

Durag Model HM-1400 TRXC HgCEMS



HM-1400 TRXC HgCEMS

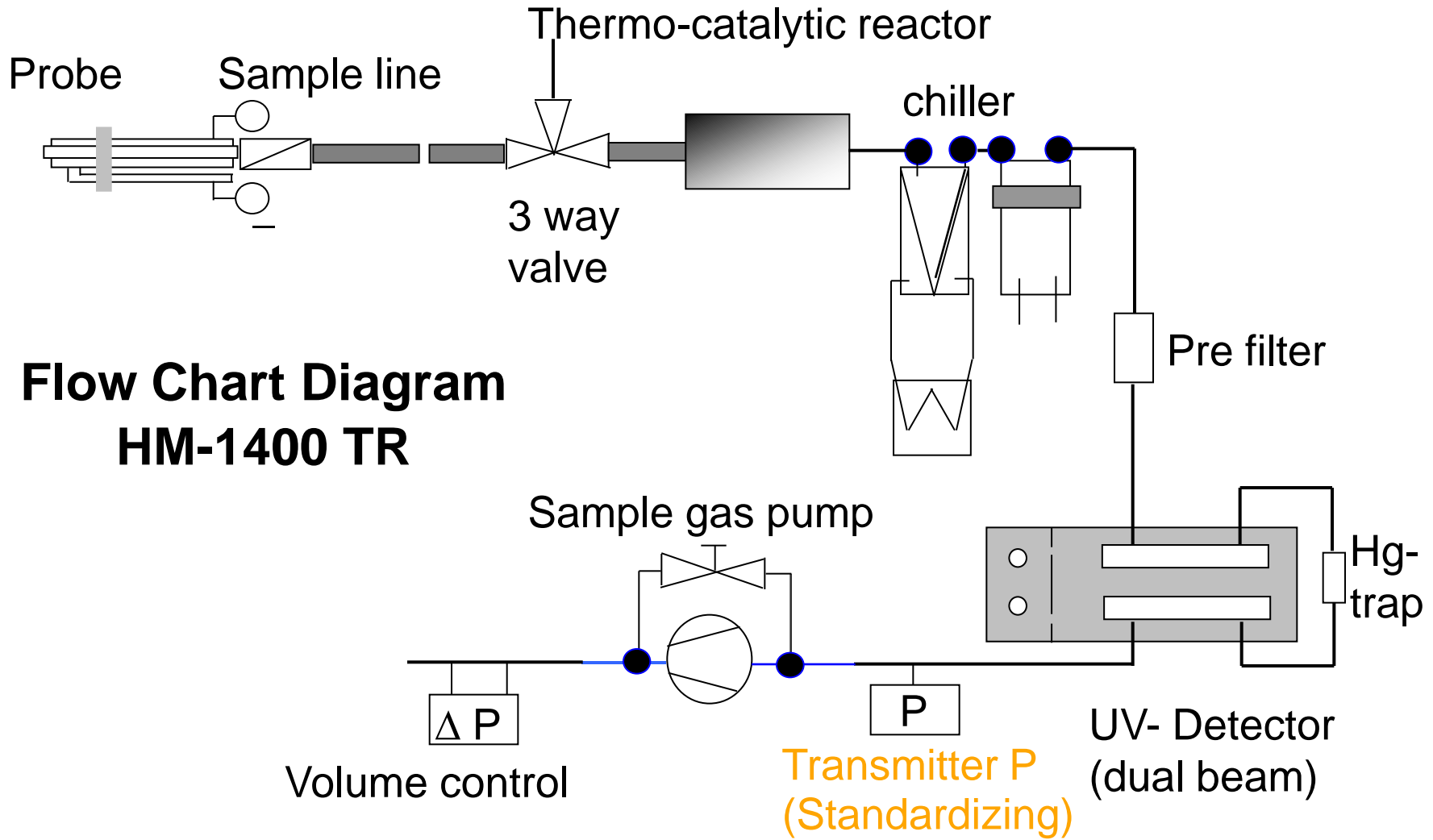


- Extractive principle
- Certified Hg⁰ Calibration Gas bottle daily cal-checks
- Detection of Hg⁰ by dual beam photometer
- Operation by help of keypad with text messages
- Cabinet design, easy to use, simple exchange of components easy access
- PLC control

