



Instruction Manual

Model 1570 *Sample Conditioning Drawer*



AMETEK[®]

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Receiving and Storage

The UAI SCD (Sample Conditioning Drawer) is a complete pre-assembled unit. No assembly is necessary when received on-site.

Carefully inspect the product and any special accessories included with it immediately on arrival by removing them from the packing and checking for missing components against the packing list.

Check the items for any damage in transit and, if required, inform the shipping insurance company immediately of any damage found.

Storage location should be protected from the elements. Although all components provided are designed to resist corrosion, additional protection from heat (>140°F / 60°C) and humidity is recommended.

Definition of Symbols



WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR HAZARDOUS AREA INSTALLATION.

THE SUPPLY POWER CIRCUIT MUST INCLUDE AN OVERPROTECTION DEVICE WITH A MAXIMUM RATING OF 20A. A DISCONNECT SWITCH MUST BE LOCATED IN CLOSE PROXIMITY TO THE PROBE.

IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED PER CLAUSE 5.4.4(i) IN STANDARD EN 61010-1.

CAUTION, RISK OF DANGER SYMBOL INDICATES INJURY MAY OCCUR IF MANUFACTURER'S INSTRUCTIONS ARE NOT ADHERED TO. PLEASE READ MANUAL CAREFULLY WHEN SYMBOL IS DISPLAYED.



CAUTION, HOT SURFACE SYMBOL INDICATES EXPOSED SURFACE TEMPERATURE CAN CAUSE BURNS OR PERSONAL INJURY. CARE SHOULD BE TAKEN WHEN CONTACT IS REQUIRED.



CAUTION, RISK OF ELECTRICAL SHOCK SYMBOL INDICATES ELECTRICAL SHOCK MAY OCCUR. CAUTION SHOULD BE TAKEN BEFORE DISCONNECTING OR CONTACTING ANY ELECTRICAL CONNECTIONS.



PROTECTIVE CONDUCTOR TERMINAL SYMBOL INDICATES THE TERMINAL LOCATION FOR THE PROTECTIVE CONDUCTOR. FAILURE TO CONNECT TO THE PROTECTIVE CONDUCTOR TERMINAL MAY RESULT IN A SHOCK HAZARD.

Specifications

| OPERATING SPECIFICATIONS | |
|--------------------------------------|---|
| Sample Flow Rate | 0 to 8 l/m ** |
| Maximum Inlet Temperature | |
| Stainless Steel Heat Exchanger | 700°F (370°C) |
| Kynar/Glass Heat Exchanger | 280°F (138°C) |
| Maximum Inlet Gas Dew Point | 194°F (90°C)* |
| Maximum Inlet Water Vapor Content | 70%* |
| Minimum Ambient Temperature | 34°F (0°C) |
| Maximum Ambient Temperature | 105°F (41°C)* |
| Maximum Cooling Power (Second Stage) | 126 BTUs per hour (120 kJ/Hr) |
| Outlet Sample Dew Point | 39°F (4°C) |
| Maximum Input Power | 550 Watts*** |
| Voltage | 95-125VAC 50/60 Hz or 190-250VAC 50/60 Hz (External fuse required or 20A or less) |
| Electrical Classification | General Purpose |
| Temperature Classification | FM/CSA T3A, ATEX 143°C (T3) |
| SCD Dimensions | 29" L x 19" W x 10.5" H |
| Weight | 75 lbs (34kg) |
| Soluble Gas Removal Rates | NO 0% loss NO ₂ <10% loss SO ₂ < 2% loss CO 0% loss CO ₂ < 2% loss |

*AT REDUCED FLOW RATE ABOVE 77°F. (25°C.) AMBIENT.

**SEE GAS COOLER CAPACITY CHART BELOW.

| COOLER CAPACITY DATA | | | | | | | | | | | | |
|----------------------|----------------------------------|-------|-------|-------|----------------------------------|-------|---------|---------|-----------------------------------|-------|---------|-------|
| | Ambient 77°F/25°C Water Vapor | | | | Ambient 90°F/25°C Water Vapor | | | | Ambient 105°F/25°C Water Vapor | | | |
| | 12% | 15% | 30% | 50% | 12% | 15% | 30% | 50% | 12% | 15% | 30% | 50% |
| 1570 | 8 l/m | 8 l/m | 7 l/m | 6 l/m | 6 l/m | 6 l/m | 5.5 l/m | 4.5 l/m | 3 l/m | 3 l/m | 2.5 l/m | 2 l/m |

Description and Principle of Operation

SAMPLE CONDITIONING DRAWER OVERVIEW

The Sample Conditioning Drawer (SCD), in combination with up to four Analyzers, a Heated Filter/Probe and Sample Line, is a complete Extractive Sample Conditioning System - ideal for CEMS or Process Monitoring. The compact 6U SCD, with its integral 8-Lpm thermoelectric cooler, 2-micron filter, calibration gas manifold, sample and condensate pumps, provides a filtered 4°C dew point sample gas ready for analysis.

The SCD has the following features:

Basic SCD - Controlled by an external PLC, toggle switches, DCS or data logger

- Four Channel Sample Conditioning System (Maximum)
- Six Calibration Gases (Maximum) Direct or System Calibrations
- 19" Rack Mount Chassis with Drawer Slides
- Model 1570 Thermoelectric Gas Sample Cooler
- 316SS and Kynar/Glass Heat Exchangers are available
- Cooler Capacity 8 LPM @ 15% Liquid
- 77°F Ambient Dew point controlled at 4°C
- CCS Condensate Sensor accessible on rear panel
- 2 Micron Fine Ceramic Filter accessible from front panel
- Maximum of 6 Calibration Gas Selection Solenoids
- Internal Calibration Gas Regulator - Set @10 Psig
- System or Direct Calibration Selection with Block & Bleed Design
- Vacuum Gauge, SS, Liquid Filled (0 - 30" Hg)
- Pressure Gauge, SS, Liquid Filler (0 - 15 Psig)
- Sample Vacuum Switch (Adjustable - Set @ 7" HG)
- Sample Pressure Switch (Adjustable - Set @ 5 Psig)
- Loss of Calibration Gas Pressure Switch (Adjustable - Set @ 5 Psig)
- Single Head Mini Dia-Vac Sample Pump with Integral B/P Regulator
- Dual Head Peristaltic Liquid Pump
- 1/4" SS Compression Fittings for Analyzers gas outputs
- Alarm Contacts:
 - High Inlet Sample Pump
 - Low Sample Pressure
 - Condensate Sensor
 - High Cooler Temperature
 - Low Calibration Gas Pressure

Description and Principle of Operation

SYSTEM DESCRIPTION

In order to analyze combustion products or incinerator effluents utilizing a direct extractive sampling technique, it is important to remove the water vapor without removing the water-soluble fraction(s) from the gas sample. The heat exchangers (impingers) used in the Universal Analyzers SCD Thermoelectric Cooler is designed to minimize the gas/ condensate area and time of contact to reduce to a minimum, the amount of mass transfer of those water soluble components from the gas phase into the liquid phase. The result is a dry gas sample that has the same composition on a dry basis before and after passing through the cooler.

A gas sample is usually taken from a stack with a probe extending into the stack mounted onto a heated filter. The heated filter is maintained at a temperature above the dew point of the stack gas, usually 300°F to 400°F in order to avoid cementing the filtered particulates to the filter medium with condensate. A means is usually provided to automatically blow the particulates trapped by the filter, back into the stack on a periodic basis.

The stack gas sample is clean but "wet" after passing through the filter assembly. The moisture in the gas sample comes from the fuel as a product of combustion, from the humidity in the air, which supports the combustion, and from the water content which was trapped in the fuel. This latter source of water in the sample can be from burning moist coal, wet garbage, or from water injected into the firebox. Water from all of these sources will remove the water-soluble gases from the sample stream if allowed to condense in the sample line prior to the controlled separation within the Universal Analyzers' heat exchangers in the sample cooler.

In order to maintain the temperature of the gas sample above the dew point as it is transported to the gas sample cooler, a Heated Sample Line (HSL) is usually employed. The SCD can be configured with a HSL controller.

The Universal Analyzers gas sample cooler contains the special impinger type heat exchanger(s). These are mounted within heat transfer blocks which are cooled by thermoelectric elements utilizing the "Peltier Effect" discovered in France over half a century ago. Where high water contents are encountered, it is efficient to remove the condensate in two stages, one at the temperature of the air in the vicinity of the "Precooler" and then by passing the sample into a heat exchanger cooled by the thermoelectric elements. The precooler can remove water that will condense at the temperature of the environment. In high water content samples, this could be as much as 70% of the water in the sample.

The thermoelectrically cooled stage is temperature controlled at a factory setting of 4°C.

The SCD contains additional components to insure that a clean, dry sample is presented to the analyzer panel for minimum analyzer maintenance. A CCS Condensate sensor is provided to sense the presence of condensate, should any exist in the tubing following the chiller. A 2-micron coalescing filter which collects particulates on the outside of the cylindrical filter, surrounded by a transparent bowl will allow the operator to inspect the condition of the filter.

The location of the sample pump (Oil-less diaphragm pump) within the sampling system is the subject of much debate. If the pump is located upstream from the chiller, it should have a heated head to avoid the presence of a two-phase mixture, which shortens the life of a diaphragm and causes maintenance problems. In the SCD the sample pump is in the sample line after the chiller. This allows the sample pump to handle a cool, dry sample with much reduce pump maintenance problems.

