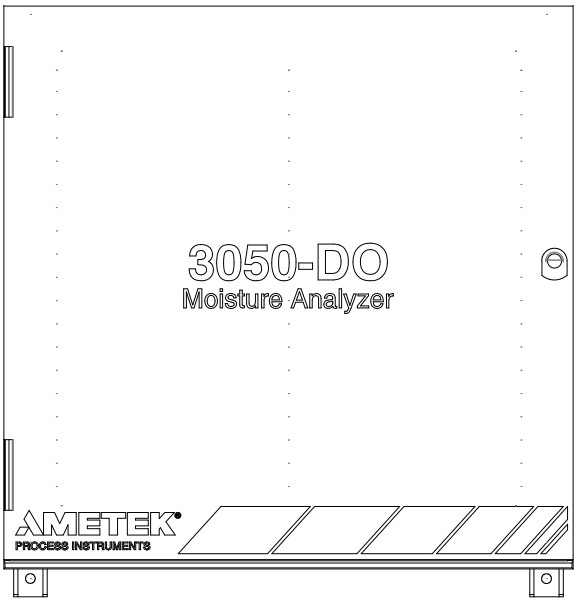
AMETEK®
PROCESS INSTRUMENTS

USER MANUAL

3050-DO Moisture Analyzer



PN 305725901, Rev YF
AMETEK 3050 Configurator Software Version 2.20

Every successful enterprise has as its driving force someone with vision, courage and determination to make it succeed. Within the AMETEK Process Moisture Analysis business, such a person was John Day. Over a period of many years of practical experience working with customers, John became the committed "product champion" of the Quartz Crystal Microbalance method of moisture measurement. He constantly provided ideas on applications, marketing and product improvements which he felt were desirable for increasing the worldwide business.

Sadly, John was not to live to see the full results of this inspiration, so we proudly dedicate this new product to his memory.

JOHN DAY
1952 - 1997

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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.

Read this manual before beginning the installation and operation of the 3050-DO Analyzer. Failure to do so, and or use of the equipment in a manner not specified in this manual or accompanying documents, may impair the protection against fire, electrical shock and injury originally provided by this equipment. In addition, failure to follow the installation and start-up instructions may void the instrument warranty.

Electrical Safety

Up to **240 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.

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.

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.

Important Notice to Users

Equipment used in Class I, Division 2 hazardous locations.

Power, input, and output (I/O) wiring must be in accordance with Class I, Division 2, Groups A,B,C,D, T4 or Non-Hazardous Areas Only. (Note: Division 2 Standalone Analyzer is not supplied with the 24 VDC power supply option.)

Division 2 standalone analyzer is not supplied with the 24 VDC power supply option.

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

Exposure to some chemicals may declare the sealing properties of materials used in the following devices: Power Supply Module.

All input and output wiring must be in accordance with Class I, Division 2 wiring methods (NEC Sec 501.4(b) or CEC 18-152) and in accordance with the authority having jurisdiction.

If the 3050-DO Analyzer is to be powered by a source of 24 VDC other than that supplied by AMETEK, the power source's output must be isolated from hazardous mains voltages using double or reinforced insulation which has a minimum dielectric strength of 2300 VAC. When the 3050-DO Analyzer is used in a Class I, Division 2 area, this external power source must be located in a general purpose area or be approved for Division 2 areas.

Electromagnetic Compatibility (EMC)

Read and follow the recommendations in this section to avoid performance variations or damage to the internal circuits of this equipment when installed in harsh electrical environments.

The various configurations of the 3050-DO Analyzer should not produce, or fall victim to, electromagnetic disturbances as specified in the European Union's EMC Directive. Strict compliance to the EMC Directive requires that certain installation techniques and wiring practices are used to prevent or minimize erratic behavior of the Analyzer or its electronic neighbors. Below are examples of the techniques and wiring practices to be followed.

In meeting the EMC requirements , the various Analyzer configurations described in this manual rely heavily on the use of metallic shielded cables used to connect to the customer's equipment and power. Foil and braid shielded I/O and DC power cables are recommended for use in otherwise unprotected situations. In addition, hard conduit, flexible conduit, and armor around non-shielded wiring also provides excellent control of radio frequency disturbances. However, use of these shielding techniques is effective only when the shielding element is connected to the equipment chassis/earth ground at both ends of the cable run. This may cause ground loop problems in some cases. These should be treated on a case-by-case basis. Disconnecting one shield ground may not provide sufficient protection depending on the electronic environment. Connecting one shield ground via a 0.1 microfarad ceramic capacitor is a technique allowing high frequency shield bonding while avoiding the AC-ground metal connection. In the case of shielded cables the drain wire or braid connection must be kept short. A two-inch connection distance between the shield's end and the nearest grounded chassis point, ground bar or terminal is highly recommended. An even greater degree of shield performance can be achieved by using metallic glands for shielded cable entry into metal enclosures. Expose enough of the braid/foil/drain where it passes through the gland so that the shield materials can be wrapped backwards onto the cable jacket and captured inside the gland, and tightened up against the metal interior.

Inductive loads connected to the low voltage "Alarm Contacts" are not recommended. However, if this becomes a necessity, adhere to proper techniques and wiring practices. Install an appropriate transient voltage suppression device (low voltage MOV, "Transzorb," or R/C) as close as possible to the inductive device to reduce the generation of transients. Do not run this type of signal wiring along with other I/O or DC in the same shielded cable. Inductive load wiring must be separated from other circuits in conduit by using an additional cable shield on the offending cable.

In general, for optimum protection against high frequency transients and other disturbances, do not allow installation of this Analyzer where its unshielded I/O and DC circuits are physically mixed with AC mains or any other circuit that could induce transients into the Analyzer or the overall system. Examples of electrical events and devices known for the generation of harmful electromagnetic disturbances include motors, capacitor bank switching, storm related transients, RF welding equipment, static, and walkie-talkies.

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

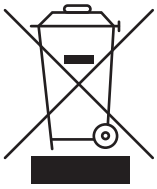
Caution – Refer to accompanying documents
(ATTENTION – SE RÉFERER AUX DOCUMENTS JOINTS)
Achtung – Beachten Sie beiliegende Dokumente

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.
- 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

The 3050 Moisture Analyzer is a smart sensor that measures trace concentrations of moisture in a process gas stream. At the heart of the 3050-DO Analyzer is a 3050-OLV, which has been modified for operation at moisture concentrations below 100 PPBV. The 3050-DO Analyzer is compatible with He, Ar, Ne, Xe, Kr, O_2, H_2, N_2, NO, CO, CO_2, light hydrocarbons, natural gas, refrigerants, air, and specialty gases. Refer to Figure 1-4 for a Gas List. The analyzer is calibrated to measure moisture content from 1–2500 PPMV. Data output can be in units of PPMV, PPMW, lb/mmscf, and mg/Nm^3.

The heart of the 3050-DO Analyzer is a quartz crystal microbalance (QCM) Sensor that is sensitive to moisture. The QCM Moisture Sensor is simply a quartz crystal oscillator, in which the quartz crystal has been coated with a proprietary hygroscopic coating. This coating selectively, and reversibly, absorbs moisture from a Sample gas stream. As the crystal is exposed to a gas stream containing water vapor, the hygroscopic coating absorbs moisture from the gas stream, changing the mass of the coating. Changes in the mass are detected as changes in the natural resonance frequency of the oscillator.

In the analyzer's **Normal** operating mode, the QCM Sensor is alternately exposed to the Sample gas and a dry Reference gas. A dry Reference gas is produced by passing a portion of the Sample gas through a dryer to remove any moisture present (i.e., the moisture content of the dry Reference is less than 0.010 PPMV). The difference in the resonant frequency of the QCM Sensor, as measured when exposed to each of the two gas streams, is a function of the moisture content of the Sample gas. Thus, the moisture concentration of the Sample gas is determined from this frequency difference. The calibration data, which relates the moisture concentration of the gas stream to the measured frequency difference, are stored in an EEPROM within the QCM Sensor module.

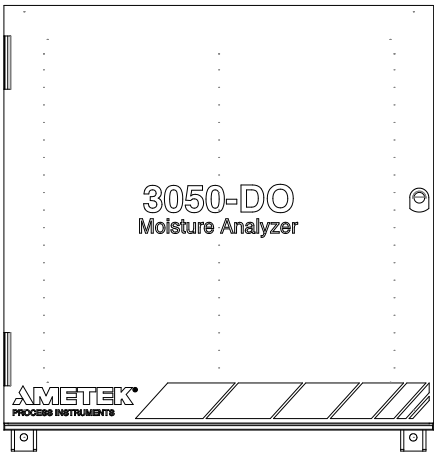


Figure 1-1.
3050-DO Analyzer.

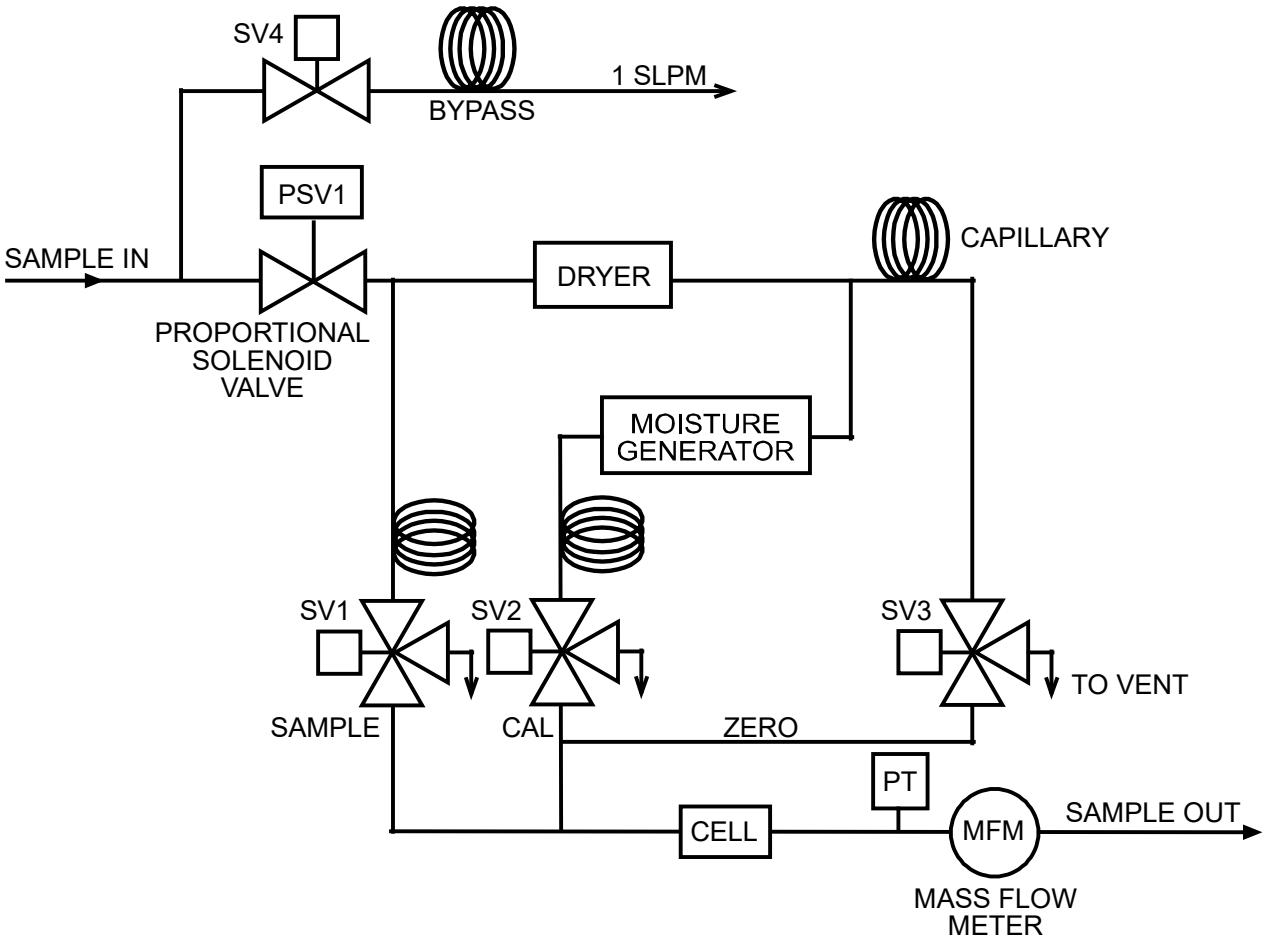


Figure 1-2.
3050-DO Analyzer (Black Box only)
Flow Diagram.

Controller Communication

All analyzer functions are controlled by a microprocessor housed within the smart Sensor. Communication with the smart Sensor is achieved through the following connections:

- One analog input, 4–20 mA.
- One analog output, 4–20 mA, isolated. Can be either loop powered or powered by the analyzer.
- Three alarm contacts (dry relay contacts).
- One RS-232 serial port.
- One RS-485 serial port.

The 3050-DO Analyzer has no local user programming functions. It requires serial communication with an external PC for configuration. Once configured, the analyzer is capable of standalone operation. The analyzer is factory configured and packaged with Configurator Software for initial setup of operating parameters. For enhanced interface and process monitoring, AMETEK offers optional System 2000 Software with graphical user interface to record and process your data in a Windows 95/NT format. User provided software may also be used with the 3050 serial ports.

Verification

The 3050-DO Analyzer has a built-in Moisture Generator for onboard Verification. A portion of the dry Reference gas flows through the Moisture Generator where a known amount of moisture is added. When Cell Verification is initiated, the QCM Sensor is alternately exposed to gas from the Moisture Generator and dry Reference gas. The moisture value is compared to a stored value. The Sensor can make an adjustment if the value is within a tolerance band. If the value is outside the tolerance band, an alarm will activate.

Since the Moisture Generator uses a dried portion of Sample gas, Sensor Verification is performed on a sample of the process gas. This yields the most realistic test of the sensors performance under process conditions.

Gas Flow

Normal operation of the 3050-DO Analyzer includes an internal bypass, which increases the response speed of the system; however, the 3050-DO Analyzer is capable of running in a **Gas Saver** mode which allows the analyzer to run on a sample volume of 150 SCCM.

Internal Timing

The analyzer operates in two timing modes. The **Normal** mode consists of short intervals of Sample and Reference gas. The **Sensor Saver** mode reduces the exposure of the Sensor to the Sample gas by increasing the time spent on the dry Reference.

If the analyzer detects abnormal degradation of Sensor performance over time in the **Normal** mode, the analyzer will automatically switch to **Sensor Saver** mode. Once the analyzer switches to **Sensor Saver** mode, it will not switch back on its own.

The **Sensor Saver** mode extends the life of the Sensor, but provides slower response time. The analyzer updates every 2.5 minutes instead of 1 minute; however, the analyzer still responds within specifications. Refer to analyzer specifications in Chapter 5.