HM-1400 TRXC HgCEMS

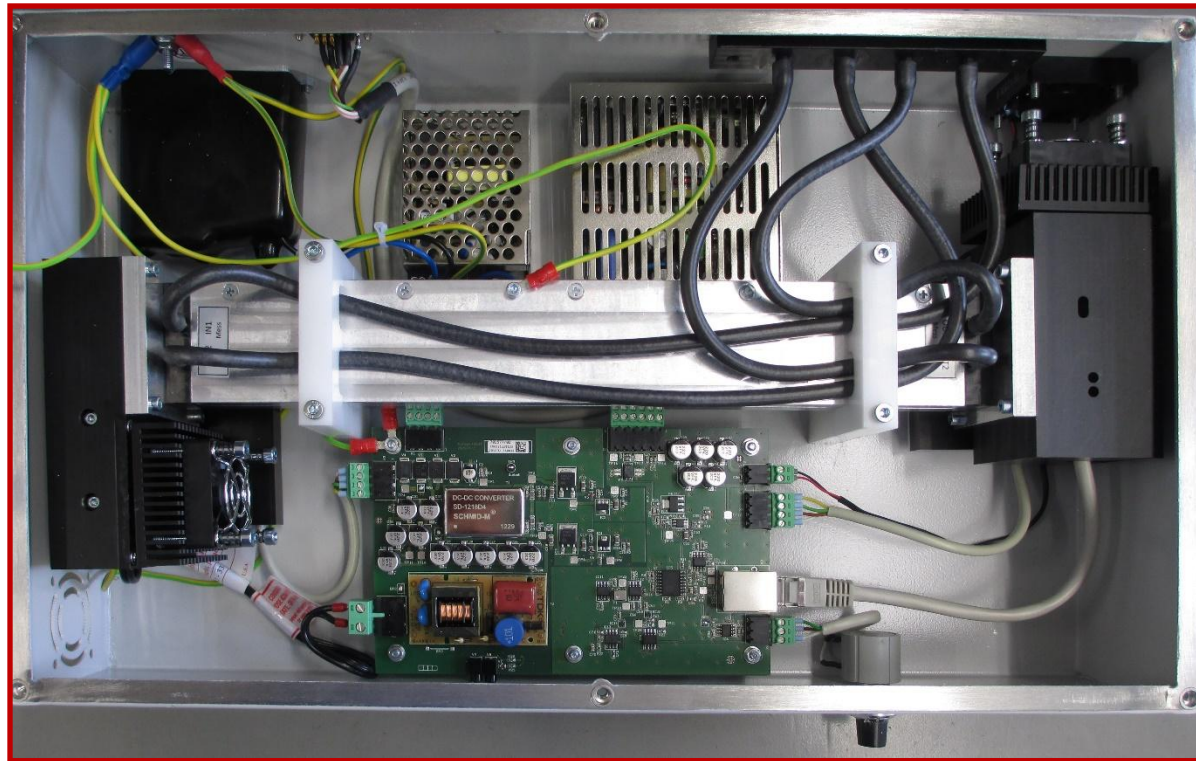
Model	Use	Description	Features
HM-1400TRXC	Continuous mercury emissions monitoring for cement, power, industrial or Superfund sites	Direct extraction to a dry cold vapor atomic absorption and UV photometer First HgCEMS to use certified bottled Hg ⁰ Calibration Gas	Control module interface via MODBUS, TCP/IP; minimal maintenance; EPA protocols for compliance/calibration; switchable ranges