The condensate is removed from the SCD heat exchanger(s) using a continuously running peristaltic tubing pump that can be used with the heat exchanger either under pressure or vacuum. This is an easy solution that lends itself to leak testing because of the positive displacement nature of the peristaltic pump. It is however, a device that requires periodic maintenance to replace the peristaltic tubing.

Description and Principle of Operation

SYSTEM DESCRIPTION

A filtered, 4°C Dew point Sample Gas is distributed to up to 4 Gas Channels/ Analyzers. Flow Control is provided utilizing flow meters with a flow control needle valve to pinch off the sample flow causing the sample pump to pump higher on the pump curve. An adjustable back pressure regulator is provided in the SCD, between the inlet and outlet of the sample pump to allow a portion of the gas pumped to be recirculated back to the inlet if discharge pressure exceeds the back pressure control point. With the integral back pressure regulator, the flow meters can be adjusted without impacting the Sample Pump's life and System Pressure.

The SCD can have up to 6 Calibration Gas Selection Solenoids for selecting zero and various pan gases. Calibration Method can either be through the System, (Probe) or Direct, (direct to the Analyzers). Comparing the System and Direct Calibration Analyzer value allow for calculation of System Bias, (Loss of Soluble Gases in the sampling system). Direct Calibration can also be useful for Analyzer maintenance. The Calibration Manifold is designed for Block and Bleed so that trapped Calibration Gases are vented when "Sample" is selected. An internal Gas Regulator sets the SCD Calibration Gas Pressure to 5-10 Psig to compensate for the variation in the supply gas cylinder regulator pressures.

Installation



CAUTION: SAFETY CONCERNS

The drawer cover is to be opened only by authorized technicians or the installing contractor. There are no operator adjustments which operations personnel will be required to access inside the Sample Conditioner Drawer (SCD).

Mains supply cord must be supplied for operation of the SCD and the HSL. Both shall be rated for the maximum current shown on the Serial Label and shall meet the requirements of IEC 127 or IEC 245. The mains connector shall be selected to mate with the mains supply outlets within the facility where the sample cooler will be located.



CAUTION: POWER SHALL BE DISCONNECTED BY REMOVING THE MAINS SUPPLY CORD BEFORE SERVICING THE SCD. FAILURE TO DO SO MAY RESULT IN ELECTRICAL BURNS, SHOCK, OR LOSS OF LIFE.

Environmental Ratings:

Operating Ambient Temperature: 0°F to 105°F:
Operating Humidity: 5 to 95%
Operating Altitude: 0 to 6500 ft.
Storage Temperature: -20°F to 140°F

Note: The SCD should be installed away from heat sources in a well-ventilated area of an instrument rack or enclosure. Completely enclosing any instrument generating energy will cause the temperature of the interior of the enclosure to rise to too great a level for the sample cooler to perform reliably.

Note: The SCD is designed to be 19" Rack Mountable, normally located below the CEMS/Process Analyzers. Drawer Slides are provided to aid in future serviceability. It is important in running and tubing to the rear of the Drawer, that an adequate wire/tubing service loop be provided to allow full extension of the Drawer for service.

The sample inlet is a 3/8" compression fitting supplied at the rear panel of the Drawer. The heat insulation on the heated tube bundle should be stripped no more than 3" to avoid plugging the exposed line. The sample outlets, located on the rear of the Drawer, are 1/4" compression fittings marked Channels #1 through #5. The Calibration Gas Bulkheads are 1/4" compression fittings also. Normally 1/4" TFE Tubing would be used to interconnect to the Rack's Analyzers and Calibration Gases Gas Cylinders.

Installation



WARNING: ALTHOUGH UNIVERSAL ANALYZERS PRESSURE TESTS THE SCD TO ENSURE LEAK FREE OPERATION, THE CALIBRATION GAS SYSTEM SHOULD BE PRESSURE TESTED, AFTER INSTALLATION, TO AVOID LOSS OF VALUABLE CALIBRATION GASES.

A 3/8" tube is provided as the condensate drain connection at the outlet of the Peristaltic Liquid Pump. The Dual head peristaltic pump is used to withdraw the condensate from each Impinger. Care must be taken to drain the condensate into a safe drain because of the potential of condensed sulfuric acid.

Supply Power Input Ratings to the SCD are: 120VAC, 50/60HZ@ maximum consumption of 550 watts. A power cord is provided to connect to the Fused Power Entry Module (PEM) for System Power. The male end of the power cord must be accessible after installation into the relay rack since the power switch, and receptacle, is located on the rear of the SCD and will be hard to reach once installed. This power cord must also be connected to a grounded power source.

Power for the Heated Sample Line (HSL) is connected to TB-6 located on a bracket on the rear panel of the SCD. Wire the HSL Input Power to TB6-1 (H/L1), TB6-2 (N/L2) and TB6-G (Ground). Wire HSL Switched Controlled Output Power to TB6-3 (H/L1), TB6-4 (H/L2) and TB6-G (Ground) - maximum 20 Amps. Control and Outputs are available on TB-1 and TB-2 respectively. The Phoenix terminal blocks allow a quick release of the wiring block for easy removal of the Drawer.

Due to the fact that the SCD is built based on the Voltage requested by the customer, connecting the SCD to other than the listed voltage on the Ratings Label, would void the warranty and will cause damage to the SCD. If a voltage change is requested, please contact the factory for further instructions. This would include returning the SCD to the factory.

Start-Up



CAUTION: ON THE NON-PLC CONTROLLED SCD, THE HEATED PROBE, HSL AND ANY OTHER HEATED ZONES SHOULD BE AT THE NORMAL OPERATING TEMPERATURES BEFORE STARTING THE SAMPLE PUMP. WITH THE PLC CONTROLLED SCD, THE SYSTEM SHOULD AUTOMATICALLY BE MAINTAINED OFF-LINE UNTIL THE CHILLER AND OTHER HEATED ZONES ARE WITHIN NORMAL OPERATING TEMPERATURES

Apply power to the SCD. The indicated temperature will start to drop immediately. It should be below the over-temperature alarm point in approximately four minutes and the "COOL" green LED lamp should light. When the temperature reaches the control set point, the rate at which the temperature drops will be reduced. The temperature will stabilize within 1°C of the control set point.

Start the sample gas flow by turning on the sample pump and adjusting the flow control valves to the desired flow rate or as required by the analyzer manufacturer.

The green "DRY" LED light will be on. With the CCS Condensate sensor, the light will go out and the alarm relay de-energized when the sensor detects condensate. A test can be performed by putting water on the condensate sensor, if the sample pump is powered through the alarm relay contacts, it will cease running. When the condensate sensor is wiped dry, the sample pump will restart.

To adjust the SCD's Calibration Gas regulator, the Gas Cylinder pressure regulators should be adjusted to 15- 20 Psig, place the SCD into direct calibration and adjust the calibration gas regulator to show 5-10 Psig on the Pressure Gauge. The set pressure should be the same as sample pressure to achieve the same flow rate in "Direct Calibration" as in "Sample". Factory set at 10 Psig.

Shutdown

Stop sample gas flow to the cooler by disconnecting the heated sample line. Allow the drain pump to run for several minutes to remove any remaining condensate from the heat exchangers. After all condensate has been drained, turn off power to the SCD.

Maintenance

Before performing any maintenance on the cooler, ensure that all plant safety procedures are followed. As with any electrical device, ensure power is removed before performing any procedures.

The cooler is designed for maintenance free operation but if any is required, ensure power has been removed before maintenance or repair is performed.

For the best performance of the cooler, the following maintenance schedule is recommended:

| Maintenance Activity | Frequency |
|------------------------|----------------------------------|
| Peristaltic Pump | Replace tubing every 3 months |
| Diaphragm Sample Pump | Replace diaphragm every 6 months |
| Clean Heat Exchanger | Annually |
| Inspect Heat Sink Fans | Monthly |

MAINTENANCE PROCEDURES

REPLACEMENT OF PERISTALTIC TUBING (IF EQUIPPED)

1. Please refer to manufacturers website for instructions: bit.ly/1zfmrzt
2. YouTube: bit.ly/1MPLUJO

REPLACEMENT OF SAMPLE PUMP DIAPHRAGM

Please refer to manufactures website for instructions: <http://www.airdimensions.com>

INSTALLING OR REPLACING HEAT EXCHANGERS

Removing the Heat Exchanger

1. Remove the inlet and outlet tubes by loosening the compression fittings. Always use a backup wrench on the fitting body to ensure no damage to the heat exchanger occurs.
2. Remove the drain fitting using the same procedure as the inlet/outlet. Remove the drain fittings from the exchanger. Use a backup wrench on the lower heat exchanger hex to prevent damage to the exchanger.

Replacing the Heat Exchanger

1. Dry and clean the heat exchanger opening in the heat transfer block using a dry, lint-free cloth (If reusing the heat exchanger, clean the outside as well.) Dried heat transfer paste can be removed by using a very fine abrasive pad wrapped around a drill bit.
2. Smear the outer diameter of the heat exchanger with heat transfer paste.
3. Gently push the heat exchanger into the heat transfer block until the head is fully seated against the insulation on top.
4. Reinstall the drain fitting. Ensure pipe tape is used on the pipe threads before installation. Use a backup wrench on the heat exchanger lower hex to prevent damage to the exchanger.
5. Reconnect the drain, inlet and outlet tubes.

