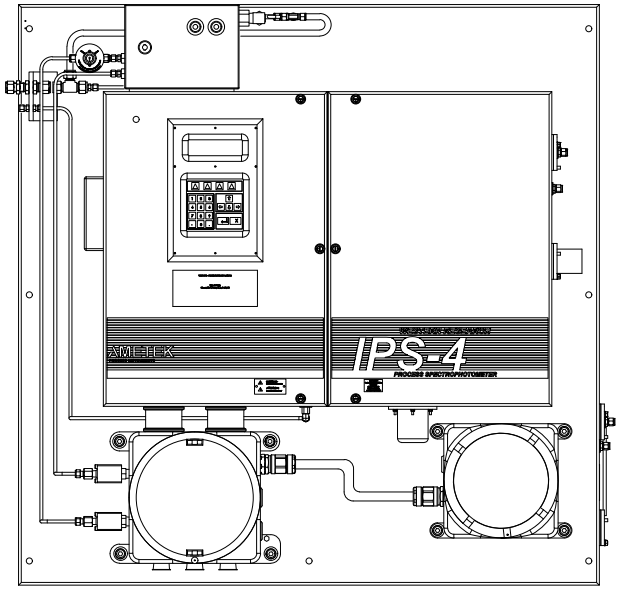
AMETEK®
PROCESS INSTRUMENTS

ESSENTIAL HEALTH and SAFETY

IPS-4 Analyzer
Zone 1/Division 1



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Overview

About This Document

This document primarily describes the essential health and safety requirements for the components that make up the IPS-4 Analyzer intended for use in explosive atmosphere locations. These sections are described below.

The procedures and information discussed in this document include only abbreviated steps to install, operate, and perform maintenance on the IPS-4 Analyzer. They do, however, include all relevant safety warnings and cautions to ensure the safety of personnel and the analyzer in explosive atmosphere locations. [For complete and detailed descriptions of the procedures discussed in this guide, refer to the analyzer User Manual.]

AMETEK takes great effort to ensure that its translations of documents into foreign languages are accurate and complete. However, in the case of any discrepancies between the English version and the translated version, the original English version shall take precedence. AMETEK will not assume liability for any such discrepancies, or issues arising from them.

Important Safety Information

Warnings, Cautions, Notes

WARNINGS, CAUTIONS, and NOTES contained in this document 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.

Personnel and Equipment Safety Information

Before working on the IPS-4 Analyzer, read and understand the following Warnings and Cautions, which contain important safety and general information that applies to all aspects of working on the analyzer.

Additional Notes, Warnings, and Cautions are included in individual procedures in this document (and in the analyzer *User Manual*) to indicate special conditions to consider during installation, before opening its covers or doors, and while working on the analyzer.

Warnings

Review and follow these Warnings to avoid personal injury or environmental contamination.

High voltages are present in the analyzer housings. Always disconnect power and/or external power sources to the analyzer before opening any covers or doors on the analyzer to check or perform maintenance on any components within the enclosures.

If it is necessary to open the analyzer's covers or doors while the circuits are live, first monitor the area for flammable gases (and proceed only when the area is safe). To work on the analyzer with it powered up and its Electronics Enclosure door open, the Purge Control Unit must be in ***BYPASS*** *mode.*

When the Electronics Enclosure and/or other enclosures are open, take appropriate precautions to avoid electrical shock. Hazardous voltages are present inside.

All electrical connections, adjustments, or servicing of the analyzer should be performed only by properly trained and qualified personnel.

All electrical connections, materials, and methods (plus all safety policies and procedures) must be made in compliance with local wiring regulations and electrical code for the hazardous area, as specified by the Owner Company, local electrical-inspection authority, and National/EU regulations.

Follow appropriate regulatory and/or company procedures to lock out the analyzer while working on the analyzer electronics.

Before working on the analyzer, test the area for flammable gases. If a flammable gas atmosphere is present, do not open any doors without first disconnecting power and/or alternate power sources to the analyzer.

The glass Xenon Flash Lamp is under high internal pressure which could result in flying glass fragments if ruptured. Handle the tube with care to avoid dropping it, subjecting it to impacts, applying excessive force to it, or scratching it.

While handling a flash lamp, always wear protective devices (face mask, clothing) to prevent possible injury, especially to hand and face areas.

Before working on the sample system, confirm that the system has been purged with Zero fluid and is isolated (blocked in) from the process.

Because ultraviolet radiation can harm your eyes, never look directly into the operating lamp. If the Xenon Flash Lamp must be viewed while energized, wear safety glasses that block ultraviolet radiation.

If the Oven/Sample System Enclosure is heated, the components within it will be hot; take precautions to avoid burning yourself.

*Explosion Hazard – Do Not enter purge **BYPASS** mode in the presence of explosive atmosphere.*

Verify ground continuity of all equipment before applying power.

The sample gas may contain highly toxic and corrosive substances. Proper personal protective equipment including fresh air breathing apparatus, eye protection, and skin protection MUST BE worn when installing the sample tap and/or opening the main oven chamber for inspection or maintenance.

If sample gases contain highly toxic and corrosive compounds, analyzed sample must be returned to the process or vented to a safe area.

Cautions

Review and follow these Cautions to avoid damaging the equipment.

The electronic circuit boards and other static-sensitive components should be stored and transported in static-shielding carriers or packages.

For electrical-shock protection, the analyzer must be operated from a grounded power source that has a securely connected protective-ground contact.

If it becomes necessary to handle any of the electronic circuit boards, do not subject the boards to static discharge. The ideal solution is a static-safe work area. Since such areas typically are not available at analyzer installation sites, the use of a wrist strap connected directly to a ground is recommended. If a wrist strap is not available, you should at the very least touch the metal chassis (to ground yourself) before handling or touching the boards.

When handling the Xenon Flash Lamp, it is very important not to touch the lamp windows because residual oils from the fingers will absorb ultraviolet light. The window is the flat surface at the end of the narrow glass tube. The lamp assembly is fragile and should be handled with care.

Take extreme care to avoid damaging the threads on the cable entry glands on the Disconnect Enclosure. Clean, defect-free threads are essential to ensure a flameproof connection.

Special Warnings and Information

Equipment Used in Class I, Division 1 and Zone 1 Hazardous Locations

Refer to the Specifications sections in this document and in the analyzer *User Manual* for details about the suitability of this equipment in hazardous areas.

Explosion Hazard – Substitution of Components May Impair Suitability for hazardous locations.

Risque d'explosion – La substitution de composants peut rendre ce materiel inacceptable pour les emplacements est designé dangereux.

Explosion Hazard – Do Not Disconnect Equipment Unless Power Has Been Switched Off or the Area is Known to be Non-Hazardous.

Risque d'explosion – Avant de déconnecter l'équipement, coupez le courant où vous assurez que l'emplacement est designé non dangereux.

For installations using North American wiring practice, all input and output wiring must be in accordance with Class I, Division 1 and Zone 1 wiring methods (NEC Sec 501.10(a) and 505.15(b)) or IEC 60079-14) and in accordance with the authority having jurisdiction.

Warning Labels

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

Protective Conductor Terminal

Caution – Risk of electric shock

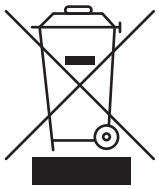
Caution – Refer to accompanying documents

CAUTION – Hot Surface

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 reached 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.
- If you need further assistance in recycling your AMETEK product, contact us through our Customer Support page at https://www.ametekpi.com/customersupport/request-support.

Classified, Hazardous Area Protection Components and Functions

The Division 1/Zone 1 versions of the IPS-4 are designed to be, and comply with requirements for, electrical equipment in Division 1 and Zone 1 classified hazardous areas. The methods of protection used include type "p" (pressurized), and type "d" (Flameproof enclosure).

The purge system, redundant heater control, Disconnect Enclosure, and Electronics Enclosure designs ensure that the system will not ignite surrounding gases. For this reason, any repairs must not bypass these safety considerations and must use only recommended components.

The purge system consists of the Electronics Enclosure, a purge controller, an overpressure vent, a Bypass switch and power/signal Disconnect Enclosure. It maintains a positive pressure in the Electronics Enclosure that prevents flammable and corrosive gases from contacting electrical components. The oven enclosure and the seals between the enclosures are designed to ensure that the required 5x factor of safety to ensure that the sample containment system will not interfere with proper operation of the purge system.

The Disconnect Enclosure receives a pneumatic signal from the purge controller when the enclosure has been adequately purged and the overpressure is maintained. Until these conditions are met, the relays in the Disconnect Enclosure break all power and signal connections between the field and the analyzer. When the Electronics Enclosure is opened or the pressurization gas supply is lost, the system will shut the analyzer down and transfer a set of contacts that may be used to provide an alarm.

The Bypass switch enables operation of the analyzer by applying air pressure to the Disconnect Enclosure – bypassing the purge controller. This feature must only be used when the area is known to be safe and is being continuously monitored (See Combustible Gas Detection protection techniques in NFPA70 article 500 and 505). Figure 1 is a state diagram showing the operation of the pressurization system and the pressure settings.

The analyzer must be installed and operated in accordance with this instruction manual. Instrument air or nitrogen may be used as the purge gas.

Once the analyzer has been located in an area contaminated with flammable gases or vapors the IPS-4 purge system must be activated to keep these gasses out of the enclosure. For this reason, AC power and an instrument air supply must be connected to the IPS-4. See "Start-Up and Verification" in this document and in the analyzer User Manual *for instructions on how to initialize the purge system. If it is not required that the IPS-4 be powered On at this time, switching the power Off at the power source will shut down the analyzer while maintaining the protective internal pressure. Switching the power On again will re-activate the IPS-4 if the purge controller is still in the normal pressurization mode.*

For the protection system to operate properly, the cover on the Disconnect Enclosure must be properly installed and the Electronics and Oven Enclosure doors must be securely shut. All door latches must be properly tightened with the key.

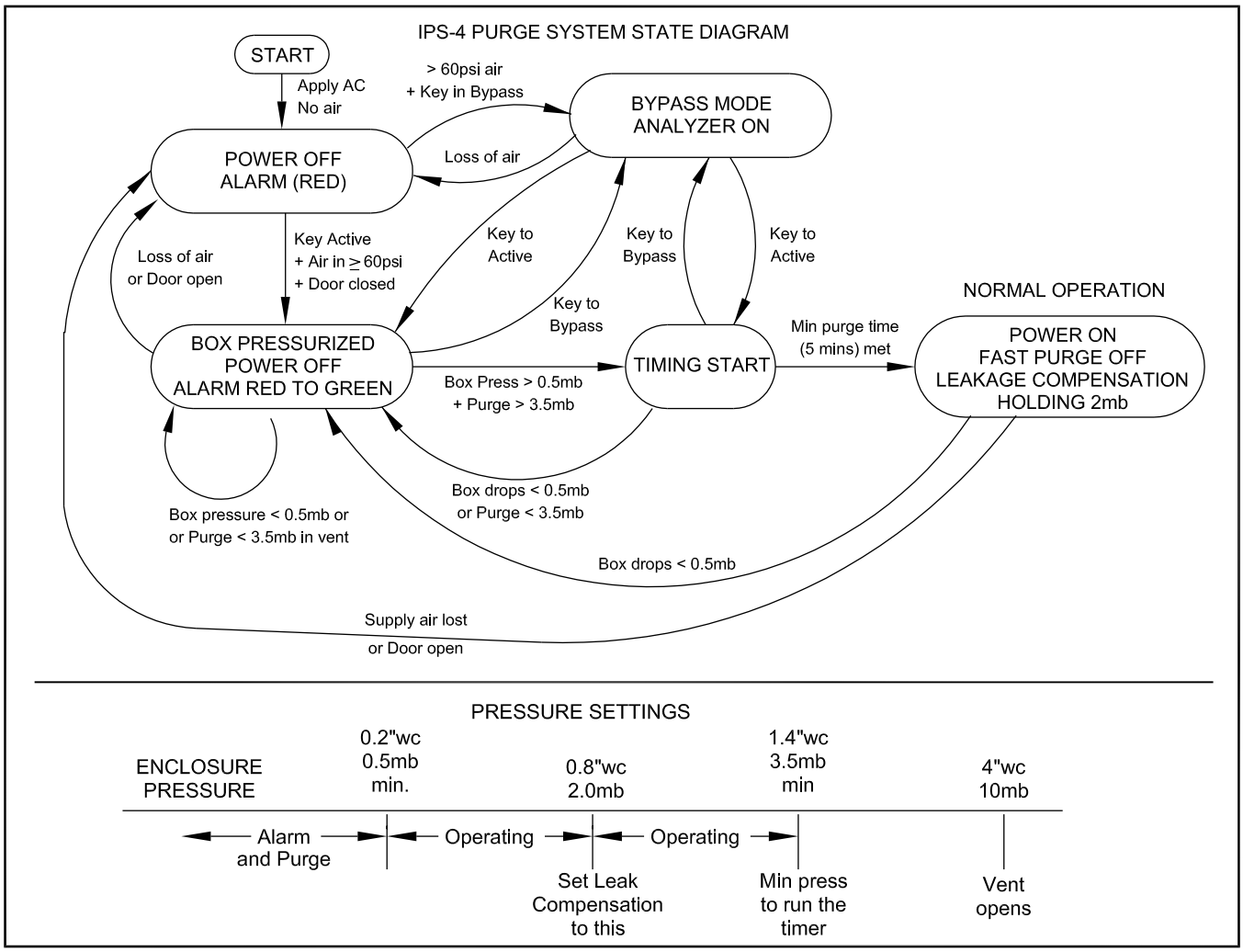


Figure 1.
Pressurization system state diagram.