HM-1400 TRXC HgCEMS



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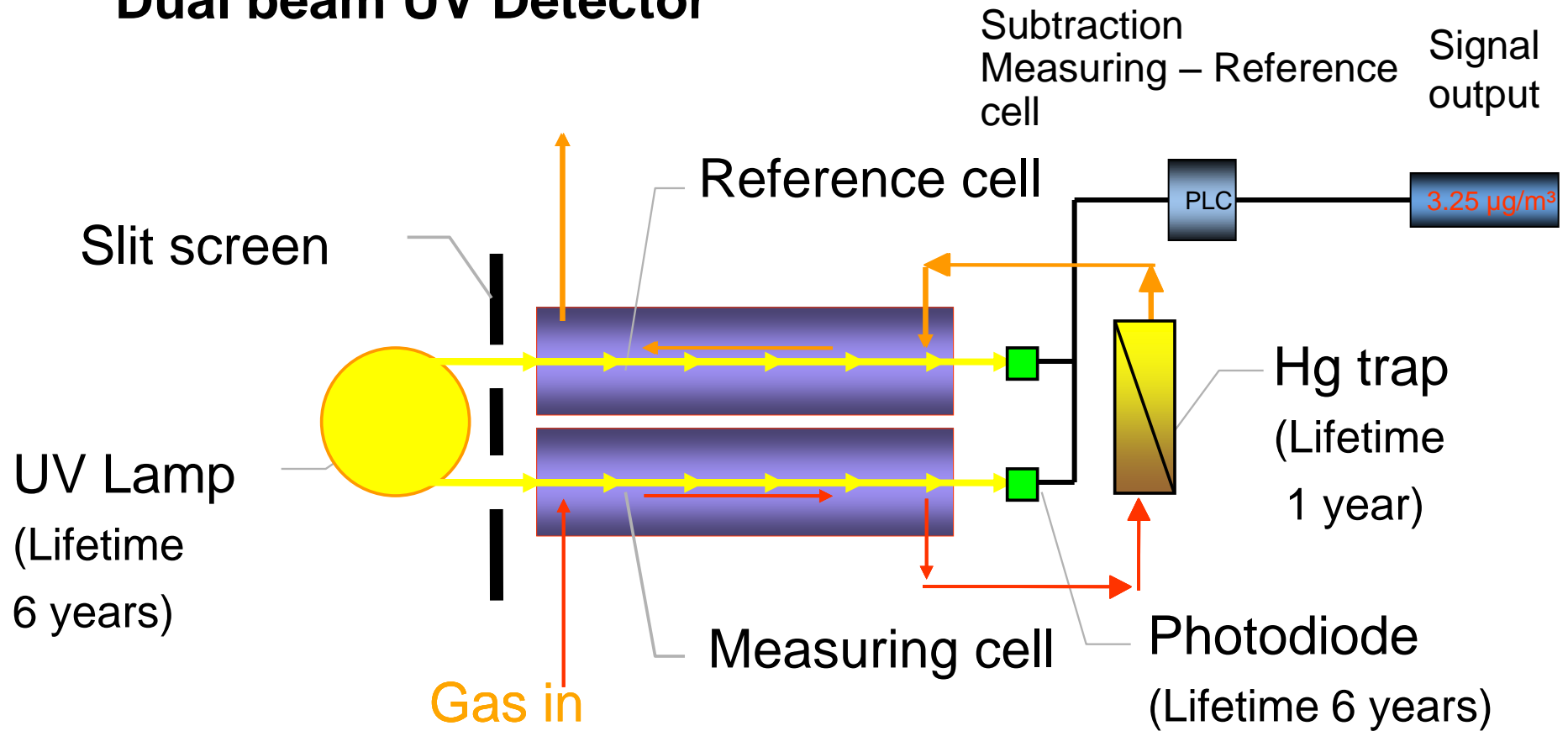
Photometer