Maintenance

MAINTENANCE SCHEDULE

The cooler heat sink is used to dissipate heat away from the heat transfer block/ Peltier elements. Over time in an industrial environment, dust/debris can build up between the fins on the back side of the heat sink. This build will reduce the efficiency of the cooler and can cause premature failure of the Peltier elements.

INSPECT HEAT SINK FINS

Using a flash light (or other light source), shine a light through the heat sink fins. If the fins are unobstructed, you should be able to see the aluminum blower fins. If the blower is not visible or partial obstruction exists, clean the heat sink fins.

CLEAN HEAT SINK FINS

Access to the left side of the SCD, is required.

First, remove the side panel from the unit. Remove the screws securing the side panel.

Looking in from the left side, the heat sink assembly should be visible at the rear of the enclosure. Immediately in front of the fan is the inlet side of the heat sink. Using a soft bristled brush, gently remove the debris from the heat sink. Alternatively, a computer safe aerosol cleaner can be used to remove the debris.

Clean any loose debris from the enclosure and fan motor using a vacuum or compressed air. Replace all connectors, reference electrical drawings for details. Reinstall the side panel.

CLEANING INSTRUCTIONS

Should the Heat Exchangers require cleaning, disconnect the tubing and remove the Exchangers from the Heat Transfer Blocks. Wipe off the white heat sink compound with a clean rag. Disassemble the Exchanger. Refer to Drawing Numbers P0147 through P0149 for an illustration on the assembly of the exchanger. Wipe off all surfaces with a clean rag.

STAINLESS STEEL EXCHANGER (IF REQUIRED)

- a) Soak in soap and water solution, or
- b) Soak in Solvent such as MEK, Acetone, etc. or
- c) Soak in a 10% HNO_3 solution

PV (GLASS & KYNAR) (IF REQUIRED)

- a) Soak in Alcohol to remove hydrocarbons

DO NOT USE MEK, ACETONE OR SIMILAR SOLVENTS ON PV EXCHANGERS

Re-assemble Exchangers with new O-Ring(s). Apply an even coat of Heat Sink Paste to the exterior of the exchanger tube only. Re-install into Heat Transfer Block and reconnect tubing.

Maintenance

DAILY:

- Verify and Adjust Flow Meters to Normal Flow rate
- Verify Vacuum Gauge < 4" HG
- Verify Pressure Gauge > 6 Psig

PLC CONTROLLED SYSTEMS:

- Check Alarm Display Status on Operator Interface
- "System Normal" - Normal System Operation
- "Chiller Malfunction" - Moisture Detected in Condensate or Chiller Temperature > 10°C
- "High Sys Vacuum" - High Sample Inlet Vacuum > 7" Hg
- "Low Sys Pressure" - Low Sample Pressure < 5 Psig
- "Low Calibration Gas" - Low Calibration Gas Pressure < 5 Psig
- "Heated Zone M/F" - Low/High Temperature on Probe or Sample Line

WEEKLY:

NON-PLC SYSTEMS:

- Check Chiller Status - Temperature, Cool and Dry
- Chiller Display - 4°C ± 1°C
 - "Cool" - Green
 - "Dry" - Green
- Alarm Statuses are available as an relay contact on TB 2
- Chiller Malfunction - Chiller Temperature > 10°C or Moisture Detected
- Moisture Detected in Condensate Sensor
- Vacuum Switch - High Sample Inlet Vacuum > 7" Hg
- Pressure Switch - Low Sample Pressure < 5 Psig
- Low Calibration Gas - Low Calibration Gas Pressure < 5 Psig

QUARTERLY:

- Check Sample Pump for Normal Operation
 - Single Head Pump 4-6 Liters/Min @ < 2" Hg @ 10 Psig
 - Note: Pump Diaphragm replacement dependent on Load, Sample Composition and Ambient Temperatures
- Check Sample Filter by observing color and noting any flow restriction. Change as required.

BIANNUALLY:

- Replace Tubing on Peristaltic Liquid Pump
- Replace Diaphragm and Gaskets on Sample Pump
- Check Pressure setting of Back Pressure Regulator on Sample Pump
- Check Vacuum Switch } 7" Hg
- Check Pressure Switch < 5 Psig
- Leak Check the Sample System

Troubleshooting

The presence of water in liquid form after the sample cooler is an indication of a fault in the system. Reasons for the presence of condensate in the system after the sample cooler could be one or more of the following:

1. Overloading of the cooling capacity of the cooler due to too much water vapor or too great a sample flow rate.
2. The heat exchanger has become full of condensate.
3. An air leak in the condensate removal tubing.
4. The temperature of the air passing through the heat sink is too high.
5. Failure of the sample cooler. (See troubleshooting table on next page)

Dimensional drawings, installation drawings, and schematics are included as part of this manual. If additional information is required, assistance can be obtained by calling (775) 883-2500 or FAX request to (775) 883-6388.

Troubleshooting

The following table should give an overview of possible errors and an instruction to check and to repair them (is not valid for the starting-up period of cooler).

| Error | Possible reason | Check/Repair |
|---|---|--|
| No sample gas flow | Heat exchanger plugged | Check for an obstruction Remove heat exchanger from unit and disassemble |
| | Alarm pump shutoff | Verify cool & dry indicators are illuminated |
| | No power on cooler | Ensure cooler has power supplied |
| Condensate | Inadequate drain apparatus | Verify drain tubing is unobstructed and equipment is functioning satisfactory |
| | Excessive flow rate | Reduce the flow rate |
| | High ambient temperature | Reduce the ambient temperature (Increase ventilation or relocate cooler) |
| | Defective cooler fan or blower | Verify air flow across the heat sink Hold hand in front of heat sink fins and ensure air movement |
| High oxygen readings/low pollutant readings | Leak | Loose connection |
| | | Verify all fittings are leak free |
| | | Defective peristaltic pump tubing |
| | | Replace tubing |
| | | Broken or leaking heat exchanger |
| Remove heat exchanger and replace if broken or repair (replace O-Ring) if leaking | | |
| 'Dry' light is not illuminated | Condensate | See "Condensate" error |
| | Faulty condensate sensor or circuit board | Disconnect/ Unplug the 2 wire cable from the CCS terminals, located on the power supply board. If the dry light does not illuminate, consult the factory |
| 'Cool' light is not illuminated | Ambient temperature too high | Reduce the ambient temperature (Increase ventilation or relocate cooler) |
| | Flow rate/water content too high | Lower the flow rate through the cooler and observe the results. If condition corrects itself, consult the factory for further troubleshooting |
| | Failed peltier element | Measure resistance between the red & black peltier leads. A failed peltier element will read high resistance or 'Open'. Consult wiring diagram for wire location details |

Spare Parts

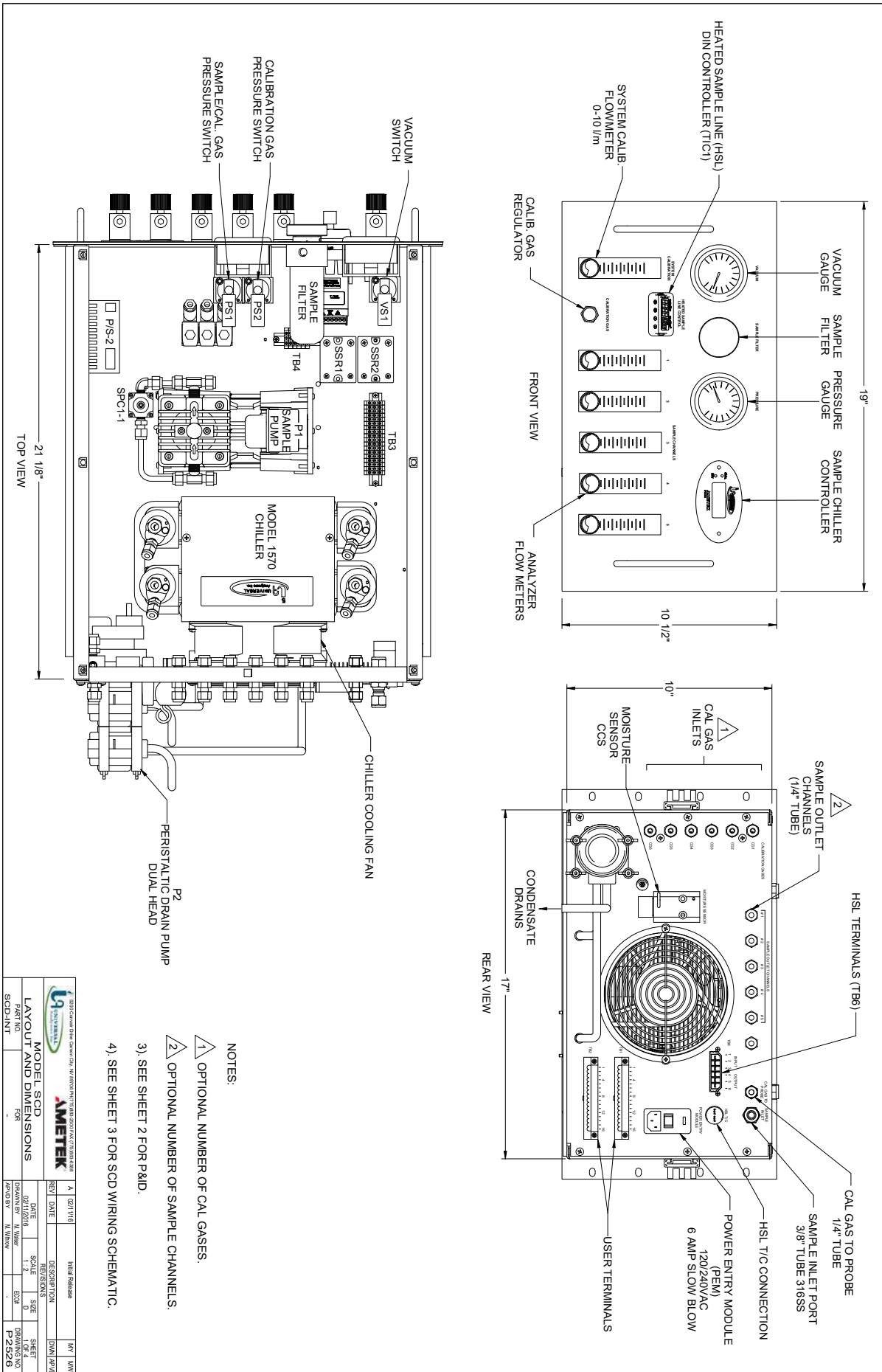
| Consumable Parts | |
|--|------------|
| Part | P/N |
| Peristaltic Pump Tubing, #15, 5' length | 9216-0002 |
| 6 Amp Slow Blow Fuse for 3000 Series Power Supply | 3010-0005 |
| 12 Amp Fast Acting Fuse for 3000 Series Power Supply | 3010-0006 |
| Filter Element - 2 µm Ceramic | 4980-0007 |
| Sample Pump Rebuild Kit - Mini Dia-VAC (for Single Head) | 9515-0018 |

