



# Model 270SF

## Gas Sample Probe

Instruction Manual

*(General Purpose / FM/CSA Approved for Class I DIV 2 Group B, C, D / ATEX Zone 2)*



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## 1.0 Receiving and Storage

The Universal Analyzers 270SF Extractive Gas Sample Probe is completely pre-assembled. 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 articles 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.

The 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.

## 2.0 Definition of Symbols



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.

### 3.0 Product Identification & Configuration

For the current version and standard options of the Model 270SF product configuration, visit the Universal Analyzers website.

<https://www.universalanalyzers.com/>

Navigate to: Products -> Gas Sample Probes -> Model 270SF

A link to the current configuration is provided at the bottom of the page.

Alternate options to the standard options may be available. Contact Universal Analyzers for other solutions.

## 4.0 Specifications

<b>OPERATING SPECIFICATIONS</b>	
<b>Sample Flow Rate</b>	0 to 20 l/min
<b>Calibration Gas Requirement</b>	Sample flow rate plus 10%
<b>Operating Pressure Drop at 10 l/m</b>	12 inch w.c. (3.0 kPa)
<b>Maximum Stack Temperature</b>	700 °F (370 °C)
<b>Oven Temperature</b>	340 °F (170 °C)
<b>Enclosure Dimensions (exterior) (certain options have larger dimensions):</b>	
Fiberglass	19 ½" x 17 ½" x 9 ½" (500 mm x 440 mm x 240 mm) (HxWxD)
SS	16" x 14" x 9 ¼" (410 mm x 360 mm x 230 mm) (HxWxD)
<b>Weight</b>	25 lbs (12 kg) (plus probe tube)
<b>Input Voltage Requirement</b>	115/230VAC at 50/60 Hz
<b>Input Power Requirement</b>	125 W (certain options require more power)
<b>Electrical Classification</b>	General Purpose or FM/CSA Class I, Div 2, Groups A, B, C, & D & ATEX II 3G Ex nA IIC 175oC (T3)
<b>Max Ambient Operating Temperature</b>	200 °F (93 °C)
<b>Temperature Rating</b>	T3A (for hazardous area approved units)
<b>Blowback Tank Volume</b>	0.7 ft <sup>3</sup> (19.8 l)
<b>Recommended Blowback Pressure</b>	60 to 120 psig (4.1 to 8.3 barg)
<b>Blowback Duration</b>	0.5 sec to empty accumulator
<b>Enclosure</b>	NEMA 4X fiberglass Stainless steel (optional)
<b>Sample Line Connection</b>	3" heat shrink boot (standard) 4" heat shrink boot (optional) 2" heat shrink boot (optional)
<b>Heater Type</b>	Rod heaters in aluminum block, controlled w/ thermal switch
<b>Available Filter</b>	2 µm ceramic (standard) 2 µm sintered 316SS (optional) (other porosities available)
<b>Chamber Materials</b>	316SS (standard) SilcoNert™ coated 316SS Hastelloy C-276 PTFE coated 316SS

## 5.0 Description and Principle of Operation

### APPLICATION

The Universal Analyzers Model 270SF Extractive Gas Sample Probe Assembly is designed to be installed on sample stack. The 270SF may be installed in an unclassified location, or may be installed in Class 1 Division 2 or Zone 2 hazardous locations if the appropriate options are selected.

The 270SF filter will mount by means of a pipe flange to a mating flange on the stack. The size of the flange can be specified by the user and includes 2", 3", 4", 6" 150 class flanges. A 1/2" female NPT threaded connection is provided for the probe tube to connect to the 270SF through the mounting flange. Stack temperatures and corrosive gases will determine the material and design of the probe tube to be used. The probe tube is purchased separately, but if purchased with the probe it will be installed.

The 270SF provides a filter to clean the sample gas before it reaches the heated sample line. Sample flow rates of up to 20 liters per minute can be extracted and filtered through the 270SF with a minimal amount of pressure drop. Filter changes can be made in less than one minute.

