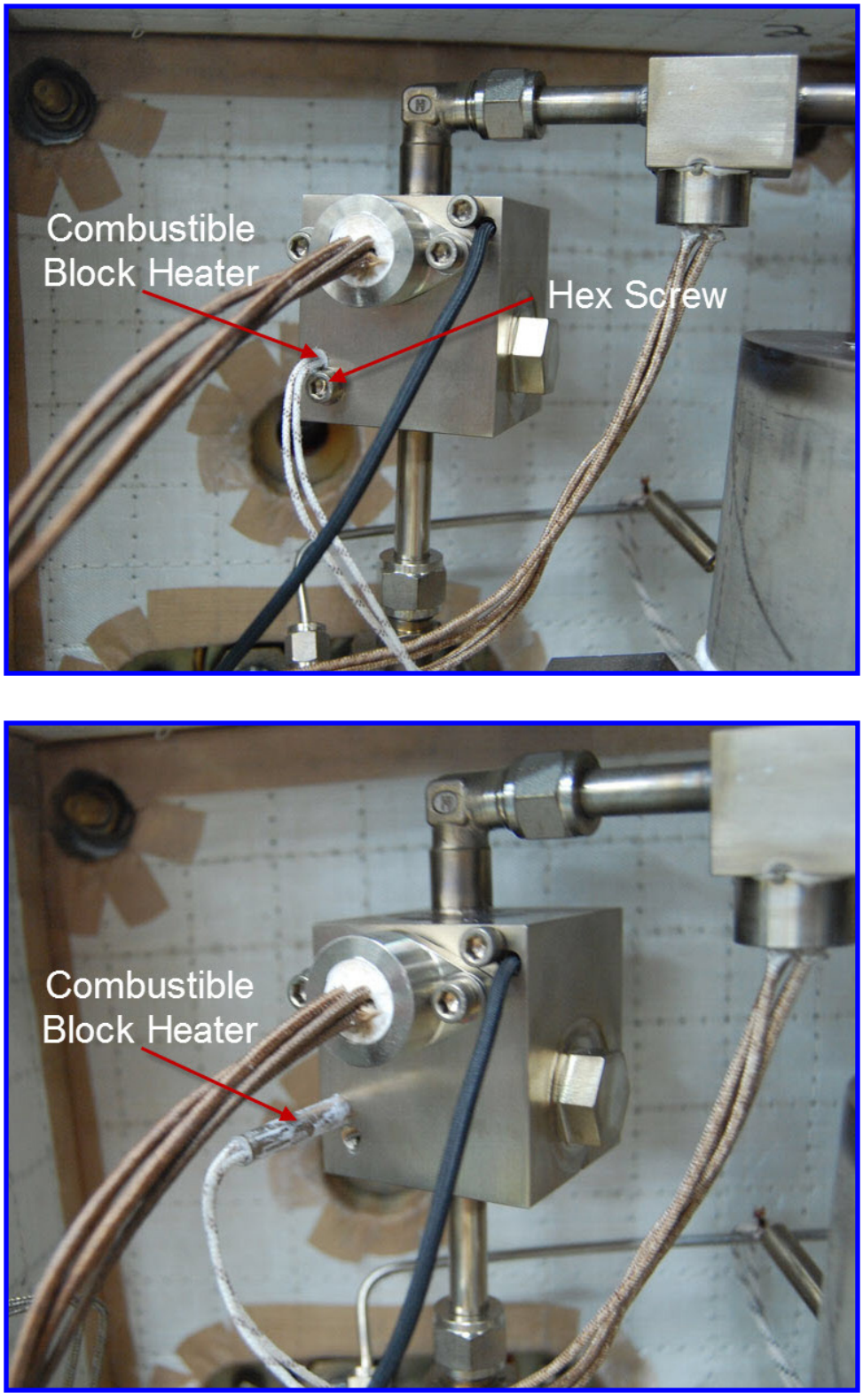


Figure 3-9.
Combustibles Block Heater Replacement.

Replacing the Sensor Board

To replace the **Sensor** board (Figure 3-10):

1. Disconnect all wires.
2. Loosen the two Phillips screw located on the back of the electronics plate.
3. Slide the board out until the pegs at the top line up with the holes in the **Sensor** board plate and drop it down.
4. Replace the **Sensor** board.
5. Properly tighten the screws.