Dual Beam Detector View

HM-1400 TRXC HgCEMS

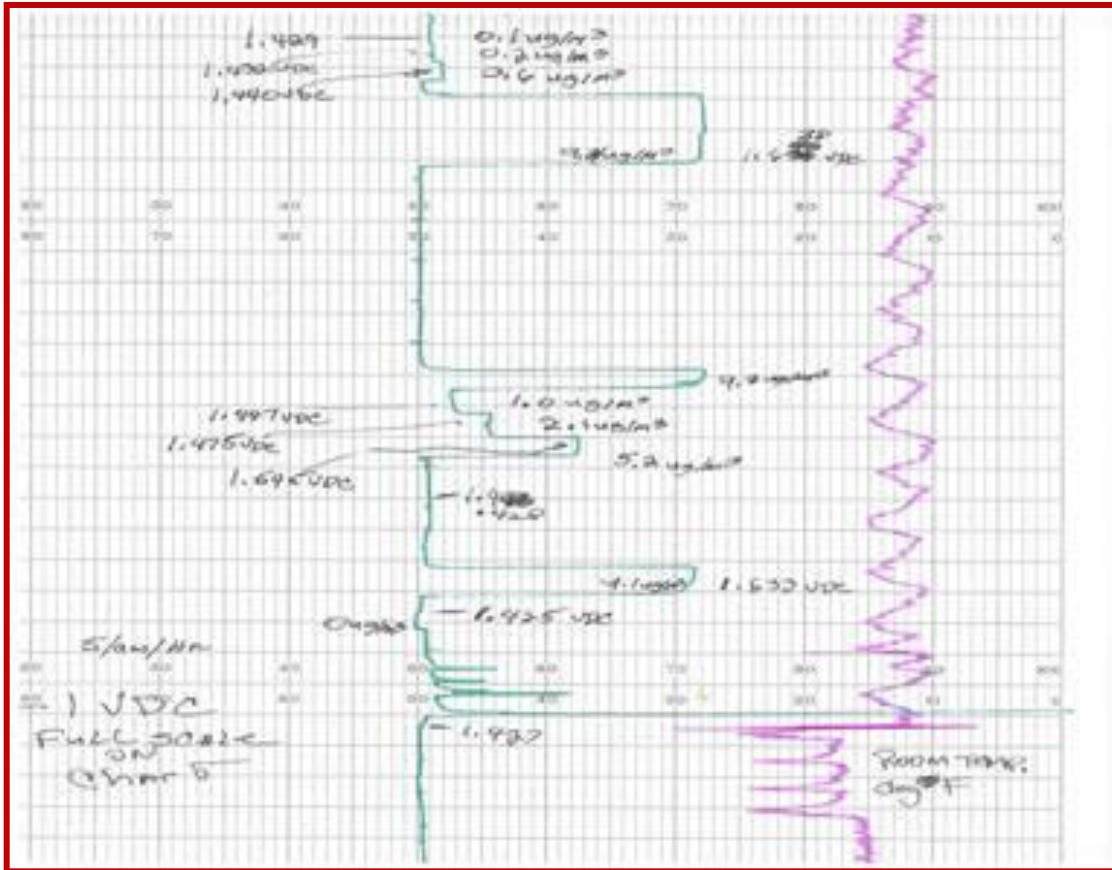
Photometer Dual beam UV Detector



HgCEMS with certified Hg⁰ bottles and supply system

- The principle of using Calibration gas has been in use since the inception of CEMS (and the EPA).
 - With respect to Hg⁰ Calibration Gas, over the last 7 years there has been significant work done in the specialty gas bottle market.
 - A breakthrough in mid-2013 for a stable Hg⁰ gas that meets EPA and NIST accuracies and shelf life
- HgCEMS has been developed that is designed specifically to use Gas bottles.
 - The overall costs, initial and operational shall be lower with drastically reduced risk of lost or no data.

Bottle Calibration Gas Tests



- The testing shows that using certified bottled calibration gas is much more stable than the Hg^{++} to Hg^0 calibrator.
- The results from this has shown stable, repeatable measured values as low as 0.1 ug/m^3 .
- In addition, we ran 2 additional tests:
- Tests were run to check for cross sensitivity effects from SO_2 .
 - We ran the spectrum from 0.1 ug/m^3 - 9.0 ug/m^3 with SO_2 levels at 200ppm and 300ppm with no effects to the Hg value.
- A quarterly Calibration Gas Audit (CGA) as defined by USEPA was run on the photometer based on a scale of 0 - 10 ug/m^3 and the unit passed without difficulty.
 - using values of 2.0 ug/m^3 ,
 - 5.0 ug/m^3 and
 - 9.0 ug/m^3

Universal Analyzer Hg Probe System



- 275E Extraction Probe w/
 - SN-316 Stainless Steel w/ SilcoNert® Coating < 400°F (204°C)
 - TK-T/C Only (Type K) For Remote Control
 - 4in Flange
 - Standard “Cannon Shot” Blowback
 - 3in Boot (Standard) - 2.75-2.9 (69.8mm-73.5mm) Dia. Flood Cal (Standard)
 - 115-115 VAC 50/60 Hz
 - Failsafe (Standard) HK-Integrated HPA with Type K T/C for Remote Control
 - Filter Element, Sintered Titanium, (9" Long)

Universal Analyzer Hg Probe Tube



- Heated Probe Assembly
 - 6SX - 6 FT 316SS Heated Probe, w/ Titanium Inner Tube - (Stack Temp < 750°F)
 - 4 Inch Flange
 - 115 - 115 VAC 50/60 Hz
 - Remotely Controlled

Universal Analyzer HMI/PLC Sample System Controller

- PLC Enclosure
 - Probe Temperature Control (Type-K TC Input)
 - Heated Probe Tube Temperature Control (Type-K TC Input)
 - Combustion Chamber Temperature Control (Type-K TC Input)
 - Heated Sample Line Temperature Control (Type-K TC Input) (w/ GFCI Circuit)
 - Blowback Control
 - Includes Associated Solid State Relays



