



Model 728DCD

Dilution Probe Controller

Instruction Manual



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1.0 Receiving and Storage

The Universal Analyzers Model 728 Dilution Probe Controller Drawer is a completely 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 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.

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 of all Model 728 product configuration, visit the Universal Analyzers website.

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

Navigate to: Products -> Gas Sample Probes -> Model 728

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

4.0 Specifications

OPERATING SPECIFICATIONS	
Dilution Air Flow Rate Range	5 to 15 l/m
Dilution Air Pressure Range	20 to 80 psig (1.4 to 5.5 barg)
Dilution Air Dew Point	-40°F/°C
Dimensions	10 1/2" Hx19" Wx21 3/8" D (267mm x 483mm x 543mm)
Weight	25 lbs (11.3kg)
Operating Connections Provided	Dilution air inlet Dilution air to sample probe Diluted sample from sample probe Cal gas inlet (6 maximum) Sample/Cal gas outlet to analyzer bank Vacuum gauge line inlet to monitor Condition of eductor
MATERIAL SPECIFICATIONS	
Chassis	Aluminum
Block and Bleed Manifold	316SS
Cal Gas Regulator	316SS
Solenoid Valve Wetted Parts	316SS with Viton o-rings
Internal Tubing	PTFE Teflon

5.0 Description and Principle of Operation

DESCRIPTION

Dilution air having a low water dew point and clean of any of the measured components is to be provided to the Dilution Air Inlet at a pressure of up to 100 psig. A precision regulator adjusts the pressure and flow rate to a value that provides the eductor in the Dilution Probe with enough vacuum to create a sonic flow of sample through the Critical Orifice in the Dilution Probe to be diluted by the Dilution Air. The resulting diluted sample is carried back to the Sample Inlet in the Dilution Control Drawer to pass through the flow meters to be carried to the bank of Analyzers.

A bank of solenoid valves (up to six allowed) mounted to a manifold is provided to introduce Cal Gas through a block and bleed valve. Then the calibration gas goes through a pressure regulator and flow meter up to the probe. If the block and bleed valve is energized the sample would be sent through the Cal Gas Outlet to the Probe to calibrate the entire sample system. Drawing P1144, Sheet 2 de-energized as shown. In order to send cal gas directly to the analyzers, SV11 and SV3-SV9 (only one) should be energized.

A needle valve is provided on each of the flow meters that run to an analyzer to throttle flow. There is no needle valve on the bypass and the cal gas lines. A dilution system must be maintained at **AMBIENT PRESSURE AT ALL TIMES!** If your system is malfunctioning check that the system is not pressurized for any reason.

A vacuum tap inlet from the dilution eductor in the probe is provided to allow the operator to watch the action of the eductor. If the eductor fails, the vacuum gauge indicates a drop back close to atmospheric pressure. This should be relatively constant. If not that indicates a blockage or that they system is being pressurized.

APPLICATION

The Model 728 Dilution Probe Control Drawer is designed to control the pressure of dry dilution air to a Dilution Extractive Probe and to indicate the flow rate of that dilution air. Provision are made for feeding any one of up to six calibration gasses directly to the Dilution Probe to serve as a total system calibration check.

The Model 728 Dilution Probe Control Drawer used along with a Dilution Extractive Probe, and dilution air cleanup kit, makes up a complete Sample Conditioning System for a CEMS Installation. Analyzers having appropriate sensitivity for the dilution ratio used in the Dilution Probe and Cal Gas bottles make up the balance of the CEMS Installation. Note that dilution analyzers require a pump inside of them. They are designed to be bypassed around and draw their own sample using the internal pump. Use care when purchasing an analyzer to ensure it is the correct one for your dilution system.