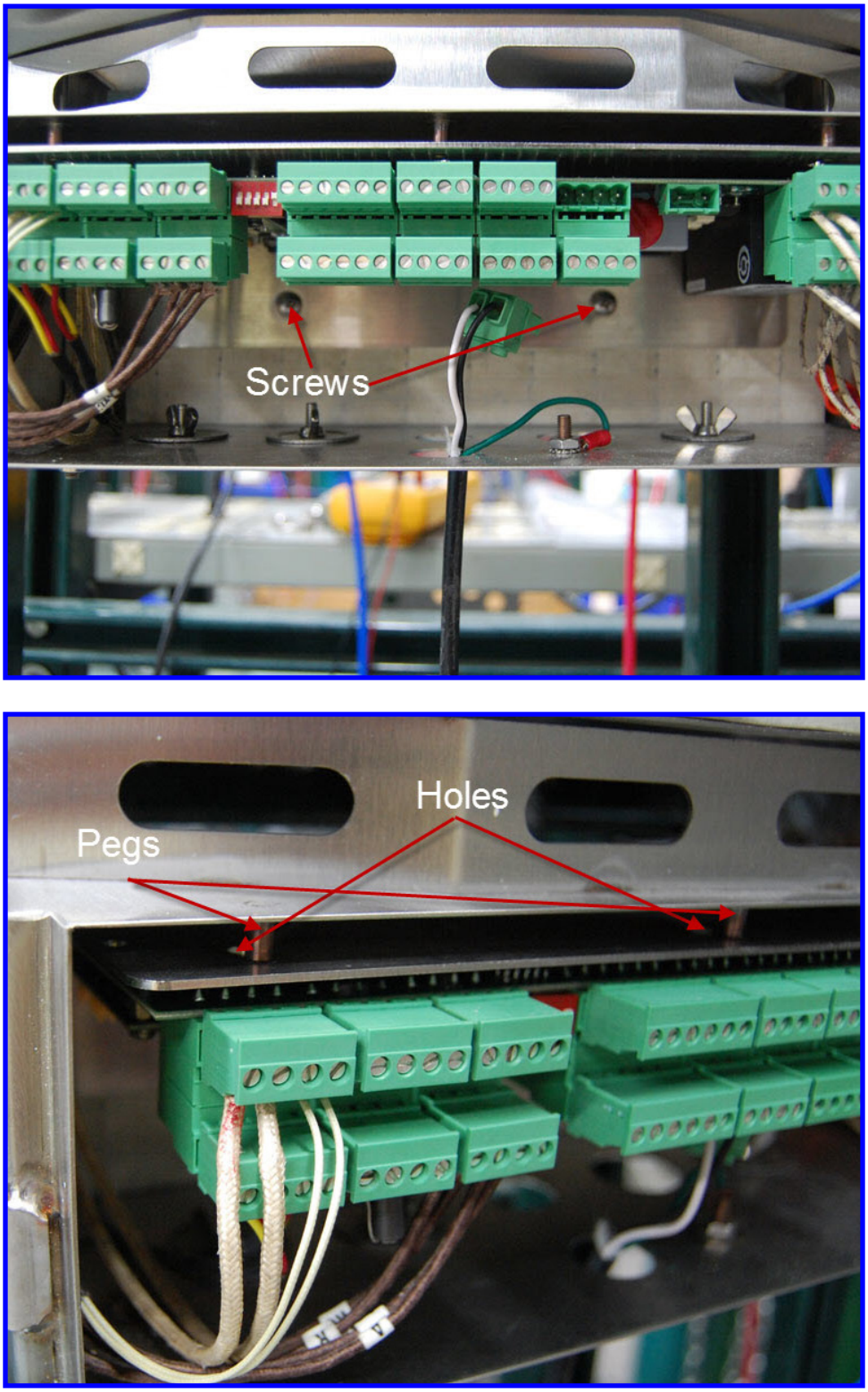


Figure 3-10.
Sensor board removal.

Alarm and Warning Messages

This section lists the Error (Alarm / Warning) messages that can be triggered by the system, to alert you to potential or impending problems with the analyzer. Descriptions of the Alarms and Warnings, along with possible trigger conditions, and corrective action to take to correct the Error, are also included. These system and error messages are listed alphabetically to make them easier to locate.

Alarms

Alarm Condition / Description / Corrective Action
Analog Output 1 Error The analog output measurement does not match the setting. ***Trigger Conditions:*** • Open 4–20 mA loop. • Failed or faulty read-back circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the 4–20 mA loop for an open circuit. • Check for a failed analog output. • Check for a failed or faulty read-back circuit.
Box Temp High Box temperature is four degrees or higher above the setpoint. ***Trigger Conditions:*** • Failed Temperature Control Circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the associated cables/wiring for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the associated components for proper operation and replace faulty parts if necessary. **Contact AMETEK to verify operation before removing and replacing parts.**

Alarm Condition / Description / Corrective Action
Box Temp Low Box temperature is four degrees or lower below the setpoint. ***Trigger Conditions:*** • This condition may be triggered upon analyzer power-up while the analyzer is warming up to its normal operating temperature, but will clear after the analyzer has properly warmed up to its normal operating temperature. • Faulty Heater connection. • Faulty RTD connection. • Faulty Heater. • Faulty RTD. • Low power. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Box Heater and Box Temperature RTD wiring for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the Box Temperature RTD for a short or open circuit. Replace the RTD if necessary. **Contact AMETEK to verify operation before removing the RTD.** • Check the Box Heater for proper operation. Replace the Heater if necessary. **Contact AMETEK to verify operation before removing the RTD.** • Check the AC mains power to ensure adequate power is being supplied.
Box Temp Rise Failure Box temperature failed to heat. ***Trigger Conditions:*** • This condition may be triggered upon analyzer power-up while the Box temperature is warming up to its normal operating temperature, but will clear after the Cell has properly warmed up to its normal operating temperature. • Faulty Box Heater connection. • Faulty RTD connection. • Faulty Box Heater. • Faulty RTD. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Box Heater and Box Temperature RTD wiring for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the Box Temperature RTD for a faulty circuit. Replace the RTD if necessary. **Contact AMETEK to verify operation before removing the RTD.** • Check the Box Heater for proper operation. Replace the Heater if necessary. **Contact AMETEK to verify operation before removing the RTD.**

Alarm Condition / Description / Corrective Action
Cell Failure (Open) Cell resistance exceeds the normal limit. ***Trigger Conditions:*** • Open Cell connection. • Faulty Cell. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Cell for an open circuit. • Check the Cell for proper operation. Replace the Cell if necessary. **Contact AMETEK to verify operation before removing the Cell.**
Cell Mv Mismatch The Cell Mv measurement does not match the real-time Cell measurement. ***Trigger Conditions:*** • Faulty A/D circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the A/D circuit for proper operation. This could indicate faulty electronics.
Cell Over Temp Cell temperature is four degrees or higher above the setpoint. ***Trigger Conditions:*** • Faulty Thermocouple. • Failed Temperature Control Circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the associated cables for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the Cell Thermocouple for a short or open circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.**
Cell T/C Failure The Thermocouple is not connected or is open. ***Trigger Conditions:*** • Faulty Thermocouple connection. • Faulty Thermocouple. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Thermocouple wiring for proper connections and inspect it for damage (cuts, nicks, burn marks, etc.). • Check the Thermocouple for a short or open circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.**

Alarm Condition / Description / Corrective Action
Cell T/C Measurement Mismatch The redundant temperature measurement does not match the real-time Thermocouple measurement. ***Trigger Conditions:*** • Faulty Thermocouple. • Faulty Thermocouple circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Thermocouple wiring for proper connections and inspect it for damage (cuts, nicks, burn marks, etc.). • Check the Thermocouple for proper operation. • Check the Thermocouple circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.**
Cell Temperature Control A critical over-temperature condition has occurred. ***Trigger Conditions:*** • Shorted, open, or faulty Thermocouple. • Failed Temperature Control Circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the associated cables for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the Thermocouple for a short or open circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.** After this check has been made, cycle the analyzer AC power Off-On; this will reset the analyzer and clear this alarm.
Cell Temp Rise Failure Cell heater failed to heat the Cell. ***Trigger Conditions:*** • Faulty Cell Furnace Heater connection. • Faulty Thermocouple connection. • Faulty Cell Furnace Heater. • Shorted Thermocouple. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the associated cables for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the Thermocouple for a short or open circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.** After this check has been made, cycle the analyzer AC power Off-On; this will reset the analyzer and clear this alarm.