Flanged Flameproof Enclosure

When the IPS-4 is supplied with the 4660 Sample System option, the flow-meters are installed in a flanged flameproof enclosure. Care must be taken to ensure that all of the bolts are installed and the flange surfaces are kept in good condition. The minimum flamepath length must be at least 1 inch (25.4mm) and smooth (250 microinches or better). The gap between the flange surfaces with the bolts tightened must not exceed 0.0015 inches (0.0381MM).

Specifications

For a complete listing of all analyzer specifications, refer to the analyzer *User Manual*.

Utility Requirements

Specifications	Descriptions
Power Consumption	**Without Oven Heater:** <300 W maximum start-up (from a cold start) with continuous average, depending on ambient temperature. **With Oven Heater:** <700 W maximum start-up (from a cold start) with continuous average, depending on ambient temperature.
Supply Voltage	120 VAC (105–132 VAC), 47–63 Hz OR 240 VAC (209–264 VAC), 47–63 Hz
Instrument Air	The aspirator medium must be transported in 316 stainless steel. **Minimum pressure:** 490–700 kPag (70–100 PSIG / 4.8–6.9 BARG) **Air Quality:** As per ANSI/ISA-S7.0.01 (1996) Quality Standard for Instrument Air.
Outputs	256 x 64 pixel vacuum-fluorescent display with multilingual capability. Four (4) isolated analog outputs, configurable as 0–20 mA or 4–20 mA (two are standard; two are optional). Up to eight (8) relays (NO, contact rating 100 VA, 240 V maximum), which indicate the operational status of the analyzer. Each relay provides one SPST (Form A) dry (potential free) contact. Two (2) Form C loss of purge alarm contacts rated 240 VAC 5 A maximum RS-485 serial port, isolated. RS232 serial port, non-isolated. Fast Ethernet (IEE802.3). Modbus TCP (Supports single Modbus Client).

Specifications	Descriptions
Ambient Temperature Limits	-20 °C ≤Ta ≤50 °C, without external heating or cooling.
Sample System Limits	**Sample Pressure** Up to 10,000 kPag (1,450 PSIG/100 BARG) can be accommodated, depending on the application. See product markings or customer-specific drawings in the Documentation Package folder shipped with the analyzer. **Oven/Sample System Enclosure Temperature** For applications with a heated sample system, the Oven will operate at temperatures up to 150 °C (302 °F).

Approvals and Certifications

The IPS-4 Analyzer is certified with regard to electrical safety for Pollution Degree 2 (normally nonconductive environmental pollution occurs with occasional condensation) and Installation Category II (local level transients, less than those found at power distribution level). Mains supply voltage fluctuations are not to exceed 10 percent of the nominal supply voltage.

Approvals and certifications for the Zone1/Division1 IPS-4 Analyzer include:

NEC/CEC	Class I, Division 1, Groups A, B, C, D, Class II, Division 1 Groups F & G, and Class III Class I, Zone 1, AEx d px IIC T3, Class I, Zone 1, Ex d px IIC T3
ATEX and IECEx	Ex II 2 G Ex db pxb IIC T3 Gb IP65

NOTE

Models with the 4660 sample system flowmeter installed are reduced to gas groups BCD and IIB+H2.

Ex

Analyzer Markings

The IPS-4 Analyzer will be marked with a corresponding label to indicate its Ex equipment certification and ratings.

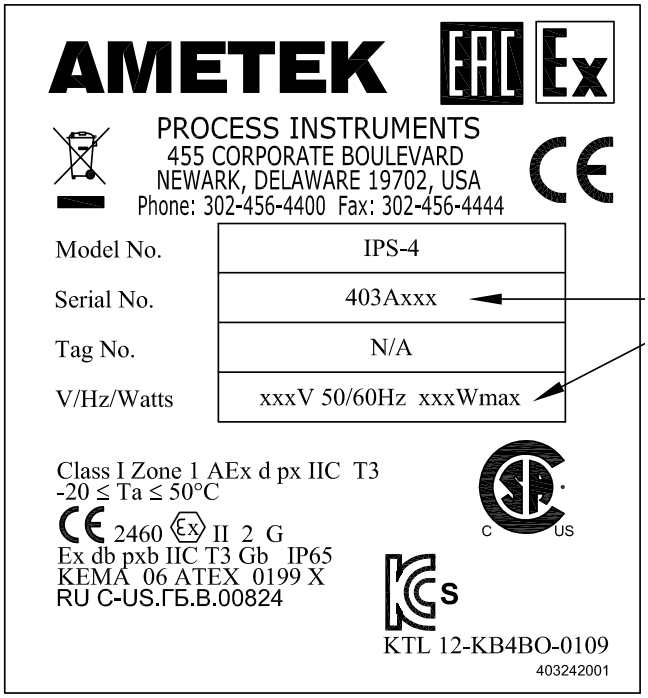


Figure 2-1.
IPS-4 ATEX Label for Zone 1 model without 4660 sample system option.

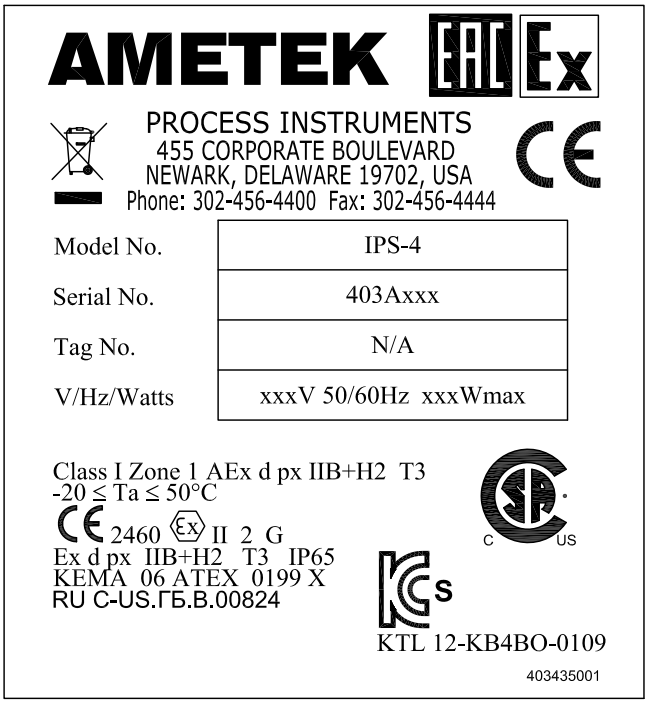


Figure 2-2.
IPS-4 ATEX Label for Zone 1 model with 4660 sample system option.

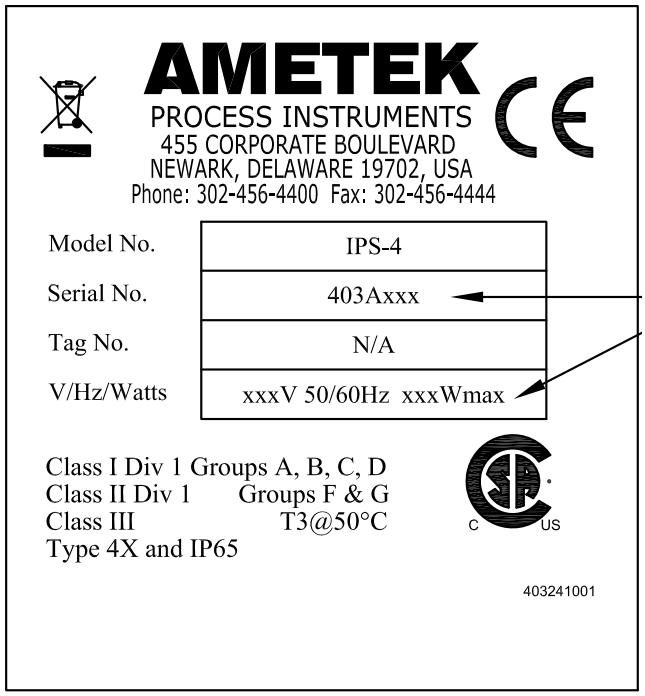


Figure 2-3.
IPS-4 Label for Division 1 model without 4660 sample system option.

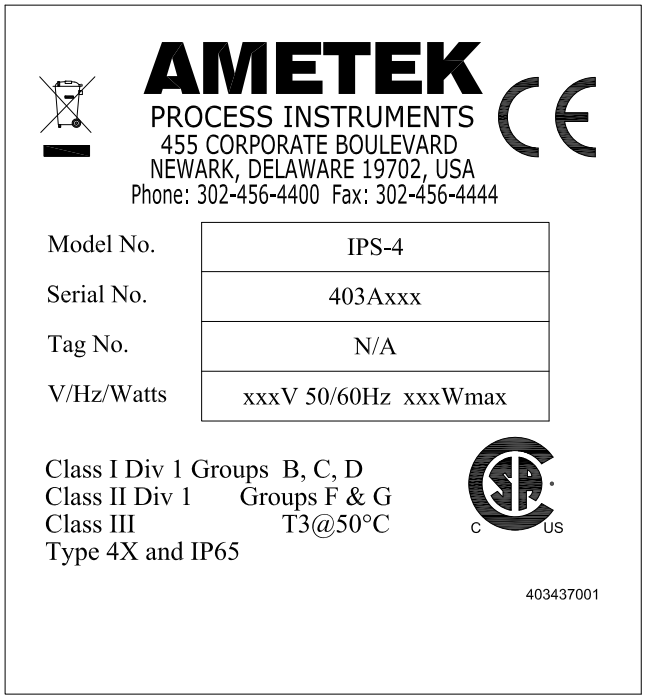


Figure 2-4.
IPS-4 Label for Division 1 model with 4660 sample system option.

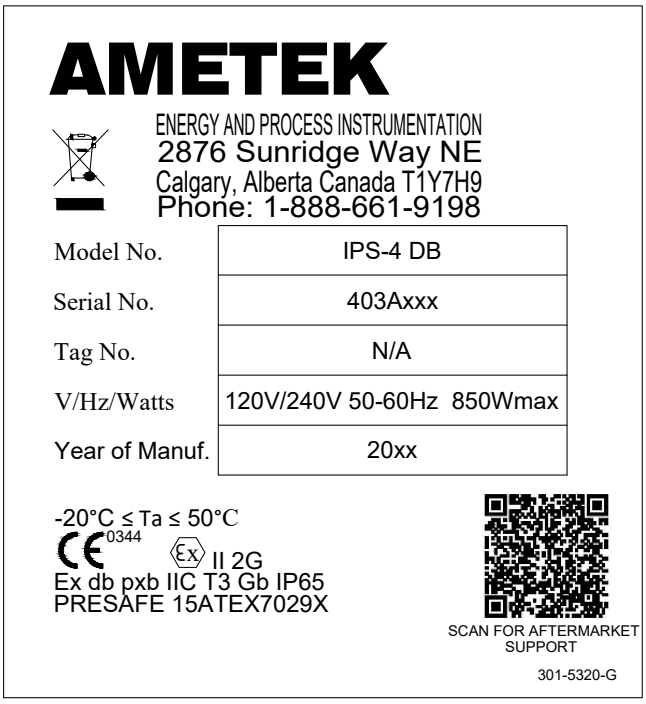


Figure 2-5.
IPS-4 Label for Zone 1 model with Dual Bench option.