### GENERAL DESCRIPTION, HEATED FILTER SECTION

The Model 270SF is an extractive gas sample probe consisting of the filter body mounted in a NEMA 4X fiberglass enclosure or stainless-steel enclosure. An optional blowback system is provided to allow the blowback to occur on command from a remote location or from an installed timer card.

Two 63-watt heaters are mounted in an aluminum sleeve around the filter cavity, with a thermal switch for control. This heater assembly maintains the temperature of the filter between 310 °F and 340 °F (150 °C to 170 °C). A second thermal switch, set at 225 °F (107 °C) may be provided to be used as an alarm contact, if the temperature drops below the switch temperature. An optional independent temperature sensor can be provided to measure the temperature of the filter.

In colder climates, an additional heater can be supplied for the enclosure. This heater may be controlled by a thermal switch to maintain 170 °F (77 °C) inside the enclosure or may be monitored by a temperature sensor to allow control of the heater by the customer. The enclosure heater uses instrument air to transfer heat from the heater to the enclosure, and to circulate air in the enclosure to obtain a more even air temperature throughout the enclosure.

Several types of filter elements can be supplied with the 270SF. A 2 µm ceramic filter is supplied as an economical general-purpose filter. A similar ceramic filter with an internal 0.1 µm coating is available for finer filtration or to provide a surface to enhance the blowback capability where the particulates may fill the pores of the 2µm element. A 2 µm sintered 316SS filter can be inserted for those applications where the ceramic filter is determined to be unsuitable. Additional filtration materials and pore sizes are available on request.

Blowback air is used to clean the filter element. Compressed air supplied to the blowback assembly needs to be clean and dry (-40 °F/°C recommended). Instrument quality air is preferred. The air pressure should be between 60 and 120 psig (4.1 to 8.3 barg), with 80 psig (5.5 barg) providing the best blowback for the amount of air used. High pressure air fills the accumulator (a 7" (180 mm) diameter SS sphere) and provides a substantial blast when the high flow solenoid valve opens. This dislodges the particles from the filter and moves them back through the probe tube into the sample point. The blowback events should be set to occur before the pressure drop across the filter begins to increase beyond acceptable limits. By installing and monitoring a vacuum gauge ahead of the sample pump, a maintenance interval can be established. This can be as often as every fifteen minutes but should be no less frequently than once per day. The period between blowback cycles can be based on a calculation to estimate the amount of sample required to deposit from three to five grams of solids in the filter element.

Instrument air usage is minimal and is smoothed by the fact that the air accumulator is charged over a length of time through a 1/4" instrument air line. The recharge time could be extended by placing a restriction in the air line if it were desired to reduce the pressure pulses on the instrument air supply and to consume instrument air more smoothly.

The calibration gas (cal gas) is injected into the chamber ahead of the filter. This is as close to the sample source as achievable, which is usually required. A back-pressure check valve (set at 3 psig (0.2 barg)) is provided in the cal gas injection path to ensure that calibration gas does not leak into the sample while the sample is being drawn through the filter.

#### **OPTIONAL COMPONENTS**

**Heated Blowback:** The normal blowback accumulator may be covered by a heating element that maintains the blowback accumulator at approximately 400 °F (200 °C). By heating the air used for blowback, this prevents cooling of the filter during blowback, and thus minimizes the chances for particles trapped in the filter to be cemented into the filter due to moisture.

**Timed Blowback:** A timer may be added to the 270SF probe to control the blowback at a certain frequency. It will require that the blowback solenoid voltage match the probe's supply voltage. The timer is an analog timer, settable using a potentiometer on the card, with a period ranging from 15 minutes to 24 hours.

**Probe Tip Filter Blowback:** A probe tip filter may be purchased and installed separately from the 270SF probe. The 270SF blowback may be used to clean that filter instead of the filter installed in the 270SF. Please note that if the blowback is used on the probe tip filter, it may not be used to clean the 270SF filter.