Alarm Condition / Description / Corrective Action
Cell Under Temp Cell temperature is four degrees or lower below the setpoint. ***Trigger Conditions:*** • This condition may be triggered upon analyzer power-up while the Cell is warming up to its normal operating temperature, but will clear after the Cell has properly warmed up to its normal operating temperature. • Faulty Heater connection. • Faulty Thermocouple connection. • Faulty Heater. • Faulty Thermocouple. • Failed Temperature Control Circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Heater and Thermocouple cables for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Check the Cell Thermocouple for a short or open circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.** • Check the Heater for a short or open circuit. Replace the Heater if necessary. **Contact AMETEK to verify operation before removing the Heater.**
Cold Junction Compensator Failure The PCB temperature sensor has failed. ***Trigger Conditions:*** • This can be caused by faulty electronics. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the associated cables for proper connections and inspect them for damage (cuts, nicks, burn marks, etc.). • Test the PCB temperature sensor for proper operation. Use a multimeter to measure the resistance of the Temperature Sensor and to test for an open circuit. After this check has been made, cycle the analyzer AC power Off-On; this will reset the analyzer and may clear any problems with the PCB.
Combustible Detector Open (applicable only to WDG-VC Analyzers) Combustibles Detector is open or not connected. ***Trigger Conditions:*** • Bad Combustibles Detector. • Bad electronics or wiring. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Combustibles Detector for an open circuit. • Check the operation of the electronics and check the wiring for damage or improper connections. • Check the Combustibles Detector for proper operation. Replace the Detector if necessary. **Contact AMETEK to verify operation before removing the Detector.**

Alarm Condition / Description / Corrective Action
Flow Sensor Failure The Flow Sensor failed (open). ***Trigger Conditions:*** • Faulty Flow Sensor. • Faulty Flow Sensor circuit. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Flow Sensor for proper operation. • Check the Flow Sensor for a faulty circuit.
Low Sample Flow Low sample flow detected. ***Trigger Conditions:*** • This condition may be triggered upon analyzer power-up while the analyzer is warming up, but will clear after the analyzer has properly warmed up to its normal operating temperature. • Loss of Aspirator Air. • Plugged Inlet Probe. • Plugged Sample System. ***Corrective Action:*** • Check the Aspirator Air line for damage. • Check the Aspirator Air supply to ensure it is adequate. Take appropriate safety precautions, power down the Analyzer, and: • Check the Sample System and Inlet Probe for plugging problems. Refer to "Plugged Plumbing Check" for information on how to check for plugging problems.
Methane Detector Open (applicable only to WDG-VM Analyzers) Methane Detector is open or not connected. ***Trigger Conditions:*** • Bad Methane Detector. • Bad electronics or wiring. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Methane Detector for an open circuit. • Check the operation of the electronics and check the wiring for damage or improper connections. • Check the Methane Detector for proper operation. Replace the Detector if necessary. **Contact AMETEK to verify operation before removing the Detector.**

Alarm Condition / Description / Corrective Action
Over Temp Relay Tripped The Cell over-temperature relay has tripped. ***Trigger Conditions:*** • Over-temperature condition. • Open Thermocouple. • Failed Temperature Control Circuit. ***Corrective Action:*** From the User Interface or PC Configurator Software: • Check the **Cell Temp** reading to verify if the Cell temperature is above its setpoint. Take appropriate safety precautions, open the Analyzer door, and: • Check the Thermocouple for an open circuit. Replace the Thermocouple if necessary. **Contact AMETEK to verify operation before removing the Thermocouple.** After this check has been made, cycle the analyzer AC power Off-On; this will reset the analyzer and clear this alarm.
RTD Failure The Box Temp RTD Failed. ***Trigger Conditions:*** • Faulty RTD. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Check the Box Temperature RTD wiring for proper connection and inspect it for damage (cuts, nicks, burn marks, etc.). • Check the Box Temperature RTD for a short or open circuit. Replace the RTD if necessary. **Contact AMETEK to verify operation before removing the RTD.**

Warnings

Alarm Condition / Description / Corrective Action
Analog Output 1 Out Of Range The analog output value is saturated (high or low). ***Trigger Conditions:*** • Incorrect range setting. ***Corrective Action:*** From the User Interface or PC Configurator Software: • Check the range configured for Analog Output 1. Change it to the required range if necessary.
Analog Output 2 Out Of Range The analog output value is saturated (high or low). ***Trigger Conditions:*** • Incorrect range setting. ***Corrective Action:*** From the User Interface or PC Configurator Software: • Check the range configured for Analog Output 2. Change it to the required range if necessary.
Analog Output 3 Out Of Range The analog output value is saturated (high or low). ***Trigger Conditions:*** • Incorrect range setting. ***Corrective Action:*** From the User Interface or PC Configurator Software: • Check the range configured for Analog Output 3. Change it to the required range if necessary.
Cell Life Nearing Its End The ZrO_2 Cell is nearing its end of life. This is based on calibration history. ***Trigger Conditions:*** • Low Cell output. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Replace the ZrO_2 Cell. **Contact AMETEK to verify operation and to order a new Cell.**

Alarm Condition / Description / Corrective Action
Comb Calibration Required Combustibles Calibration is required. ***Trigger Conditions:*** • Last Calibration failed. • Unit has never been calibrated. ***Corrective Action:*** • Restart the Calibration and allow sufficient time for it to complete its cycle.
Comb Detector Life Nearing Its End The Combustibles Detector sensitivity is near its end of life. This is based on calibration history. ***Trigger Conditions:*** • Low Combustibles Detector output. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Replace the ZrO_2 Cell. **Contact AMETEK to verify operation and to order a new Cell.**
High Cell Mv The combustible measurement is no longer valid (set to full-scale) due to lack of O_2. ***Trigger Conditions:*** • Hydrocarbon upset. ***Corrective Action:*** • Check to determine if there has been a Hydrocarbon upset in the plant.
Last CH_4 Calibration Failed The last methane calibration failed. ***Trigger Conditions:*** • Tank Empty. • Bad solenoid. • Insufficient time allowed for calibration. • Bad detector. ***Corrective Action:*** • Check the Calibration tank. • Check the solenoid for proper operation. • Restart the Calibration and allow sufficient time for it to complete its cycle. • Check the Methane Detector for proper operation.