6.0 Installation



TO COMPLY WITH HAZARDOUS AREA STANDARDS, UNIT MUST BE INSTALLED IN A MINIMUM IP54 ENCLOSURE AND PROTECTED FROM DUST/ WATER INGRESS. ADEQUATE VENTILATION MUST BE PROVIDED FOR DISSIPATION OF A MINIMUM OF 1200 BTU/HR (1265 KJ/HR)

The Controller should be mounted in a 19" relay rack or placed on a shelf in view of and handy to be adjusted by the operator of the CEMS facility.

The wiring from the solenoid valves should be connected to the PLC, data logger, or Analyzer's as required to operate the appropriate solenoid to control the flow of calibration gas and sample flow.

A source of dry, purified dilution air should be provided (dew point below -30°C) and brought to the Dilution Air Inlet fitting on the Controller. A line from the Dilution Air Outlet should be connected to the inlet of the Eductor in the Dilution Probe.

The Cal Gas Outlet fitting on the Controller should be connected to the Cal Gas Inlet fitting on the Dilution Probe.

The Sample Inlet fitting on the Controller should be connected to the outlet of the Dilution Eductor supplied as part of the Dilution Probe.

The Vacuum Tap Inlet fitting on the Controller should be connected to the vacuum tap on the Dilution Eductor supplied as part of the Dilution Probe.

Calibration gasses, span and zero gas, should be connected from the cal gas tank regulators as part of the tank manifold assembly associated with the gas bottles to the Calibration Gas fittings, CG1 through CG6 or as many calibration gasses as are provided (up to a total of 6).

7.0 Start-Up

Apply power to the Special Dilution Probe. Allow an hour for the enclosure to come up to temperature and stabilize. This warm-up period is extremely important to avoid the presence of condensation within the Swirkllean filter. Condensation within a filter causes the particles to be cemented to the filter surface.

Open the dilution air valve SV2 by flipping the dilution motive air switch to enable. Note that if that switch is disabled or a low temperature condition exists (Temperature controller on drawer is being used) then the valve will not open. Adjust the pressure to 50 psig (3.4 Bar) at the start to produce a vacuum within the eductor. Monitor the vacuum produced by observing the vacuum gage connected to the Dilution Probe Controller.

Select your zero-gas using the selection switch. When the analyzer is lined out, adjust the zero on the analyzer.

Select your span gas using the selection switch. Determine from a ratio of the indicated concentration on the analyzer and the actual concentration of the span gas what dilution ratio is being provided by the Dilution Probe. The dilution ratio can be adjusted by varying the pressure of the dilution air control regulator. A higher pressure will increase the flow of air and provide a higher dilution ratio. A lower pressure will decrease the flow of dilution air and reduce the dilution ratio. When the dilution ratio is judged to be satisfactory, (great enough to ensure no condensation will occur in the sample line), the span control on the analyzer can be adjusted to the desired value for reporting purposes.

8.0 Shutdown

All that is generally required is the power entry module be switched off to perform maintenance or repairs on the drawer. It is recommended the power cord be removed from the back as well as a separate safety precaution. If performing any operations on the air side of the systems you should secure those air flows to the drawer.

9.0 Maintenance

The only periodic maintenance required should be to blow any dust out of the drawer every 6 months. The rest of the equipment is tested by already performing your system calibrations.

10.0 Troubleshooting

As mentioned in the product description, there are very few faults that can happen to the dilution drawer. The most likely being a leak due to a O-Ring, a faulty relay, or a faulty solenoid. If the desired value cannot be obtained you likely have a leak somewhere or your motive air isn't at the correct pressure. Refer to the 275HD manual for dilution air pressure vs dilution ratio graphs.

If you are still obtaining incorrect readings check the vacuum gauge for any potential blockages or that the educator is not achieving sonic flow.

If your system is not vented to atmosphere then you will have issues that cannot be easily explained with an electrical fault or failed regulator.

11.0 Drawings and Spare Parts

For the current revision of all Model 728DCD drawings and spare parts, visit the Universal Analyzers website.

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

Navigate to: Products -> Gas Sample Probes -> Model 728DCD

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 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.