Installing the Analyzer

The Installation and Start-Up chapter contains information about the following topics:

- Where to find safety information in this guide before working with the analyzer.
- How to store the analyzer before installation.
- How to uncrate and inspect the analyzer for damage before installing it.
- Tools, equipment, and supplies required for installation.
- How to install the mechanical components and sample lines, and perform a leak check on all of the fittings and connections before powering up the analyzer.
- How to make all of the required electrical connections.
- How to apply power to the analyzer and configure it for operation.
- What to expect during normal operation.

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

Safety Considerations

Before beginning the installation of the analyzer and before powering it up, review and follow all safety requirements listed following the Table of Contents near the beginning of this document and the analyzer User 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 IPS-4 Analyzer is certified with regard to electrical safety for Pollution Degree 2 (normally nonconductive environmental pollution occurs with occasional condensation) and Installation Category II (local level transients, less than those found at power distribution level). Mains supply voltage fluctuations are not to exceed 10 percent of the nominal supply voltage.

Pre-Installation Requirements

Storage Prior to Installation

If the analyzer is stored for any period of time prior to installation, it must be housed in a temperature-controlled environment where it is not subject to dripping or splashing liquids, corrosive gases/liquids, high humidity, or excessive heat or cold.

Uncrating and Inspecting the Analyzer

The analyzer, along with its associated sample system, is shipped pre-mounted on unistruts (or on a backpan) either alone in a crate or in a crated weatherproof shelter. The Optical Bench Assembly is shipped in a separate box within the Analyzer crate.

Upon receiving the analyzer system, remove the shipping crate and check the exterior of the shelter and/or analyzer for damage. Remove the Optical Bench Assembly from its box and check it for any physical damage. Replace the Optical Bench Assembly in its box until it is ready to be installed.

Open the shelter and/or analyzer and check to ensure that all of the components within are secure and that there is no physical damage. Check that all of the components and wiring within the Electronics Enclosure and Oven/Sample System Enclosure are secure and that there is no physical 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.

After the inspection, close and secure all doors with at least one latch. This will keep the electronics equipment secure and will prevent damage to the doors and electronic components during installation.

For non-shelter systems, avoid damaging the analyzer piping or instrumentation by lifting it out of its shipping crate using only its unistruts or backpan, or metal enclosure. DO NOT use any external instrument or tubing connectors as a handle for lifting.

The analyzer (on unistruts) weighs approximately 74 kg (163 lb) to 100 kg (220 lb), depending on the system. Use caution when lifting it from its crate.

General Installation Information

Figure 3 illustrates an example of the layout of components within the IPS-4 Analyzer. The components in the Electronics Enclosure generally do not change. However, many of the sample system components in the Oven/Sample System Enclosure in this example illustration are optional and are configured specifically for the application.

Customer-specific drawings for your analyzer are located in the Documentation Package folder shipped with the analyzer.

Tools, Equipment, and Supplies Required for

Installation

While installing the analyzer, the following tools, equipment, and supplies are required:

- Door latchkeys (two keys are supplied with the analyzer), attached to the exterior of the analyzer.
- Set of open-end wrenches for fittings and set of metric ball drivers.
- Wire Cutters, strippers, and crimpers.
- Flat blade instrument screwdriver.
- Soft, non-abrasive cloth.
- Wrist Strap (for grounding).
- Detergent-based leak detector (Snoop® or another suitable leak detection agent is permissible).
- Ethernet cable (**supplied by customer/end user**), for systems using a permanent Ethernet connection. Length will vary, depending on application.
  Minimum requirements: CAT 5e (maximum 100 m).
  Special requirements may be necessary for outdoor analyzer installations, hazardous locations, and/or lengths greater than 100 m.
  Systems using Ethernet also require a ferrite core (**supplied by AMETEK**).
  For systems using a *temporary* Ethernet connection, a crossover cable must be used.
- One power-disconnect switch (breaker), rated for at least 250 VAC, 20 A. For safety reasons during maintenance, this switch allows the main AC power to be disconnected from the analyzer. **Supplied by customer/end user**.
- A supply of 1/4-inch O.D. 316 stainless steel tubing for the Instrument Air (or N_2) and Span fluid lines. Length will vary, depending on the distance between the analyzer and the supply source. **Supplied by customer/end user**.
- Supply tubing and pressure regulator(s) for the purge system. This line should be sized to ensure that the pressure at the purge controller inlet will not drop below 60 PSI (4 BAR) with a flow of up to 350 L/minute. Installation of one or two regulators is required to ensure that the inlet pressure does not exceed the rated inlet pressure (60–115 PSI) and should allow for possible failure of one regulator to avoid hazards of excessive air pressure on the enclosure.

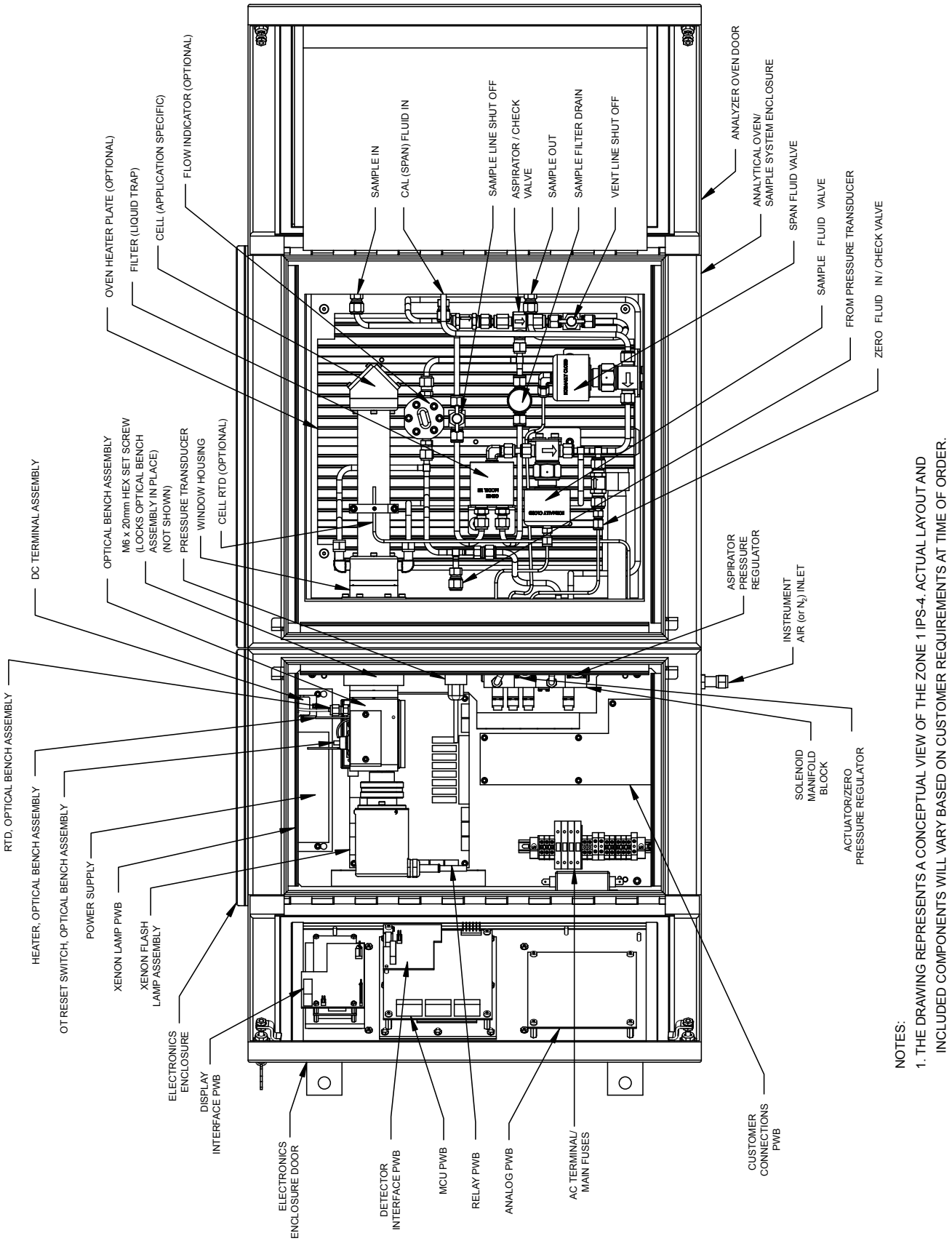


Figure 3.
Analyzer component layout details, example only.

Installing the Mechanical Components

Do not mount the Optical Bench Assembly in the Electronics Enclosure until after the analyzer has been installed in its designated location.

Mounting the Analyzer

The analyzer system comes mounted on a backpan.

Figure 4 illustrates the mounting hole locations and dimensions, plus necessary clearances on all sides.

While installing the mechanical components, refer to customer-specific drawings for your analyzer. These drawings are located in the Documentation Package folder shipped with the analyzer.

Location and Environment

The IPS-4 Analyzer is designed for operation in environments classified "Pollution Degree 2" per IEC 61010, so it must be shielded from conductive pollution and subject to only temporary condensation.

The entire analyzer system can be mounted directly on a wall, in a specially designed cabinet, or in a custom-built shelter. With its IP65/NEMA 4 rating, the analyzer system is also suitable for installation in outdoor locations.

Regardless of which installation method is used, be sure to install the analyzer in a vibration-free location, and as close as possible to the sample extraction point to minimize the amount of sample lag time.

The minimum allowable clearances are (if possible, provide extra room to allow sufficient access for servicing the analyzer). See Figures 4.1 and 4.2:

Below:	610 mm (24")
Front:	762 mm (30") – door swing clearance
Oven/Sample System side:	762 mm (30") – door swing clearance
Electronics Enclosure side:	457 mm (18") – door swing clearance

Figure 4-1 is an example of an analyzer layout. Mounting configuration and layout for your analyzer system may vary. Refer to the customer-specific drawings in the Documentation Package folder shipped with the analyzer.

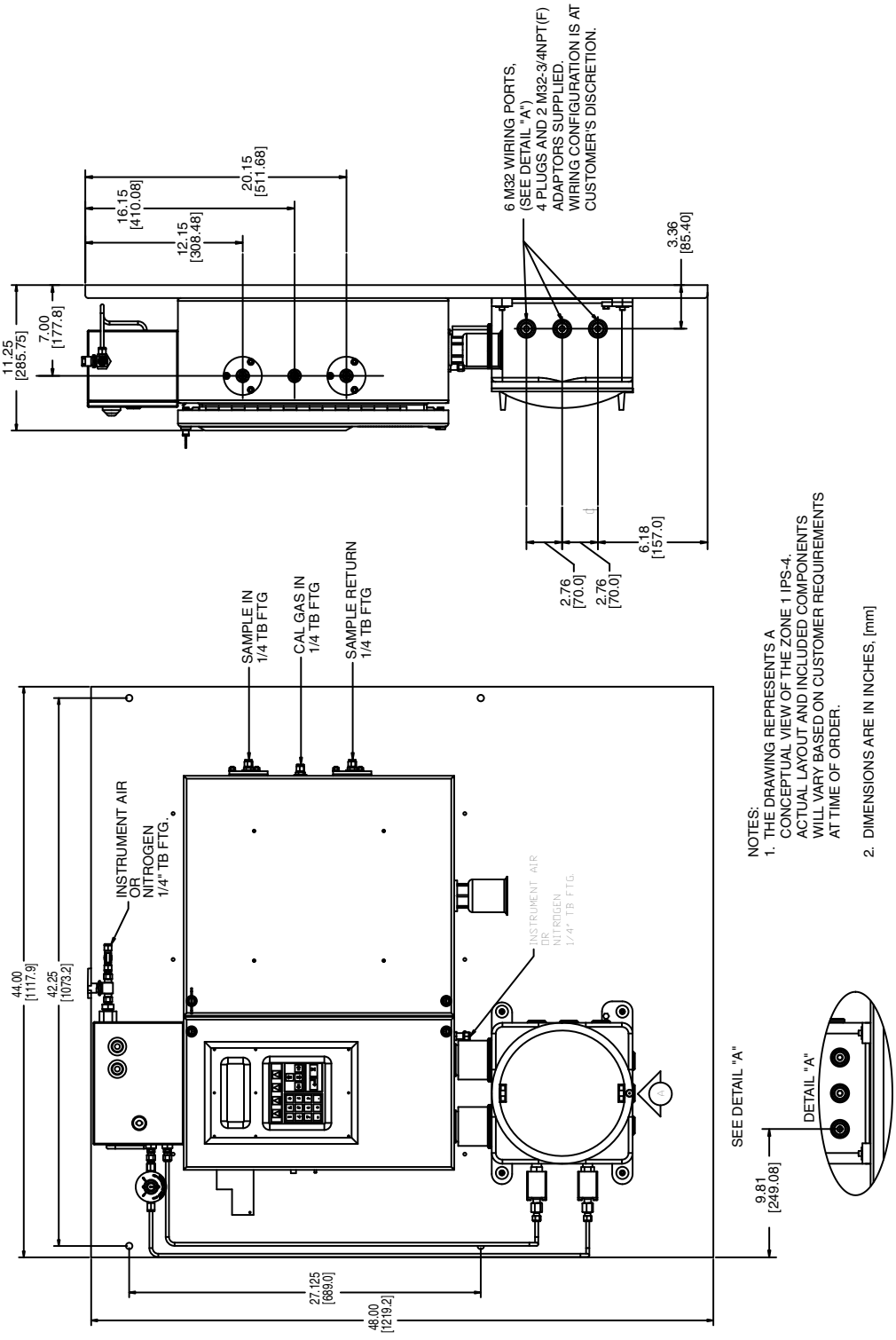


Figure 4-1.
Analyzer mounting details, example only.