Alarm Condition / Description / Corrective Action
Last Comb Calibration Failed The last combustible calibration failed. ***Trigger Conditions:*** • Tank Empty. • Bad solenoid. • Insufficient time allowed for calibration. • Bad detector. ***Corrective Action:*** • Check the Calibration tank. • Check the solenoid for proper operation. • Restart the Calibration and allow sufficient time for it to complete its cycle. • Check the Combustibles Detector for proper operation.
Last Flow Calibration Failed The last Flow Sensor calibration failed. ***Trigger Conditions:*** • Plugged Sample System. • Faulty O_2 Cell. ***Corrective Action:*** • Check the Sample System (and Inlet Probe) for plugging problems. Refer to "Plugged Plumbing Check" for information on how to check for plugging problems. • Check the O_2 Cell for proper operation.
Last O_2 Span Calibration Failed The last oxygen Span Calibration failed. ***Trigger Conditions:*** • Span Calibration gas tank is empty. • Elapsed Span Calibration time too short. • Faulty Calibration gas solenoid. • Faulty O_2 Cell. ***Corrective Action:*** • Check the Span Calibration gas tank. Replace if necessary. • Allow sufficient time to allow the Span Calibration gas to flow through the O_2 Sensor and to stabilize. Refer to "Calibration/Aspirator Air Setup Checks" in this chapter for additional information. • Check the Calibration gas solenoid for proper operation. • Check the O_2 Cell for proper operation.

Alarm Condition / Description / Corrective Action
Last O_2 Zero Calibration Failed The last oxygen Zero calibration failed. ***Trigger Conditions:*** • Zero Calibration gas tank is empty. • Elapsed Zero calibration time too short. • Faulty Calibration gas solenoid. • Faulty O_2 Cell. ***Corrective Action:*** • Check the Zero Calibration gas tank. Replace if necessary. • Allow sufficient time to allow the Zero Calibration gas to flow through the O_2 Sensor and to stabilize. Refer to "Calibration/Aspirator Air Setup Checks" in this chapter for additional information. • Check the Calibration gas solenoid for proper operation. • Check the O_2 Cell for proper operation.
Methane Calibration Required Methane Calibration is required. ***Trigger Conditions:*** • Last Calibration failed. • Unit has never been calibrated. ***Corrective Action:*** • Restart the Calibration and allow sufficient time for it to complete its cycle.
Methane Detector Life Nearing Its End The Methane Detector sensitivity is near its end of life. This is based on calibration history. ***Trigger Conditions:*** • Low Methane Detector output. ***Corrective Action:*** Take appropriate safety precautions, open the Analyzer door, and: • Replace the ZrO_2 Cell. **Contact AMETEK to verify operation and to order a new Cell.**
Oxygen Calibration Required O_2 Calibration is required. ***Trigger Conditions:*** • Last Calibration failed. • Unit has never been calibrated. ***Corrective Action:*** • Restart the Calibration and allow sufficient time for it to complete its cycle.

Specifications

Specifications included in this chapter for the WDG-V, WDG-VC, WDG-VCM, and WDG-VM versions of this analyzer are typical for the ranges listed. For custom ranges/applications refer to accompanying Manual Supplements *shipped with the analyzer, or consult with your AMETEK representative.*

WDG-V Analyzer Specifications

Specification	Description
Output Range	Oxygen: From 0–1 % to 0–100 % Combustibles: From 0–2,000 PPM to 0–10,000 PPM Methane: From 0–1 % to 0–5 %
Accuracy	Oxygen: ±0.75 % of measured value or ±0.05 % O_2, whichever is greater Combustibles: ±2 % of full scale output range Methane: ±5 % of full scale output range
Response	Oxygen: 90 % of a step change <6 seconds Combustibles: 90 % of a step change <20 seconds
Drift	<0.1 % of cell output per month; <0.005 % O_2 with 2 % O_2 applied
Aspirator Air Requirements	5 SCFH
Maximum Flue Gas Temperature / Probe Types / Probe Lengths	704 °C (1300 °F) / 316 SS / 91 cm – 274 cm (36" – 108") 1024 °C (1875 °F) / 310 SS / 91 cm – 274 cm (36" – 108") 1649 °C (3000 °F) / Hexoloy®/ 60 cm – 183 cm (24" – 72")
Maximum Sample Dewpoint	392 °F (200 °C) standard
Alarms	Five dry contact alarms. One Service Alarm, One Data Valid Alarm. Remaining alarms can be set to oxygen, combustibles, and methane.
Contact Rating	0.5 A, 30 V maximum, non-inductive load, DC or AC 10 W maximum
Diagnostics	Watchdog timer and Service alarm (Trouble alarm). Cell Resistance Measurement. Individual I/O control. Cell/Detector end-of-life warning.
Communications	RS-485, 2-wire, Modbus, HART® Option available.
Analog Output	Three isolated linear current outputs. Select O_2, combustibles, methane, Cell mV. Each output can be 4–20 mA, 0–20 mA, 20–4 mA, or 20–0 mA and is fully scalable. Hold or Track during Calibration maximum load 1000 ohms.
Sample Pressure	±10 inch water gauge
Flow Sensor	Blocked flow sensor for measuring flow in the sample loop. Alarm set to 45 % of nominal flow.
Environment	Ambient Temperature: -25 °C to 65 °C (-13 °F to 149 °F) -20 °C to 60 °C (-5 °F to 140 °F) with Haz-Loc Certification Relative Humidity: 10 % to 90 %, non-condensing
Power Requirements (WDG IVCM/IQ)	115 VAC, ±10 %, 47–63 Hz, 740 VA maximum 230 VAC, ±10 %, 47–63 Hz, 740 VA maximum
Calibration	Calibrate or verify calibration. Store last 10 calibration data. Selectable calibration gas run time and process recovery time. Timed automatic calibration with optional Remote Calibration Unit.