**NH3 Converter:** An ammonia converter may be incorporated into the probe, for use in measuring ammonia slip. A separate manual provides more detail on the operation of the converter.

**Extended Probe Tube Support:** For long probe tubes, it may be desirable to support the probe tube at a distance from the probe. This prevents the probe tube threads or end from being unduly stressed from the weight of the probe. It is available in 2, 3, 4, or 5 foot lengths. A 270SF probe without an extended probe tube support has a 3 inch (8 cm) support.

**Z-Purge Panel:** For those cases where a 270SF probe is needed in a hazardous location, but probe options need to be used which are not approved for use in hazardous locations (e.g., a blowback timer), a Z-purge can be incorporated into the 270SF probe. This allows for the safe use of general purpose options in the probe by using air to purge the probe enclosure of potentially flammable gases before startup, and to pressurize the probe to prevent the entrance of hazardous gases during operation. The Z-purge panel can be mounted on top or on the side of the 270SF probe.



## 6.0 Installation

The probe tube (AKA stinger, straw, or quill) should be screwed into the 1/2" female NPT fitting accessible from the process side of the mounting flange. To prevent galling, coat the threads with an anti-seize compound. Remove any anti-seize compound from the inner wall of the probe tube before attaching it to the probe. The length of the probe tube should be selected to extend into the center third of the stack; or if the stack diameter is greater than 12', at least 6' into that stack. The studs on the mounting flange should be joined to the sampling nozzle on the stack and the assembly bolted into place.

A heated sample line should be supported close to the Model 270SF. The heated sample line should be fed through the heat shrink boot on the bottom of the enclosure. Connect the sample tube to the center 3/8" compression tubing fitting on the filter. The unheated portion of the sample tube should be kept short and insulated to minimize cooling. Connect the calibration gas line to 1/4" tubing fitting located on the left side of the chamber. It is connected to the chamber via a check valve. If the compressed air line is part of the heated sample line, it should be connected to the 1/4" compression fitting adjacent to the blowback accumulator, near the top of the enclosure. If an external airline is to be used to supply instrument air to the Model 270SF, bring the air into the enclosure through a bulkhead fitting (supplied by others) installed in the wall of the enclosure. Connect the other end of the bulkhead fitting to a tube and route this tube to the 1/4" compression fitting by the blowback accumulator.

Provide power to the terminal block(s) within the stack filter enclosure in the Model 270SF. 125 watts is the minimum power required, but depending on options, up to 500 watts may be required. Power is 115 VAC or 230 VAC, at 50/60 Hz, depending on options chosen. The voltage to be used must be specified at order time. If the filter or enclosure heaters will be customer controlled, note that these must have their own power wires and they may be connected to separate terminals. Customer heater control will require that the power to the power wires feeding these controlled heaters must be turned on and off at the customer end as required to control the temperature of the heaters.



**NOTE: 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 multiple power circuits are used (e.g., due to customer-controlled heaters), each circuit must have its own protection.**



**An independent ground wire should be run to the grounding terminal on the terminal strip. If multiple power circuits are used, each should have its own ground wire.** Ensure the power supplied to the heater matches the heater voltage requirement shown on the serial number tag. The voltage requirement may be changeable (depending on options) by changing the jumpers on the terminal strips (reference terminal strip label or drawings for details).

Connect other wires or tubing as necessary, depending on the options chosen. Refer to current version of the Model 270SF configuration and the current version of the Model 270SF drawings for details.

The final installation step is to ensure that the sample line is insulated completely. Close the cover of the enclosure and secure the latches. After securing the heated sample line, use a heat gun to shrink the entry boot onto the sample line. There is a heat activated glue inside the boot which will aid in sealing the boot to the heated sample line.

## 7.0 Start-Up

Apply power to the Model 270SF. Allow fifteen to twenty minutes for the filter to reach its control temperature. This warm-up period is extremely important to avoid the condensation within the 270SF filter, which may cement the particulates to the filter.