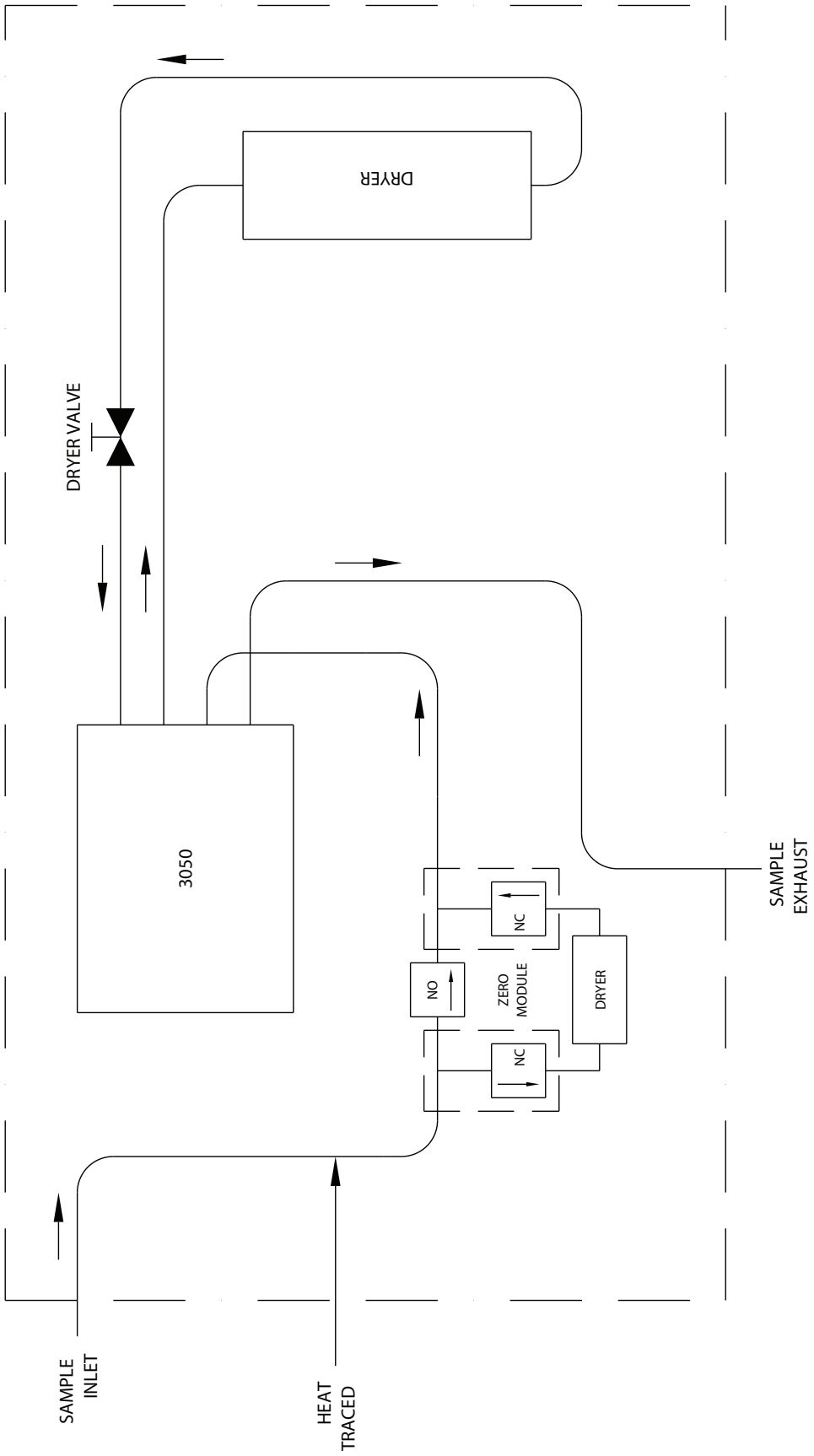


Figure 1-3.
3050-DO Analyzer Sample System Flow Diagram.

3050-DO Analyzer Gas List

The following gases have been tested for chemical compatibility with the seals and gaskets used in this instrument:

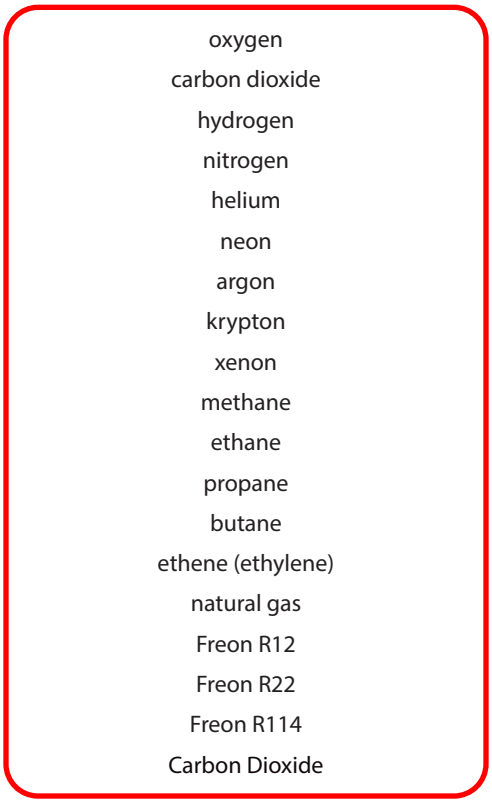


Figure 1-4.
3050-DO Analyzer Gas List.

NOTE

Contact AMETEK Service with inquiries regarding other applications.

Installation and Start-Up

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.

"PN" in this chapter refers to AMETEK Part Number.

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.

Pre-Installation Requirements

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. 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 %, non-condensing

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

Analyzer Site Preparation

Observe the following guidelines when selecting an analyzer installation location:

- **Space Requirements**
  Nema-4x enclosure – approximately 64 x 35 x 67 cm plus clearance for analyzer connections. Refer to Figure 2-1.

- 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 limits listed in the specifications. If the ambient temperature is outside the specified limits or the vibration is excessive, contact your AMETEK representative to discuss solutions and special options to address ambient temperatures.

- **Power Requirements**
  The 3050-DO is shipped according to the customer order and is fused and set for the voltage of the required mains power. The power requirements are stated on the metal plate on the analyzer enclosure and in the Specification chapter in this manual.

- **System Tubing**
  Recommended system tubing is 1/8 inch OD, 316 stainless steel meeting ASTM #632 specifications (AMETEK PN 257707000 or equivalent).

- **Dry Reference Gas**
  A dryer (AMETEK Dryer PN 305400901S or equivalent) is required to dry Reference gas to less than 0.025 PPMV.

  A dryer (AMETEK Dryer PN 305580901S or equivalent) is required to dry the gas to less than 0.01 PPMV to Zero calibrate the 3050-DO Analyzer.

  Dryers must be periodically replaced. In normal use, the dryer (PN 305400901S) should dry a 50 PPM Reference gas to specification for one (1) year.

Sample Gases

The 3050-DO Analyzer is designed to operate on a clean gas stream; specifically, the Sample gas stream must be free of particulates and aerosols. If the 3050-DO Analyzer is being used on a clean gas stream (i.e., free from particulates and aerosols), AMETEK Process Instruments recommends that the analyzer be installed in accordance with the information provided in the following sections of this manual. However, if the process gas stream contains, or has the possibility of containing particulate materials, AMETEK Process Instruments recommends that a inline, 1/8" tube 7 UM filter (supplied) be installed an the inlet of the analyzer. AMETEK filter (PN 271639001) is ideally suited for this purpose, and will mount directly on the inlet fitting of the analyzer. While installing this filter at the inlet of the analyzer will protect the analyzer from any particulates present in the Sample gas, it will also increase the response time of the system. This increase in response time is caused by the large surface area of the filter element.

AMETEK Process Instruments manufactures sample systems for the 3050-DO Analyzer that are designed to remove particulates and aerosols from a gas stream, protecting the analyzer from damage, while maintaining fast sample system response. If you have questions concerning the sampling requirements of your process gas, please contact us at any of the addresses located in the front of this manual.

Sample Pressure and Temperature Requirements

Pressure reduction is user supplied to ensure sample pressure to the analyzer remains within the range of 20–50 PSIG. The pressure reducer/regulator with gauge should be installed near the Sample tap between the tap and analyzer (see Figure 2-3). For optimum performance, sample line should be heat traced to maintain a constant sample temperature. Optimum Sample gas input is 60 °C.

Unpacking and Inspecting the Equipment

Remove any packing material from the 3050-DO Analyzer. 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).

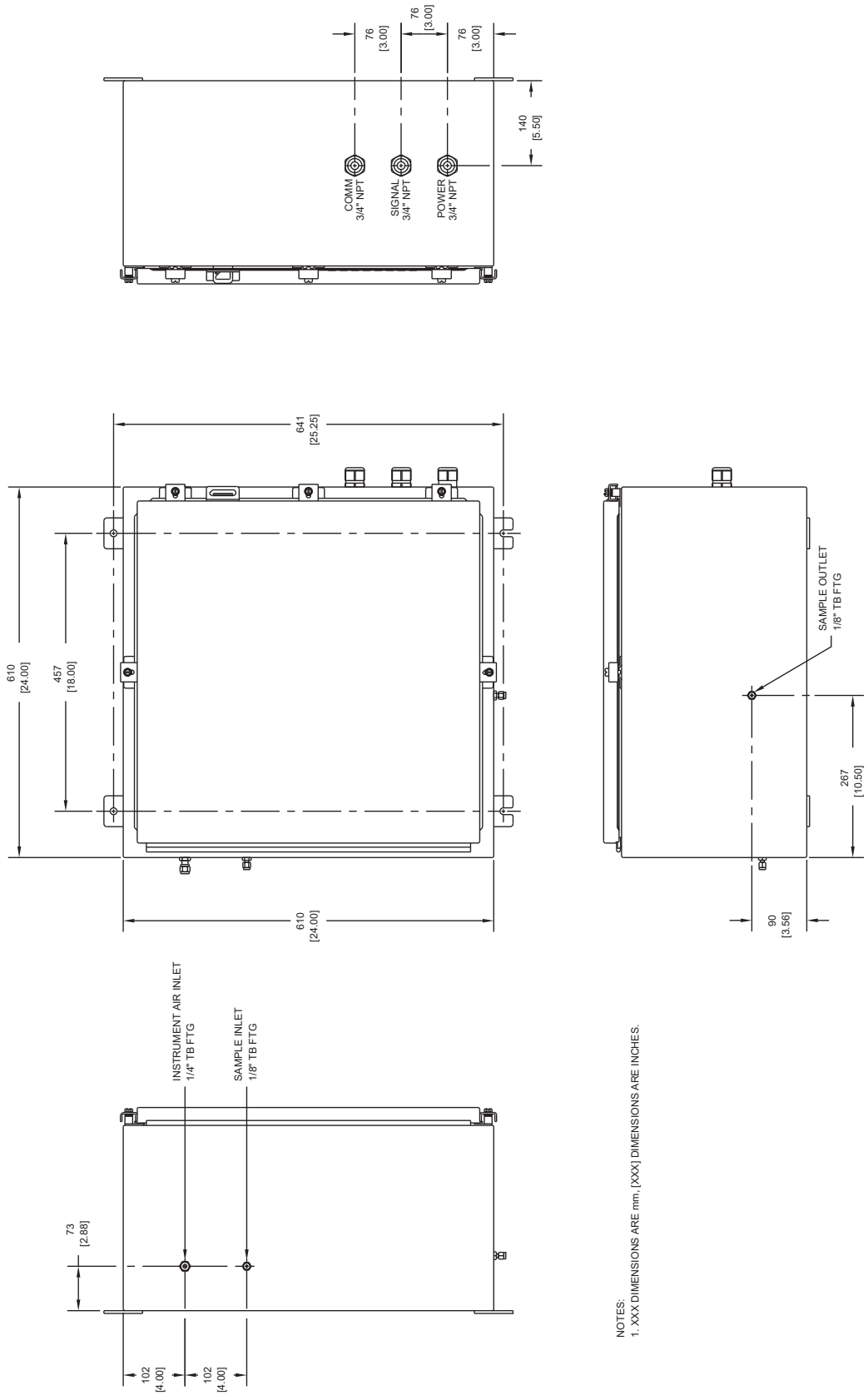


Figure 2-1.
Installation dimensions.

Mechanical Installation

Install the 3050-DO Analyzer as close as possible to the sample source. The unit should be protected from direct exposure to weather and sunlight, and located so that the ambient temperature specifications will not be exceeded.

1. If not already installed, install a main process shut-off valve at the Sample tap. Refer to Figure 2-3.

2. Install the 3050-DO Analyzer in its selected location and bolt in place. Refer to Figure 2-2.

3. Connect instrument air to 1/4-inch tube fitting. Maximum input 100 PSIG. Refer to Figure 2-1. Set the Pilot Valve to 80–100 PSIG.

4. Connect an appropriate vent tube/system to the 1/8-inch Sample Out fitting on the analyzer.

5. **Optional Heated Pressure Reducer:**
   If the Heated Pressure Reducer was purchased, connect its 1/4-inch relief out and vapor bypass tube fittings to appropriate vent tube/system. Refer to Figure 2-4.2.

6. Open the main process shut-off valve and purge entire length of sample line (up to the analyzer) to an appropriate area for at least five (5) minutes. Close the main process shut-off valve. This will help prevent contamination from entering the Cell.

7. Connect the sample line to the 1/8-inch Sample In fitting.

Make this connection immediately after the purge has completed.

8. Reinspect the process line connections and ensure that all are connected to the proper external supply, exhaust, and drain tubing, to ensure the hazardous process gas will not be released into the atmosphere.

Differential pressure between Inlet and Outlet must be at least 20 PSIG.

9. Open the main process shut-off valve.

10. Prior to applying power to the analyzer, open the valve to the Dryer 1/4 to 1/2 turn.

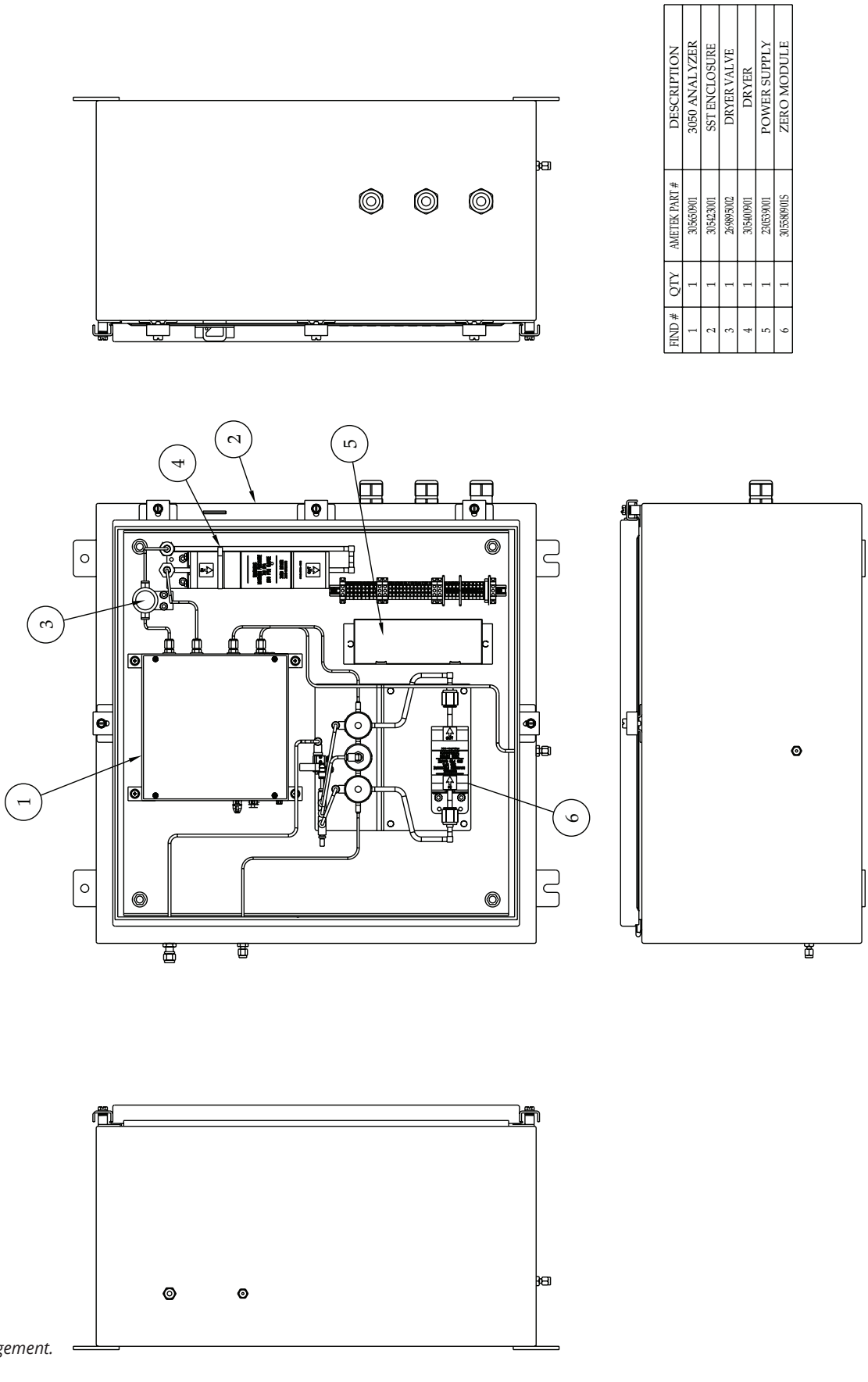


Figure 2-2.
Analyzer arrangement.