Specification	Description
Calibration Gas Requirements	Use calibration gases @ 10 PSIG, 3.0 SCFH. Use certified mixtures only. O_2 Span Gas: Instrument air or from 1.0–100 % O_2, balance N_2 (typically, 2 % O_2, balance N_2). O_2, Combustibles, and CH_4 Zero Gas: 2 % O_2 or from 0.1–10 % O_2, balance N_2. Combustibles Span Gas (WDG-VC and WDG-VCM models only): 60–80 % of the selected combustibles recorder output range in equal mixtures of CO + H_2, 3–4 % O_2, balance N_2. CH_4 Span Gas (WDG-VM, WDG-VCM models only): 2 % CH_4, 8–10 % O_2, balance N_2. For example, using a 2000 PPM Combustibles range, span with a mix of 800 PPM CO, 800 PPM H_2, 3–4 % O_2, balance N_2.

NOTES

1. All static performance characteristics are with operating variables constant.
2. System accuracy referenced to 0.1 to 10 % calibrated range.
3. Response is to calibration gas.
4. Specifications for combustibles and methane apply only to those versions equipped for measuring these gases.

WDG-VC Analyzer Specifications

Specification	Description
Output Range	Oxygen: From 0–1 % to 0–100 % Combustibles: From 0–2,000 PPM to 0–10,000 PPM
Accuracy	Oxygen: ±0.75 % of measured value or ±0.05 % O_2, whichever is greater Combustibles: ±2 % of full scale output range
Response O_2	90 % of a process step change <6 seconds
Drift	<0.1 % of cell output per month (<0.005 % O_2 per month with 2 % O_2 applied)
Aspirator Air Requirements	≈ 3 SCFH (1.4 L/minute) at 15–100 PSIG (1.05–7.04 kg/cm^2)
Maximum Flue Gas Temperature / Probe Types / Probe Lengths	704 °C (1300 °F) / 316 SS / 91 cm – 274 cm (36" – 108") 1024 °C (1875 °F) / 310 SS / 91 cm – 274 cm (36" – 108") 1649 °C (3000 °F) / Hexoloy®/ 60 cm – 183 cm (24" – 72")
Maximum Sample Dewpoint	392 °F (200 °C)
Sample Pressure	±10 inch water gauge
Environment	Ambient Temperature: -25 °C to 65 °C (-13 °F to 149 °F) -20 °C to 60 °C (-5 °F to 140 °F) with Division 2 Option Relative Humidity: 10 % to 90 %, non-condensing Maximum Altitude: 5000 meters
Power Requirements	115 VAC, ±10 %, 47–63 Hz, 740 VA maximum 230 VAC, ±10 %, 47–63 Hz, 740 VA maximum
Calibration Gas Requirements	Use calibration gases @ 10 PSIG, 3.0 SCFH (1.4 L/minute). Use certified mixtures only. O_2 Span Gas: Instrument air or from 1.0–100 % O_2, balance N_2. O_2 Zero Gas and Combustibles Zero Gas: 2 % or from 0.1–10 % O_2, balance N_2 . Combustibles Span Gas: 60–80 % (PPM ranges) of the selected combustibles recorder output in certified mixtures of CO + H_2, 3–4 % O_2, balance N_2. CH_4 Span Gas (WDG-VM, WDG-VCM models only): 2 % CH_4, 8–10 % O_2, balance N_2. For example, using a 2000 PPM Combustibles range, span with a mix of 800 PPM CO, 800 PPM H_2, 3–4 % O_2, balance N_2.

NOTES:

1. All static performance characteristics are with operating variables constant.
2. System accuracy referenced to 0.1 to 10 % calibrated range.
3. Response is to calibration gas (without flame arrestors).

WDG-VCM Analyzer Specifications

Specification	Description
Output Range	Oxygen: From 0–1 % to 0–100 % Combustibles: From 0–2,000 PPM to 0–10,000 PPM Methane: From 0–5 %
Accuracy	Oxygen: ±0.75 % of measured value or ±0.05 % O_2, whichever is greater Combustibles: ±2 % of full scale output range Methane: ±5 % of full scale output range
Response O_2	90 % of a process step change <6 seconds
Drift	<0.1 % of cell output per month <0.005 % O_2 per month with 2 % O_2 applied
Aspirator Air Requirements	≈ 3 SCFH (1.4 L/minute) at 15 to 100 PSIG (1.05 to 7.04 kg/cm^2)
Maximum Flue Gas Temperature / Probe Types / Probe Lengths	704 °C (1300 °F) / 316 SS / 91 cm – 274 cm (36" – 108") 1024 °C (1875 °F) / 310 SS / 91 cm – 274 cm (36" – 108") 1649 °C (3000 °F) / Hexoloy®/ 60 cm – 183 cm (24" – 72")
Maximum Sample Dewpoint	392 °F (200 °C)
Sample Pressure	392 °F (200 °C)
Environment	Ambient Temperature: -25 °C to 65 °C (-13 °F to 149 °F) -20 °C to 60 °C (-5 °F to 140 °F) with Division 2 Option Relative Humidity: 5 % to 90 %, non-condensing Maximum Altitude: 5000 meters
Power Requirements	115 VAC, ±10 %, 47–63 Hz, 740 VA maximum (750 VA maximum floor mount option) 230 VAC, ±10 %, 47–63 Hz, 740 VA maximum (2000 VA maximum floor mount option)
Calibration Gas Requirements for Combustibles Detector	Use calibration gases @ 10 PSIG, 3.0 SCFH (0.70 kg/cm^2, 0.7 L/minute). Use certified mixtures only. O_2 Span Gas: Instrument air or from 1.0–100 % O_2, balance N_2. O_2 Combustibles and CH_4 Zero Gases: From 0.1–10 % O_2, balance N_2. Combustibles Span Gas: 60–80 % (PPM ranges) or 40–60 % (% ranges) of the selected combustibles recorder output range in certified mixtures of CO + H_2, 3–4 % O_2, balance N_2. CH_4 Span Gas: 2 % CH_4, 8–10 % O_2, balance N_2.