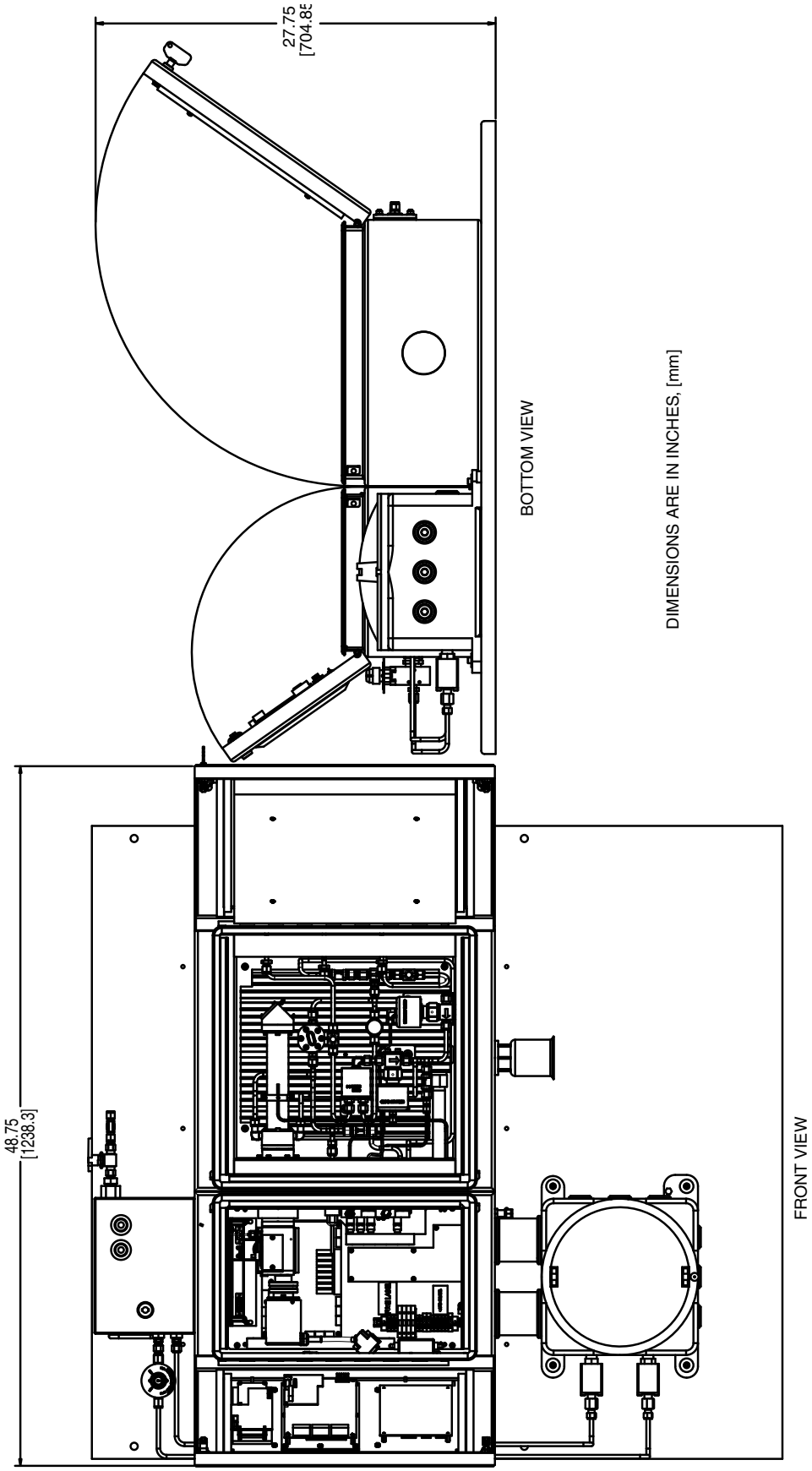


Figure 4-2.
Analyzer mounting, door clearance.

The surrounding ambient temperature of the analyzer should be maintained between -20 °C to +50 °C (-4 °F to +122 °F). If the analyzer system is mounted within an AMETEK-designed shelter, these conditions are taken into consideration in the design of shelter.

To mount the analyzer:

Non-Shelter Installations:

In a suitable, accessible location, mount the analyzer on a vibration-free wall or instrument rack.

Shelter Installations:

In a suitable, accessible location, install the analyzer in a vibration-free location.

Refer to customer-specific shelter drawings in the Documentation Package folder shipped with the analyzer.

Outdoor Installations:

In most cases, the analyzer must be shielded from harsh environmental elements such as wind, rain, and sun. In these cases a rain shelter or sun shade is required.

Also, proper water drainage must be considered in the mounting location to allow for suitable and safe working conditions for service personnel.

Installing the Optical Bench Assembly

After the analyzer has been installed, the Optical Bench Assembly can be mounted in the Electronics Enclosure. All electrical connections to the Optical Bench Assembly are made via pre-wired connector plugs (no hard wiring is required).

Ensure there is no power being supplied to the analyzer while installing the Optical Bench Assembly.

Refer to Figures 4.2, 5.1, and 5.2 for the locations of the Optical Bench Assembly, boards, cable connectors, and other components discussed in this procedure.

To install the Optical Bench Assembly:

1. Slide the Optical Bench onto the Window Housing inside the Electronics Enclosure (Figure 3). Install the clamp to secure the assembly in place.

2. Connect the Heater/OT (over-temperature) Switch wiring harness connector from the Optical Bench to **J401B** on the **Relay** board.

3. Connect the RTD cable connector from the Optical Bench to the in-line connector (labelled "**CON2**") that leads to **J402** on the **Analog** board.

4. Connect the DC cable connector from the Xenon Flash Lamp Assembly to **J2** on the **Xenon Lamp** board, located near the top of the Electronics Enclosure.

5. Connect the ribbon cable (**Cable 5**) from the Optical Bench to connector **P2** on the **Detector Interface** board, mounted to the **MCU** board.

   Clamp the ribbon cable using the clamp provided, leaving enough length on each end to avoid pulling or binding.

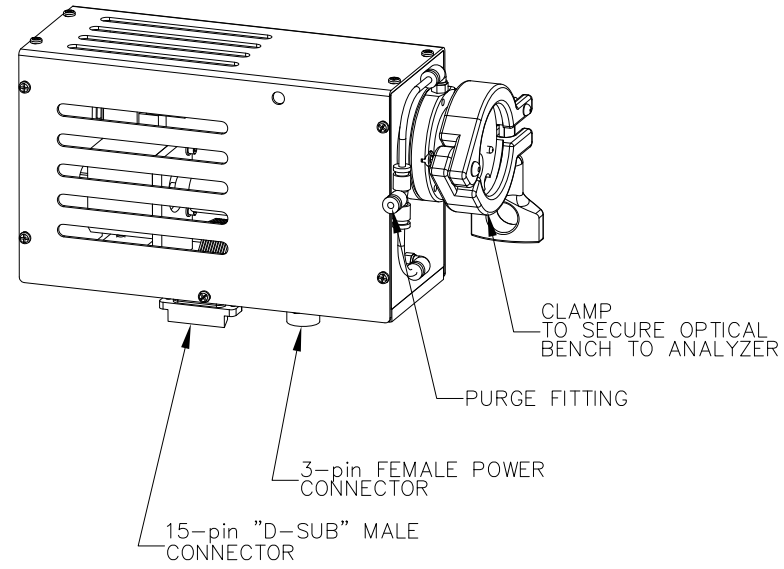


Figure 5-1.
Optical Bench NDIR Assembly.

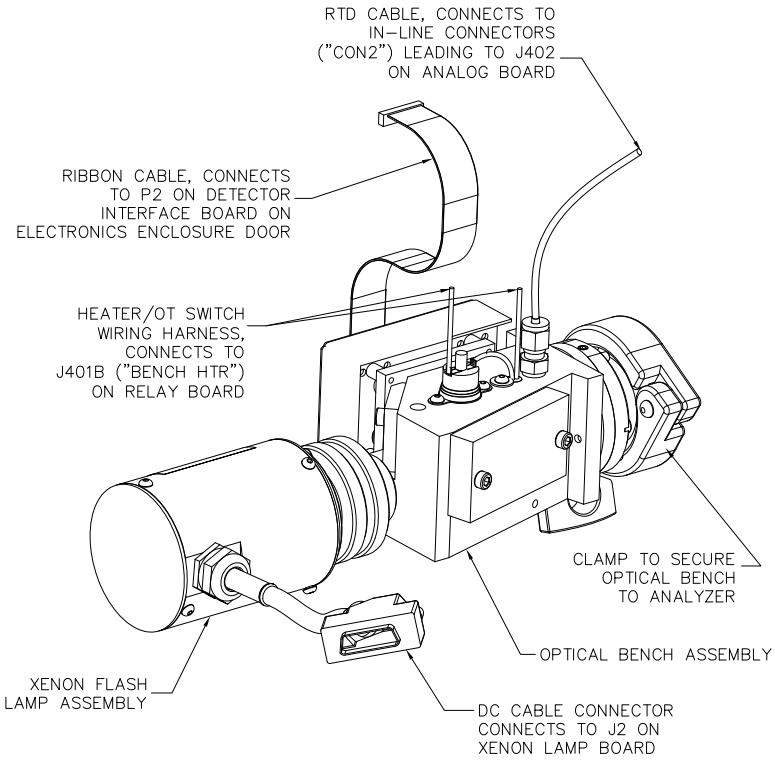


Figure 5-2.
Optical Bench UV Assembly.

Installing the Sample System

Sample systems will vary for each application, depending on the hazardous location, whether the application is gas or liquid, heated or non-heated, etc. Sample system components can include, but are not limited to:

- Sample probe (or process tap)
- Sample/vent lines
- Filters
- Sample transport method
- Visual flow indicators (or meters)
- Span, Zero, Sample valves

If your application uses any of these or other special-requirement sample system components, the customer-specific drawings and *Manual Supplements* – that describe and illustrate installation, operation (if applicable), and maintenance (if applicable) – will be included in the Documentation Package folder shipped with the analyzer.

All regulatory agency, personnel safety procedures, and installation/removal procedures must be followed during the installation/removal of the sample system components. A breathing apparatus must be worn when installing/removing equipment from the extraction point. The sample stream may be under positive pressure, and injury or death from inhaling toxic gases/liquids in the stream could result from attempting

Installing the Sample Probe/Sample Tap

If the Sample Probe is supplied by AMETEK, refer to customer-specific drawings in the Documentation Package folder shipped with the analyzer for installation information. If the Sample Probe/Sample Tap is not supplied by AMETEK, refer to the information and drawings shipped with the probe.

Installing and Connecting the Sample and Vent Lines

The Sample and Vent Lines can be supplied by AMETEK or the customer. Heated lines, which are not supplied by AMETEK, can only be monitored by the analyzer; they cannot be controlled.

If an aspirator is used to drive the sample fluid (typical in gas applications), the Sample and Vent Lines must be minimum 3/8-inch O.D. to avoid back pressure. This is of particular importance for the Vent Lines.

For Vent Lines longer than 15 metres (50 feet), 1/2-inch O.D. tubing is recommended.

This procedure applies to both unheated and heated Sample and Vent Lines. Refer to appropriate customer-specific Sample/Vent Line Installation drawings (if lines supplied by AMETEK) for additional information. These drawings are located in the Documentation Package folder shipped with the analyzer.