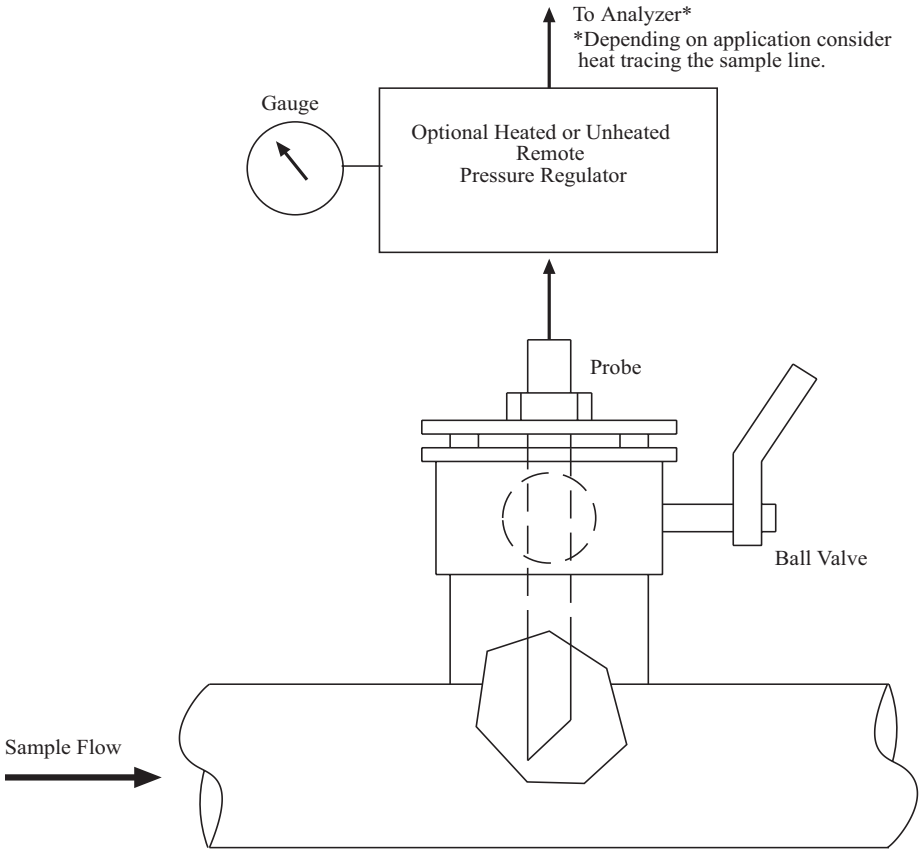


Figure 2-3.
Typical Probe Installation.

Optional Heated Pressure Reducer Installation

Refer to Figures 2-4.1 and 2-4.2 for systems with the Heated Pressure Reducer option.

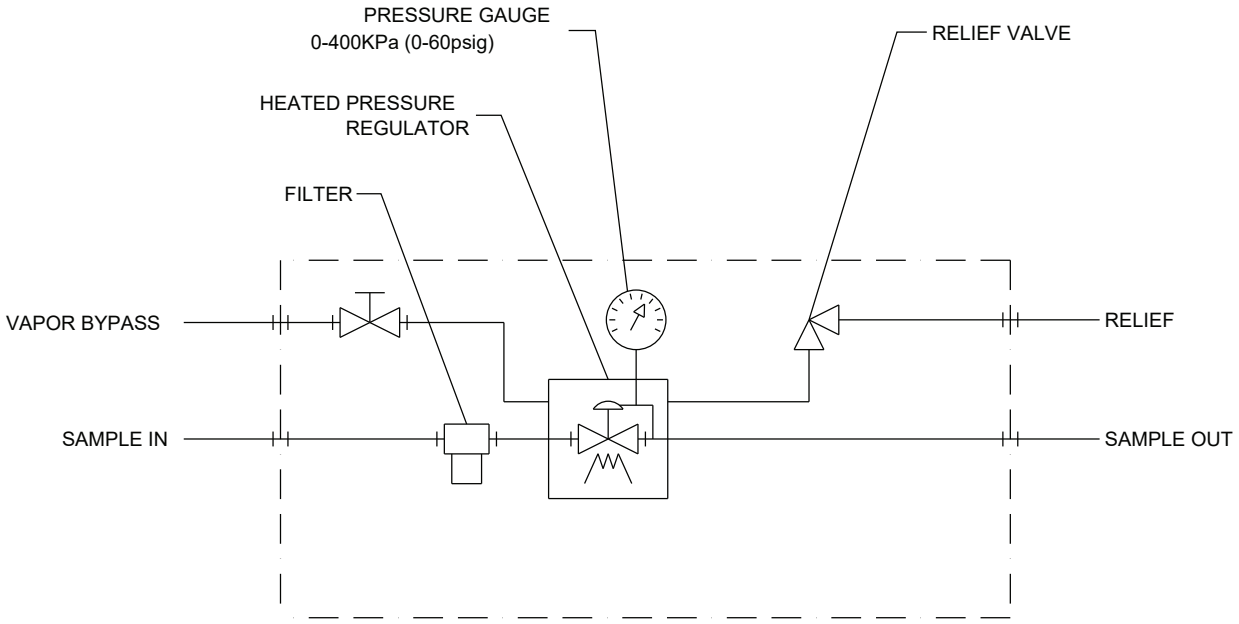


Figure 2-4.1.
Optional Heated Pressure Reducer Flow diagram.

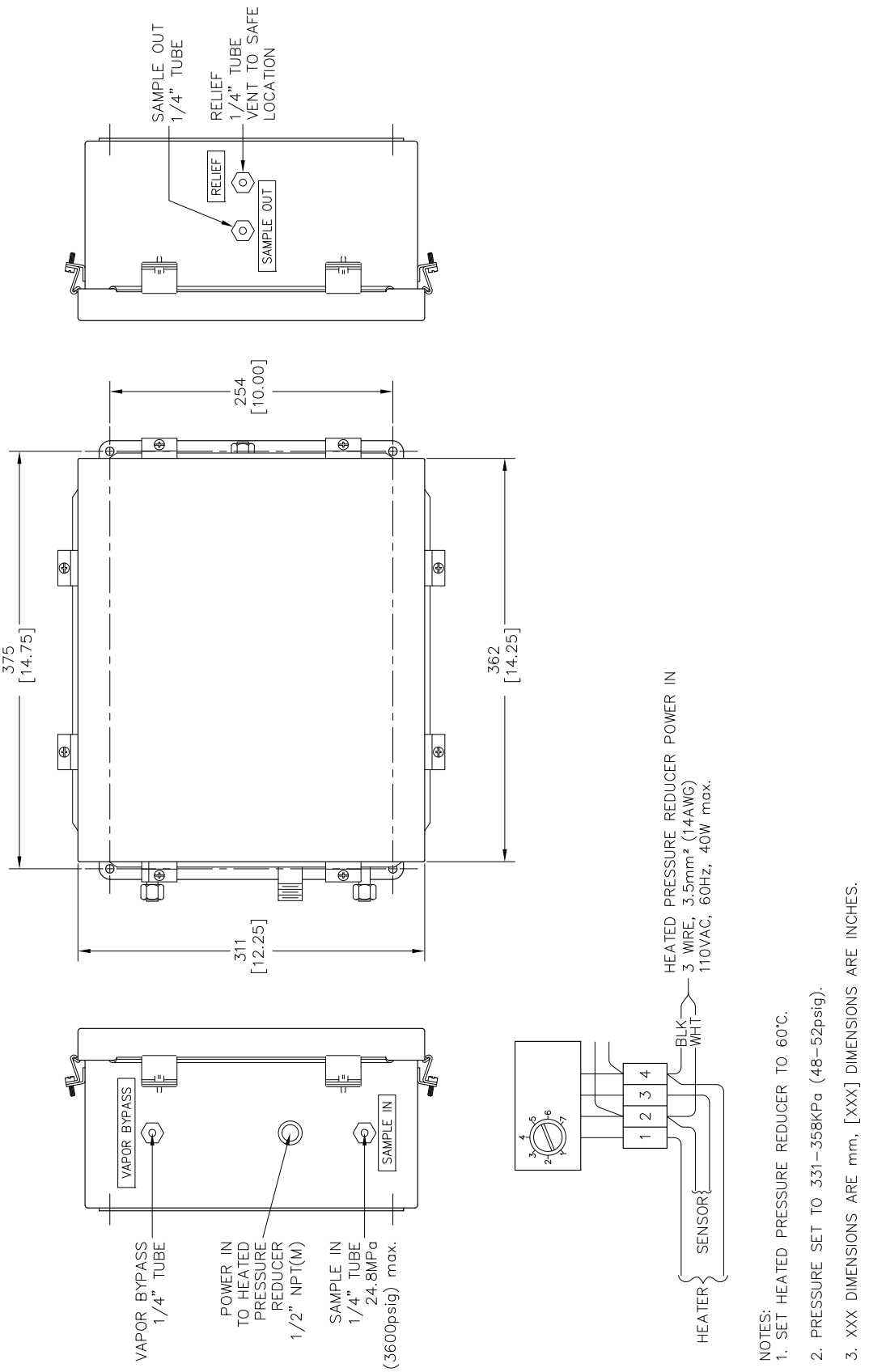


Figure 2-4.2.
Optional Heated Pressure Reducer installation.

Electrical Connections in the Customer Connection Junction Box

To make the connections in the Customer Connection Junction Box:

1. Access the terminals in the Customer Connection Junction Box (Figure 2-5).

2. Connect the 4–20 mA analog output and alarm contacts from the terminal block to user recording equipment as shown in Figures 2-5 and 2-6.

3. Connect serial communication from the analyzer to the PC being used for customer parameter setup. Refer to Figures 2-5 and 2-7.

   RS-232 Out:
   Connect the RS-232 cable connector on the sample system.

4. RS-485 In:
   Connect the RS-485 cable to the terminal block.
   OR
   RS-485 Out:
   Remove the factory-installed RS-485 termination plug from the RS-485 Out connection when communicating with multiple analyzers, except for the last analyzer in a chain.

   Refer to Figures 2-5, 2-8, and 2-9.

5. Connect line power to the analyzer. Refer to Figure 2-5.

6. **Optional Heated Pressure Reducer:**
   If the Heated Pressure Reducer was purchased, connect line power to its terminals, as shown in Figure 2-4.2.

7. When installing external wiring to the Junction Box, use appropriate through-wall bulkhead connections suitable for the hazardous area classification and the environmental conditions of the installation site.

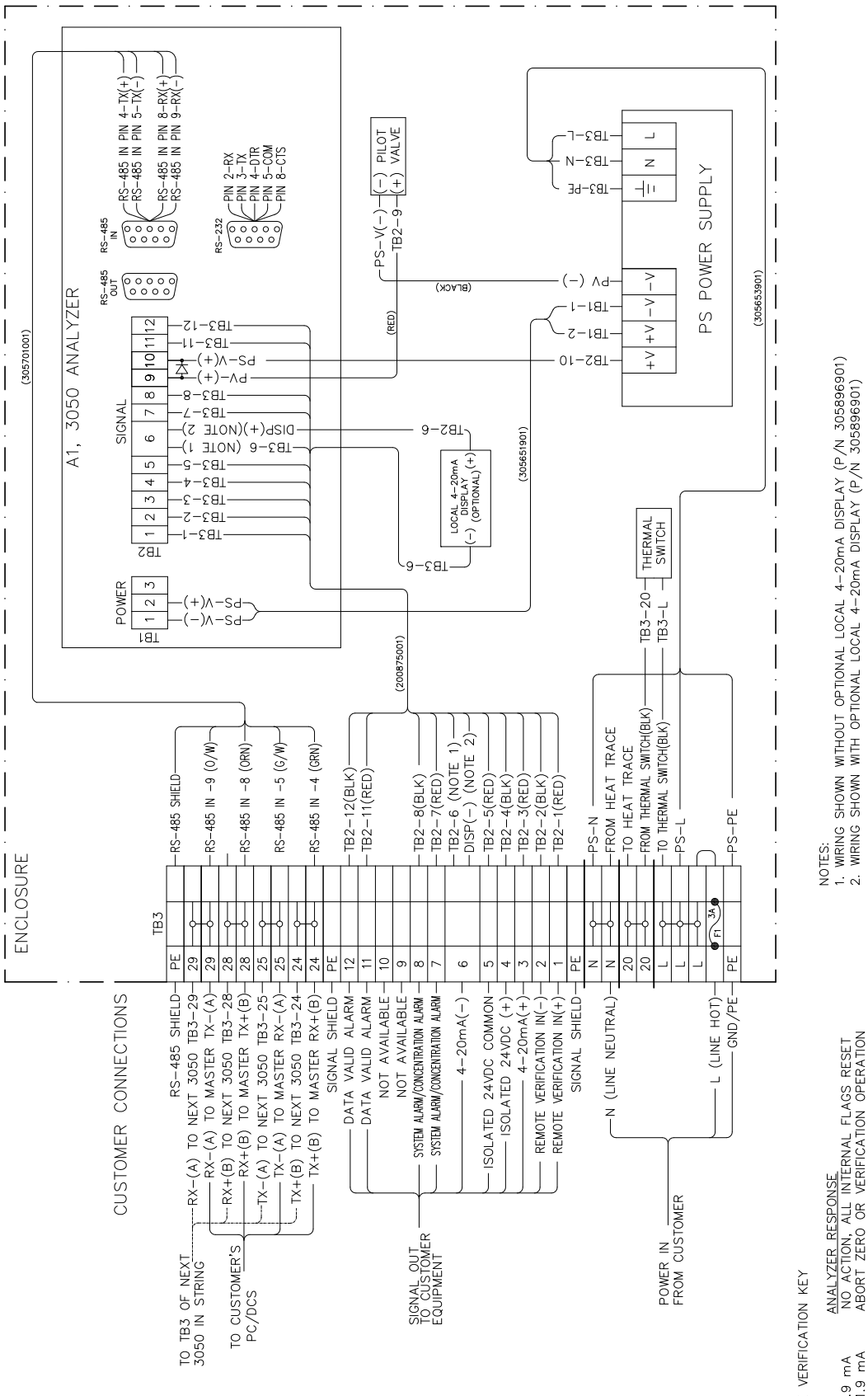
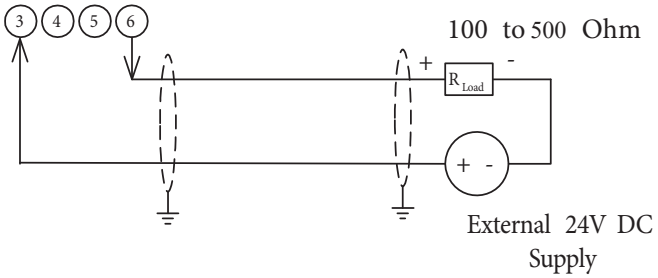


Figure 2-5.
Interconnect Wiring.

4–20 mA Output Wiring

4-20 mA Output, Loop Powered (TB-3)



4-20 mA Output, Self Powered (TB-3)

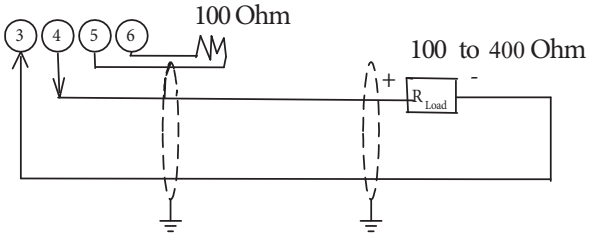


Figure 2-6.
4–20 mA Output wiring.

NOTE

The cable should be shielded with a single twisted pair.

NOTE

Cable shields should be connected to both the analyzer and the DCS. If this is not possible, cable shields should be tied to the chassis at each 3050-DO Analyzer. If this is not possible, tie the shield at the PC or DCS to the chassis and the remaining shield to the chassis through a 0.1 mF @ 500 V capacitor.

NOTE

The 3050-DO Analyzer signal common is connected to earth ground. If the analog output is also grounded, the analog output will no longer be electrically isolated. Contact AMETEK if this situation occurs.

Analyzer power must be removed when connecting or disconnecting the 4–20 mA signal.

The 4–20 mA loop circuit must have a load resistance of between 100–500 ohms or malfunction may occur (maximum 100 ohms when local 4–20 mA display is present). If a loop check is performed, a 100 ohm resistor must be placed in series with the ammeter.