NOTES:

1. All static performance characteristics are with operating variables constant.
2. System accuracy referenced to 0.1 to 10 % calibrated range.
3. Response is to calibration gas (without flame arrestors).

WDG-VM Analyzer Specifications

Specification	Description
Output Range	Oxygen: From 0–1 % to 0–100 % Methane: From 0–5 %
Accuracy	Oxygen: ±0.75 % of measured value or ±0.05 % O_2, whichever is greater Methane: ±5 % of full scale output range
Response O_2	90 % of a process step change <6 seconds
Drift	<0.1 % of cell output per month (<0.005 % O_2 per month with 2 % O_2 applied)
Aspirator Air Requirements	≈ 3 SCFH (1.4 L/minute) at 15–100 PSIG (1.05–7.04 kg/cm^2)
Maximum Flue Gas Temperature / Probe Types / Probe Lengths	1300 °F (704 °C) / 316 SS / 91 cm – 274 cm (36″ – 108″) 1875 °F (1024 °C) / 310 SS / 91 cm – 274 cm (36″ – 108″) 3000 °F (1649 °C) / Hexoloy®/ 60 cm – 183 cm (24″ – 72″)
Maximum Sample Dewpoint	392 °F (200 °C)
Sample Pressure	±10 inch water gauge
Environment	Ambient Temperature: -25 °C to 65 °C (-13 °F to 149 °F) -20 °C to 60 °C (-5 °F to 140 °F) with Division 2 Option Relative Humidity: 5 % to 90 %, non-condensing Maximum Altitude: 5000 meters
Power Requirements	115 VAC, ±10 %, 47–63 Hz, 740 VA maximum (750 VA maximum floor mount option) 230 VAC, ±10 %, 47–63 Hz, 740 VA maximum (2000 VA maximum floor mount option)
Calibration Gas Requirements for Combustibles and Methane Detector	Use calibration gases @ 10 PSIG, 3.0 SCFH (0.70 kg/cm^2, 0.7 L/minute). Use certified mixtures only. O_2 Span Gas: Instrument air or from 1.0–100 % O_2, balance N_2. O_2 Combustibles and CH_4 Zero Gases: From 0.1–10 % O_2, balance N_2 Combustibles Span Gas: 60–80 % (PPM ranges) or 40 to 60 % (% ranges) of the selected combustibles recorder output range in certified mixtures of CO + H_2, 3–4 % O_2, balance N_2. CH_4 Span Gas: 2 % CH_4, 8–10 % O_2, balance N_2.

NOTES:

1. All static performance characteristics are with operating variables constant.
2. System accuracy referenced to 0.1 to 10 % calibrated range.
3. Response is to calibration gas (without flame arrestors).

Remote Calibration Unit (RCU) Specifications

O_2 Only RCU
O_2 and Combustibles RCU
O_2, Combustibles and Methane RCU

Specification	Description
Enclosure	UL Type 4X (NEMA 4X (IP56), Division 2
Environment	Ambient Temperature: -18 °C to 60 °C (0 °F to 140 °F) with Division 2 Option Relative Humidity: 0 % to 90 %, non-condensing Maximum Altitude: 2000 meters

Approvals and Certifications

WDG-V Analyzer Directives and Standards

ATEX and IECEx Zone 2	II 2 G Ex pz IIC T3 Gc, without pressure switch II 2 G Ex d pz IIB + H_2 T3 Gc, with pressure switch
Enclosure	Hinged NEMA 4X (IP65). Purged version available.
General Safety (LVD)	Directive 2014/35/EU
NEC/CEC	Class I Division 2, Groups A, B, C, D (w/o pressure switch) Class I Division 2, Groups B, C, D w/ Series 1950G Dwyer pressure switch Class II, Division 2, Groups E, F, G (all models) AEx pz IIC T3 Gc (North America Zone 2) Temperature Code T3
EMC	Directive 2014/30/EU

WDG-VC Analyzer Directives and Standards

Enclosure	Contact AMETEK.
General Safety (LVD)	Directive 73/23/EEC
EMC	Directive 2004/108/EC

WDG-VCM Analyzer Directives and Standards

Enclosure	Hinged NEMA 3R, weather resistant, stainless steel. Optional hinged NEMA 4X (IP56), explosion-proof, purged, Division 2.
General Safety (LVD)	Directive 73/23/EEC
EMC	Directive 2004/108/EC

WDG-VM Analyzer Directives and Standards

Enclosure	Hinged NEMA 3R, weather resistant, stainless steel. Optional hinged NEMA 4X (IP56), explosion-proof, purged, Division 2.
General Safety (LVD)	Directive 73/23/EEC
EMC	Directive 2004/108/EC

Remote Calibration Unit (RCU) Directives and Standards

EMC	Directive 2004/108/EC
Low Voltage Directive	Directive 73/23/EEC.
IEC Installation	Category II
IEC Pollution Degree 2	

WDG-V Analyzer Marking

WARNING–PRESSURIZED ENCLOSURE
AVERTISSEMENT–ENCEINTE PRESSURISE

THIS ENCLOSURE SHALL NOT BE OPENED UNLESS THE AREA IS KNOWN TO BE FREE OF FLAMMABLE MATERIAL OR UNLESS DEVICES WITHIN HAVE BEEN DE-ENERGIZED.

CETTE ENCEINTE NE DOIT PAS ÊTRE OUVERTE SAUF SI VOUS SAVEZ QUE LA ZONE NE CONTIENT PAS DE MATÉRIEL INFLAMMABLE OU SI TOUS LES APPAREILS ONT ÉTÉ ÉTIENTES.

AREA CLASSIFICATION:	CLASS 1 DIVISION 2, GROUPS A, B, C AND D
PRESSURIZATION TYPE:	NFPA 496 TYPE Z, Ex TYPE Z, Ex pxc IICTS Gc
TEMPERATURE CODE:	T3 (180C)
INT. FREE VOLUME:	40.3L
PROTECTIVE GAS:	CLEAN, DRY INSTRUMENT AIR ONLY (-20 TO 60C) 80-120 PSI (5.5–8.3 bar)
OVER PRESSURE:	0.15" H_2O MIN., 0.35" H_2O MAX, 3.64" H_20 MAX (PURGE)
MAX LEAKAGE RATES:	15 LPM

PURGE AIR START-UP PROCEDURE: WARNING-POWER SHALL NOT BE RESTORED AFTER THE ENCLOSURE HAS BEEN OPENED UNTIL THE ENCLOSURE HAS BEEN PURGED FOR 10 MINUTES WITH THE RAPID EXCHANGE VALVE OPEN.