To avoid damaging the Sample or Vent Lines, use two wrenches to ensure that the fitting body does not turn on the Teflon line.

Heated Lines only:

- Refer to customer-specific Sample/Vent Line drawings.
- When laying out the lines, ensure the ends with the electrical leads are at the location of the external power supply.
- Install heat shrink around the Sample and Vent Line wiring and terminate the Sample and Vent Line wiring to the external power source.

Refer to power termination instructions supplied with the Sample and Vent Lines for details.

Ensure there is no power being supplied to the Sample and Vent Line temperature-control zone circuits or external power source. Do not apply power until the entire system has been installed, leak checked, and the analyzer is ready for power-up.

To install the Sample and Vent Lines:

1. Lay out the Sample and Vent Lines.

   Route the Sample Line from the analyzer to the sample probe (or process tap) and the Vent Line from the analyzer to the return/vent location.

   Ensure there are no loops, sags, or other traps in the Sample and Vent Lines. Provide support where needed.

2. Make the connections at the analyzer. Refer to Figure 4-1.

3. Connect the Sample Line to the sample probe or process tap.

4. Connect the Vent Line from the analyzer to the return/vent location.

Installing and Connecting the Instrument Air/Zero Fluid Line

Instrument Air or Nitrogen can be used as the aspirator/pneumatic valve drive fluid and to Zero the analyzer. This procedure assumes Instrument Air is being used for these functions. The procedure is the same, regardless of which medium is being used.

The customer supplies the Instrument Air/Zero fluid line. The tubing must be 1/4-inch O.D. 316 stainless steel tubing with appropriate 1/4-inch tube connectors.

If using Instrument Air:

- The Instrument Air must meet the ANSI/ISA-7.0.01 (1996) specifications at all times. If the Instrument Air cannot meet these requirements, an inlet filter system must be installed.

- The air must be supplied to the analyzer pressure regulator at a pressure of 490–700 kPag (70–100 PSIG / 4.8–6.9 BARG). Pressure requirements may vary, depending on the application; refer to customer-specific drawings located in the Documentation Package folder shipped with the analyzer.

If using N_2:

- Use only ultrahigh purity (UHP) Nitrogen.

To install the Instrument Air (or Zero fluid) line:

1. Route the line from the Instrument Air/Zero fluid supply to the analyzer.

2. Before connecting it to the analyzer, blow down (purge) the line to remove any liquids or particulate that may be present in it.

3. Connect the line to the Instrument Air/N_2 supply and to the analyzer. The plumbing for purge systems and the Instrument Air/N_2 feed through the analyzer manifold is already made by AMETEK.

Installing and Connecting the Purge Fluid Line

Instrument Air or Nitrogen can be used to operate the purge system. This procedure assumes that Instrument Air is being used and is the same for Nitrogen. If using instrument air, the air must meet the ANSI/ISA-7.0.01 (1996) specification. If using nitrogen, use only ultrahigh purity (UHP) nitrogen.

The purge gas must be supplied via a pressure regulator and maintained at 60–115 PSI (4–8 bar) and must be able to provide a flow of at least 300 L/minute (after the initial purge, the flow is very low – just enough to compensate for leaks from the enclosure).

1. Provide a source of either Instrument Air or UHP grade Nitrogen.
2. Before connecting the purge inlet, purge the air line to clear any water or particulates
3. Connect the air supply to the 1/4-inch purge supply connection fitting on the top of the analyzer (see Figure 6).
4. Ensure that the Bypass switch is in the **ACTIVE** position and that all enclosure doors are closed and latched
5. Open the purge inlet valve and set the regulator to 60–65 PSI (4 BAR). The left indicator should change from RED to GREEN and the right from BLACK to YELLOW.
6. After approximately 5 minutes, the right indicator should change from YELLOW to BLACK indicating a successful purge.
7. Open the Electronics Enclosure. The indicators on the purge controller should go back to RED and yellow.
8. Close the inlet valve and open the door and proceed with the analyzer installation.

*The purge system should only be placed into **BYPASS** if the area is known to be clear of flammable gases.*

Installing the Calibration (Span) Fluid Line (Optional)

For applications that require Spanning, the Span fluid line is supplied by the customer. The line must be 1/4-inch 316 stainless steel tubing. Refer to the customer-specific Flow Diagram in the Documentation Package folder shipped with the analyzer.

To install the Span fluid line:

1. Route the line from the calibration fluid supply to the analyzer.

2. Before connecting it to the analyzer, blow down (purge) the line to remove any liquids or particulate that may be present in it.

3. Connect the line to the calibration fluid supply and to the analyzer. The plumbing for the calibration fluid feed through the analyzer manifold is already made by AMETEK.

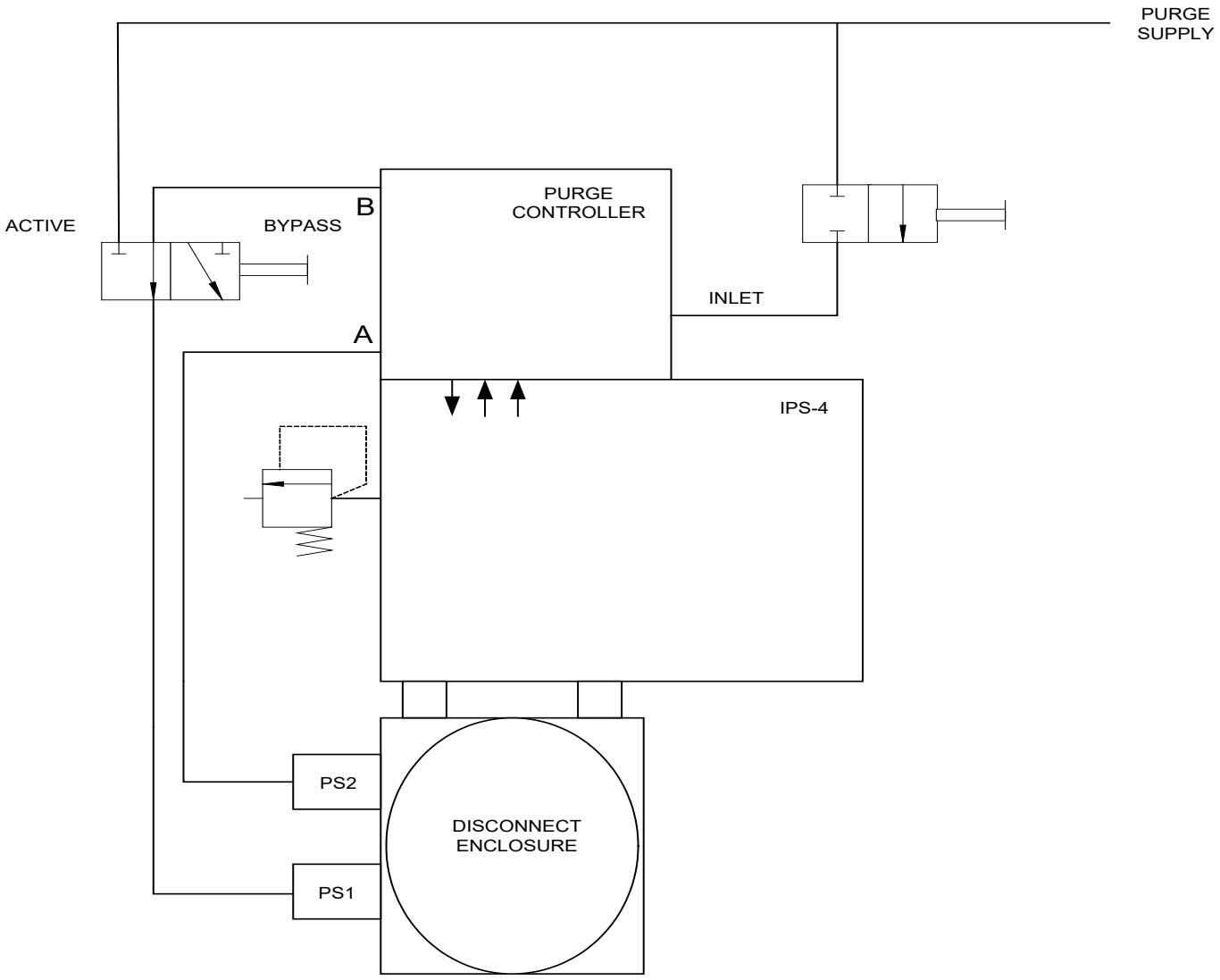


Figure 6.
Purge System.

Connecting I/O Signals, Alarm Relay Contacts, and AC Power

The analog input/output signals, alarm relay contacts, and AC power requirements are specific to each analyzer installation.

For AC electrical supply cable and conduit requirements, refer to – and comply with – local wiring regulations and electrical codes for the area.

Refer to the "Electromagnetic Compatibility (EMC)" page in the contents section of the IPS-4 Analyzer User Manual for information that discusses the EMC Directive regarding techniques and wiring practices to be followed.

Electrical Connections

Termination points for power and all signals are located in the Disconnect Enclosure. Six (6) metric M32 straight thread conduit entries are provided (three (3) on the bottom of the enclosure and three (3) on the side) for power, relay, and signal wiring. We recommend that three be used, but all six may be used if needed. 3/4-inch NPT conduit adaptors are available from AMETEK. Note that unused holes must be plugged with M32 hole plugs. Do not use 3/4-inch NPT hole plugs with thread adapters. Only properly certified conduit connectors must be used. WIRING SEALS MUST BE LOCATED AT THE WALL OF THE DISCONNECT ENCLOSURE. NO ADDITIONAL ENTRIES CAN BE ADDED TO THE DISCONNECT ENCLOSURE WITHOUT VOIDING THE CERTIFICATION.

Figure 7 illustrates the general locations of all customer termination points, while the Customer Connections drawing specifically details the signal, relay contact, and AC power connection points. This customer-specific drawing is located in the Documentation Package folder shipped with the analyzer.

To make the signal, relay contact, and AC power connections:

1. Open the Disconnect Enclosure.

   If a power-disconnect switch (breaker) was installed, open (turn off) the breaker before making the AC power connections. AC Power and relay connections are made at the **AC Disconnect** board.

2. Route the analog input/output signal wiring and alarm relay contact conductors through one of the Signal cable entry ports and into the Disconnect Enclosure.

   Terminate the signal and alarm relay contact wires as detailed in the Customer Connections drawing.

3. Route the AC power conductors through the Power cable entry port and into the Disconnect Enclosure.

   Terminate the AC power wires as detailed in the Customer Connections drawing.

Do not apply power to the system until after all of the wiring has been installed, connected, and verified, and only if the purging system (if used) is ready for operation.

4. Plug all unused cable entry ports with certified plugs.

Permanent Ethernet Cable Connections (Optional)

When using the Ethernet interface on the analyzer, the minimum requirements for the Ethernet cable is a CAT 5E (maximum 100 m) cable to connect the analyzer to the network, up to a maximum of 100 m from the hub. For outdoor analyzer installations, hazardous locations, and/or lengths greater than 100 m, special requirements may be necessary. Contact your network administrator for information.

For details about setting up Ethernet parameters, refer to "Ethernet Network Screen" in Chapter 3 of the IPS-4 Analyzer *User Manual*.