Start the sample pump and determine that the proper amount of sample is being supplied to the instrumentation from the 270SF.

Perform a calibration cycle to ensure that the calibration lines are properly installed and sealed. A flow meter should be installed in the calibration gas supply line to ensure that there is at least 10 percent more calibration gas being supplied to the 270SF than is being withdrawn as sample. This will ensure that the filter and probe are being properly flooded with calibration gas. Excess calibration gas will pass through the probe tube into the stack, and will ensure that only calibration gas, and not stack gas, is being drawn from the probe.

Open the instrument air valve to charge the blowback accumulator. Exercise the blowback valve to insure it is properly wired or plumbed. After a blowback cycle, the presence of a slight pulse on the sample tubing in the analyzer shelter and the temporary dilution of the sample with instrument air is normal and signifies that a blowback cycle has occurred.

The optimum time between blowback cycles is to be determined by experience. Once a day is usually sufficient in relatively clean applications. The requirement could be as frequent as every fifteen minutes where the dust and soot levels are severe. It is better to blowback too often than not often enough. A vacuum gauge in the sample line can be helpful to indicate if the particulate loading of the filter has started to restrict the flow of sample. The blowback cycle should be initiated before unacceptable pressure drop occurs.

## 8.0 Shutdown

Before removing power from the unit, ensure filter chamber has been purged of any potentially hazardous components.

To purge the chamber, perform the following:

1. If equipped, perform a manual blowback operation.
2. Using instrument air or other inert gas, flow ~10 l/m for 15-30 minutes through the filter chamber. This gas can be routed through the chamber via the calibration gas line. Continue operating the sample pump while the inert gas is flowing to the probe.
3. Close the filter isolation valve, if installed.
4. Turn off the sample pump, or disconnect the sample line.

After the filter chamber has been purged, follow the maintenance procedure to change the filter.

Cap the sample outlet tube connection and disconnect power from the unit.

Note: If electrical wires are to be disconnected, follow applicable 'Lock Out/ Tag Out' requirements.

## 9.0 Maintenance

### CHANGING THE FILTER



**CAUTION: THIS PROCEDURE CAN CAUSE SEVERE BURNS. USE PROPER PROTECTION.**

Changing the filter in the Model 270SF is extremely easy. Using gloves to protect the hand from heat, grasp the cap on the end of the filter body opposite the probe and turn it counterclockwise. A screwdriver or other appropriate tool may be inserted through the hole on the side filter cap to loosen the cap. The cap may be hot and may cause burns if protection is not used.

Removing the cap also removes the filter. There is an O-ring at the far end of the filter, which will remain inside the filter chamber when the cap and filter are removed. Use an appropriate tool to remove the O-ring from the filter chamber.

Remove the filter from the cap. It may help to use a twisting motion when removing the filter. Inspect the O-rings at each end of the filter to ensure they are still elastic and will seal the filter. Replace the O-rings if they are charred, deformed, or no longer flexible.

Install the new filter into the cap. Once again, a twisting motion may make this easier. Ensure that the filter is straight in the cap, and carefully insert it and the filter base O-ring into the filter chamber. Screw the cap onto the filter body. Do not use any tool to tighten the cap. The filter replacement procedure is complete.

## 10.0 Troubleshooting

The following table gives an overview of possible issues and instructions to check and to repair them.