*In Loop Powered mode, remove the factory installed 100 resistor at **TB3-5** to **TB3-6** and the jumper at **TB3-3** to **TB3-4**.*

*In Self Powered mode, when the optional local 4–20 mA display is present and no remote device is in use, the circuit must be completed with a factory installed jumper from **TB3-3** to **TB3-4** and a 100 resistor from **TB3-5** to **TB3-6**.*

RS-232 Wiring

Maximum RS-232 cable length is 10 meters.

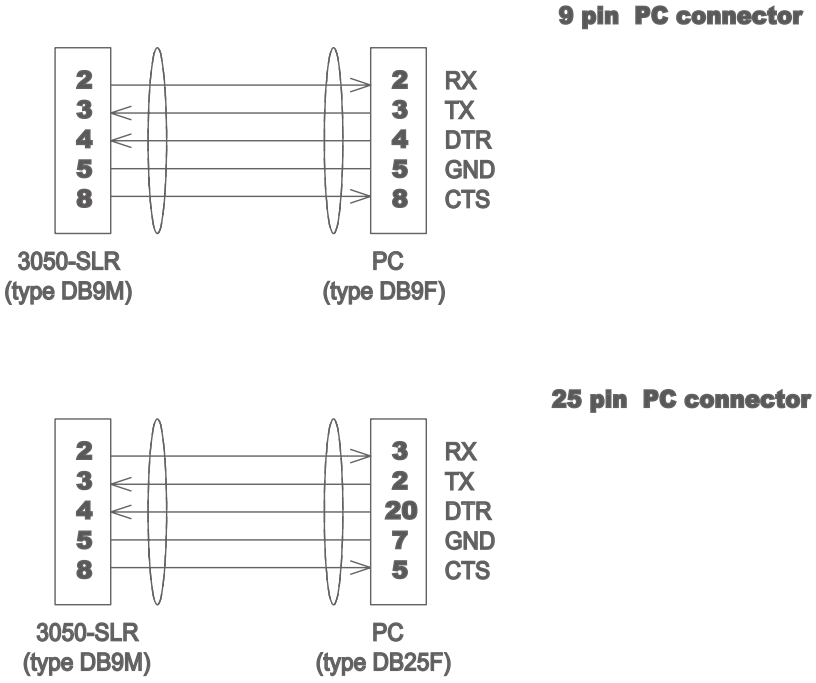


Figure 2-7.
RS-232 Wiring.

RS-485 Cables, Multiple 3050-DO Analyzers

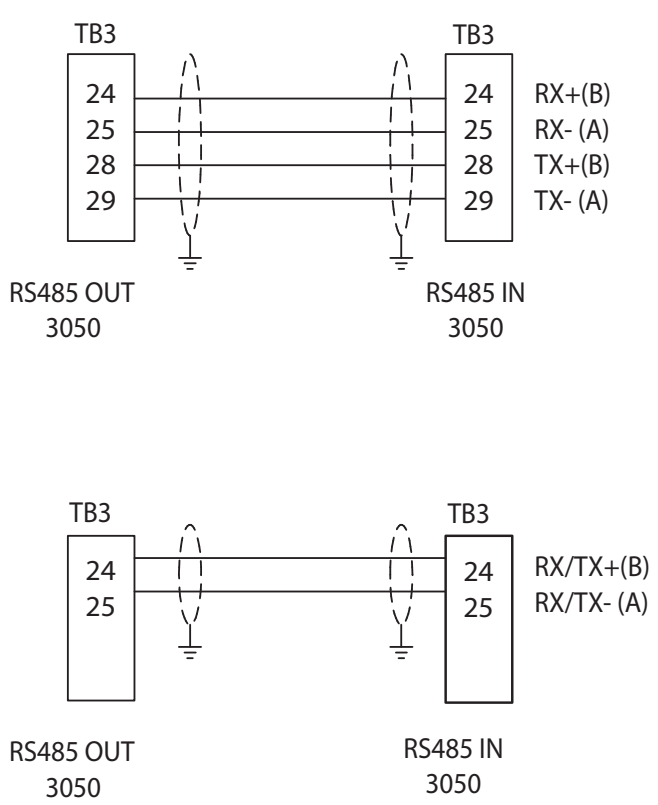


Figure 2-8.
RS-485 Cables,
Multiple 3050-DO Analyzers.

NOTE

Total cable length not to exceed 1000 m. Cable should be low capacitance type for use in RS-485 applications (nominal impedance of 120 ohms, shielded twisted pairs). For example, Belden 9841 in 2-wire applications, Belden 9842 in 4-wire applications.

NOTE

Install the terminator plug (PN 305900901) in the RS-485 ***OUT*** *position of the last controller in networks with both single and multiple 3050 Analyzers.*

NOTE

Cable shields should be tied to ***TB3-GND*** *at each 3050 Analyzer. If this is not possible (for example, in the case of a ground loop), tie the shield at the PC or DCS to the chassis and all other shields to earth through a 0.1uF @ 500 V capacitor.*

RS-485 to RS-232 Conversion for Host PC

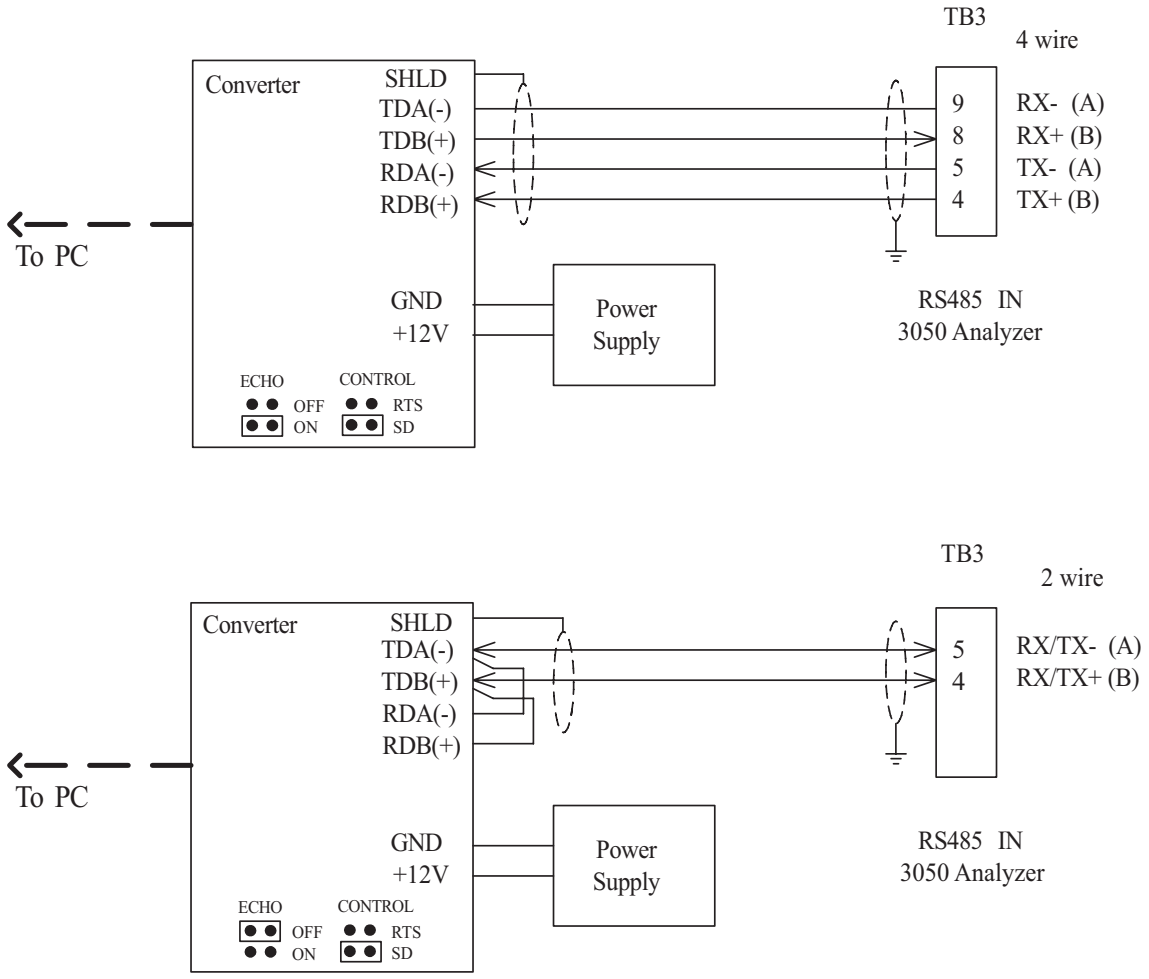


Figure 2-9.
RS-485 to RS-232 Conversion for Host PC.

NOTE

Converter and Power Supply are not suitable for use in hazardous locations.

Refer to Chapter 4 for replacement part numbers.

Analyzer Start-Up

1. Turn On the power source.

2. Open the main process shut-off valve. Adjust the sample pressure to between 20–50 PSIG. Allow the analyzer to dry down before recording moisture concentration measurements.

Dry Down Period

Allow a minimum of two (2) hours for the analyzer to dry down and stabilize. For sample systems, allow a minimum of three (3) days. System alarms are normal during this period. When dry down is complete, Cell frequency will be stable and the recorded data will have leveled off.

Status LEDs and Alarms

There are three (3) LEDs used for local indication of the system status, located on the Black Box inside the 3050-DO Analyzer enclosure:

- The GREEN LED indicates power is supplied to the system.
- The RED LED is used to reflect the status of the Concentration, Data Valid, and System alarms. In the event of a Concentration alarm, the RED LED will be On.
- The YELLOW LED reflects sample flow status. On indicates Sample gas is being measured, Off indicates dry Reference gas.

For more information about alarms, refer to "Alarm and Warning Messages" in Chapter 4.

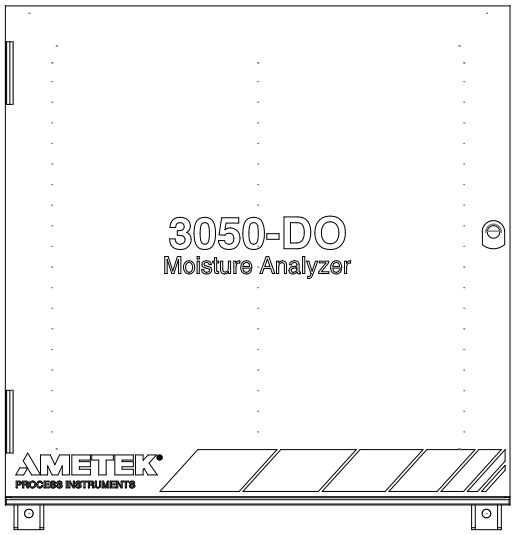


Figure 2-10.
Status LED Alarms.

Configuring the 3050-DO Analyzer for Remote Verification

The analyzer can be commanded to initiate a Zero calibration and Verification remotely via a 4–20 milliamp input into terminals **TB-3 1 (+)** and **TB-3 2 (-)** (see Figure 2-5).

The analyzer response to a current input is described below:

Input	Analyzer Response
0–7.9 mA	No action, all internal flags reset
8–11.9 mA	Abort Zero Calibration or Verification
12–15.9 mA	Initiate Verification
16–20 mA	Initiate Zero Calibration

A current level should be **maintained for a minimum of 2 seconds** for the analyzer to accept the command.

Once a command has been accepted, the current input must drop below 8 mA before a subsequent command will be accepted.

For example, with an input level of 4 mA, a remote DCS raises the input to 14 mA for 2 seconds. The analyzer will initiate a Verify Cycle. To abort the cycle, the input must first be lowered to less than 8 mA for two seconds, then increased to 10 mA for two seconds. Finally the input should again be dropped to less than 8 mA to reset all internal flags before another remote command is accepted.

See also "Working From the Verification Tab" in Chapter 3.

AMETEK 3050 Analyzer Configurator Software

The 3050 Configurator Software provides a graphical user interface to set up parameters for either a single analyzer or multiple analyzers.

Although you can set and view parameters for multiple analyzers using the 3050 Configurator Software, you can only work with one analyzer at any time.

Installing the Configurator Software

1. Insert the Configurator Software CD into the PC's CD ROM drive.

2. The installation program should begin to run immediately. If it does not start automatically, click **RUN** from the Windows **Start** menu. Type the appropriate drive letter, followed by a colon (:) and a backslash (\ ) and the word "setup.exe" (for example, d:\setup.exe) and click **OK** to start the installation program.

3. Follow the instructions on the subsequent screens to complete the installation. When you get to the **Setup Complete** screen, click **Finish** to complete the installation. The default location for the 3050 Configurator Software is in the **AMETEK** folder.

Configuring the 3050-DO Analyzer

This section provides instructions for setting up your operating parameters using the Configurator Software.

Working From the General Tab

Use the **General** tab to view the current configuration and define parameters for the analyzer and to configure the **PC Communications** (Figure 3-1). With Version 2.0 and later, you must click the **Setup** button and accept the changes before communications begin.

NOTE

*After communication with the analyzer has been established, any changes to the analyzer communications parameters must be made from the **Device Communication** tab. These changes must be made before you make any changes to the computer serial port settings.*

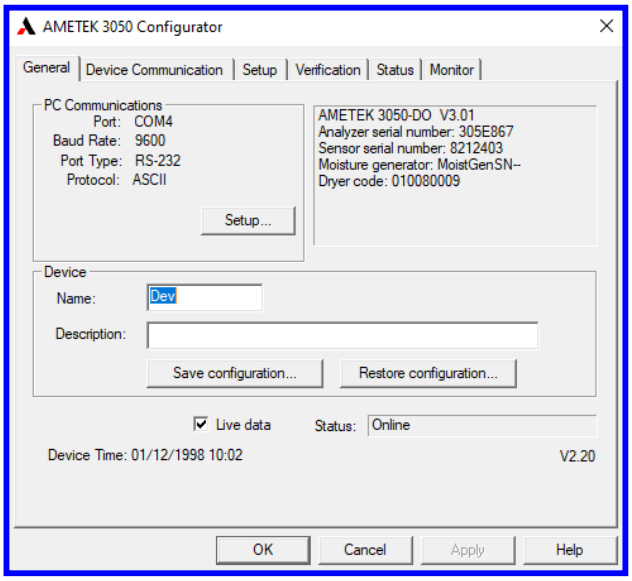


Figure 3-1.
General tab.

PC Communications

Displays information that has been configured from the **Communication Settings** dialog box.

Setup

Allows you to set up the communication parameters required to establish communication with the analyzer (see "**PC Communications Setup Options**" in this chapter).

Click the **Setup** button to view the serial port **Communication Settings** dialog box, where you can configure **PC Communications** (Figure 3-2.1).

Serial Numbers

When the analyzer is connected to the PC, the **Analyzer Name** and **Software Version**, **Analyzer serial number**, **Sensor serial number**, and the **Moisture generator** and **Dryer codes** are displayed to the right of **PC Communications** (Figure 3-1).

In the lower right-hand corner, above the **Help** button, the **Configurator Software version number** is displayed.

Device

Name

Enter a name for the analyzer.

Description

Enter a description for the analyzer.

Save Configuration

Saves the analyzer's current internal parameters to a file. The **Save As** dialog box opens so that you can name and save the file.

Restore Configuration

Restore previously saved parameters to the analyzer from a file. The **Open** dialog box appears so that you can select and open the file.

*The **Restore configuration** button can also be used to restore analyzer parameters.*

Live Data

Checked (default)	The system connects to and uses live data from the analyzer.
Not checked	The system uses demonstration data.

Status

Displays the status of the analyzer (device) you are communicating with. Indicates if the analyzer is **Online**, **Offline**, or in **Demo Mode**.

Online	The PC and analyzer are connected and communicating properly.
Offline	The **Live Data** box is checked on the **General** tab and the connection is broken or Offline.
Demo Mode	The **Live Data** box is not checked on the **General** tab. No analyzer is connected through the serial port. This allows you to exercise program options without communication with the analyzer.

Saving the Settings on the General Tab

To save settings on the **General** tab, click **Apply**.

To discard the changes you have made, click **Cancel**. This will close the 3050 Configurator Software program.

*Clicking **OK** or **Cancel** will close the 3050 Configurator Software.*

PC Communications Setup Options

When you select **Setup** from the **PC Communications** area on the **General** tab, the **Communication Settings** dialog box is displayed (Figure 3-2.1), which allows you to choose from three **Communication Protocol** options, each with its own parameter settings.