To install the customer Ethernet cable:

1. Route the Ethernet cable through one of the Signal cable entry ports and into the Disconnect Enclosure.

2. Connect the cable to **J6**.

3. Route the cable to the network connection in the plant and connect it.

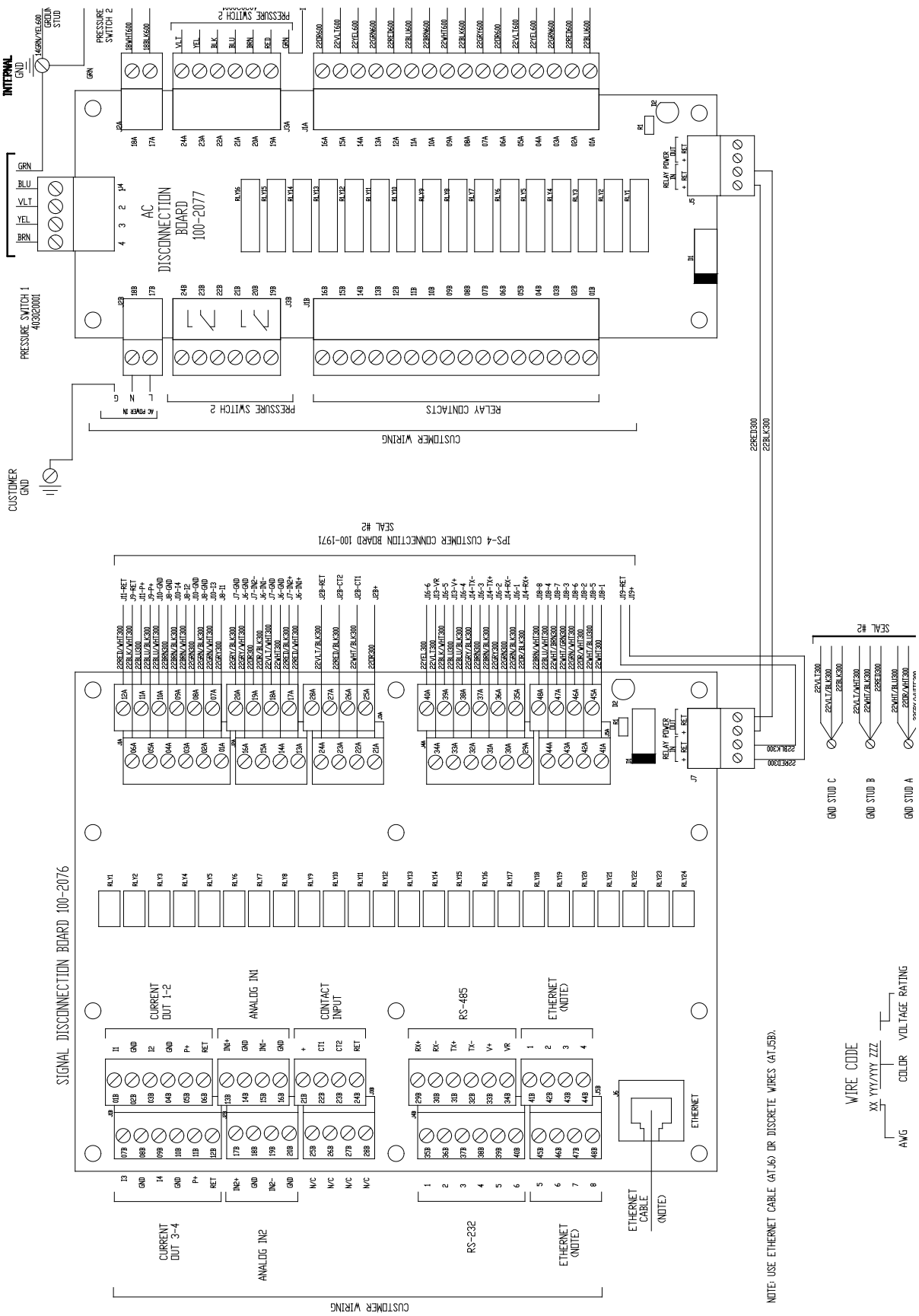


Figure 7.
Signal Disconnection board (100-2076) and AC Disconnection board (100-2077).

Start-Up and Verification

This section describes equipment and controls on the analyzer system that require adjustments and settings before, during, and after power-up. Refer to Figure 3 for the general locations of analyzer equipment or controls that require adjustments. The customer-specific Component Layout drawing illustrates the actual layout for your system.

Powering Up the Analyzer

Before operating the analyzer for the first time, following a power-up or reset, or after maintenance, manually backflush the analyzer sample system and adjust the sample flow rate. Following initial power-up, a series of system checks should be performed to ensure the analyzer is operating properly, prior to commissioning the analyzer into service. If start-up problems occur refer to "Start-Up Diagnostic Checklist," later in this document, for problems and corrective action to fix any problems.

Hazardous Locations Applications
For verification and troubleshooting purposes during power up, it will be necessary to work with the analyzer doors open.

Before powering up the analyzer, test the area for flammable gases. If a flammable gas atmosphere is present, do not apply power to the analyzer or any alternate power sources that supply power to the analyzer components. Proceed only when the area is found to be safe. DO NOT LEAVE POWER CONNECTED TO THE ANALYZER IF THE DOORS ARE OPEN UNLESS YOU ARE CONTINUOUSLY SAMPLING THE AREA FOR FLAMMABLE GASES AND ATTENDING TO THE ANALYZER.

When the analyzer doors are open, take appropriate precautions to avoid electrical shock. Hazardous voltages are present inside.

*For normal operation, the Disconnect Enclosure cover must be installed, the analyzer doors must be closed and latched, and the purge system must be operating normally (**BYPASS** key on the **ACTIVE** position and the purge controller indicators GREEN (left) and BLACK (right).*

Do not apply main AC power to the analyzer if the Xenon Flash Lamp Assembly electrical connections have not been made.

*The analyzer is shipped from the factory without a password (security is disabled). Upon powering up the analyzer for the first time, all configurable parameters can be changed until a password is entered in the **Change Password** function (**Login/Set Password** screen, **SYSTEM SETTINGS** menu).*

*Setting up security for the analyzer is necessary to ensure analyzer settings are not inadvertently changed while working from the User Interface Panel. **If changing the password, be sure to record and store the password in a safe place for reference.***

To power up the analyzer and verify it is operating properly:

1. Apply air pressure to the purge system. Switch the Purge Bypass switch from **ACTIVE** to **BYPASS** (switch is located to the left of the purge controller unit).
2. With the Electronics Enclosure open:

   Open the Bench Heater and Oven Heater fuses. Refer to the Fuse Legend (at the back of the Electronics Enclosure) for the location of these fuses. If a power-disconnect switch (breaker) was not installed, main AC power will be applied to the analyzer.

*Do not power up the temperature-control zone circuitry (**Bench Heater** fuse and **Oven Heater** fuse, if Oven/Sample System Enclosure is heated) until after the sample system leak check has been performed and verified, as described later in this procedure.*

   If a power-disconnect switch *was installed*, close it to apply main AC power to the analyzer.

3. After applying AC main power to the analyzer, the message "**System Starting**" is displayed momentarily on the top line of the User Interface Panel. Following this, the **AMETEK Process Instruments** start-up screen will appear. This screen also displays the software version.

   After the start-up screen, the system defaults to the **HOME** screen which allows you to view the current status of up to seven factory-configured parameters. These parameters are displayed on the left side of this screen. The right side of this screen displays the current operational status of the analyzer. Descriptions of these parameters and states are described under "HOME Menu Screen" and "System Status Messages (HOME Screen)" in Chapter 3 of the IPS-4 Analyzer *User Manual*.

If these screens do not appear, check the AC wiring to ensure it is properly connected.

To check the AC wiring, take all necessary safety precautions to power down the analyzer and open the **Main AC Power** and **DC Power** fuses.

Wait 2 minutes to allow the high-voltage capacitors to discharge.

Review the Customer Connections drawing and check the wiring terminations from the main AC power supply source to the analyzer.

Take all necessary safety precautions and reapply power to the analyzer by closing the **Main AC Power** and **DC Power** fuses. Check the User Interface Panel again to see if these screens appear. If so, continue with the next step.

4. Perform a leak (pressure) check to ensure there are no leaks in the system, then return to this procedure and complete the remaining start-up and verification tests.

   To perform the leak check, follow the procedure under "Sample System Leak Check" in this document.

5. After the leak check has been performed and has passed, close the **Bench Heater** fuse and **Oven Heater** fuse (if Oven/Sample System Enclosure is heated) to apply power to the Measuring Cell and Oven Heater temperature-control zone circuitry. Ensure that the sample system door has been closed and latched.

   Watch the purge controller until the indicators turn GREEN (left) and BLACK (right). Install the key in the bypass valve and place it in the **ACTIVE** position. Remove the Bypass and Enclosure keys and keep them in a safe place.

*No alarms will be displayed on the **HOME** screen or entered into the **Alarm Log** until AFTER the system has left the **Not Ready** state for the first time after power-up, which occurs after the entire sample system has reached normal operating temperature and has stabilized (2–3 hours).*

6. While performing the remaining start-up tests, close the analyzer doors to allow the sample system to warm up to normal operating temperature (necessary only if Oven/Sample System Enclosure is heated).

NOTE

The Oven and the rest of the sample system will reach normal operating temperature (application-specific) in approximately 2 hours, but may take up to another hour to stabilize.

To minimize the time it takes for the entire sample system to warm up to normal operating temperature, be sure to close the doors after performing the checks that require them to be open.

7. While working from the User Interface Panel, perform the following checks to ensure the analyzer temperature-control zone circuitry is operating properly and the system pressures are set appropriately. Record the temperature value for each zone and the system pressures to use as a reference later while comparing the values.

NOTE

For instructions on working from the User Interface Panel, refer to Chapter 3 of the IPS-4 Analyzer User Manual.

If changes need to be made to any of the parameters settings, a password must be entered to allow the changes to be made. For details about entering a password, refer to "Login/Set Passwords Screen" in Chapter 3 of the IPS-4 Analyzer User Manual.

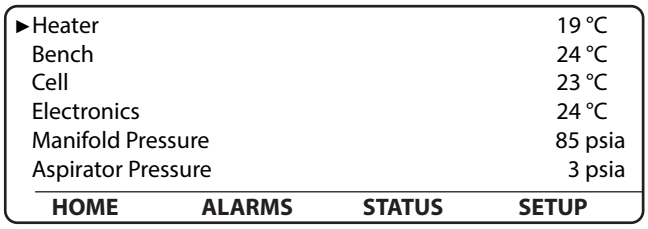


Figure 8.
STATUS menu (example screen).

a. Press the **STATUS** soft key to view the **STATUS** screen (Figure 8).

Check and record the current operating temperature readings. This will help you determine if the signal wiring is properly terminated and if all of the circuitry is operating properly.

Pay close attention to the temperatures of the (Oven) **Heater** (if used), (Optical) **Bench**, and **Cell** (if used) readings. If these temperatures do not increase, check the wiring for proper connections. If the wiring is properly connected, it may indicate a shorted RTD for that temperature zone.

The Oven Heater temperature parameter is available only for applications with a heated Oven.

b. Check the pressure of the pilot valves – Manifold block and Zero fluid (if used) pressure. Adjust the Actuator/Zero pressure regulator to obtain a minimum pressure of 490 kPag (70 PSIG / 4.8 BARG).

c. Check the **Aspirator Pressure** (gas applications only) from the **STATUS** screen; the pressure should be adjusted to the value stated on the system drawings, or enough to see a flow on the Flow Indicator (or meter), if used, or to achieve an acceptable response time. Typically, a good response time is less than 30 seconds to T90 when the sample system is clean and operating at peak efficiency – response time may vary due to Sample Line length. The response is application-specific and will vary, depending on the sample system.

8. View the current output ranges. To do this:

a. Press the **SETUP** soft key to view the **SETUP** menu screen. Scroll down to select **Current Outputs** and press **ENTER** to display the **Current Outputs 1** through **4** screen. Scroll down to select **Current Outputs 1** screen (Figure 9).

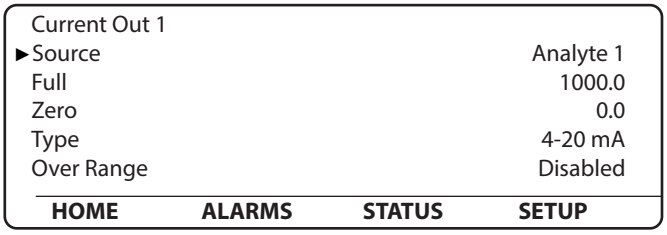


Figure 9.
Current Output Setup screen (Current Out 1).

Check the **Current Out 1** Source (species), Full (full-scale), and **Zero** (zero point) settings/values and compare them to the settings/values listed on the analyzer documentation shipped with the analyzer to ensure they correspond.

b. Check the other outputs, comparing their settings/values to their corresponding settings/values listed on the analyzer documentation.

If any of the settings need to be changed, refer to "Current Output Setup Screens" in Chapter 3 of the IPS-4 Analyzer *User Manual* for details.

9. View the relay settings. To do this:

    a. Press the **SETUP** soft key to view the **SETUP** menu screen. Scroll down to select **Relays** and press **ENTER** to display the **Relay** screen. Scroll down to select **Relay 1** and press **ENTER** to display the **Relay 1** screen (Figure 10).

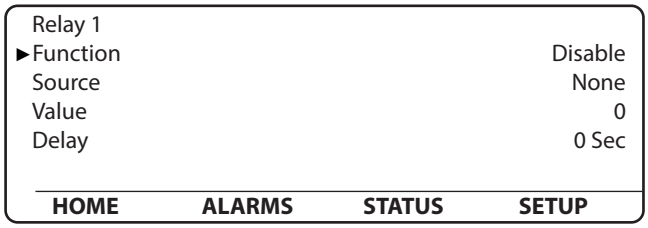


Figure 10.
Relay Setup screen (Relay 1).