<b>Error</b>	<b>Possible reason</b>	<b>Check/Repair</b>
No sample gas flow	Filter element plugged	Check/ replace filter element
	Filter chamber exit port plugged	Remove filter element and inspect exit port. Exit port will be located at 0° or 180° from the top, depending on configuration
Low temperature alarm	Insufficient warm-up time	Ensure power has been applied to the unit for a minimum of 15 minutes
	Power disconnected	Ensure power is supplied to the unit. Check by measuring for AC voltage on TB1-1 & 2
	Control switch defective	Verify by measuring for a closed circuit between TB1-1 & 4
High oxygen readings/ low pollutant readings	Leak	Leaking past the filter cap O-ring: Remove filter element using the filter change instructions. Inspect the O-ring under the filter cap by removing the 3 screws in the top of the cap and removing the aluminum section from the filter cap plug. The O-ring under the aluminum cap should be pliable, undamaged, and seated in its groove. Replace the O-ring if necessary.
		Leaking blowback solenoid valve: Block or disconnect the blowback supply and look for a change in the analyzer readings.
		Loose connection: Verify all fittings are tight and leak free
Low readings during calibration	Insufficient calibration gas flow	Ensure calibration flow is at least 110% of the sample gas flow

## 11.0 Drawings and Spare Parts

For the current revision of all Model 270SF drawings and spare parts, visit the Universal Analyzers website.

<https://www.universalanalyzers.com/>

Navigate to: Products -> Gas Sample Probes -> Model 270SF

Links to all current drawings and spare parts for standard probe configurations are provided at the bottom of the page.

## 12.0 Standard Terms & Conditions of Sale and Warranty

THE FOLLOWING TERMS/CONDITIONS, TOGETHER WITH ANY OTHER TERMS/CONDITIONS SPECIFICALLY AGREED TO IN WRITING BY SELLER, SHALL APPLY TO ALL ORDERS ("Order(s)") FROM, AND SALES OF PRODUCTS ("Products") OR SERVICES ("Services") TO BUYER. ANY ACCEPTANCE OF ANY ORDER OF BUYER IS CONDITIONED UPON THESE TERMS/CONDITIONS. ANY ADDITIONAL OR DIFFERENT TERMS/CONDITIONS PROPOSED BY BUYER IN ANY DOCUMENT ARE OBJECTED TO AND SHALL NOT BE BINDING UPON SELLER. No salesperson is authorized to bind Seller to any promise or understanding not expressed herein.

### I. PRICES

All prices are subject to change without notice in the event of any changes in cost of materials or labor, specifications, quantities, delivery schedules, customs duties, other factors beyond Seller's control, or in the event of delays caused by instructions of the Buyer, or failure of the Buyer to give Seller adequate information. Further, prices payable by the Buyer shall be subject to immediate increase, should the Seller as a result of governmental action or regulation including, without limitation, those contemplated by an investigation under Section 232 of the Trade Expansion Act of 1962 (19 U.S.C. §1862), incur additional duties, tariffs or restrictions on products sold hereunder, or on the raw materials that are used in making such products. In no event shall prices include any amounts imposed on the Buyer in connection with Buyer's purchases from Seller, such as taxes, including but not limited to Value Added Tax (VAT) or excise taxes, duties, tariffs, or any other costs assessed against the Buyer by a governmental authority.

### II. DELIVERY

Delivery dates are approximate and are dependent on prompt receipt by Seller of all necessary information. Seller may deliver all or any part of Products/ Services as early as 30 days in advance of agreed schedule. The point of delivery shall be "Exworks" Seller's premises, unless otherwise specified by Seller. Upon delivery, title to Products and all risk of loss or damage thereto shall pass to Buyer. Where Buyer notifies Seller that it cannot take timely delivery of the Products, Seller may place such Products in storage, at the risk of Buyer, and Buyer shall reimburse Seller for all expenses incurred in connection with such storage. Buyer shall dispose of the packing materials for Products at its own expense, and shall defend, indemnify and hold harmless Seller from any legal obligations in connection with such packing waste.

### III. PAYMENT

A. The term of payment shall be net 30 days from date of Seller's invoice, unless otherwise specified. Payments shall be made by Buyer without any deduction or set-off. Unless otherwise agreed, payment shall be made in U.S. dollars. Seller may charge late payment fees at the rate of 1.5% per month, or the highest rate permitted by law, whichever is less, accruing daily.