SHUT DOWN PROCEDURE: HOT INTERNAL PARTS ARE ABOVE IGNITION TEMPERATURE OF COMBUSTIBLE GASES. POWER MUST BE REMOVED FROM BOTH THE SENSOR AND CONTROL UNIT FOR 90 MINUTES WHILE MAINTAINING ENCLOSURE PRESSURIZATION BEFORE DOOR IS OPENED, UNLESS THE AREA IS DEMONSTRATED TO BE NON-HAZARDOUS.

CAUTION THE OUTSIDE SURFACES OF THIS CABINET AND ALL INSIDE SURFACES MAY BE HOT ENOUGH TO CAUSE BURNS. USE PROPER PROTECTIVE EQUIPMENT WHEN SERVICING.

AVERTISSEMENT LA SURFACE EXTÉRIEURE DE CETTE ENCEINTE ET TOUTES LES SURFACES INTÉRIEURES PEUVENT ÊTRE SUFFISAMMENT CHAUDES POUR CAUSER DES BRÛLURES. UTILIZEZ UN ÉQUIPEMENT DE PROTECTION ADAPTÉ LORS DE LA MAINTENANCE.

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French Warnings/Français Adverstissements

NOTES SUR LA SECURITE

LES AVERTISSEMENTS, LES PRÉCAUTIONS ET LES NOTES CONTENUS DANS CE MANUEL ATTIRENT L'ATTENTION SUR DES INSTRUCTIONS CRITIQUES COMME SUIT:

Une procédure de fonctionnement qui n'est pas strictement suivie peut engendrer une blessure de personne ou une contamination de l'environnement.

Une procédure de fonctionnement qui n'est pas strictement suivie peut endommager l'équipement.

Informations importantes à ne pas laisser passer :

Sécurité électrique

Une tension jusqu'à **5 kV** peut être présente dans le boîtier. Coupez toujours les alimentations électriques avant d'effectuer une maintenance ou un dépannage. Seuls des techniciens qualifiés électriquement doivent effectuer les connexions électriques et les vérifications de terres.

Une utilisation quelconque de l'équipement de manière non spécifiée par le constructeur peut compromettre la protection de la sécurité d'origine fournie par l'équipement.

Mise à la terre

La mise à la terre de l'instrument est obligatoire. Les spécifications de performance et la protection de sécurité sont invalides si le fonctionnement de l'instrument est effectué depuis une alimentation électrique à la terre impropre.

Vérifiez la continuité de la terre de tout équipement avant d'alimenter électriquement.

Note importante aux utilisateurs

Il n'y a pas de composant à maintenir à l'intérieur même des composants de l'analyseur WDG-V. Ne pas retirer le capot d'un analyseur WDG-V. Se référer à du personnel qualifié pour la maintenance.

Les instructions suivantes s'appliquent à l'unité d'affichage hôte :

L'alimentation électrique, les entrées et sorties (E/S) doivent être en accord avec les méthodes de câblage en zone Class I, Class II Division 2 (se référer au code électrique national) et en accord avec l'autorité locale ayant juridiction.

AVERTISSEMENT – RISQUE D'EXPLOSION – LA SUBSTITUTUON DE COMPOSANTS PEUT COMPROMETTRE LA CONFORMITE DE ZONE CLASS I , CLASS II DIVISION 2.

AVERTISSEMENT – RISQUE D'EXPLOSION – EN ZONE EXPLOSIBLE, COUPEZ L'ALIMENTATION ELECTRIQUE AVANT DE REMPLACER OU CABLER UN MODULE.

AVERTISSEMENT – RISQUE D'EXPLOSION – NE DECONNECTEZ PAS L'EQUIPEMENT SAUF SI L'ALIMENTATION ELECTRIQUE A ETE COUPEE OU SI LA ZONE EST SANS RISQUE.

CET EQUIPEMENT EST CONFORME A UNE UTILISATION EN ZONE CLASS I, DIVISION 2, GROUPES A, B, C ET D, CLASS II, DIVISION 2 GROUP E, F, ET G OU HORS ZONE EXPLOSIBLE SEULEMENT.

AVERTISSEMENT : L'EXPOSITION A DES PRODUITS CHIMIQUES PEUT DEGRADER LES PROPRIETES DES JOINTS DES MATERIAUX UTILISES DU MODULE SUIVANT : MODULE D'ALIMENTATION ELECTRIQUE.

AVERTISSEMENT : RISQUE D'EXPLOSION. EN ZONE A RISQUE, COUPEZ L'ALIMENTATION ELECTRIQUE AVANT DE RETIRER OU DE REMPLACER UN CABLAGE, UN MODULE, LA BATTERIE OU UN COMPOSANT SAUF S'IL EST CERTAIN QUE LA ZONE NE CONTIENT PAS DE CONCENTRATIONS DE GAZ OU VAPEUR IMFLAMMABLE.

AVERTISSEMENT : LA SUBSTITUTION DES COMPOSANTS SUIVANTS PEUT COMPROMETTRE LA CONFORMITE DE ZONE DIVISION 2 DE L'ALIMENTATION ELECTRIQUE.

AVERTISSEMENT : LA BATTERIE DOIT ETRE REMPLACEE AVEC LA REFERENCE AMETEK 1000-652-VE.

La température ambiante maximum ce cet analyseur est de 55 °C (131 °F).

L'afficheur hôte est un élément complexe de l'analyseur qui doit être maintenu par un technicien qualifié avant une expertise en technologie de l'instrument et en systèmes électriques. AMETEK recommande que tout équipement nécessitant une maintenance soit renvoyé à l'usine. Vous devriez seulement essayer de réparer ou maintenir cet équipement après avoir reçu une formation d'un représentant AMETEK / Division P&AI. Si vous décidez d'effectuer la maintenance de cet analyseur, ayez conscience que des hautes tensions, des hautes températures et d'autres conditions potentiellement à risque peuvent surgir.