O'Brian Sample Line

- Pre-insulated sample tube bundle with SV47 jacket
- Heated: Quantity (1) 3/8" x 0.062" and (1) 1/4" x 0.040" wall, PFA tubes
- Unheated: Quantity (3) 1/4" x 0.040" wall, PFA tubes
- 18 watt/ft. zone style constant power density, CPD,
 - cable rated for 208 V nominal (200-216 VAC)
 - Maximum controlled temperature of 400°F/204°C
 - Type K thermocouple located 50 ft. in from the power end
 - Quantity (9) 14 gauge TFE 204C rated wires (color coded)
 - Quantity (4) 18 gauge TFE 204C rated wires (color coded)
 - Quantity (3) 18 gauge type K shielded messengers
- Ambient Conditions
 - LOW Ambient Temp with 25 MPH (40 kph) wind: . . . -20° F
 - HIGH Ambient Temp with 10 MPH (16 kph) wind: . . . 104° F
 - Process Temperature at LOW ambient: 388° F
 - Process Temperature at HIGH ambient: 597° F
 - Operating Voltage: 208 VAC
 - Max Inlet Temperature: 400° F
 - Max Current Draw: 139/15 Amps



Universal Analyzer 500 Series Gas Cooler



- Two (2) 5" heat exchangers
 - Titanium
- One or two gas streams
- Flow rates from 1 – 5 l/m STP
- Digital display
- Adjustable temperature set point
- Stable dew point
- On-board electronics for liquid sensor

AirGas Specialty Gas Division

Cylinders:

- AirGas Hg⁰ certified gas meets 40CFR Part 63; Appendix-A, section 3.1.4:
 - “NIST-Traceable Elemental Hg Standards means either: compressed gas cylinders having known concentrations of elemental Hg, which have been prepared according to the “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards”; or calibration gases having known concentrations of elemental Hg, produced by a generator that meets the performance requirements of the ‘EPA Traceability Protocol for Qualification and Certification of Elemental Mercury Gas Generators’ or an interim version of that protocol.”
- Handling the cylinders is the same as handling other low concentration, reactive EPA protocols (i.e. NO, NO₂, SO₂, H₂S, CO) are now.
 - The gas cylinders are easy to transport from site to site. More tests can be performed in a day.



AirGas Specialty Gas Division

CERTIFICATE OF ANALYSIS
Grade of Product: CERTIFIED STANDARD-SPEC

Part Number: X02N09C15A7XJ0 Reference Number: 82-124425045-1
 Cylinder Number: CC501977 Cylinder Volume: 130.0 Cubic Feet
 Laboratory: ASG - Riverton - NJ Cylinder Pressure: 1800 PSIG
 Analysis Date: Mar 14, 2014 Valve Outlet: 600
 Lot Number: 82-124425045-1

Expiration Date: Sep 14, 2014

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
MERCURY	13.00 micrograms per cubic meter	12.90 micrograms per cubic meter	+/- 5%
NITROGEN	Balance		

Notes:
Measurement Traceability is directly versus a Thermo 811 mercury generator vendor Prime, NIST Report 839.03-08-105. Stated analytical uncertainty includes the 811 generator.

Signature on file

Approved for Release _____

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CERTIFICATE OF ANALYSIS
Grade of Product: CERTIFIED STANDARD-SPEC

Part Number: X02N09C15A5RC5 Reference Number: 82-124425047-1
 Cylinder Number: CC500728 Cylinder Volume: 130.0 CF
 Laboratory: ASG - Riverton - NJ Cylinder Pressure: 1800 PSIG
 Analysis Date: Mar 14, 2014 Valve Outlet: 600
 Lot Number: 82-124425047-1

Expiration Date: Sep 14, 2014

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
MERCURY	23.00 micrograms per cubic meter	23.50 micrograms per cubic meter	+/- 5%

Notes:
mercury generator certified at NIST as a local uncertainty includes the NIST uncertainty

CERTIFICATE OF ANALYSIS
Grade of Product: CERTIFIED STANDARD-SPEC

Part Number: X02N09C3HA38F7 Reference Number: 82-124425044-1
 Cylinder Number: CC502215 Cylinder Volume: 130.0 CF
 Laboratory: ASG - Riverton - NJ Cylinder Pressure: 1800 PSIG
 Analysis Date: Mar 14, 2014 Valve Outlet: 600
 Lot Number: 82-124425044-1

Expiration Date: Sep 14, 2014

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
MERCURY	7.000 micrograms per cubic meter	7.200 micrograms per cubic meter	+/- 5%
NITROGEN	Balance		

Notes:
Measurement Traceability is directly versus a Thermo 811 mercury generator certified at NIST as a vendor Prime, NIST Report 839.03-08-105. Stated analytical uncertainty includes the NIST uncertainty of the 811 generator.