B. If the financial condition of Buyer is unsatisfactory to Seller, Seller may require full or partial payment in advance, or satisfactory security, in the form of a letter of credit or otherwise. In the event of bankruptcy or insolvency of Buyer, Seller may immediately cancel any Order then outstanding.

C. Buyer grants Seller a purchase money security interest in Products located in the United States, or Services, as well as any proceeds, for the purpose of securing the obligations of

Buyer hereunder. Buyer authorizes Seller to execute on Buyer's behalf and file such financing statements as Seller deems appropriate to perfect and notify Buyer's creditors of Seller's security interest.

### IV. VARIATIONS IN QUANTITY; CHANGES.

Buyer shall accept delivery of quantities greater or smaller than the quantity specified in Order(s), provided that any such variation shall not exceed 5% of the quantity originally specified, or 2 units, whichever is greater. Seller shall not be required to give notice of any such variations other than in the applicable shipping notice and invoice. Seller reserves the option to make changes to Products or Services which do not affect form, fit, or function, and shall deliver Products to the latest configuration part number at the time of delivery.

### V. EXPORT CONTROLS; FCPA; ANTI-BOYCOTT

A. Buyer shall not make any disposition of the Products, by way of transshipment, re-export, diversion or otherwise, except as applicable U.S. export laws and regulations may expressly permit, and other than in and to the ultimate country of destination specified on Order(s) or declared as the country of ultimate destination on Seller's invoices or in the End Use Statement that Buyer supplies Seller. Seller shall not be named as shipper or exporter of record or U.S. principal party-in-interest (USPPI) unless specifically agreed to in writing by Seller in which case, Buyer shall provide Seller with a copy of the documents filed by Buyer for Export clearance purposes. At Seller's request, Buyer shall supply end-use and end-user information to determine export license applicability. Failure of Buyer to comply with this section shall constitute a material default allowing Seller to cancel related Order(s) without liability.

B. Buyer warrants that it shall not violate or cause the Seller to violate the U.S. Foreign Corrupt Practices act of 1977 (FCPA), as amended, the United Kingdom Bribery Act (UKBA) of 2010, as amended, or their respective implementing regulations in connection with Buyer's sale or distribution of the Products and/or Services, and that Buyer does not know or have reason to believe that any consultant, agent, representative or other person retained by Buyer in connection with the sale and/or distribution of Products/Services has violated, nor caused Seller to violate the FCPA and/or the UKBA. Where Buyer learns of or has reason to know of any violation of FCPA and/or UKBA in connection with the sale or distribution of Products/Services, Buyer shall immediately advise Seller.

C. Buyer further warrants that Buyer shall not violate or cause Seller to violate the U.S. Antiboycott Provisions of the U.S. Export Administration Regulations issued pursuant to the U.S. Export Administration Act of 1979, as amended, in connection with Buyer's purchase of Products/Services and that Buyer shall not request or require Seller to make statements or

certifications against countries that are not subject to boycott by the U.S.

## **VI. WARRANTIES**

A. Seller warrants that Products manufactured by Seller, when delivered, shall be free from defects in material/workmanship. Seller warrants that Services shall be performed in accordance with generally accepted industry practice. Seller's obligations under this warranty shall be limited exclusively to repairing or replacing, at Seller's option, any part of Products which, if properly installed, used and maintained, proved to have been defective in material or workmanship within 1 year from the date of shipment or re-performing the Services. Seller warrants for a period of 1 year from the date of shipment that software or firmware, when used with Products, shall perform in accordance with Seller's published specifications. Seller makes no warranty, express or implied, that the operations of the software or firmware shall be uninterrupted or error-free, or that functions contained therein shall meet or satisfy the Buyer's intended use/requirements. Buyer shall notify Seller of any defect in the quality or condition of Products (including software/firmware) or Services within 7 days of the date of delivery or performance, unless the defect was not apparent on reasonable inspection, in which case, within 7 days after discovery of the defect. If Buyer does not provide such timely notification, it shall not be entitled to reject Products (including software/firmware) or Services, and Seller shall have no liability for such defect.