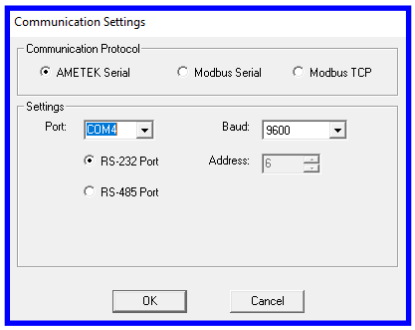


Figure 3-2.1. Communication Settings dialog box (AMETEK Serial selected).

Communication Protocol

NOTE

Information on all three communication protocols is discussed in the following pages.

AMETEK Serial

Select this for *initial* PC Communications setup. Once communication with the analyzer has been established, the **Modbus Serial** can be selected if desired.

Modbus Serial

If desired, this can be selected after communication with the analyzer has been established.

Modbus TCP

If desired, this can be selected after communication with the analyzer has been established. Using this option allows for remote communication between the analyzer and the customer DCS, DAS, or PLC.

NOTE

*When changing from **AMETEK Serial** to **Modbus Serial** or **Modbus TCP**, the analyzer communication parameters must be changed* before *the computer serial port settings.*

AMETEK Serial Communication Setup

When you select the **AMETEK Serial** communication option (Figure 3-2.1), the following parameter settings are available:

Settings

Port

Select the COM port on your computer where the connection to the analyzer is installed.

Baud (Rate)

Select the baud rate at which data will be transferred.

RS-232 Port

Select this if the analyzer is connected to an RS-232 port.

RS-485 Port

Select this if the analyzer is connected to an RS-485 port.

Address

Choose the network address to which the analyzer is connected.

Modbus Serial Communication Setup

When you select the **Modbus Serial** communication option (Figure 3-2.2), the following parameter settings are available:

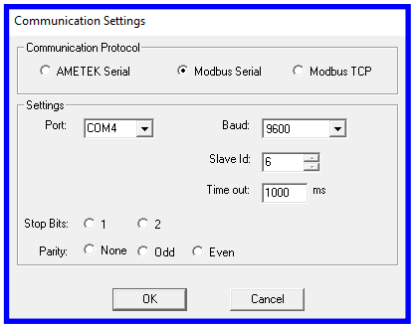


Figure 3-2.2. PC Serial Communication Settings dialog box (Modbus Serial selected).

Settings

Port

Select the COM port on your computer where the connection to the analyzer is installed.

Baud (Rate)

Select the baud rate at which data will be transferred.

Slave Id

This is the Modbus® slave address of the analyzer, where 0 = *Disabled* and 1–255 = *Enabled*. If using the RS-232 port, the address setting is not applicable (it is greyed out).

If using the RS-485 port, enter a unique Modbus address (Slave ID) for the analyzer.

Time out (ms)

Time out value (duration) that the software will use to attempt to establish communications with the analyzer. AMETEK recommends a value of 1000 ms.

Stop Bits

Select the number of Stop Bits (1 or 2) of the Modbus network.

Parity

Select the parity of the Modbus network (None, Odd, or Even).

Modbus TCP Communication Setup

When you select the **Modbus TCP** communication option (Figure 3-2.3), the following parameter settings are available:

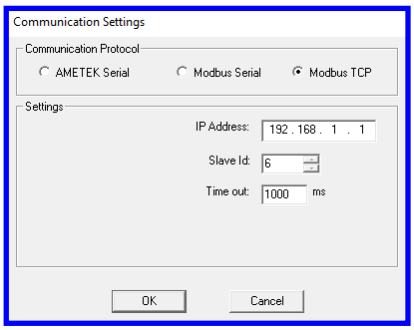


Figure 3-2.3.
PC Serial Communication Settings dialog box (Modbus TCP selected).

Settings

IP Address

Enter a unique address for each analyzer. This is determined based on network settings for the analyzer.

Slave Id

This is the Modbus® slave address of the analyzer, where 0,1 = *Disabled* and 2–255 = *Enabled*. If using the RS-232 port, the address setting is not applicable (it is greyed out).

If using the RS-485 port, enter a unique Modbus address (Slave ID) for the analyzer.

Time out (ms)

Time out value (duration) that the software will use to attempt to establish communications with the analyzer. AMETEK recommends a value of 1000 ms.

Saving the PC Communication Settings

To save the settings from any of the **PC Communications** settings screen, click **OK**.

To discard the changes you have made, click **Cancel**.

Working From the Device Communications Tab

NOTE

*For initial setup of **PC Communications** parameters, click the **Setup** button on the **General** tab.*

Configuring Multiple Analyzers

Use the **Device Communication** tab (Figures 3-3.1 and 3-3.2) to set the analyzer's communication parameters to agree with the PC settings when controlling analyzers connected in a daisy chain.

Changing Communication Parameters

1. Change the *analyzer* parameter(s) first.
2. Click **Apply** to confirm the change. This may cause the analyzer to go Offline.
3. Change the PC settings or physical wires/cables.
4. Reset the analyzer by cycling the AC power Off-On.

Baud (Rate)
Select the baud rate at which data will be transferred.

RS-485 Port
Identifies the analyzer's type of serial communication cable that is being used.

Two-Wire RS-485	Select this if you are using a two-wire cable.
Four-Wire RS-485	Select this if you are using a four-wire cable.

Address
This identifies the analyzer's address. Choose the network address for the analyzer being connected.

Parity (**Modbus Serial** communication only)
Select the parity of the Modbus network for your analyzer.

Stop Bits (**Modbus Serial** communication only)

Select the number of stop bits of the Modbus network for your analyzer.

NOTE

The 3050-DO Analyzer can only operate at the four combinations listed below.

Parity	Stop Bits
Odd	1
Even	1
None	1
None	2

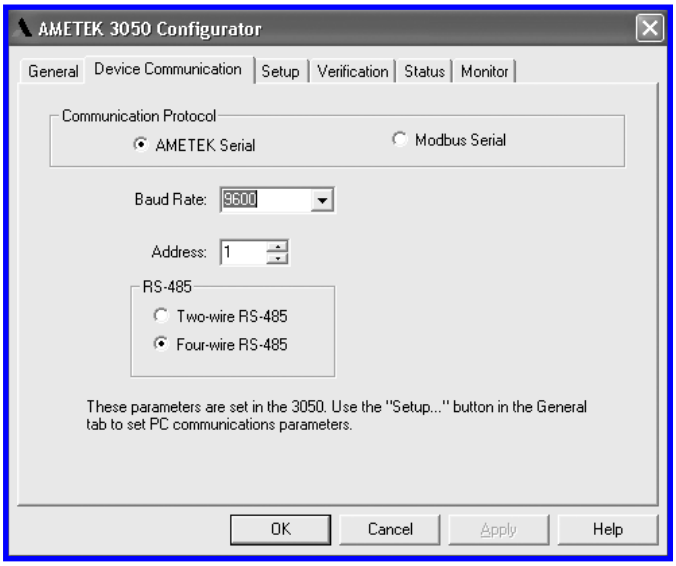


Figure 3-3.1.
Device Communications setup screen for AMETEK Serial.

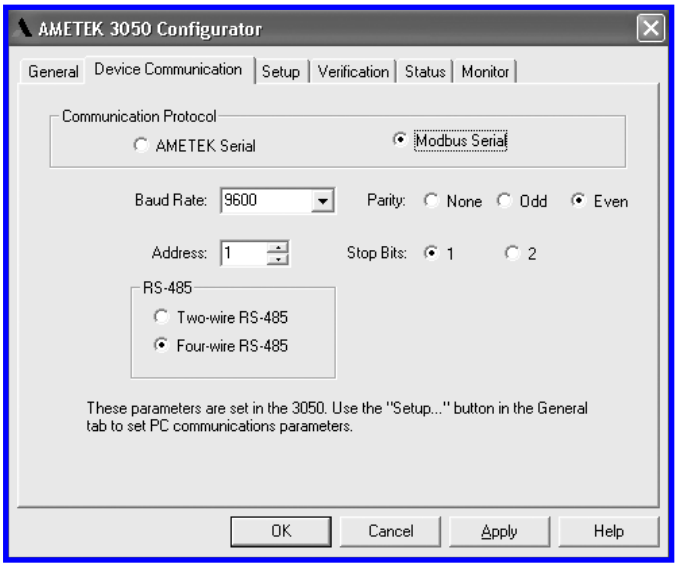


Figure 3-3.2.
Device Communications setup screen for Modbus Serial.

Saving the Settings on the Device Communication Tab

To save settings on the **Device Communication** tab, click **Apply**.

To discard the changes you have made, click **Cancel**. This will close the 3050 Configurator Software program.

PC Communications

Once the Device (analyzer) communication settings have been changed, the **PC Communications** setup screen will automatically open. Select the appropriate options that correspond with the communication settings on the Device and click **OK**.

It will take a few seconds to establish communication and display "**Online**" in the **Status** field on the **General** tab.

NOTE

*If communication is lost, cycle the analyzer AC power Off-On and click **Setup** on the **General** tab to change the PC Communications.*

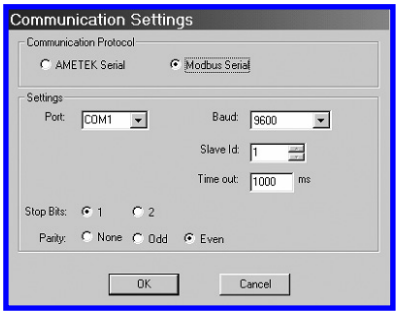


Figure 3-4.
PC Serial Communication Settings dialog box, for Modbus Serial.

Working From the Setup Tab

Use the **Setup** tab to define analyzer parameters.

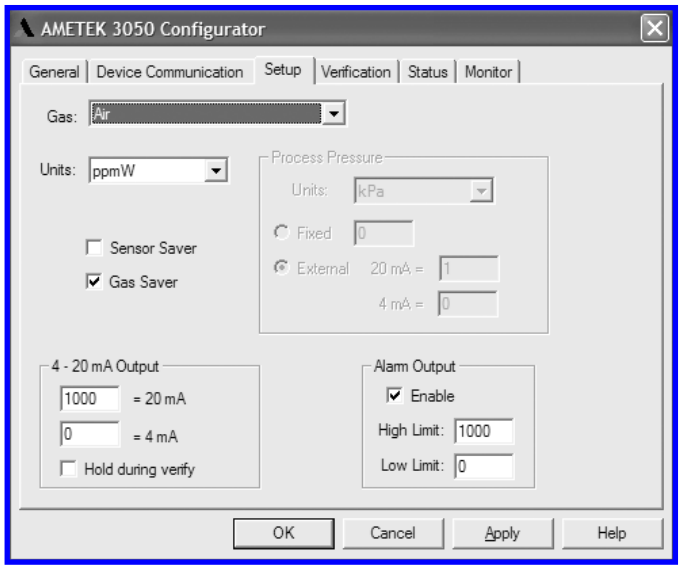


Figure 3-5. Setup tab.

Gas

Select the gas being sampled.

Units

Select the unit of measurement.

NOTE

All values entered must be in the same unit of measure as selected.

NOTE

Dewpoint Temp: This analyzer cannot be configured to read Dewpoint output. The 4–20 mA inputs are to be used for remote Verification only. Refer to "Configuring the 3050-DO Analyzer for Remote Verification" in Chapter 2.

Process Pressure

Used when ***dewpoint C*** or ***dewpoint F*** is selected as unit of measure (from the **Units** dropdown list).

Units

This dropdown list box allows you to specify the unit of measure for pressure input.

Fixed

Select this if using a fixed input. If selected, you must enter a *fixed* value.

External

Select this if using an external input. If selected, you must enter values for **20 mA** and **4 mA** points.

Absolute pressure is required.

Sensor Saver

Select this check box to enable **Sensor Saver**.

Checked	Analyzer operates with a slow cycle time, maximizing Measuring Cell life at the expense of system response time.
Not Checked	Analyzer operates with a rapid cycle time, minimizing system response time.

Gas Saver

Select this check box to enable **Gas Saver**.

Checked	Analyzer runs on a sample flow rate of 150 SCCM.
Not Checked	Analyzer uses an internal bypass, which increases the response speed of the system. Provides sample flow rate >1 SLPM.

4–20 mA Output

Set up your analog output range.

20 mA	Enter the high analog output limit.
4 mA	Enter the low analog output limit.
Hold during verify	Check this box to hold analyzer output during a Verification or a Zero calibration.

Alarm Output

Select this check box to set up the limits for the Concentration Alarm.

Enable	Check this box to enable the Concentration Alarm.
High Limit	Enter the high limit for the Concentration Alarm.
Low Limit	Enter the low limit for the Concentration Alarm.

Saving the Settings on the Setup Tab

To save settings on the **Setup** tab, click **Apply.**

Working From the Verification Tab

Use the **Verification** tab to schedule a routine Verification or a Zero calibration.

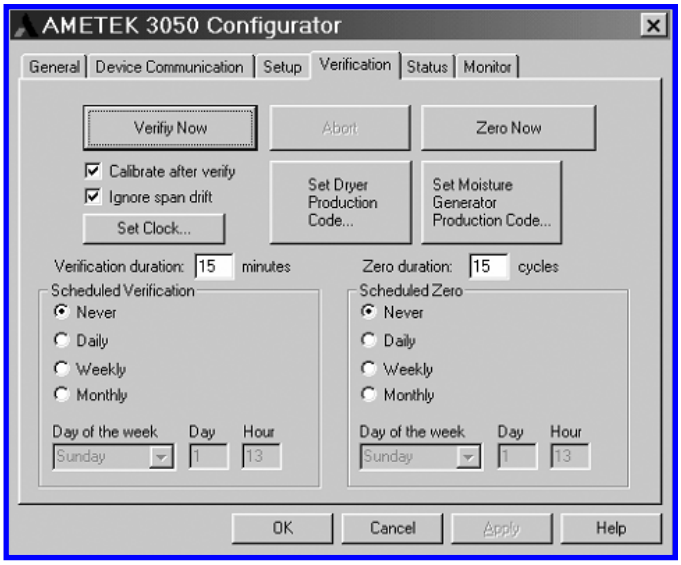


Figure 3-6.1.
Verification tab.

Verify Now

Click this button to start the Verification.

Abort

Click this button to terminate the Verification or Zero calibration. The Zero calibration will be performed, followed by the Verification.

Zero Now

Click this button to start the Zero calibration.

Calibrate after verify

Checked	The analyzer performs a Span adjustment at the end of the Verification.
Not Checked	The analyzer performs only a Verification.

Ignore span drift

Checked	One time Span value change is not limited.
Not Checked	One time Span value change is limited to 10 % of the existing Span value.

Set Dryer Production Code

Click to enter the **Dryer Production Code** for the Dryer that is installed in the analyzer. Click **OK** to accept.

NOTE

You must enter a new Dryer code each time you replace the Dryer.

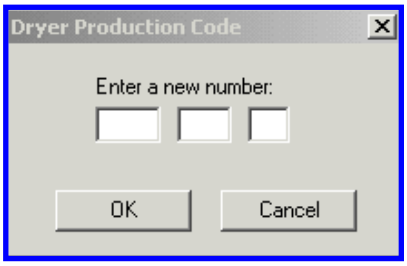


Figure 3-6.2.
Dryer Production Code entry dialog box.

Set Moisture Generator Production Code

Click to enter the **Moisture Generator Production Code**. Click **OK** to accept.

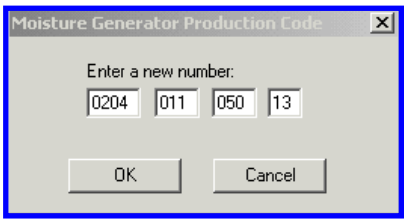


Figure 3-6.3.
Moisture Generator Production Code entry dialog box.

Set Clock

Click **Set Clock** to synchronize the analyzer and PC clocks. The **Time Synchronization** box opens with the PC time and date and the analyzer time and date. Click **Synchronize** to set the time, or click **Cancel** to close the box.

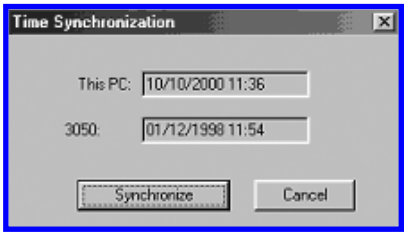


Figure 3-6.4.
Time Synchronization dialog box.

Verification duration

Enter the **Verification duration** in minutes. The system defaults to the minimum time required.