Signature on file

Approved for Release _____

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AirGas Specialty Gas Division

Elemental Mercury Gas Specifications

- Concentrations range from 0.2ug/ml³ to 60ug/ml³
- Balance Nitrogen
- Pressure (depending on cylinder size)
 - 300A's = 2000 PSIG (5500 Usable Liters)
 - 150A's = 1800 PSIG (3600 Usable Liters)
- Traceable to NIST certified cylinder mixtures
- Analytical Accuracy $\pm 5\%$ (currently)

AirGas Specialty Gas Division

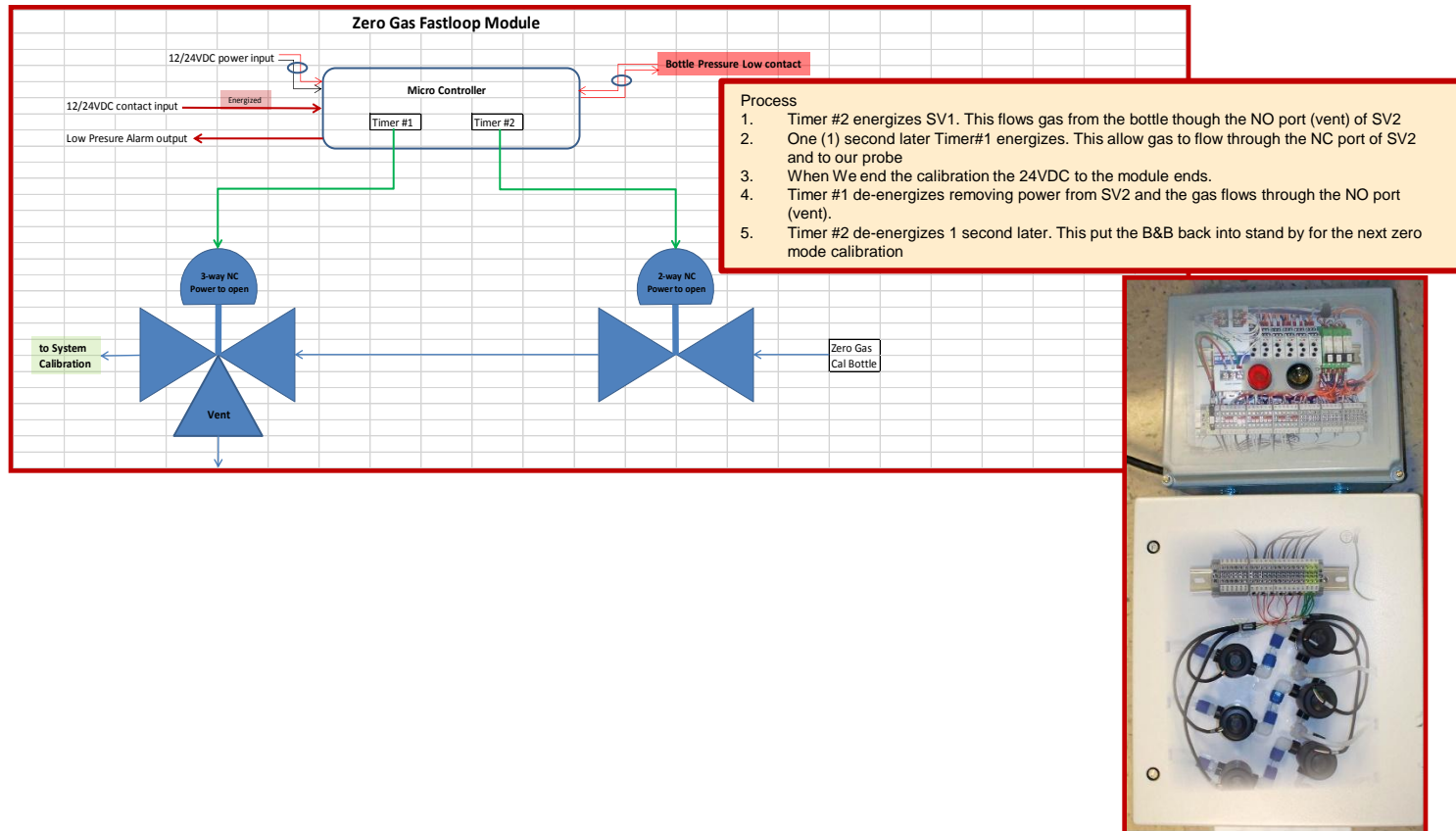
- AirGas developed a standardized regulator and valve treatment.
 - AirGas has perfected a new coated regulator that has eliminated the initial value “creep”
 - Previous systems had approximately an hour of “creep” time initially