B. Seller's warranty obligations shall not apply to Products which (1) have been altered or repaired by someone other than Seller, or (2) have been subjected to misuse, neglect, or improper use or application, or (3) are normally consumed in operation, or (4) have a normal life inherently shorter than the warranty period stated therein.

C. No Products may be returned unless authorized in advance by Seller, and then only upon such conditions to which Seller may agree. Buyer must obtain a Return Material Authorization (RMA) number from Seller prior to any return shipment, and such RMA number must appear on the shipping label and packing slip. Buyer shall be responsible for returned Products until such time as Seller receives the same at its facility, and for all charges for packing, inspection, shipping, transportation or insurance associated with returned Products.

D. This section VI sets forth the exclusive remedies and obligations for claims based upon defects in or nonconformity of Products/Services, whether the claim is in contract, warranty, tort (including negligence of any degree or strict liability) or otherwise. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED OR STATUTORY. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY.

## **VII. PATENTS/INDEMNITY**

If Buyer receives a claim that Products, or part thereof manufactured by Seller infringes a patent, Buyer shall notify Seller promptly in writing and give Seller information, assistance and exclusive authority to evaluate, defend and settle such claim. Where Buyer has furnished specifications/designs for the manufacture of the allegedly infringing Products, Buyer shall defend, indemnify and hold harmless Seller against third-party claims for infringement arising out of Seller's use of such specifications/designs.

## **VIII. LIMITATION OF LIABILITY**

The total liability of Seller on any claim, whether in contract, tort (including negligence of any degree and strict liability) or otherwise arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair, replacement or use of any Products/Services, shall not exceed the price allocable to the Products/Services or part thereof which gives rise to the claim. IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT, WARRANTY, TORT, (INCLUDING NEGLIGENCE OF ANY DEGREE, STRICT LIABILITY OR PATENT INFRINGEMENT) OR OTHERWISE, SHALL SELLER, ITS AFFILIATES, SUBCONTRACTORS, OR SUPPLIERS BE LIABLE FOR ANY LOSS OF PROFIT OR REVENUES, LOSS OF USE OF THE PRODUCTS OR SERVICES, OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES, SERVICES OR REPLACEMENT POWER, DOWNTIME COSTS OR CLAIMS OF BUYER'S CUSTOMERS FOR DAMAGES OR FOR ANY SPECIAL, PROXIMATE, CONSEQUENTIAL, INCIDENTAL, INDIRECT OR EXEMPLARY DAMAGES. If Buyer transfers title to, or leases Products sold hereunder to, or otherwise permits or suffers use by, any third party, Buyer shall obtain from such third party a provision affording Seller and its subcontractors/suppliers the protection of the preceding sentence. Any action against Seller must be brought within 18 months after cause of action accrues.

## **IX. EXCUSABLE DELAYS**

A. Seller shall not be liable for delays in delivery or failure to perform due directly or indirectly to causes beyond Seller's reasonable control including but not limited to: acts of God; war; terrorism; civil commotion; riots; embargoes; government regulations, orders, instructions or priorities; port congestion; acts of or failure to act on the part of Buyer or its agents/employees; fires; floods; sabotage; nuclear incidents; earthquakes; storms; epidemics; strikes; lockouts or other labor difficulties; shortages of or inability to timely obtain proper labor, materials, components, shipping space or transportation, fuel, supplies or power at current prices; or due to limitations imposed by the extent of availability of Seller's normal manufacturing facilities.

B. If a delay excused per the above extends for more than 90 days and the parties have not agreed upon a revised basis for continuing providing Products/Services at the end of the delay, including adjustment of the price, then either party (except where delay is caused by Buyer, in which event only Seller) upon thirty (30) days' notice may terminate the Order with respect to the unexecuted portion of the Products/Services, whereupon Buyer shall promptly pay Seller its reasonable termination charges upon submission of Seller's invoices thereof.