Scheduled Verification

Use this to schedule the frequency and time for a Verification to take place.

Never	Select *Never* to disable the Verification from being performed. This will disable the **Day of the week**, **Day**, and **Hour** fields.
Daily	Select *Daily* to enable a daily Verification. Then, enter the time of day (1 through 24) in the **Hour** field.

The analyzer uses a 24-hour clock. Example, 1:00 PM = 13 Hours.

Weekly	Select *Weekly* to enable a weekly Verification. Then, select a day from the **Day of the week** drop-down list, and enter the time of day (1 through 24) in the **Hour** field, to indicate when the Verification will begin.
Monthly	Select *Monthly* to enable a monthly Verification. Then, enter the day of the month (1 through 28) in the **Day** field, and the time of day (1 through 24) in the **Hour** field, to indicate when the Verification will begin.

Zero duration

Enter the **Zero duration** in minutes. The system defaults to the minimum time required.

Scheduled Zero

Use this to schedule the frequency and time for routine Zero calibrations to take place.

Never	Select *Never* to disable the Zero calibration from being performed. This will disable the **Day of the week**, **Day**, and **Hour** fields.
Daily	Select *Daily* to enable a daily Zero calibration. Then, enter the time of day (1 through 24) in the **Hour** field.

The analyzer uses a 24-hour clock. Example: 1:00 PM = 13 hours.

Weekly	Select *Weekly* to enable a weekly Zero calibration. Then, select a day from the **Day of the week** drop-down list, and enter the time of day (1 through 24) in the **Hour** field, to indicate when the Zero calibration will begin.
Monthly	Select *Monthly* to enable a monthly Zero calibration. Then, enter the day of the month (1 through 28) in the **Day** field, and the time of day (1 through 24) in the **Hour** field, to indicate when the Zero calibration will begin.

Saving the Settings on the Verification Tab

To save settings on the **Verification** tab, click **Apply.**

To discard the changes you have made, click **Cancel**. This will close the 3050 Configurator Software program.

Viewing Live Data From the Status Tab

Use the **Status** tab to view current readings and the status of the analyzer.

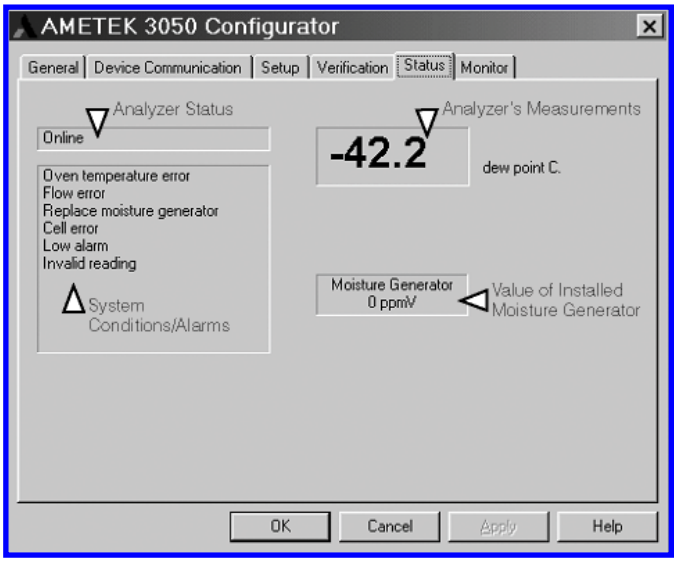


Figure 3-7.
Status tab.

Working From the Monitor Tab

Use the **Monitor** tab to observe analyzer operation. From this tab you can also collect data, calibrate the internal flow meter, and test the analyzer alarm contacts and mA outputs.

NOTE

Using the test buttons takes the analyzer Offline.

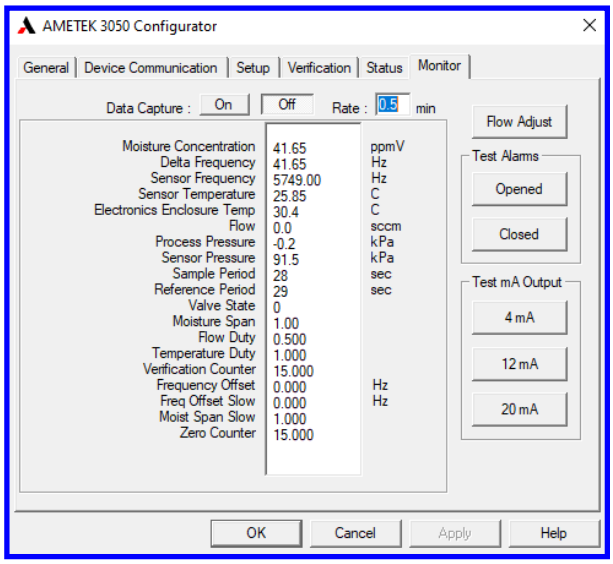


Figure 3-8.1. Monitor tab.

Data Capture

Use the **Data Capture** feature to collect and save analyzer data displayed on the **Monitor** tab to an Excel compatible file.

On — Press the **On** button to start data collection. Enter a file name in the "**Save As**" dialog box (see Figure 3-8.2) and click "**Save**" button. The file format is ".CSV" which is Excel compatible. All data displayed on the **Monitor** tab will be stored in this file.

Off — Press the **Off** button to stop data collection. The file will close when the **Off** button is pressed or another configurator button is selected.

NOTE

*If you exit the **Monitor** tab, the **Data Capture** will automatically terminate.*

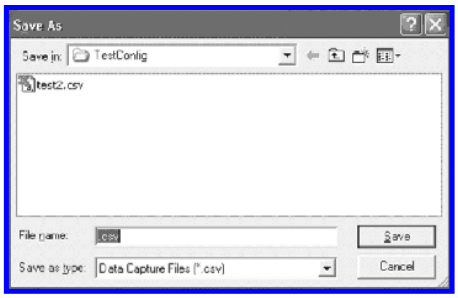


Figure 3-8.2.
Save As dialog box, Monitor tab.

Rate

The preferred data collection rate is "0.5" minutes (factory-set default). A record is created every 30 seconds. The collection rate can be increased to one (1) minute or more.

Flow Adjust

Flow Adjust is a utility designed to calibrate the internal flow meter inside the 3050-DO Analyzer. To calibrate the flow meter, an external flow meter is needed to compare the flow reading on the analyzer with the actual flow.

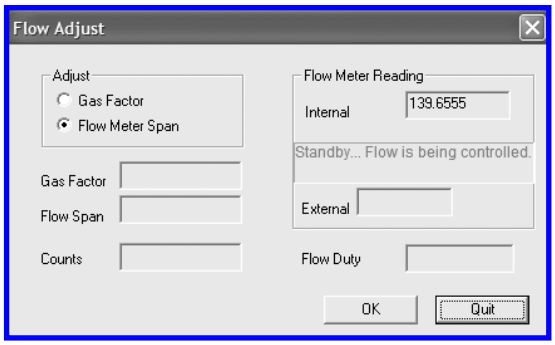


Figure 3-8.3.
Flow Adjust dialog box, Flow is being controlled.

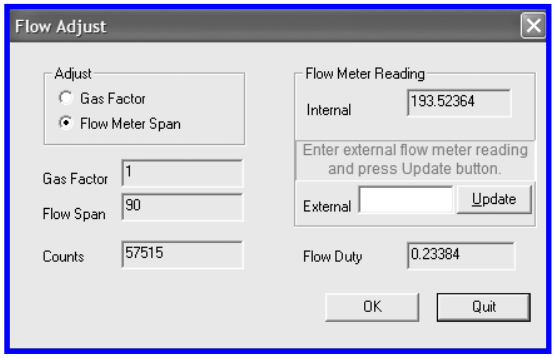


Figure 3-8.4.
Flow Adjust dialog box, enter external flow meter reading.

Adjust

Gas Factor

Select **Gas Factor** if you run gas mixtures.

Flow Meter Span

Select **Flow Meter Span** if you run pure gases.

Flow Meter Reading

This function is used to calibrate the **Internal** flow meter. To do this:

1. Run a sample line to the **Sample In** port at the back of the analyzer.

2. Connect the flow meter to the **Exhaust Out** port at the back of the analyzer.

3. Turn On the analyzer and wait for the analyzer to control the oven temperature at around 60 °C.

4. From the **Monitor** tab, click the **Flow Adjust** button.

   Wait a few minutes for the analyzer to control the flow, and the **External** text field to become enabled (see Figure 3-8.4).

   Enter the value displayed on the external flow meter and click the **Update** button. The **External** text field will become disabled again and the configurator will calculate a new **Flow Span** and send it to the analyzer. The analyzer will attempt to control the flow again and when it's done, the **External** text field will become enabled again. You can repeat this process until the value of the *internal* flow meter matches the *external* flow meter. When calibration is complete, click **OK** to return to the **Monitor** tab.

Test Alarms

The **Test Alarms** buttons allow you to toggle the alarm contacts to an *Opened* or *Closed* state. Use a multi-meter set to ohms to read resistance. Refer to the "Interconnect Wiring" diagram in Chapter 2 (Figure 2-5) for the analyzer contact locations.

Opened contacts should read infinity.

Closed contacts should read zero ('**0**').

Test mA Output

The **Test mA Output** buttons allow you to test the analog outputs. Use a meter while testing the outputs. Refer to Figure 2-6 for wiring.

To exit out of **Test** mode, click another button. **Test** mode will automatically time out after 10 minutes of inactivity.

*When the analyzer switches from **Test** mode to **Online**, the analyzer resets itself.*

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 assumes that you have installed the AMETEK 3050 Configurator Software program and that you are using the program to troubleshoot the analyzer. This chapter only addresses troubleshooting the black box (electronics unit) problems and not any external sample system problems. This chapter also assumes that you have already tried to upload all of the analyzer's memory parameters onto the black box using the 3050 Configurator Software and the **.DEV** file that was shipped with your analyzer, or the **.DEV** file which you have saved after initial analyzer startup.

This chapter describes includes analyzer Diagnostic Charts, and Alarm and Warning Messages.

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

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

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

Requesting Analyzer Training

To request training, visit our main **Customer Support** page and choose **Analyzer Training** and then **Analyzer Training Form**, or follow the link below.

https://www.ametekpi.com/customersupport/analyzer-training/requestform

3050-DO Analyzer Replacement Parts

** Indicates recommended stock spare parts to have on hand.*

Refer to the Figure number listed for the location of the part.

Part Description	AMETEK Part No.	Figure
Moisture Generator, 1 PPM (nominal)*	305540901S	1-2
Sensor Assembly*	305121901S	1-2
Sour Natural Gas Sensor Assembly	305122902S	—
Solenoid Valves (4) General Services (Viton)	305644901S	1-2
Solenoid Valves (4) Sour Natural Gas (EPDM)	305644902S	1-2
Dryer*	305400901S	2-2
Dryer Zero Module	305580901S	2-2
3050-DO Moisture Analyzer *User Manual*	305725901	—
MCU Board	305110902S	—
Cell Interface Board	305113906S	—
Sample, Bypass, Reference, and Verify Capillary	305431901S	1-2
RS-485 to RS-232 Converter	265858005	2-9
RS Converter Power Supply, Universal	269128002	2-9
RS-485 to RS-232 Self-powered Converter	590858901	2-6
RS-485 Termination Plug	305900 01	2-5, 2-8
Sample System 24 Volt DC Power Supply	230 539 001	—
Fuse, 3.15 A	280750251	—
Fuse, 0.125 A, 250 V	280750238	—
Flow Meter	305449901S	1-2
2 Micron Filter, inline 1/8 inch tube	305448902S	—
System tubing	257707000	—

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 corrective action to take to correct the Error, are also included.

If a system alarm is triggered, the RED LED on the front panel of the 3050-DO Analyzer will flash to signal the source of the problem. The RED LED will flash On for one (1) second and Off for one (1) second. Once a flash sequence has completed, the LED will remain off for five (5) seconds. At the end of the pause period, the sequence will be repeated. If there are multiple system alarms then the highest priority alarm will be indicated until it clears. The alarms are listed in order of priority with the higher priority alarm having the fewest flashes.

** Indicates System Alarm and Data Invalid Signal.*

Alarm Condition / Description / Corrective Action	LED Flashes per Cycle
Zero Alarm Problem* Zero parameter is out of range. ***Corrective Action:*** Check and/or replace the Zero Dryer. Call AMETEK Service.	**1**
Sample Sensor Failure* Sample Sensor hardware failure. ***Corrective Action:*** Replace the Sensor or call AMETEK Service.	**2**
Calibration Failure* Analyzer performance out of tolerance as detected during Verification. ***Corrective Action:*** Call AMETEK Service.	**3**
Oven Temperature* Oven temperature is out of tolerance. ***Corrective Action:*** This will occur during start-up until the oven warms up. Call AMETEK Service if the problem persists.	**4**

Alarm Condition / Description / Corrective Action	LED Flashes per Cycle
Flow Out of Tolerance*	**5**
Sample flow rate too high or too low. ***Corrective Action:*** Check the Inlet and Outlet pressure. Call AMETEK Service if the problem persists.	
Battery Low*	**6**
Battery needs to be replaced. ***Corrective Action:*** Call AMETEK Service.	
Reference Gas*	**7**
Analyzer detected problem with Reference gas. ***Corrective Action:*** Check and/or replace the Dryer. Call AMETEK Service if the problem persists.	
Enclosure Temperature	**8**
Excessive internal temperature. ***Corrective Action:*** External temperature should be 80 °C or less. Call AMETEK Service.	
Moisture Generator Date	**N/A**
Moisture Generator date has expired. ***Corrective Action:*** Replace the Moisture Generator.	
Dryer Alarm	**10**
Dryer failure Imminent. ***Corrective Action:*** Replace the Dryer.	
Concentration Alarm	**11**
Moisture concentration is out of user defined limits. ***Corrective Action:*** Review alarm settings and use the Configurator Software to identify source of error.	

The Data Valid contact Opens on all alarms and stays Closed during normal functions and readings. An Open Data Valid contact indicates Verification is in process or an alarm condition. The RED LED flashes 11 times if an invalid condition occurs.

Specifications

NOTE

Specifications included in this chapter are typical for the ranges listed. For custom ranges/applications, or consult with your AMETEK representative.