| Basic Parts | |
|---|------------|
| Part | P/N |
| Heat Exchanger/Impinger - 316SS 5" | 5200-S050 |
| Heat Exchanger/Impinger - Glass/Kynar 5" | 5200-K050 |
| Glass Tube, Outer - Heat Exchanger Replacement 5" | 5201-0002 |
| O-Ring, 316SS Heat Exchanger - Viton 2-021 | 4904-0013 |
| O-Ring, Glass/Kynar Heat Exchanger - Viton 2-018 | 4904-0003 |
| O-Ring, Glass/Kynar Heat Exchanger - Viton 2-120 | 4904-0004 |
| Paste, Heat Sinking - 0.1 Ounce Container | 8010-0001 |

| Critical Parts | |
|---|------------|
| Part | P/N |
| Peltier Element, Pair - 15VDC 8.5 Amp 40mm Sq. | 3016-0002 |
| Solenoid, 2-Way/24 VDC | 4955-0040 |
| Solenoid, 3-Way/24 VDC | 4955-0041 |
| Power Supply Board - 15VDC 500 Watt | 3600-0011 |
| Controller Circuit Board | 3600-0012 |
| Peristaltic Pump Head, #15 | 4958-0006 |
| Peristaltic Pump Motor, 115VAC 6 RPM | 4958-0028 |
| Peristaltic Pump Motor, 230VAC 12 RPM | 4958-0045 |
| Vacuum Switch, 0-29" Hg, Sample Inlet Vacuum | 3103-0017 |
| Pressure Switch, 0-15 PSIG, Sample/Calibration Pressure | 3103-0018 |
| Temperature Sensor Assembly, AD592 | 1150-0017 |

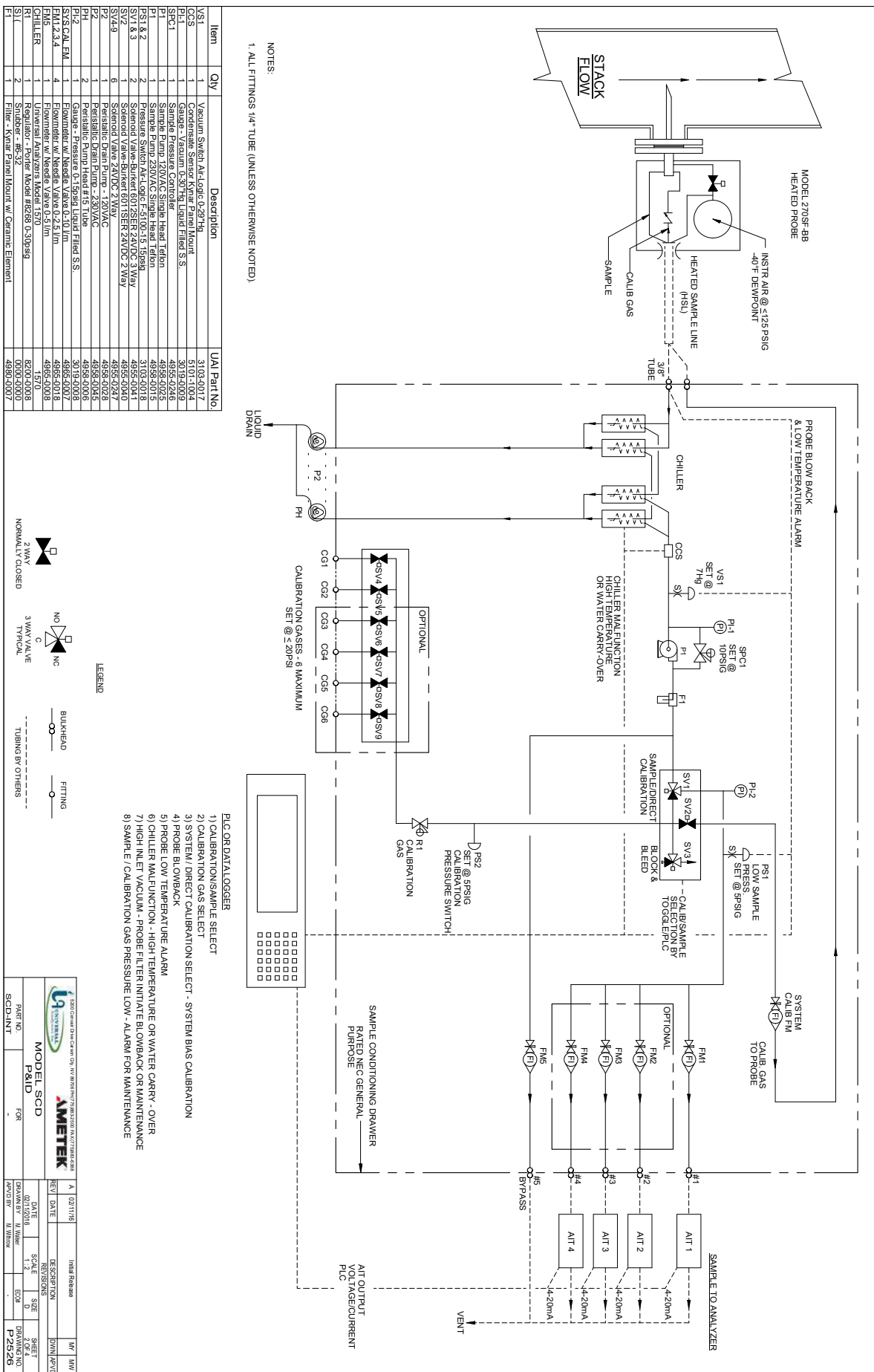
| Optional Parts/Accessories | |
|---|------------|
| Part | P/N |
| Solid State Relay, 3-32VDC / 240VAC 25 Amp (Sample Pump) | 3152-0002 |
| CCS Assembly - Condensate Sensor | CCS |
| O-Ring, Filter Bowl - Viton 2-030 | 4904-0006 |
| Sample Pump - 115VAC Mini Dia-VAC Alum/Teflon Single Head | 4958-0025 |
| Sample Pump - 230VAC Mini Dia-VAC Alum/Teflon Single Head | 4958-0015 |
| Regulator, Calibration Gas | 8200-0008 |
| Vacuum Gauge, Glycerin Filled, 0-29" Hg | 3019-0009 |
| Pressure Gauge, Glycerin Filled, 0-15 PSIG | 3019-0008 |
| Sample Pressure Control 3-36 Psig Adjustable | 4955-0246 |
| Flow Meter, 0-10 Liters per Minute, SS Needle Valve | 4965-0007 |
| Flow Meter, 0-5 Liters per Minute, SS Needle Valve | 4965-0008 |
| Flow Meter, .2-2.5 Liters per Minute, SS Needle Valve | 4965-0018 |
| Flow Meter Knob | 4902-0002 |