    Check the **Relay 1** ***Function*** (operational status setting for this relay), ***Source*** (species), ***Value***, and ***Delay*** (zero point) settings/values and compare them to the settings/values listed on the analyzer documentation shipped with the analyzer to ensure they correspond.

    b. Check the other relays, comparing their settings/values to their corresponding settings/values listed on the analyzer documentation.

    If any of the settings need to be changed, refer to "Relay Setup Screens" in Chapter 3 of the IPS-4 Analyzer *User Manual* for details.

10. If using an Ethernet connection to communicate with the analyzer, set up the Ethernet parameters as described in the section "Ethernet Network Screen" in Chapter 3 of the IPS-4 Analyzer *User Manual*.

11. After approximately 2–3 hours, at which time the entire sample system has now reached its normal operating temperature (application-specific) and has stabilized, the system will leave the **Not Ready** state for the first time.

    Temporarily open the Electronics Enclosure door and listen for an intermittent clicking sound, which indicates the Xenon Flash Lamp is on (flashing).

    If there is no clicking sound, and the analyzer is in a state other than the **Not Ready** state, this can indicate problems with the wiring. If necessary, power down the analyzer and check all associated wiring.

12. If the analyzer sample system cools down to below its normal operating temperature and returns to the **Not Ready** state, wait until it warms up enough and the analyzer leaves the **Not Ready** state.

    Check the User Interface Panel for current alarms. To view alarms that have been detected, press the **ALARMS** soft key to view the **ALARMS** screen. Use the **UP/DOWN** arrow key to select **Current Alarms** and press **ENTER** again to view any active alarms (on the **Current Alarms** screen, Figure 11).

    If any alarms exist, take appropriate action to correct the alarms before continuing. For more information about alarms and corrective action to take to correct and reset alarms, refer to "Alarm Conditions and Corrective Action" in Chapter 4 of the IPS-4 Analyzer *User Manual*.

    If no alarms exist (Figure 12), or after all alarm conditions have been cleared (reset), recheck the temperature of each zone from the **STATUS** screen.

    Compare the values to the values recorded earlier to ensure they have increased, have reached their normal operating temperatures, and have stabilized.

    Normal operating temperatures are values that are within 5 °C (typical; set point may vary) of the Set Point values.

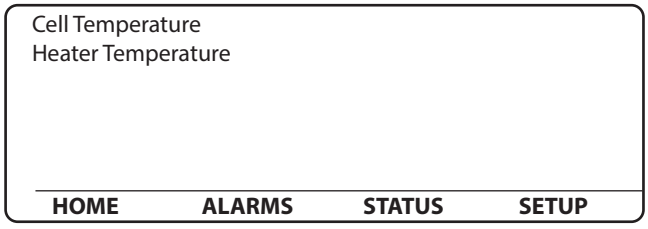


Figure 11. Active alarms displayed (example), Current Alarms screen.

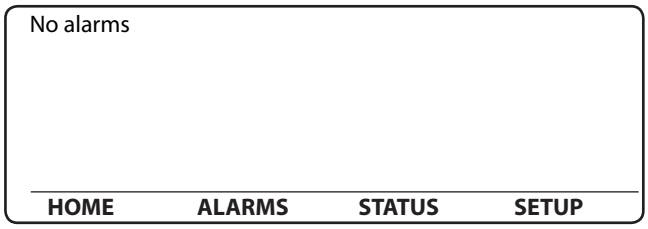


Figure 12. No active alarms, Current Alarms screen.

13. Open the Vent Line isolation valve (on the Sample Probe, process tap, or inside the Oven/Sample System Enclosure). Open the Sample Line isolation valve (on the Sample Probe, process tap, or inside the Oven/Sample System Enclosure) to allow sample fluid into the sample system.

14. Zero the analyzer as described under "Manually Zeroing the Analyzer Sample System" in this document. After the Zero, switch the analyzer back to **Measure** mode (from the **Calibration** screen, select **Start Measure** and press **ENTER**). From the **HOME** screen (Figure 13), check the response time of the analytes. Typically, a good response time is less than 30 seconds to T90 when the sample system is clean and operating at peak efficiency. Response time may vary due to Sample Line length.

    Record the initial sample response time in a log book, as described under "Recording Initial Readings" in this document.

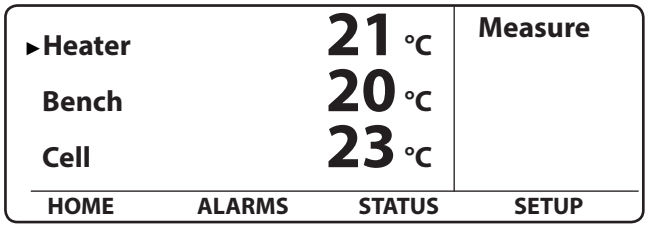


Figure 13.
HOME screen (example).

15. **For systems using an Aspirator:**
    Adjust the Aspirator Pressure Regulator to achieve normal operating flow rates as described under "Adjusting the Sample Flow Rate" in this document. The optional Flow Indicator (or meter), if used, will provide a visual indication of sample flow.

16. Close and secure the analyzer doors.

The start-up and verification checks are complete and the analyzer is ready for normal operation.

Start-Up Diagnostic Checklist

This checklist describes problems that can be encountered while powering up the analyzer and/or preparing it for normal operation. If the analyzer experiences problems during power-up, review this checklist and perform the corresponding corrective action to fix any problems.

Alarm Condition / Description / Corrective Action
Problem Encountered Status/error code conditions for current alarms are displayed on the User Interface Panel. ***Corrective Action*** To view current alarms, press the **ALARMS** soft key to view the **ALARMs** screen. For information about viewing current alarms, refer to "Alarm Notification (HOME Screen)" and "ALARMS Menu Screen" in Chapter 4<?? of the IPS-4 Analyzer *User Manual*. For detailed information about these alarms, refer to the alarm conditions and corrective action in the "Maintenance and Troubleshooting" chapter of the IPS-4 Analyzer *User Manual*.
Problem Encountered The Xenon Flash Lamp is not operating (intermittent clicking sound is not heard). ***Corrective Action*** Check the system state on the right side of the **HOME** screen. Note that the Xenon Flash Lamp will not operate when the system is in the **Not Ready** state. If the system is in a state other than **Not Ready**, take appropriate safety precautions and check for proper wiring connections.
Problem Encountered The LEDs on the **Relay**, **Customer Connection**, or **MCU** boards are not on. ***Corrective Action*** Take appropriate safety precautions and check for proper I/O wiring connections.
Problem Encountered Temperature zone values do not increase. ***Corrective Action*** The over-temperature circuits may have been tripped; press the Reset Switch (**S501**) on the **Relay** board or the Reset Switch on the **Optical Bench**. If the temperature zone values still do not increase, check the fuses (**Bench Heater** and **Oven Heater**, if used) for proper connections and blown fuses (located at **TB1** in Electronics Enclosure). If the temperature zone values still do not increase, take appropriate safety precautions and check for proper wiring connections for the appropriate temperature zone wiring..

Sample System Leak Check

The analyzer sample system has been pressure-checked for leaks at the factory as part of AMETEK's quality assurance procedures.

However, fittings can loosen during transport. Also, the Sample, Vent, Instrument Air (or N_2), and Calibration (Span, if used) Fluid lines are installed on-site. Therefore, it is important that a leak check is performed on the entire sample system prior to commissioning the analyzer for operation for the first time, or following the replacement of any lines/fittings or Measuring Cell parts.

If the analyzer is configured for a heated sample system, perform the sample system leak check prior to applying power to the Oven/Sample System Enclosure circuitry (must not be hot).

Preventing leaks in the sample handling system is critical to ensure proper analyzer operation. If sample fluid migrates into the Optical Bench Assembly or Reflector Block due to a leak in the Measuring Cell Assembly, the optics will become damaged and will likely require replacement. Most leaks are preventable with the regular replacement of the Measuring Cell o-rings.

Do not use a leak detection fluid on hot fittings. If the analyzer system is at operating temperature, the temperature-control zone circuitry fuses must be opened to allow the temperature-control zones to cool before using a leak detection fluid on the fittings.

After all piping and electrical connections have been made:

- Refer to the system Analyzer Flow Diagram in the customer-specific drawings shipped with the analyzer.
- Identify the portions of the system to be tested.
- Identify the location of the pressure sources that can be applied for leak testing.

When pressurizing the system, do not exceed 1.5 times the rated pressure for that branch o the sample system. (see inlet markings or drawings).

If a portion of the system includes a pressure sensor, first, pressurize the system and then block it off and monitor for a drop over time.

If a pressure sensor and isolation valves are not available, pressurize the system and use a suitable leak detections fluid (such as Snoop® or another suitable leak detection agent) on all fittings.

Manually Zeroing the Analyzer Sample System

The Zero function forces the analyzer to purge the sample system with a Zero fluid to remove any residual contaminants in the sample system.

For heated systems, all temperature zones must be at their operating set points before performing a Zero. If necessary, view the temperature zones to verify this.

*Pressing **CANCEL** at any time during this procedure will abort the procedure and return the software to the **HOME** screen.*

To manually Zero the analyzer:

1. Ensure that the Zero fluid cylinder (Instrument Air or Nitrogen) is connected and turned on.

2. Press the **SETUP** soft key to display the **SETUP** menu. Select the **Calibration Control** sub-menu and press **ENTER**. Scroll down to the **Calibration** sub-menu and press **ENTER** to display the **Calibration** screen.

3. Use the **DOWN** arrow key to select **Start zero calibration** and press **ENTER** to purge the sample system with Zero fluid. The message "**Please wait** ..." will appear while the analyzer performs the calibration function.

   Run the Zero for 10 minutes.

Typically, the IPS-4 Analyzer controls the Zero flow rate; no adjustments are required.

If the customer provides the sample system Zero, run the manual Zero at a flow rate of 2.5 L/minute (0.08 SCFM).

4. From the **Calibration** screen, select **Start measure** and press **ENTER** to return the analyzer to **Measure** mode.

5. Press the **HOME** soft key to return to the **HOME** screen.

6. Turn off the Zero fluid.

The Zero is complete and the analyzer is now online.

Adjusting the Zero/Span Fluid Flow Rate

When the Zero or Span (if used) flow solenoid is in an energized state, Instrument Air (or Nitrogen or distilled water) flows into the sample path via a solenoid manifold block and a flow meter. The flow rate of Zero/Span (if used) fluid must be high enough to adequately flush the Measuring Cell of sample fluid to obtain a "good Zero."

Typically, the IPS-4 Analyzer controls the Zero (and Span, if used) flow rate; no adjustments are required.

If the customer provides the sample system Zero, run the manual Zero at a flow rate of 2.5 L/minute (0.08 SCFM). Since excess air flow into the analyzer sample system will cool the Measuring Cell and Oven/ Sample System Enclosure, the optimum Zero fluid flow rate is the lowest consistent with a good Zero.

A good Zero can be defined as a state where the concentration outputs are stable and further increases in Zero fluid flow rate do not reduce the concentrations observed on the analyzer User Interface Panel. A mid-scale flow indicator (or meter) should be sufficient for this purpose.

While the sample system is warming up, or when the analyzer is in standby mode (**Not Ready** state), Zero flow may be desired. During these conditions, it is important that the sample system is kept free of contamination by the sample fluid.

For additional information, refer to the Sample System *Manual Supplement* in the Documentation Package folder shipped with the analyzer.

Adjusting the Sample Flow Rate

Applications *With* an Aspirator:
The Aspirator Pressure Regulator is used to control the sample flow through the system. A typical sample flow rate is in the range of 3.0–5.0 L/minute (0.1–0.2 SCFM) and can be achieved by adjusting the Aspirator Pressure higher than 70 kPa (10 PSI) above the sample stream pressure. View the flow indicator (or meter), if used.

To avoid damaging the pressure transducer, do not set the pressure higher than 105 kPag (15 PSIG).

The analyzer pressure – measured by the pressure transducer – can also be used to set the sample flow rate. This is accomplished by first measuring the sample stream pressure with no aspiration (Drive Air Isolation Valve closed) and then adjusting the Aspirator Pressure Regulator with the Drive Air Isolation Valve open to obtain a pressure of 5–10 mmHg (0.20–0.39 inHg or 0.10–0.20 PSI) less than the value obtained with the valve closed. View the Measuring Cell pressure (**Cell Pressure**) from the **STATUS** screen.