Sommaire de Sécurité Générale

Lisez attentivement les précautions de sécurité suivantes pour éviter de se blesser et d'endommager l'équipement ou tout produit connecté à ce dernier.

Utilisez un câblage adéquat

Pour éviter les risques de feu, utilisez seulement le câblage spécifié dans le chapitre Installation de ce manuel de l'utilisateur.

Evitez les surcharges électriques

Pour éviter une électrocution ou un risque de feu, n'alimentez pas électriquement des bornes qui sont hors de la gamme spécifiée pour ces bornes.

Mettez à la terre l'analyseur

Suivez les instructions de mise à la terre fournies dans le chapitre Installation de ce manuel de l'utilisateur. Avant de connecter aux bornes d'entrée ou de sortie de l'analyseur, assurez-vous que l'analyseur est correctement mis à la terre.

Ne pas faire fonctionner sans capot

Pour éviter une électrocution ou un risque de feu, ne faites pas fonctionner l'analyseur sans capot ou avec un panneau retiré.

Utilisez des fusibles adéquats

Pour éviter tout risque de feu, utilisez des fusibles de types et classes spécifiés pour cet analyseur.

Ne faites pas fonctionner en atmosphère explosible

Pour éviter toute blessure ou risque de feu, ne faites pas fonctionner l'analyseur dans une atmosphère explosible, sauf si vous avez acheté les options spécifiquement conçues pour ces environnements.

PRECAUTIONS AUX DOMMAGES DE L'ANALYSEUR

Utilisez une alimentation électrique adéquate

Ne faites pas fonctionner l'analyseur avec une alimentation électrique qui fournit plus que la tension électrique spécifiée.

Ne faites pas fonctionner avec les défaillances suspectes

Si vous suspectez que l'analyseur est endommagé, demandez à un technicien qualifié de l'inspecter.

Mise à la terre CEM (EMC), blindage et protection contre le bruit

Dans un but de compatibilité électromagnétique, en aucune circonstance vous ne devez laisser l'écran d'un câble déconnecté en une ou deux extrémités (unité de contrôle ou de terrain ou autre appareil).

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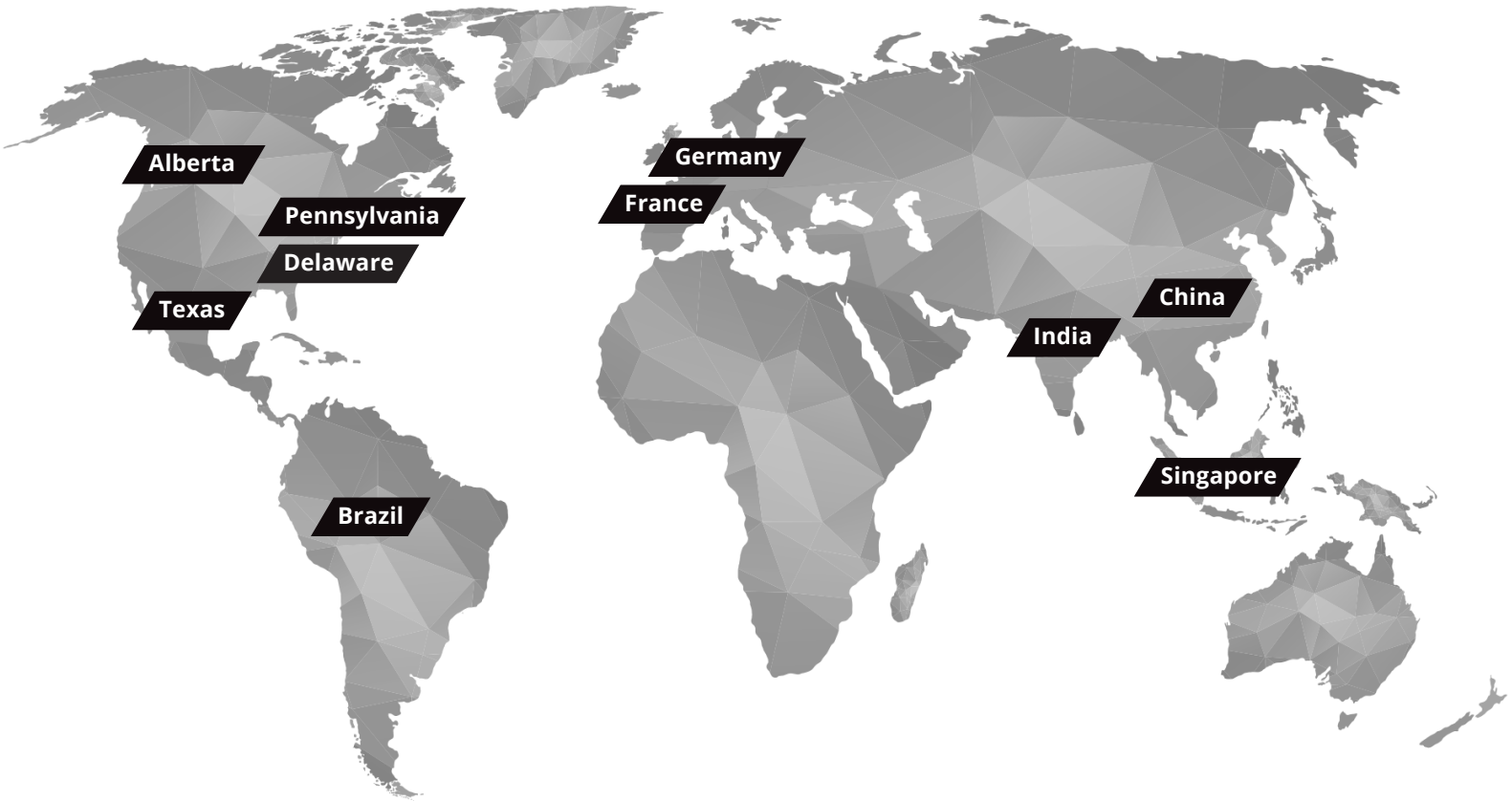

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