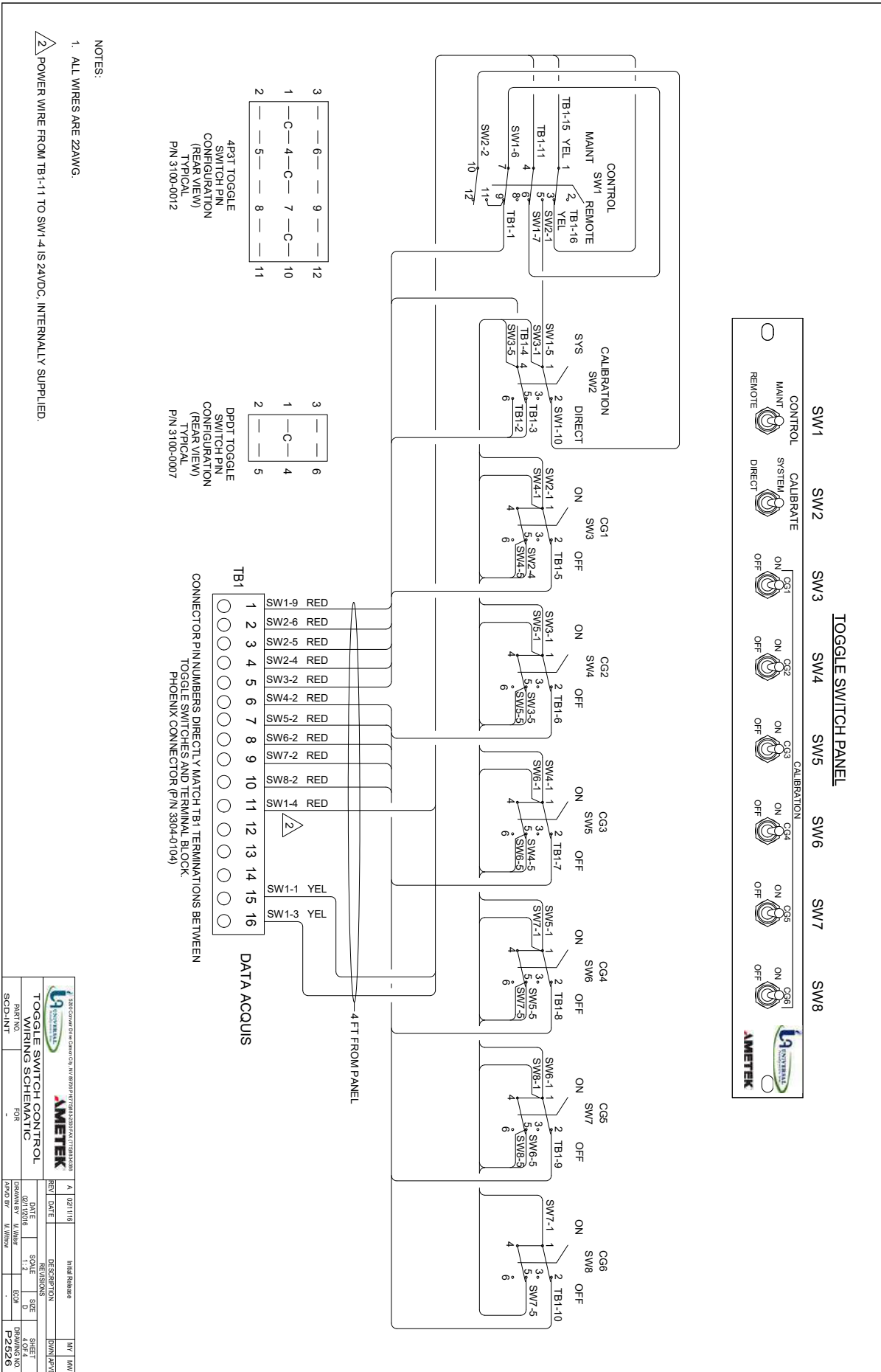
Drawings Model 1570SCD



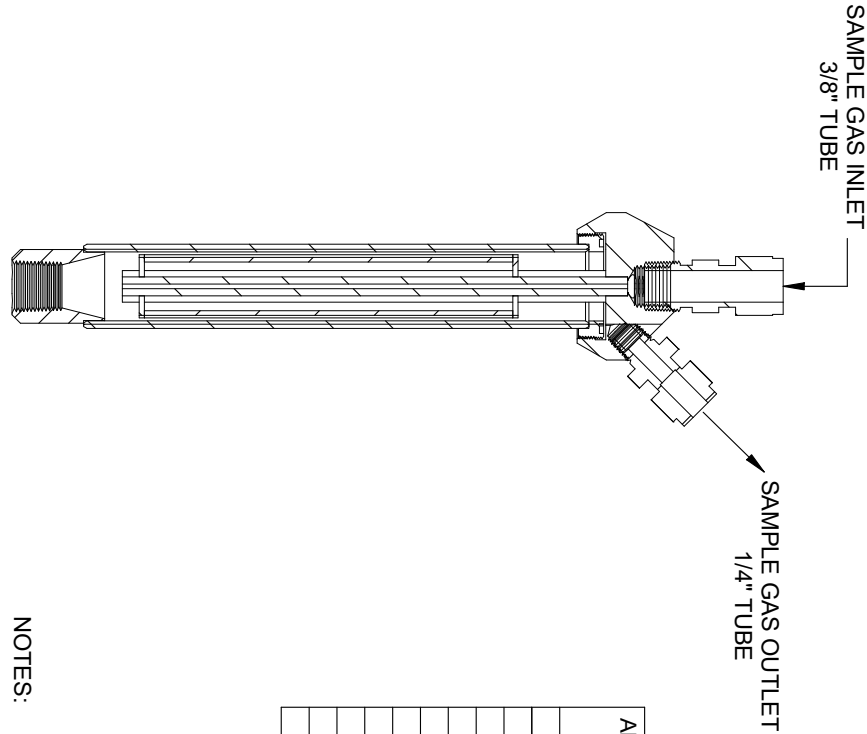
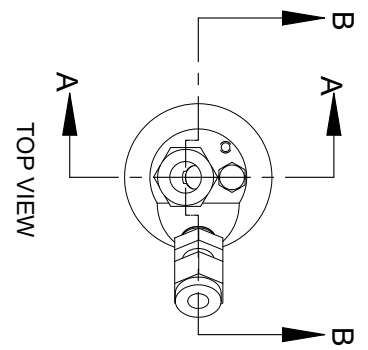
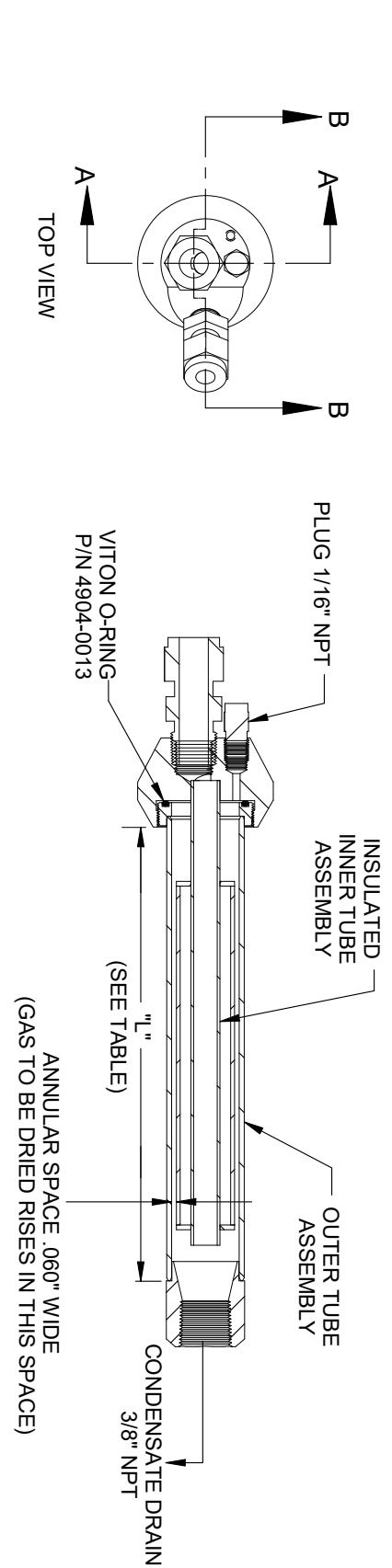
| | | |
|-----|----------|---|
| | | MODEL SCD LAYOUT AND DIMENSIONS FOR |
| REV | DATE | DESCRIPTION |
| A | 02/11/16 | Initial Release |
| REV | DATE | DESCRIPTION |
| B | 02/12/16 | SCALE SIZE |
| C | 1-2 | SIZE |
| D | 03 | FORM 1 OF 4 |
| E | 03 | FORM 2 OF 4 |
| F | 03 | FORM 3 OF 4 |
| G | 03 | FORM 4 OF 4 |
| H | 03 | FORM 5 OF 4 |
| I | 03 | FORM 6 OF 4 |
| J | 03 | FORM 7 OF 4 |
| K | 03 | FORM 8 OF 4 |
| L | 03 | FORM 9 OF 4 |
| M | 03 | FORM 10 OF 4 |
| N | 03 | FORM 11 OF 4 |
| O | 03 | FORM 12 OF 4 |
| P | 03 | FORM 13 OF 4 |
| Q | 03 | FORM 14 OF 4 |
| R | 03 | FORM 15 OF 4 |
| S | 03 | FORM 16 OF 4 |
| T | 03 | FORM 17 OF 4 |
| U | 03 | FORM 18 OF 4 |
| V | 03 | FORM 19 OF 4 |
| W | 03 | FORM 20 OF 4 |
| X | 03 | FORM 21 OF 4 |
| Y | 03 | FORM 22 OF 4 |
| Z | 03 | FORM 23 OF 4 |
| AA | 03 | FORM 24 OF 4 |
| AB | 03 | FORM 25 OF 4 |
| AC | 03 | FORM 26 OF 4 |
| AD | 03 | FORM 27 OF 4 |
| AE | 03 | FORM 28 OF 4 |
| AF | 03 | FORM 29 OF 4 |
| AG | 03 | FORM 30 OF 4 |
| AH | 03 | FORM 31 OF 4 |
| AI | 03 | FORM 32 OF 4 |
| AJ | 03 | FORM 33 OF 4 |
| AK | 03 | FORM 34 OF 4 |
| AL | 03 | FORM 35 OF 4 |
| AM | 03 | FORM 36 OF 4 |
| AN | 03 | FORM 37 OF 4 |
| AO | 03 | FORM 38 OF 4 |
| AP | 03 | FORM 39 OF 4 |
| AQ | 03 | FORM 40 OF 4 |
| AR | 03 | FORM 41 OF 4 |
| AS | 03 | FORM 42 OF 4 |
| AT | 03 | FORM 43 OF 4 |
| AU | 03 | FORM 44 OF 4 |
| AV | 03 | FORM 45 OF 4 |
| AW | 03 | FORM 46 OF 4 |
| AX | 03 | FORM 47 OF 4 |
| AY | 03 | FORM 48 OF 4 |
| AZ | 03 | FORM 49 OF 4 |
| BA | 03 | FORM 50 OF 4 |
| BB | 03 | FORM 51 OF 4 |
| BC | 03 | FORM 52 OF 4 |
| BD | 03 | FORM 53 OF 4 |
| BE | 03 | FORM 54 OF 4 |
| BF | 03 | FORM 55 OF 4 |
| BG | 03 | FORM 56 OF 4 |
| BH | 03 | FORM 57 OF 4 |
| BI | 03 | FORM 58 OF 4 |
| BJ | 03 | FORM 59 OF 4 |
| BK | 03 | FORM 60 OF 4 |
| BL | 03 | FORM 61 OF 4 |
| BM | 03 | FORM 62 OF 4 |
| BN | 03 | FORM 63 OF 4 |
| BO | 03 | FORM 64 OF 4 |
| BP | 03 | FORM 65 OF 4 |
| BQ | 03 | FORM 66 OF 4 |
| BR | 03 | FORM 67 OF 4 |
| BS | 03 | FORM 68 OF 4 |
| BT | 03 | FORM 69 OF 4 |
| BU | 03 | FORM 70 OF 4 |
| BV | 03 | FORM 71 OF 4 |
| BW | 03 | FORM 72 OF 4 |
| BX | 03 | FORM 73 OF 4 |
| BY | 03 | FORM 74 OF 4 |
| BZ | 03 | FORM 75 OF 4 |
| CA | 03 | FORM 76 OF 4 |
| CB | 03 | FORM 77 OF 4 |
| CC | 03 | FORM 78 OF 4 |
| CD | 03 | FORM 79 OF 4 |
| CE | 03 | FORM 80 OF 4 |
| CF | 03 | FORM 81 OF 4 |
| CG | 03 | FORM 82 OF 4 |
| CH | 03 | FORM 83 OF 4 |
| CI | 03 | FORM 84 OF 4 |
| CJ | 03 | FORM 85 OF 4 |
| CK | 03 | FORM 86 OF 4 |
| CL | 03 | FORM 87 OF 4 |
| CM | 03 | FORM 88 OF 4 |
| CN | 03 | FORM 89 OF 4 |
| CO | 03 | FORM 90 OF 4 |
| CP | 03 | FORM 91 OF 4 |
| CQ | 03 | FORM 92 OF 4 |
| CR | 03 | FORM 93 OF 4 |
| CS | 03 | FORM 94 OF 4 |
| CT | 03 | FORM 95 OF 4 |
| CU | 03 | FORM 96 OF 4 |
| CV | 03 | FORM 97 OF 4 |
| CU | 03 | FORM 98 OF 4 |
| CV | 03 | FORM 99 OF 4 |
| CW | 03 | FORM 100 OF 4 |