Applications *Without* an Aspirator:
If an Aspirator is not used, a Metering Valve or Ball Valve will be used to adjust and control the sample flow through the system. Refer to customer-specific drawings for appropriate settings for your application. View the flow indicator, if used.

Setting Sample Response Time

Sample response time can also be used as a parameter for setting the **Aspirator Pressure**. Response time is determined by switching the analyzer from **Zero Gas Flush** mode to **Measure** mode and recording the time it takes the analyzer to display the first reading after the switch.

To check the sample response time:

1. Observe the output concentration from the **HOME** screen.

2. Press the **SETUP** soft key to display the **SETUP** menu and then press the **DOWN** arrow key until the **Calibration** sub-menu item is displayed and selected.

3. Manually Zero the analyzer. To do this, press **ENTER** to display the **Calibration** screen. Use the **DOWN** arrow key to select **Start zero calibration** and press **ENTER**. The message "**Please wait** ..." will appear while the analyzer initializes and performs the calibration function.

   Run the manual Zero for 10 minutes. For more information about setting the Zero fluid flow rate, refer to "Adjusting the Zero/Span Fluid Flow Rate" in this document.

4. From the **Calibration** screen, select **Start measure** and press **ENTER** to return the analyzer to **Measure** mode.

5. Press the **HOME** soft key to return to the **HOME** screen and observe the analyte output concentration(s) again.

   If the sample response time is adequate (first response after a Zero is less than 30 seconds to T90), no further adjustment is necessary.

The sample response time may vary, depending on Sample Line length.

Normal Operation

After the analyzer is set up and started, the analyzer User Interface Panel defaults to the **HOME** screen. During normal operation, the top three lines of the User Interface Panel display the output names with their corresponding values displayed to the right. The User Interface Panel is updated once per second.

From the **HOME** screen, parameters or variables can only be viewed, they cannot be changed. Parameters or variables can be changed only while the software is in **Edit** mode. For more information about setting analyzer security, refer to "Login/Set Passwords Screen" in Chapter 3 of the IPS-4 Analyzer *User Manual*.

Recording Initial Readings

Before operating the analyzer, it is important to observe the analyzer to understand what normal operating conditions are, and how to use this information later to help you determine problems with the analyzer.

AMETEK recommends that you observe and record this information every month to obtain a history. From these recordings, you will be able to determine if there are problems with the analyzer, such as increasing sample response. These problems typically indicate maintenance is required.

Keep the log book in a safe location until you need to review it for patterns of a longer sample response time.

Recording Initial Sample Response Time

The analyzer sample response time can be used for two functions. One function is to help you set the sample fluid flow rate, as discussed earlier in "Setting Sample Response Time" in this document. The other function is to help you determine if the typical response time is increasing, which can indicate a plug in the sample system which, in turn, can indicate maintenance is required.

Typically, a good response time is less than 30 seconds to T90 when the sample system is clean and operating at peak efficiency. Response time may vary due to Sample Line length.

To check and record the initial sample response time:

1. Manually Zero the analyzer.

2. After the Zero is complete, view the **HOME** screen and observe the analyte output concentration changes. Observe and record the time it takes the analyzer to display the first reading after the analyzer **System State** switches from "**Zero**" to "**Measure**."

*It is important to record the response time only **after** performing a manual Zero function to simulate the same conditions during the original recordings.*

3. If the sample response time is adequate (first reading after a Zero function and after the analyzer **System State** switches from "**Zero**" to "**Measure**" is less than 30 seconds to T90), no further adjustment is necessary.

The sample response time may vary, depending on Sample Line length.

4. Record these signals in a log book every month.

Analyzer Configuration

The **Parameter List (Factory Settings)** file is located in the Documentation Package shipped with each analyzer. These configuration sheets list all of the settings that have been made to the analyzer at the factory (to meet customer requirements).

If any changes are made to the original configuration, be sure to record the changes for later reference. If the **MCU** board is ever replaced, this data must be re-entered in order to override the factory defaults.

If necessary, refer to the **Parameter List (Factory Settings)** to revert the analyzer back to its original settings.

Maintenance and Troubleshooting

Generally, there is limited maintenance required to ensure the analyzer remains operating at peak efficiency, other than that described in the "Analyzer Preventive Maintenance Schedule" [located in the Maintenance and Troubleshooting chapter of the analyzer *User Manual*]. This section discusses preventive maintenance that must be followed to ensure continued and proper operation of the analyzer. This section also describes parts that require replacing. [Refer to other sections in the Maintenance and Troubleshooting chapter of the analyzer *User Manual* for procedures to replace the parts.]

Before Performing Maintenance

Under normal operating conditions, lethal concentrations of H_2S or other toxic gases/liquids from the sample stream may be present within the analyzer sample system.

*Before working on the sample system, manually Zero the analyzer (from the **Calibration** screen, select **Start zero calibration** and press **ENTER**), isolate it (block it in) from the sample stream, and disconnect the mains AC power. This procedure is necessary prior to changing out any analyzer components or replacing any replaceable parts (as part of regular preventive maintenance), or performing leak checks following the replacement of instrument air or other adjustments to any of the connections points in the analyzer sample system. **If this is not possible, a breathing apparatus must be worn while servicing the sample system.***

The sample system is defined as all components in the analyzer system through which sample fluid passes.

Certain procedures, such as replacing source lamps, do not require that the analyzer sampling system be isolated from the sample gas stream. Adjustments to the source lamps must be done with the analyzer powered up. [These procedures can be found in the Troubleshooting and Maintenance chapter of the analyzer *User Manual*.]

You must take precautions against ESD (electrostatic discharge) damage while performing the following operations. Precautions would include the use of a wrist strap and a grounded work surface, as well as storage of electronic assemblies in anti-static packaging.

Always disconnect power and/or external power sources to the analyzer before opening any covers or doors on the analyzer to check or perform maintenance on any components within the enclosures.

*If it is necessary to open the analyzer's covers or doors while the circuits are live, first monitor the area for flammable gases (and proceed only when the area is safe). To work on the analyzer with it powered up and its Electronics Enclosure door open, the purge system must be in **BYPASS** mode.*

Cleaning/Replacing Parts in the Sampling System

To clean and/or replace parts in the analyzer sampling system:

1. Manually Zero the analyzer, isolate the analyzer sampling system from the sample gas stream, and power down the analyzer [as described in the analyzer *User Manual*].

   If an external, flame-proof disconnect switch (breaker) has been installed, open the breaker.

   If heated Sample and Vent Lines are used, disconnect power to them.

Before proceeding, test the area around the analyzer for flammable gases. If a flammable gas atmosphere is present, do not power down the analyzer or any alternate power sources that supply power to the analyzer components. Proceed only when the area is found to be safe.

Wait two (2) minutes to allow the high-voltage capacitors to discharge.

2. If the Oven/Sample System Enclosure is heated, wear insulated gloves and open the door to allow the Oven to cool down enough to ensure safe handling.

The components within the enclosure will be hot; take precautions to avoid burning yourself.

3. Continue with the procedures to disassemble, clean, replace parts in, and reassemble the appropriate sampling system component and all associated sample system tubing.

   [For information about how to determine if and when analyzer parts require cleaning or replacement, refer to appropriate sections in the Troubleshooting and Maintenance chapter of the analyzer *User Manual*.]

4. Restore power to the analyzer [as described within each procedure in the analyzer *User Manual*].

5. Perform a leak (pressure) check on all sample system fittings that were disconnected/reconnected.

6. Perform the remaining procedures for the assembly you are working on to properly commission the analyzer into operation [as described in the Troubleshooting and Maintenance chapter in the analyzer *User Manual*].

Other Maintenance

If it is necessary to perform maintenance on the analyzer while its circuits are live and with its Electronics Enclosure door open, first monitor the area for flammable gases (and proceed only when the area is safe). To work on the analyzer with it powered up and its Electronics Enclosure door open, the purge system must be in ***BYPASS*** *mode.*

When the Electronics Enclosure is open, take appropriate precautions to avoid electrical shock. Hazardous voltages are present inside.

Other maintenance and diagnostic checks that may require you to work on the analyzer with its Electronics Enclosure open

If a procedure for a certain maintenance task is not described in the analyzer *User Manual*, contact AMETEK Service for details about performing the required maintenance.

For complete details about operating and maintaining the purge system, refer to the "Pressurized Enclosure System User's Manual" shipped with the analyzer.

Examining and Caring For the Flamepaths

If it is necessary to use a cleaning agent, make sure the power to the analyzer is off. Also, the agent must be nonabrasive and must not attack aluminum (example, a suitable agent is Isopropanol).

When performing equipment maintenance in hazardous areas, all safety standards and procedures must be followed, as specified by the Owner Company, local electrical-inspection authority, and National/EU regulations.

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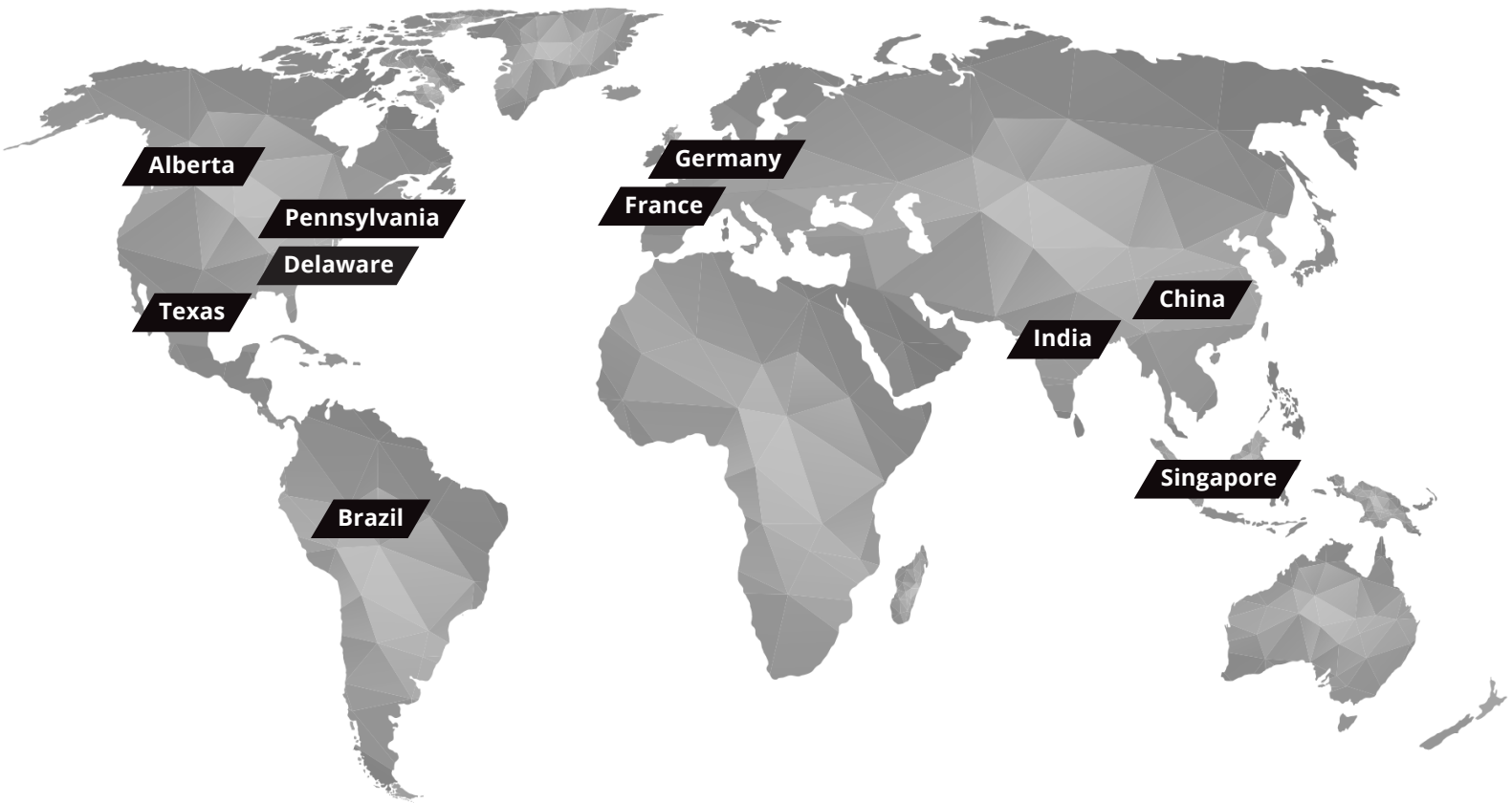

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