## **X. SOFTWARE/TECHNICAL/PROPRIETARY INFORMATION**

A. Buyer shall not acquire any rights to any software which may be delivered with Products, except as granted in Seller's standard software license. Any software license granted in connection with Products shall be an interim license, which may be withdrawn, pending payment for Products in full.

B. The purchase of Products shall not include any right to supply of technical information such as drawings or specifications.

C. Proprietary information, including drawings, documents, technical data, reports, software, designs, inventions and other technical information supplied by Seller in connection herewith



(hereinafter called "Data"), shall remain Seller's sole property and shall be held in confidence by Buyer. Data shall not be reproduced, used or disclosed to others by Buyer without Seller's prior written consent. Upon completion of Order, Buyer shall promptly return all Data to Seller together with all copies or reprints thereof then in Buyer's possession or control, and Buyer shall thereafter make no future use, either directly or indirectly, of any Data or any information derived therefrom without Seller's prior written consent. The foregoing shall in no way obligate Seller to provide or supply Data.

#### **XI. DIES, TOOLS, PATTERNS**

Seller's charges for dies, molds, patterns and the like represent the Buyer's proportionate cost thereof, it being expressly understood that they remain the property of Seller.

Modifications made to dies, molds, patterns and the like in order to manufacture Products shall be at the discretion of Seller.

#### **XII. GENERAL**

A. The rights and obligations of the Buyer and Seller hereunder shall be governed in all respects by the law of the Commonwealth of Pennsylvania, U.S.A. The exclusive forum for adjudication of any disputes shall be the federal or state courts of the Commonwealth of Pennsylvania, and Buyer/Seller hereby consent to personal jurisdiction and venue in such courts in any proceeding. The United Nations Convention on the International Sale of Goods shall not apply.

B. These Terms and Conditions of Sale together with any other terms specifically agreed to in writing by Seller constitute the entire agreement between Buyer and Seller and supersede any prior or contemporaneous representations, agreements, proposals, warranties, or understandings, oral or written, express or implied. No waiver, modification, amendment, rescission or other change to these Terms and Conditions of Sale shall be binding unless specifically agreed to in writing by an authorized representative of Seller.

C. The invalidity, of any part hereof shall not affect the validity of the remainder. The failure of Seller to assert any right at any time hereunder shall not prevent Seller's subsequent assertion of the same or different rights.

D. Buyer may not assign this contract without the prior written approval of the Seller.

#### **XIII. PROHIBITION FOR HAZARDOUS USE**

Products sold hereunder are not intended for application in, and shall not be used by Buyer in construction or application of a nuclear installation or in connection with use or handling of nuclear material or for any hazardous activity or critical application, where failure of a single component could cause substantial harm to persons or property, unless Products have been specifically approved for such activity or application.

Seller disclaims all liability for loss or damage resulting from such unauthorized use and Buyer shall defend, hold harmless and indemnify Seller against any such liability, whether arising under breach of contract, warranty, tort (regardless of the degree of fault or negligence), strict liability or otherwise.

Where Seller approves the application of the Products in a nuclear facility, the Buyer shall, before such use or provision, arrange for insurance or governmental indemnity protecting the Seller against liability and hereby releases and agrees to indemnify the Seller and its suppliers for any nuclear damage, including loss of use, in any manner arising out of a nuclear incident, whether alleged to be due, in whole or in part to the negligence or otherwise of the Seller or its suppliers.

#### **XIV. STATUTORY REQUIREMENTS**

Seller reserves the right to make any changes in the general specifications of the Products which are required for the Products to conform to any statutory requirement.

#### **XV. GOVERNMENT CONTRACTS**

Only Federal Acquisition Regulation ("FAR") supplement clauses expressly accepted in writing by Seller shall be included or incorporated by reference herein. Seller shall not be bound by and makes no representation of compliance with any FAR or FAR supplement clauses that Seller shall not have expressly accepted in writing.