Drawings Model 1570SCD





Drawings Heat Exchanger - Metallic



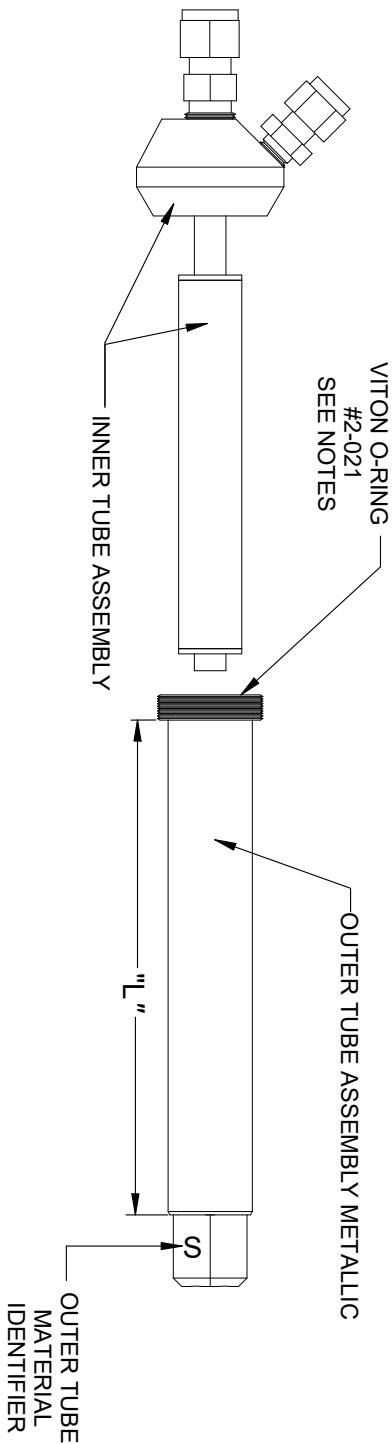
| APPROXIMATE LENGTH "L" | HEAT EXCHANGER P/N | OUTER TUBE MATERIAL | UNIVERSAL ANALYZERS SERIES |
|------------------------|--------------------|---------------------|----------------------------|
| 5" | 5200-S050 | 316SS | 500/600 |
| 5" | 5200-C050 | HASTELLOY C-276 | 500/600 |
| 5" | 5200-S05T | TEFLON COATED 316SS | 500/600 |
| 10" | 5200-S010 | 316SS | 1000/1100/3000 |
| 10" | 5200-C010 | HASTELLOY C-276 | 1000/1100/3000 |
| 10" | 5200-S01T | TEFLON COATED 316SS | 1000/1100/3000 |
| 5" | 5200-T050 | TITANIUM | 500/600 |
| 10" | 5200-C01C | HASTELLOY C-276 | 1000/1100/3000 |
| 5" | 5200-C05C | HASTELLOY C-276 | 500/600 |
| 15" | 5200-S015 | 316SS | - |

NOTES:

1). SEE SHEET 2 FOR ASSEMBLY INSTRUCTIONS.

| | | | | |
|---|-------------|-----------------------------|-------|-------|
| E | 09/14/16 | Add Heat C-276 Part Numbers | NY | MM |
| REV / DATE | DESCRIPTION | | DW/ML | AP/VD |
| REVISIONS | | | | |
| PART NO. SEE TABLE FOR HEAT EXCHANGER METALLIC NON-TEMPERATURE SENSING | | | | |
| DRAWN BY: AMETEK H. MITCHELL DATE: 12/11/95 SCALE: NTS SIZE: C SHEET: 1 OF 2 | | | | |

Drawings Heat Exchanger - Metallic



- NOTES:
1. O-RING IS FACTORY INSTALLED IN METALLIC OUTER TUBE.
 2. LIGHTLY LUBRICATE O-RING WITH SILICONE GREASE BEFORE ASSEMBLY.
 3. ANTI-SEIZE ON OUTER TUBE THREADS.