Medical grade regulator

AirGas Specialty Gas Division

Double Block & Bleed Feedback Prevention System

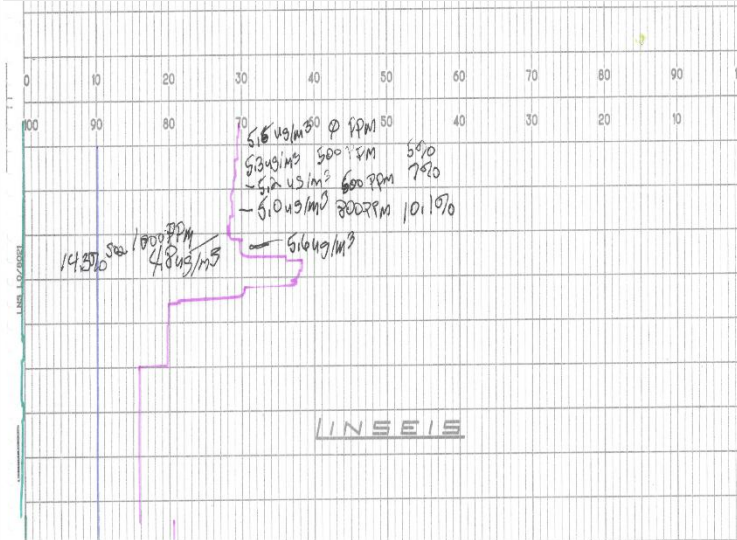


Utilities Applications

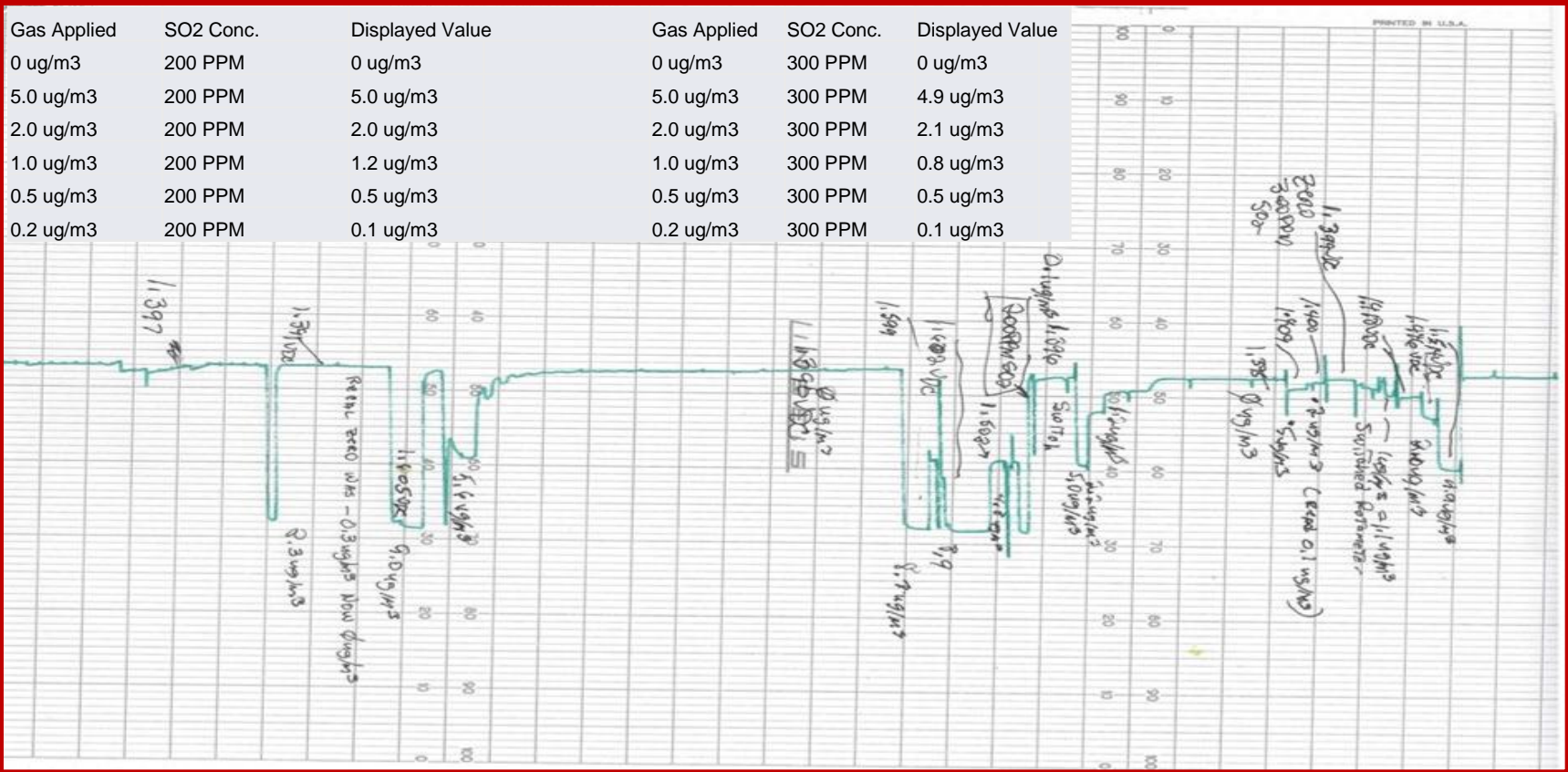
- **The Durag HM-1400 TRXC HgCEMS**
 - Provides dual range with an auto-switching capability with a contact closure to indicate when on high range.
- The system will be calibrated and checked daily, for a specified operating condition.
 - The measured range for normal operation is 0-10ug/m³
 - Low level measuring range 2-20ug/m³
- SO² levels can be 200 - 300ppm with plant scrubbing