3050-DO Moisture Analyzer Specifications

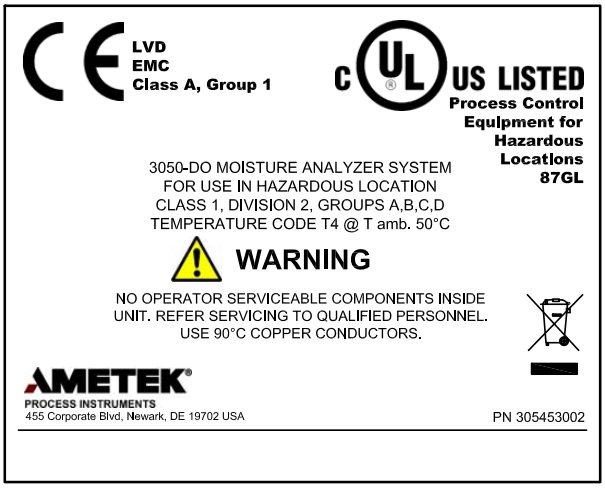
Specification	Description
Ranges	0.02–100 parts per million by volume (PPMV) Readings can also be displayed in units of PPMW, lb/mmscf, and mg/Nm_3.
Accuracy	0.02 PPMV or ± 10 % of reading, whichever is greater
Reproducibility	± 5 % of reading from 0.2–2500 PPMV
Moisture Generator Value	1 PPMV nominal
Back Pressure Regulator Requirements (if purchased)	0–1 BAR (0–15 PSIG) maximum
Sample Inlet Pressure Requirement	138–24150 kPa (20–3500 PSIG) to pressure reducer 138–345 kPa (20–50 PSIG) maximum, pressure reducer to analyzer
Exhaust Pressure	0–1 BAR (0–15 PSIG)
Minimum Differential Pressure	20 PSIG (Inlet pressure must be greater than 20 PSIG over the outlet pressure).
Data	Isolated 4–20 mA, 100–500 Ω Analog output (software configurable) RS-232 or RS-485 serial port, 2 and 4-wire mode
Minimum PC Requirements for 3050 Configurator Software	Pentium 100 32 MB RAM For Windows XP
Alarms/Alerts	Two independent contact closures 60 VDC, 30 VAC, 50 VA maximum resistive for System Alarm and Data Valid. All are fail-safe by default. Alarms are available on RS-485 interface.
Lower Detectable Limit	0.02 PPMV nominal
Sensitivity	0.01 PPMV or 1 % of reading, whichever is greater
Environmental	Ambient Temperature: Enclosed sample system: -20 °C to 45 °C (-4 °F to 113 °F) Relative Humidity: 90 % RH maximum, non-condensing Maximum Altitude: 2,000 meters (6,560 feet) IEC Pollution Degree 2 IEC Installation Category II Indoor/Outdoor Use

Specification	Description
Sample Flow Requirement	150 SCCM, 1 SLPM bypass flow available for increased response speed.
Sample (Inlet) Gas Temperature	0 °C to 100 °C (32 °F to 212 °F) Optimal results are obtained when inlet gas temperature is maintained at 60 °C (140 °F). Heat traced sample lines are recommended.
Physical Dimensions	Width: 61.2 cm (24.11 inches) Height: 64.6 cm (25.42 inches) Depth: 34.2 cm (13.47 inches) Weight: 82 kg (180 lb)
Utility Requirements	***Power Consumption*** 115 ±10 % VAC, 50/60 Hz, 150 W maximum 230 ±10 % VAC, 50/60 Hz, 150 W maximum 24 VDC 50 W maximum ***Instrument Air*** 5–7 BAR (70–100 PSIG)

3050-DO Moisture Analyzer Approvals and Certifications

Design Classifications	**Designed to meet the requirements for General Purpose Locations/Electrical Safety and the following Hazardous Location classifications:** North American Class I, Division 2, Groups A,B,C,D T4 North American Class I, Division 1, Groups B,C,D T6 Electromagnetic Compatibility Directive: EN61326-1 Industrial Low Voltage Directive: EN61010-1 Pressure Equipment Directive Russian Gosstandart Pattern Approval

3050-DO Moisture Analyzer Marking



Serial Communication Interface (Modbus)

This document describes the customer serial communication interface on the 3050 Analyzer. The communication protocol implemented is Modicon Modbus® as defined in "Modicon Modbus Protocol Reference Guide" (PI-MBUS-300 RevJ). The Modbus protocol transmission mode implemented is Remote Terminal Unit (RTU) with the analyzer operating as a slave device.

The AMETEK 3050 Analyzer supports both RS-485 and RS-232 serial communication standards.

The physical communication connection between a 3050 Analyzer and a customer DCS\SCADA\PLC\DAS or a general-purpose computer is RS-485 or RS-232. The analyzer RS-485 connection supports both 4-wire and 2-wire multi-drop systems. The RS-232 connection is used to communicate with a single analyzer using short standard cable.

The 3050 Analyzer understands two serial communication protocols. The first protocol is a proprietary ASCII serial communication protocol. This protocol is supported by AMETEK 3050 Analyzer Configurator Software, which supplied with the each analyzer. This program provides a graphical user interface to set up all the analyzer parameters as explained in Chapter 3.

The variable called SerialMode allows switching communication protocol from AMETEK ASCII to Modbus protocol and back from Modbus to AMETEK ASCII. This variable can be reached from AMETEK ASCII protocol by ID=38(26Hex) and SerialMode can be modified by modifying holding register #28(4029), as indicated in the holding registers table.

SerialMode variable could be set as follows:

Value	RS-485	Protocol
0	2-Wire	ACII
1	4-Wire	ACII
2	2-Wire	Modbus
3	4-Wire	Modbus

The **SerialMode** parameter is set to '**1**' by default.

The **SerialMode** parameter change will not disturb the present serial communication link. Power should be recycled or a reset command should be issued to activate the change in the SerialMode setting.

It is strongly recommended to configure and to test 3050 Analyzer in AMETEK ASCII mode using user-friendly 3050 Analyzer Configurator Software. The Modbus RTU protocol mode should be used for monitoring purposes.

When designing a Modbus RS-485 multi-drop communication system with the 3050 Analyzer, the system designer should consider the following:

- Analyzer primary output is moisture concentration and analyzer status codes. The update rate of the moisture concentration is one time per minute or less. Polling of these registers more frequently than once a second is not recommended.

- The maximum polling rate of a Modbus multi-drop system is determined by a number of factors including the number of devices on the system, the number of registers being polled from each device, the baud rate in half-duplex operation. Calculations, and possibly experimentation, are needed to attain optimal system operation.

Analyzer Modbus Interface Parameters

A number of analyzer Modbus interface parameters need to be set up in order to establish communication with the Modbus master. These parameters are accessed via the service port on the analyzer using a service program running on a PC.

Modbus Address

The analyzer needs to be assigned a Modbus slave address, which can be a number from **1–247** with zero ('**0**') interpreted as a broadcast address (that the analyzer will execute the command but will not send a respond back to the Modbus master).

Communication Parameters

The number of Data Bits is always eight (8); the Baud Rate is 9600 or 19200, the number of Stop Bits, and the Parity of the analyzer **Modbus Serial** communication port are software selectable. The default communication parameter settings are 9600 Baud, one (1) Stop Bit, and Even parity. A variable called ParityAndStop located in holding register '31' with Modbus slave address of 4032 determines the port settings.

Power should be cycled Off-On or a reset command should be issued to activate the Slave Address or Parity and Stop Bit change. The Baud Rate change will take effect immediately.

Value	Stop Bits	Parity
0	1	NONE
1	2	NONE
2	1	EVEN
3	1	ODD

Modbus Functions

As the Modbus protocol is designed for communication among Programmable Logic Controllers (PLCs), not all Modbus function codes supported by a slave PLC are applicable to the 3050 Analyzer. Only the following relevant function codes are implemented:

In accordance with Modbus protocol specifications, all address references in Modbus messages are numbered relative to zero. For example, the first holding register in a Modbus slave being referenced as 40001 would be addressed as zero ('**0**').

Code	Description
03	Read multiple holding registers (4x references)
06	Write one holding register (4x references)
16	Write multiple holding registers (4x references)
17	Read slave ID and status information

Exception Code

The 3050 Analyzer Modbus protocol implementation supports these exception codes:

Code	Description
01	Illegal Function
02	Illegal Address
03	Illegal Value

Unsupported function requests from the Modbus master result in exception code 01 being returned. Illegal address exception code is returned when the requested address is outside the allowed range or writing to a read-only location. When the values to be written to holding registers are outside the appropriate ranges, exception code 03 is returned.

Holding Registers

Since the RAM space on the analyzers is limited and not every customer's DCS\SCADA\DAS\PLC supports Modbus floating point value transfer, floating point values that are commonly accessed on a 3050 Analyzer are scaled and converted into integer values to load into Modbus registers for transmission. The register values need to be scaled back at the receiving end to yield the actual values. The size of a Modbus holding register is 16-bit which can assume a value from -32768 to +32767 in two's complement. The holding **Register (REG) Definitions**, **Units** of measurement, and **Scaling** factors are shown below. **Access** is 'r' (read) or 'w' (write).

REG	DEFINITION	UNIT	SCALING	ACCESS
0	Current moisture concentration (Moisture= 51 Hex)	PPM	100	r
1	Concentration held during verification (HeldConc= 52 Hex)	units	100	r
2	Sensor frequency (Frequency= 53 Hex)	Hz	1	r
3	Delta frequency (DeltaFrequency= 54 Hex)	Hz	100	r
4	Flow reading (Flow= 55 Hex)	SCCM	100	r
5	Sensor pressure (Pressure1= 4B Hex)	kPa	100	r
6	Electronics temperature (EETemp= 4C Hex)	ºC	100	r
7	Sensor temperature (CellTemp= 4d Hex)	°C	100	r
8	System alarms and warnings (SystemState= 5F Hex)	—	1	r
9	Flow control output (Loop1Duty= 60 Hex)	—	100	r
10	Heater control output (Loop2Duty= 61 Hex)	—	100	r
11	Reading is ready (DataState= 62 Hex)	—	1	r
12	Sensor pressure analog input (Analog0= 64 Hex)	counts	1	r
13	Flow analog input (Analog1= 65 Hex)	counts	1	r
14	Sensor temperature analog input (Analog2= 66 Hex)	counts	1	r
15	Process pressure analog input (Analog3= 67 Hex)	counts	1	r
16	Analyzer cycle status (OutputState= 68 Hex)	—	1	r
17	Reference period counter (ReferencePer= 69 Hex)	second	1	r
18	Sample period counter (SamplePer= 6A Hex)	second	1	r
19	Wet sensor frequency reading (WetFreq= 6B Hex)	Hz	1	r
20	Dry sensor frequency reading (DryFreq= 6C Hex)	Hz	1	r
21	Verification cycles counter (CalcCycleCount= 6F Hex)	minute	1	r
22	Electronics temperature input (AnalogEE= 70 Hex)	counts	1	r
23	Current flow reading (CurrentFlow= 8A Hex)	SCCM	100	r
24	Maximum flow deviation (MaxFlowDev= 8E Hex	SCCM	100	r
25	Special command (ModbusCommand= 93 Hex)	—	1	r,w
26	Sensor pressure coefficient (Pressure1Span= 2 Hex)	kPa	100	r,w
27	Sensor pressure offset (Pressure1Offset= 3 Hex)	kPa	100	r,w

REG	DEFINITION	UNIT	SCALING	ACCESS
28	Serial communication mode (SerialMode= 26 Hex)	—	1	r,w
29	S lave address (NodeAddress= 27 Hex)	—	1	r,w
30	Baud rate (Baud= 25 Hex)	—	1	r,w
31	Modbus protocol setting (ParityAndStop= 92 Hex)	—	1	r,w
32	Counts to voltage coefficient (AD16Offset= 01 Hex)	—	1	r,w
33	Sensor assembly setting (RefPeriod= 04Hex)	second	1	r,w
34	Sensor assembly setting (SmplPeriod= 05 Hex)	second	1	r,w
35	Sensor temperature coefficient (CellTempSpan=06 Hex)	—	100	r,w
36	Sensor temperature coefficient (CellTempOffset=07 Hex)	—	10	r,w
37	Process pressure coefficient (CustomerSpan= 08 Hex)	—	1000	r,w
38	Process pressure coefficient (CustomerOffset= 09 Hex)	—	100	r,w
39	Sensor pressure filter coefficient (Pressure1Filter= 0A Hex)	—	100	r,w
40	Flow filter coefficient (Flow Filter= 0B Hex)	—	100	r,w
41	Sensor temperature filter coefficient (CellTempFilter= 0C Hex)	—	100	r,w
42	Process pressure filter coefficient (CustomerFilter= 0D Hex)	—	100	r,w
43	Current output conversion parameter (MaOutSpan= 0E Hex)	—	1	r,w
44	Current output correction parameter (MaOutO ffset= 0F Hex)	—	10	r,w
45	Current output coefficient (AnalogOutSpan= 10 Hex)	—	1	r,w
46	Current output coefficient (AnalogOutOffset= 11 Hex)	—	1	r,w
47	Process pressure coefficient (Process Span= 12 Hex)	—	10	r,w
48	Process pressure coefficient (Process Offset= 13 Hex)	—	10	r,w
49	Flow control parameter (ProBandLoop1= 16 Hex)	—	1	r,w
50	Flow control parameter (TsLoop1= 17 Hex)	—	1	r,w
51	Flow control parameter (TiLoop1= 18 Hex)	—	1	r,w
52	Flow control parameter (SetPointLoop1= 19 Hex)	—	1	r,w
53	Flow control parameter (ActuatorLoop1= 1A Hex)	—	1	r,w
54	Flow control parameter (uMaxLoop1= 1B Hex)	—	10	r,w
55	Flow control parameter (uMinLoop1= 1C Hex)	—	10	—
56	Heater control parameter (proBandLoop2= 1D Hex)	—	1	r,w
57	Heater control parameter (TsLoop2= 1E Hex)	—	1	r,w
58	Heater control parameter (T iLoop2= 1F Hex)	—	1	r,w
59	Heater control parameter (SetPointLoop2= 20 Hex)	—	1	r,w
60	Heater control parameter (ActuatorLoop2= 21 Hex)	—	1	r,w
61	Heater control parameter (uMaxLoop2= 22 Hex)		1	r,w
62	Heater control parameter (uMinLoop2= 23 Hex		1	r,w
63	Gas based coefficient (Ppm W = 24 Hex)		1000	r. w
64	Flow control parameter (TempLoopDelay= 29 Hex)	second	1	r,w

REG	DEFINITION	UNIT	SCALING	ACCESS
65	Unit of measurement selection (MoistureUnits= 2B Hex)	—	1	r,w
66	Concentration alarm range (Alarm 1H i= 2C Hex)	—	1	r,w
67	Concentration alarm range (Alarm 1Lo= 2D Hex)	—	1	r,w
68	Concentration alarm range (Alarm 2Hi= 2E Hex)	—	1	r,w
69	Concentration alarm range (Alarm 2Lo= 2F Hex)	—	1	r,w
70	Process pressure units (PressUnits= 30 Hex)	—	1	r,w
71	Bypass valve state (Bypass State= 31 Hex)	—	1	r,w
72	Zero coefficient (FrequencyOffset= 38 Hex)	Hz	1000	r,w
73	Gas based flow coefficient (Flow Coeff0= 39 Hex)	—	1000	r,w
74	Gas based flow coefficient (Flow Coeff1= 3A Hex)	—	1000	r,w
75	Process pressure upper limit (Flow Coeff2= 3B Hex)	kPa	1	r,w
76	Flow meter parameter (FlowSpan= 3C Hex)	—	100	r,w
77	Auto verification hour (CalHour= 3D Hex)	—	1	r,w
78	Verification time in minutes (CalPeriod= 3E Hex)	minute	1	r,w
79	Auto verification day of month (CalMonthDays= 3F Hex)	—	1	r,w
80	Auto verification day of week (CalWeekDays= 40 Hex)	—	1	r,w
81	Hourly, daily, monthly auto verification (CalType= 41 Hex)	—	1	r,w
82	Software revision number (Version= 47 Hex)	—	100	r,w
83	Reset variable (System Reset= 48 Hex)	—	1	r,w
84	Default memory flag (new Flag= 49 Hex)	—	1	r,w
85	Read only except test mode (AnalogInput= 4E Hex)	—	10	r,w
86	Read only except test mode (AnalogOutput= 4F Hex	—	1	r,w
87	Used in test m ode (ReadTestFixture= 50 Hex)	—	1	r
88	Sample = 0,generator = 1,reference = 2 (ValveState= 56 Hex)	—	1	r,w
89	Current hour (Hour= 57 Hex)	hour	1	r,w
85	Read only except test mode (AnalogInput= 4E Hex)	—	10	r,w
86	Read only except test mode (AnalogOutput= 4F Hex	—	1	r,w
87	Used in test mode (ReadTestFixture= 50 Hex)	—	1	r
88	Sample = 0,generator = 1,reference = 2 (ValveState= 56 Hex)	—	1	r,w
94	Current year (Year= 5C Hex)	—	1	r,w
95	Used in test only (WriteTestFixture= 63 Hex)	—	1	—
96	Current day of week (WeekDay= 6D Hex)	—	1	r,w
97	Verification coefficient (MoistureSpan= 6E Hex)	—	1000	r,w
98	Track or hold current output flag (HoldOut= 71 Hex)	—	1	r,w
99	Fast cycle = 0, slow cycle= 1 (SlowTiming= 72 Hex)	—	1	r,w
100	Minimum verification duration (VerDurationLim it= 73 Hex)	minute	1	r,w
101	Adjust span in verification flag (AdjustSpan= 74 Hex)	—	1	r,w
102	Alarm 1 enable flag (EnableAlarm 1= 75 Hex)	—	1	r,w