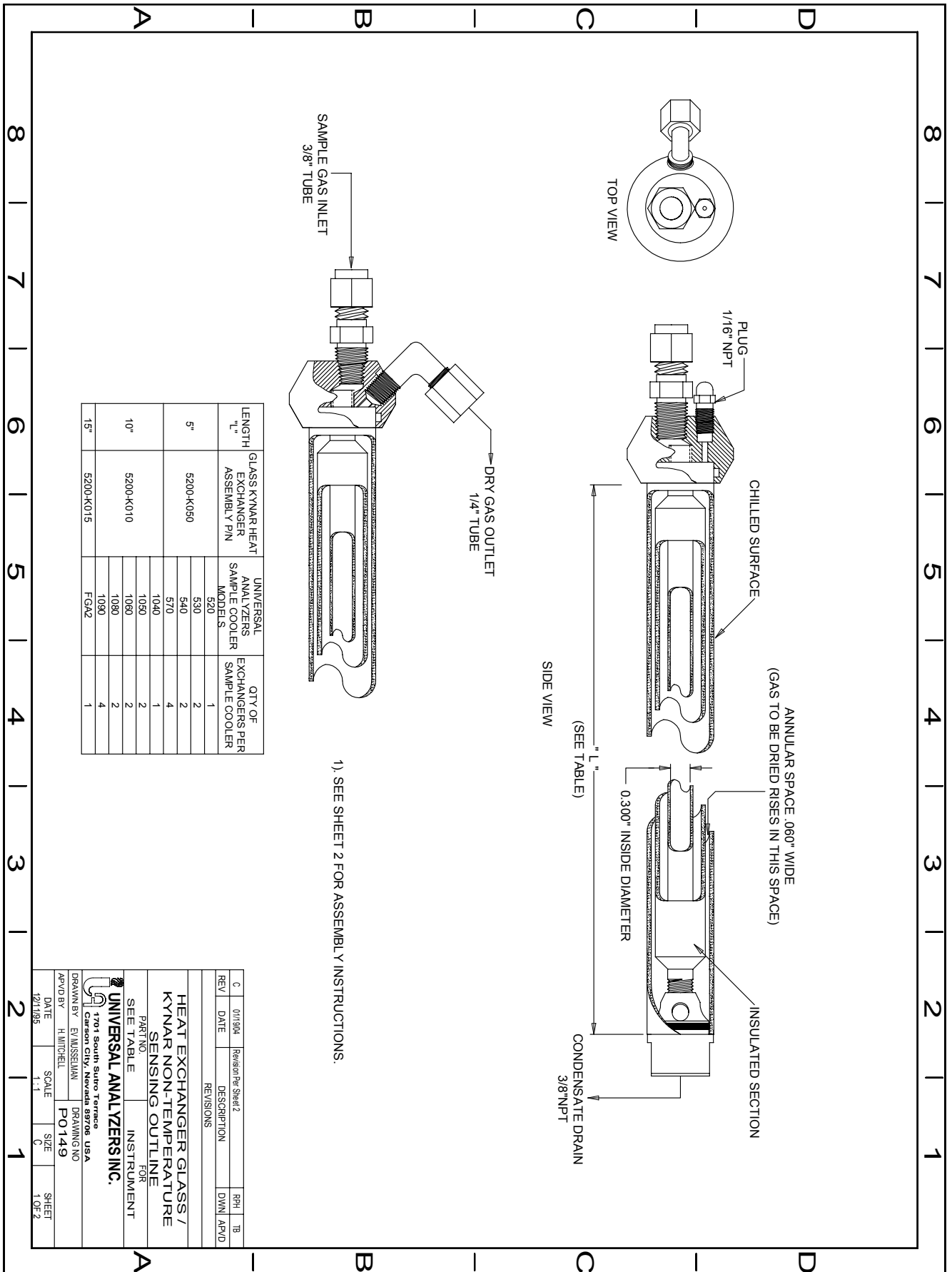
| HEAT EXCHANGER SEPERABLE | | SPARE PARTS LIST | | | |
|--------------------------|-----------|---------------------|---------------------|-------------------------|--------------------|
| APPROXIMATE LENGTH "L" | P/N | INNER TUBE ASSY P/N | OUTER TUBE ASSY P/N | VITON O-RING #2-021 P/N | PLUG 1/16" NPT P/N |
| 5" | 5200-S050 | 5201-0015 | 5201-0012 | 4904-0013 | 4951-0058 |
| 5" | 5200-C050 | " | 5201-0020 | " | " |
| 5" | 5200-S05T | 5201-0041 | 5201-0043 | " | " |
| 10" | 5200-S010 | 5201-0016 | 5201-0013 | 4904-0013 | 4951-0058 |
| 10" | 5200-C010 | " | 5201-0021 | " | " |
| 10" | 5200-S01T | 5201-0042 | 5201-0044 | " | " |
| 15" | 5200-S015 | 5201-0107 | 5201-0055 | " | " |
| 5" | 5200-T050 | 5201-0123 | 5201-0024 | " | " |
| 10" | 5200-C01C | 5201-1009 | 5201-0021 | " | " |
| 5" | 5200-C05C | 5201-1010 | 5201-0020 | " | " |

| | | | | |
|---|----------|-----------------------------|------------|------|
| E | 06/14/16 | Add Part C-276 Part Numbers | MM | MM |
| REV | DATE | DESCRIPTION | DWNL | APVD |
| | | REVISIONS | | |
| HEAT EXCHANGER ASSEMBLY NON-TEMPERATURE SENSING METALLIC | | | | |
| PART NO. | | FOR INSTRUMENT | | |
| SEE TABLE | | | | |
| DRAWN BY: EMMUSELIAN | | ECOH# | DRAWING NO | |
| APVD BY: H MITCHELL | | 2830 | P0147 | |
| DATE | SCALE | SIZE | SHEET | |
| 12/11/95 | NONE | C | 2 OF 2 | |



5200 Central Drive Carson City, NV 89706 (702) 338-2200 FAX (702) 338-2338

Drawings Heat Exchanger - Glass/Kynar



| LENGTH "L" | GLASS KYNAR HEAT EXCHANGER ASSEMBLY PIN | UNIVERSAL ANALYZERS SAMPLE COOLER MODELS | QTY OF EXCHANGERS PER SAMPLE COOLER |
|---------------|---|---|---|
| 5" | 5200-K050 | 520 | 1 |
| | | 530 | 2 |
| | | 540 | 2 |
| | | 570 | 4 |
| | | 1040 | 1 |
| | | 1050 | 2 |
| 10" | 5200-K010 | 1080 | 2 |
| | | 1090 | 2 |
| | | 1090 | 4 |
| 15" | 5200-K015 | FGA2 | 1 |

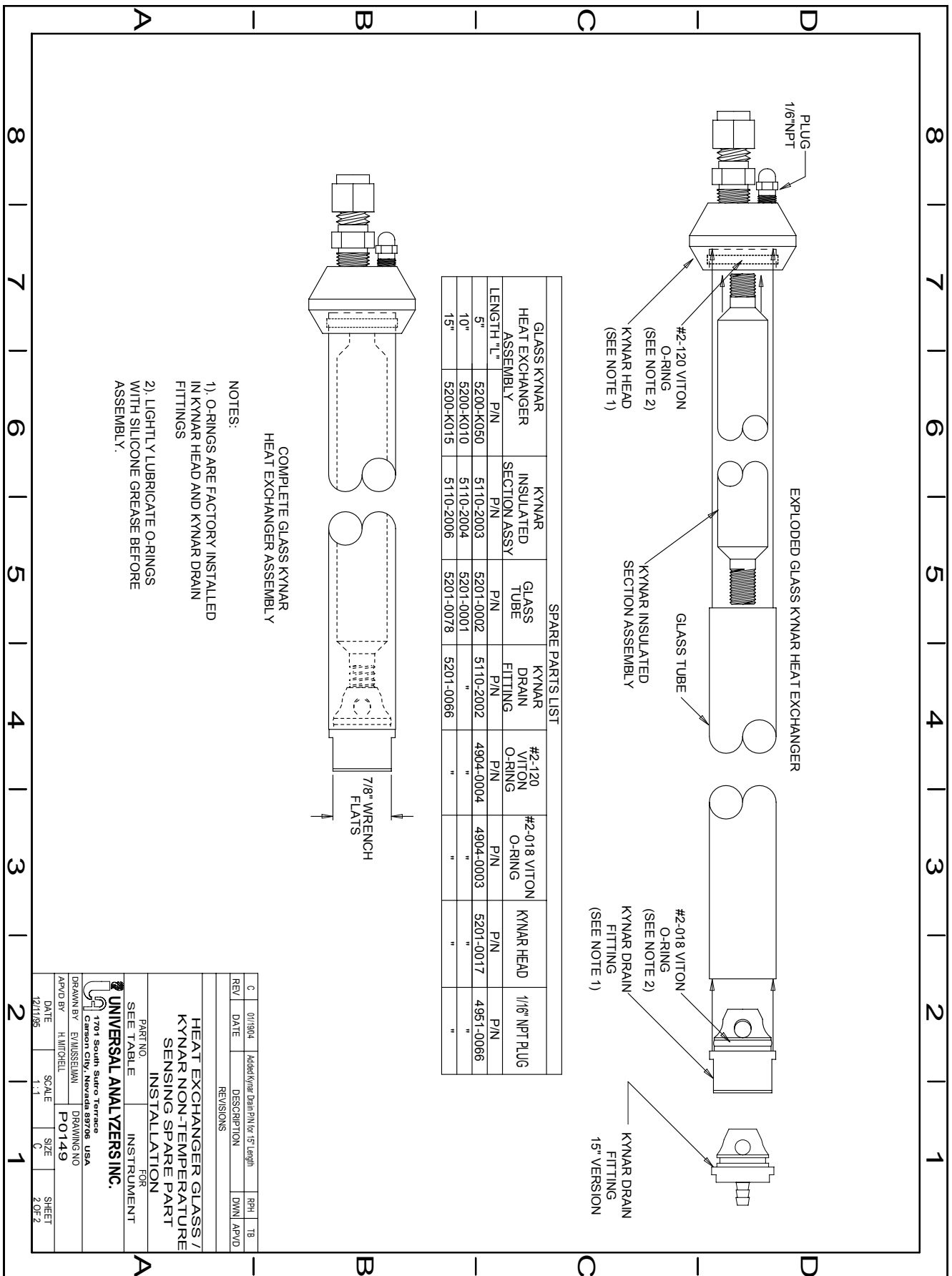
| REV | DATE | DESCRIPTION | BY | CHKD | APP'D |
|-----|----------|----------------------|----|------|-------|
| C | 01/19/04 | Revision Per Sheet 2 | | | |
| B | | | | | |
| A | | | | | |

HEAT EXCHANGER GLASS /
KYNAR NON-TEMPERATURE
SENSING OUTLINE
FOR
INSTRUMENT

PART NO. SEE TABLE

UNIVERSAL ANALYZERS INC.
701 South Sunco Terrace
Clematis, Kynar
UNIVERSAL ANALYZERS INC. USA
DRAWN BY: H. MITCHELL
DRAWING NO. PO149
DATE: 12/11/95
SCALE: 1:1
SHEET: 1 OF 2