REG	DEFINITION	UNIT	SCALING	ACCESS
103	Alarm 2 enable flag (EnableAlarm 2= 76 Hex)	—	1	r,w
104	Reserved	—	—	—
105	Dryer limit (DryerPpmHours= 7A Hex)	ppmH	1	r,w
106	Dryer counter (CurrentPpmHours= 7B Hex)	—	1	r,w
107	Flow correction coefficient (Flow Correction= 8B Hex)	—	10	r,w
108	Corrected generator reading (MoistureCorr= 8C Hex)	—	10	r,w
109	Flow correction multiplier (FlowWeight= 8D Hex)	—	10	r,w
110	Previous span before adjustment (OldMoistSpan= 8F Hex)	—	1000	r,w
111	Skip span drift limit (IgnoreSpanDrift= 90 Hex)	—	1	r,w
112	Previous offset number (OldFreqOffset= 91 Hex)	—	1000	r,w
113-114	Converts input counts to voltage (AD 16Span= 00 Hex)	—	Float	r
115-116	Dew point temperature conversion coefficient (DewCoeff0= 14 Hex)	—	Float	r
117-118	Dew point temperature conversion coefficient (Dew C oeff1= 15 Hex)	—	Float	r
119-120	Dew point temperature conversion coefficient (DewCoeff2= 42 Hex)	—	Float	r
121-122	Dew point temperature conversion (DewCoeff3= 43 Hex)	—	Float	r
123-124	Sensor calibration coefficient (PolyCoeff0= 32 Hex)	—	Float	r
125-126	Sensor calibration coefficient (PolyCoeff1= 33 Hex)	—	Float	r
127-128	Sensor calibration coefficient (PolyCoeff2= 34 Hex)	—	Float	r
129-130	Sensor calibration coefficient (PolyCoeff3= 35 Hex)	—	Float	r
131-132	Sensor calibration coefficient (PolyCoeff4= 36 Hex)	—	Float	r
133-134	Sensor calibration coefficient (PolyCoeff5= 37 Hex)	—	Float	r
135-136	Current concentration (Moisture= 51 Hex)	—	Float	r
137-138	Concentration held during verification (HeldConc= 52 Hex)	engineer units	Float	r
139-140	Delta frequency (DeltaFrequency= 54 Hex)	Hz	Float	r
141-161	Customer analyzer name (AnalyzerName= 28 Hex)	—	string	r,w
162-182	Selected gas (Gas= 2A Hex)	—	string	r,w
183-189	Analyzer serial number (SerialNumber= 44 Hex)	—	string	r,w
190-196	Sensor serial number (CellSerialNumber= 45 Hex)	—	string	r
197-203	Moisture generator serial number (MoistureGeneratorSN = 46 Hex)	—	string	r,w
204-209	Current date string (Date= 5D Hex)	—	string	r,w
210-212	Current time string (Time= 5E Hex)	—	string	r,w
213-220	Analyzer model name (ModelName= 77 Hex)	—	string	r
221-225	Dryer production code (DryerDateCode= 79 Hex)	—	string	r,w
226-228	Reserved	—	string	
229	HiSpan Limit (HiSpanLimit= 94 Hex)	—	100	r,w

REG	DEFINITION	UNIT	SCALING	ACCESS
230	LowSpan Limit (LowSpanLimit= 95 Hex)	—	100	r,w
231	EquilCal (EquilCal = 7D Hex)	—	1	r,w
232	(EquilZero = 7E H EquilZero Hex)	—	1	r,w
233	ZeroDurationLim it (ZeroDurationLimit = 7F)	—	1	r,w
234	ZeroCycleCount (ZeroCycleCount = 80)	—	1	r,w
235	ZeroHour (ZeroHour = 81)	—	1	r,w
236	ZeroPeriod (ZeroPeriod = 82)	—	1	r,w
237	ZeroMonthDays (ZeroMonthDays = 83)	—	1	r,w
238	ZeroWeekDays (ZeroWeekDays = 84)	—	1	r,w
239	ZeroType (ZeroType = 85)	—	1	r,w
240	MaxZeroError (MaxZeroError = 86)	Hz	100	r,w
241	MaxZeroDrift (MaxZeroDrift = 87)	Hz	100	r,w
242	MoistureSpanSlow (MoistureSpanSlow = 88)	—	1000	r,w
243	FreqOffsetSlow (FreqOffsetSlow = 89)	—	1000	r,w

Register #0 holds the moisture concentration value not held during Verification. This value is in PPM.

A pair of registers #135 and #136 provide the same moisture concentration value in floating point Modicon standard.

Register #1 holds the moisture concentration value held during verification cycle. The units of measurement are changing depending of flag status located in register #65.

A pair of registers #137 and #138 provide the same information in floating point format.

Register #11 is a DataState register, which is designed to synchronize the data acquisition process. This flag is cleared by read. A value of one indicates new data is available.

Register #8 is the SystemState variable, which is set to alarms and warnings. This value is decoded according to the table below.

Example:
The value of SystemState is 12612 which is the same as 3144 hexadecimal number. Corresponding alarms started from the list significant bit are: **Invalid Reading**, **Calibration Failure**, **Flow Alarm**, **Moisture Generator Date**, and **Dryer Alarm**.

Alarm Name	System State Bit	Number of blinks	Comment
Memory Failure	Bit 4	1	System Alarm
Sensor Failure	Bit 5	2	Frequency & Sensor Access
Calibration Failure	Bit 6	3	Span Out of Limit
Oven Temperature Out	Bit 7	4	Temperature Out of Limit
Flow Out of Range	Bit 8	5	System Alarm
Battery Low	Bit 9	6	Battery State
Reference Gas Alarm	Bit 10 Warnings	7	Set if Delta Frequency < -0.3 Hz
Enclosure Temperature	Bit 11	8	Temp >70 degrees C
Moisture Generator Date	Bit 12	N /A	Good for Two (2) Years
Dryer Alarm	Bit 13	10	Exceeding PPM Hours
Concentration Alarm	Bit 0 – Bit1	11	Concentration Out of Range
Invalid Reading	Bit 2	11	Verification or System Alarm
Process Pressure	Bit 3	11	Process Pressure Out of Limits

Register #25 is a ModbusCommand register. This register allows sending special commands to the 3050 Analyzer as shown in the table below.

Value	Command Description
71	Start Verification Cycle
76	Load Sensor Memory
81	Quit Verification Cycle
82	Reset Analyzer
84	Start/Stop Test Mode
90	Start Zero Cycle

The last set of registers starting from #141 represents ASCII strings. Each register is holding two ASCII characters. End of the string should be marked with integer number of zero ('0'). For example, if the AnalyzerName variable is set to "Dev", the holding register values are (considering that high byte located first) #141 (68, 101) and #142 (118, 0). Note that zero ('**0**') indicates the end of the ASCII string.

ID/Status Information

The Modbus master can poll the analyzer periodically for status information via Modbus function 17 (11 Hex). The returned information has the following format:

1 byte Slave ID	= 50h for 3050 Analyzer
1 byte Run Status	= FFh for Analyzer online (invalid signal = 0)
	= 00h for Analyzer offline (invalid signal = 1)
2 bytes Status Word	= System State which is register #8 The most significant byte comes first.
15 bytes Model Name	= Analyzer Model Name are registers 213-220
12 bytes Serial Number	= Analyzer Serial Number located in registers 183-189
4 bytes Version Number	= S200 located in register #82

The byte count is 35 (23Hex).

Analyzer Configuration Operations

This section discusses configuring the analyzer with Modbus. The 3050 Analyzer is shipped ready to communicate via Modbus using the serial communications port. While the 3050 Analyzer can be completely configured using the Modbus connection, AMETEK recommends the use of the 3050 Analyzer Configurator Software for configuring the analyzer. The 3050 Analyzer Configurator Software is compatible with Modbus RTU as well. Switching protocols can be accomplished with the 3050 Analyzer Configurator Software or with the AMETEK "ProtocolSwitch" utility, which is discussed in the next section.

Configuration Examples

All of the configuration parameters of the analyzer can be modified by the "write one or multiple holding registers" command. In most cases it is a one step operation involving setting the contents of the corresponding register. Ten different examples of using this command are presented below. The first example is presented with all "request" and "response" formatting information. For brevity, the remaining examples list just the key register information.

Example 1: Alarm Enable

Task	Action	Modbus transaction
Enable Alarm Output. Device address is 2.	Write one holding register (function 06). Register address = 102 (holding register #40103). Value = 1(1-enable, 0-disable).	Request Device Address = 02Hex Function Code = 06Hex Register Address Hi = 00Hex Register Address Lo = 66Hex Register Value Hi = 00Hex Register Value Lo = 01Hex CRC Hi CRC Lo Response Device Address = 02Hex Function Code = 06Hex Register Address Hi = 00Hex Register Address Lo = 66Hex RegisterValue Hi = 00Hex Register Value Lo = 01Hex CRC Hi CRC Lo

Example 2: Setting the High Alarm Limit

Task	Action
Set the analyzer to produce a "high concentration" alarm, when the moisture concentration exceeds 1000 PPM.	Write one holding register (function 06). Register address = 66 (holding register #40067). Value = 1000.

Example 3: Setting the Low Alarm Limit

Task	Action
Set the analyzer to produce a "low concentration" alarm, when the moisture concentration falls below 0 PPM.	Write one holding register (function 06). Register address = 67 (holding register #40068). Value = 0.

Example 4: Enabling "Hold During Verify"

Task	Action
Enable the analog outputs to "hold during Verify" at the last measured value, when the analyzer is Offline to perform a Verification.	Write one holding register (function 06). Register address = 98 (holding register #40099). Value = 1(0-track during verify, 1-hold during verify).

Example 5: Setting the High End of the Analog Output

Task	Action
Setup the analog output so that a moisture concentration of 100 PPM produces a 20 mA current output.	Write one holding register (function 06). Register address = 45 (holding register #40046). Value = 100.

Example 6: Setting the Low End of the Analog Output

Task	Action
Setup the analog output so that a moisture concentration of 1 PPM produces a 4 mA current output.	Write one holding register (function 06). Register address = 46 (holding register #40047). Value = 100 (multiplied by scale of 100).

Example 7: Switching to "Sensor Saver" Mode

Task	Action
Set the analyzer to operate in the **Sensor Saver** mode.	Write one holding register (function 06). Register address = 99 (holding register #40100). Value = 1 (enable sensor saver = 1, disable sensor saver = 0).

Example 8: Switch to Dewpoint Readings

Task	Actions
Set the analyzer to output the moisture concentration as a dewpoint, using the Centigrade scale. A fixed process pressure of 150 kPa is used for this example.	**ACTION 1** Write one holding register (function 06). Register address = 65 (holding register #40066). Value = 4 (PPMV = 0, lbs/mmscf = 1, mg/Nm3 = 2, PPMW = 3, dewpoint C = 4, dewpoint F = 5). **ACTION 2** Set process pressure units to kPa. Write one holding register (function 06). Register address = 70 (holding register #40071). Value = 0 (kPa= 0, PSIA = 1, BAR = 2, Atm = 3). **ACTION 3** Set process pressure to fixed 150 kPa. Write one holding register (function 06). Register address = 47 (holding register #40048). Value = 1500. Write one holding register (function 06). Register address = 48 (holding register #40048). Value = 1500.

Example 9: Selecting a Sample Gas

Task	Actions
Set the analyzer to operate on a Sample gas, using the data provided in the "GasNew_do.CSV" file (located in the folder where the 3050 Configurator Software is installed). For the purpose of this example, the Sample gas selected will be air.	**ACTION 1** Write multiple holding registers (function 16). Register address = 162 (holding register #40163) value = 4169Hex, Register address = 163 (holding register #40164) value = 7200Hex (Air0). **ACTION 2** Set gas related coefficients. Coefficients can be obtained from the "GasNew_do.CSV" file (located in the folder where the 3050 Configurator Software is installed). Register address = 74 (holding register #40075). Value = 998 Register address = 75 (holding register #40076). Value = 14000 Register address = 63 (holding register #40064). Value = 622 Next registers should be set for Dew Point temperature reading only. Register address = 115,116. Value = 7.89E-04 Register address = 117,118. Value = -7.14E-06 Register address = 119,120. Value = 2.31E-08 Register address = 121,122. Value = -2.57E-11 **ACTION 3** Set process pressure to fixed 150 kPa. Write one holding register (function 06). Register address = 47 (holding register #40048). Value = 1500Hex (multiplied by the scaling factor of 10). Write one holding register (function 06). Register address = 48 (holding register #40049). Value = 1500Hex (multiplied by the scaling factor of 10).

Example 10: Setting Verification Schedule

Task	Actions
Set the analyzer to automatically trigger a Verification. For this example, the analyzer will be set to perform a Verification on the third day of each month, at noon (12:00).	**ACTION 1** Set the Verification type to **Monthly**. Write one holding register (function 06). Register address = 81 (holding register #40082) value = 3Hex (never = 0, daily = 1, weekly = 2, monthly = 3). **ACTION 2** Set the **Day** of the Month to 3. Write one holding register (function 06). Register address = 79 (holding register #40080) value = 3Hex. **ACTION 3** Set the **Hour** to 12. Write one holding register (function 06). Register address = 77 (holding register #40078) value =0CHex.

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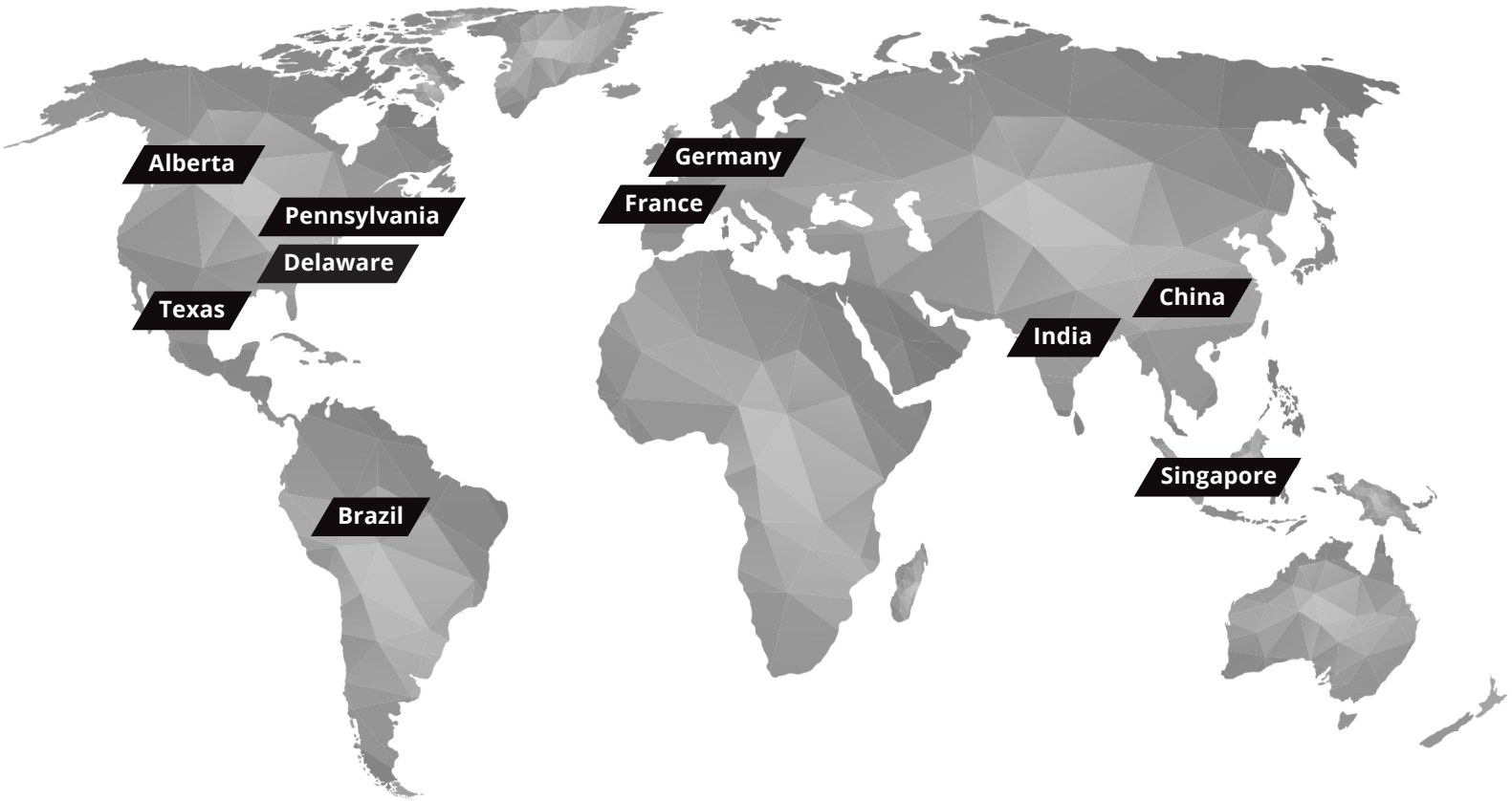

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