Drawings Heat Exchanger - Glass/Kynar



SPARE PARTS LIST

| GLASS KYNAR HEAT EXCHANGER ASSEMBLY | KYNAR INSULATED SECTION ASSY | GLASS TUBE | KYNAR DRAIN FITTING | #2-120 VITON O-RING | #2-018 VITON O-RING | KYNAR HEAD | 1/16" NPT PLUG |
|-------------------------------------|------------------------------|------------|---------------------|---------------------|---------------------|------------|----------------|
| LENGTH - "L" | P/N | P/N | P/N | P/N | P/N | P/N | P/N |
| 5" | 5200-K050 | 5110-2003 | 5201-0002 | 5110-2002 | 4904-0004 | 4904-0003 | 5201-0017 |
| 10" | 5200-K010 | 5110-2004 | 5201-0001 | " | " | " | 4961-0066 |
| 15" | 5200-K015 | 5110-2006 | 5201-0078 | 5201-0066 | " | " | " |

COMPLETE GLASS KYNAR HEAT EXCHANGER ASSEMBLY

- NOTES:**
- O-RINGS ARE FACTORY INSTALLED IN KYNAR HEAD AND KYNAR DRAIN FITTINGS
 - LIGHTLY LUBRICATE O-RINGS WITH SILICONE GREASE BEFORE ASSEMBLY.

| | | | | |
|-----|----------|--------------------------------------|-------|------|
| REV | DATE | DESCRIPTION | APP'D | DATE |
| C | 01/19/04 | Added Kynar Drain P/N for 15" Length | RPH | TB |

REVISIONS

HEAT EXCHANGER GLASS / KYNAR NON-TEMPERATURE SENSING SPARE PART INSTALLATION

FOR INSTRUMENT

UNIVERSAL ANALYZERS INC.

701 South Suro Terrace
Cottonwood, Nevada, USA
Custom Design, Assembly, Drawing

DRAWN BY: H.WITCHELL
DRAWING NO: P0149
DATE: 12/11/95
SCALE: 1:1
SIZE: 6
SHEET: 2 OF 2

Limited Warranty

I. Limited Warranty

1. Limited Warranty. Universal Analyzers, Inc (UAI) offers a limited warranty on each of its products against failure due to defects in material and workmanship for a period ending the earlier of (i) fifteen (15) months from the date of the invoice relating to the sale of the product and (ii) twelve (12) months from the date of installation of the product (collectively, the "Initial Warranty"). During the Initial Warranty, UAI offers a limited warranty against failure due to defects in material and workmanship on each part of a product repaired or replaced by an authorized service person for a period ending the later of (a) the remaining term of the Initial Warranty of the product and (b) ninety (90) days from the date of such repair or replacement. After expiration of the Initial Warranty, UAI offers a limited warranty against failure due to defects in material and workmanship on each part of a product repaired or replaced by an authorized service person for a period ending ninety (90) days from the date of such repair or replacement. UAI further offers a limited warranty that the products and parts it sells will conform to UAI's written specifications therefor. The foregoing limited warranties cover parts and labor only and UAI does not warrant and will not reimburse the buyer of its products ("Buyer") for any costs relating to the access by service persons of UAI to the product at issue. The foregoing limited warranties cover only the repair or replacement of defective parts and such determination will be in the sole discretion of UAI. In its sole discretion, UAI may make repairs or replacements under these limited warranties with either new or refurbished parts. To the extent Buyer's product cannot be remedied under these limited warranties through repair or replacement of parts, Buyer may return the product for a refund of the purchase price, less a reasonable reduction in such purchase price equal to the depreciation expense incurred by Buyer relating to such product. The limited warranties of this Section I.1. are further subject to those warranty exclusions set forth below in Section I.2.

2. Limited Warranty Exclusions. Excluding the warranties provided for in Section I.1., UAI provides all products to Buyer "as-is," without any other warranty of any kind. UAI disclaims any and all express or implied warranties of merchantability, fitness for a particular purpose and non-infringement of the intellectual property of others. UAI makes no warranty, express or implied, as to the design, sale, installation or use of its products. UAI's warranties will not be enlarged by, nor will any obligation or liability of UAI arise due to UAI providing technical advice, facilities or service in connection with any product. There is no warranty by UAI with respect to any product's: (i) uninterrupted or error-free operation; (ii) actual performance, other than the product's capability to meet UAI's specifications therefor; (iii) removal or installation from a work-site or process; (iv) electronic components or associated accessories (including without limitation circuit boards and integrated circuits); (v) maintenance (including without limitation gasket and seal replacements, adjustments, minor repairs and other inspection requirements, preventative or otherwise); (vi) use under inappropriate conditions or not in accordance with operating instructions; or (vii) use in connection with the operation of a nuclear facility. There is no warranty for labor expenses associated with field repairs or the repair or replacement of defective parts in the engine or power unit of any product if such product has been in the possession of the owner or operator for greater than twelve (12) months. There is no warranty for products determined to be, in UAI's sole discretion, damaged as a result of (a) misuse, neglect or accident; (b) improper application, installation, storage or use; (c) improper or inadequate maintenance or calibration; (d) operation outside of the published environmental specification; (e) improper site preparation or maintenance; (f) unauthorized repairs or replacements; (g) modifications negligently or otherwise improperly made or performed by persons other than UAI; (h) Buyer-supplied software or supplies; (i) use in conjunction with or interfacing with unapproved accessory equipment; (j) use of ABC-style or dry powder fire suppression agents; or (k) leaked sample materials. To the extent a UAI product is used in connection with the operation of a nuclear power facility, Buyer agrees to indemnify and hold UAI harmless from any and all actions, claims, suits, damages and expenses arising from such use. UAI provides no warranty on the oral representations made by its personnel while they are attempting to assist Buyer in the operation of a product. This Standard Limited Warranty does not apply to items consumed by the products during their ordinary use, including but not limited to fuses, batteries, paper, septa, fittings, screws, fuses, pyrolysis, dryer or scrubber tubes, sample boats, furnaces or UV lamps.

3. Non-UAI Products. UAI does not in any way warrant products it does not manufacture except to the extent the warranty of the manufacturer of the product at issue passes through or is otherwise assigned to UAI. If a manufacturer warranty is so assigned to UAI, UAI will only be bound to comply with the length of time associated with such warranty. All other terms of such warranty will be governed by this Standard Limited Warranty and UAI's General Terms and Conditions incorporated herein by reference.

Limited Warranty

4. Expenses on Non-Warranty Work. All repairs or replacements by UAI after the expiration of any applicable limited warranty period will be performed in accordance with UAI's standard rate for parts and labor. Further, if upon UAI's inspection and review, UAI determines the condition of the products is not caused by a defect in UAI's material and workmanship, but is the result of some other condition, including but not limited to damage caused by any of the events or conditions set forth in Section I.2., Buyer shall be liable for all direct expenses incurred by UAI to conduct the inspection and review of the product.

5. Exclusive Remedy. The foregoing limited warranty constitutes Buyer's exclusive remedy with respect to products sold by UAI and UAI's liability shall be exclusively limited to the written limited warranty specified herein. No employee, representative or agent of UAI is authorized to either expressly or impliedly modify, extend, alter or change any of the limited warranties expressed herein to Buyer.

6. Procedure and Costs. All limited warranty claims must be made in writing promptly following discovery of any defect. Buyer must hold defective products for inspection by UAI. If requested by UAI, Buyer must send the product to UAI for inspection. Any such returns by Buyer will be at Buyer's expense and Buyer will remain liable for any loss of or damage to the product during such product's transportation to UAI. No products will be sent to UAI for inspection unless UAI has authorized Buyer to do so.

7. Terms and Conditions. UAI's General Terms and Conditions are incorporated herein by reference and Buyer accordingly agrees to be bound by the terms thereof.

II. Limitations on UAI Liability

1. In General. Buyer agrees UAI shall not be liable for any direct, indirect, incidental, punitive or consequential damages, including lost profits, lost savings or loss of use, whether Buyer's claim is based in contract, tort, warranty, strict liability or otherwise, which Buyer may suffer for any reason, including reasons attributable to UAI. Buyer agrees these limitations on UAI's liability are reasonable and reflected in the amounts charged by UAI for its products.

2. Force Majeure. This Standard Limited Warranty does not cover and UAI shall not be liable for either direct or consequential damage caused, either directly or indirectly, as a result of: (i) any act of God, including but not limited to natural disaster, such as floods, earthquakes, or tornadoes; (ii) damages resulting from or under the conditions of strikes or riots, war, damages or improper operation due to intermittent power line voltage, frequency, electrical spikes or surges, unusual shock or electrical damage; or (iii) accident, fire or water damage, neglect, corrosive atmosphere or causes other than ordinary use.

3. Limitation on Warranty Claims. Prior to any obligation of UAI to perform any limited warranty service as set forth herein, Buyer must have: (i) paid all invoices to UAI in full, whether or not they are specifically related to the product at issue; and (ii) notified UAI of the limited warranty claim within sixty (60) days from the date Buyer knew or had reason to know of the defect



5200 Convair Drive Carson City, NV 89706 • Phone: 775-883-2500 • Fax: 775-883-6388 • www.universalanalyzers.com