Utilities Applications

Reference Gas	SO2 Conc.	Actual Conc.	% FS (10ug/m3)
5.6 ug/m3	0 PPM	5.6 ug/m3	0.00%
5.6 ug/m3	1000 PPM	4.8 ug/m3	8.00%
5.6 ug/m3	800 PPM	5.0 ug/m3	6.00%
5.6 ug/m3	600 PPM	5.2 ug/m3	4.00%
5.6 ug/m3	500 PPM	5.3 ug/m3	3.00%
5.6 ug/m3	300 PPM	5.5 ug/m3	1.00%



Utilities Applications



Utilities Applications

TEST RESULTS LINEARITY TEST US Utility Test Site

CLIENT: US Utility SYSTEM: Stack
 ANALYZER: Hg System MFG. & MODEL: Durag
 S/N: _____ FULL SCALE: 10ug/m3
 DATE: 2/19/2014 TESTED BY: L.L.P.

LINEARITY CHECK				
REQUIRED INPUTS	X AXIS INPUT CONC %	Y AXIS ANALYZER RESPONSE %	ABSOLUTE DIFFERENCE	% DIFFERENCE N/A
LOW	0.89	0.9	0.01	1.124%
MID	5.00	4.9	0.1	2.000%
HIGH	9.20	9.2	0	0.000%
LOW	0.89	0.9	0.01	1.124%
MID	5.00	4.9	0.10	2.000%
HIGH	9.20	9.1	0.10	1.087%
LOW	0.89	1.0	0.11	12.360%
MID	5.00	4.8	0.20	4.000%
HIGH	9.20	9.1	0.10	1.087%

SLOPE = 0.9869 INTERCEPT = 0.0138 C.F. = 0.9995

INPUT CONC	<u>0.89</u>	LOW AVG RESPONSE	<u>0.93</u>	AVG % DIFF	<u>4.490</u>
INPUT CONC	<u>5.00</u>	MID AVG RESPONSE	<u>4.87</u>	AVG % DIFF	<u>2.600</u>
INPUT CONC	<u>9.20</u>	HIGH AVG RESPONSE	<u>9.13</u>	AVG % DIFF	<u>0.760</u>

Cement Applications

- The system must be scaled to measure worst case – “Raw Mill Down”
- Unit has to be capable of measuring up to $200\mu\text{g}/\text{m}^3$
 - does not require a daily cal check at this level. Only a check (with either Hg^0 or Hg^{++}) that is not required to be certified and only after the raw mill is shut down.

Cement Applications

- **The Durag HM-1400 TRXC HgCEMS**
 - Provides dual range with an auto-switching capability with a contact closure to indicate when on high range.
- The system will be calibrated and checked daily, for an operating condition where the Raw Mill is on.
 - The measured range for normal operation is 0-25ug/m³
 - Low level measuring range 10-40ug/m³
- SO² levels can be as high as 850ppm when the raw mill is down and 200ppm when the raw mill is in operation.
 - A bottle of Hg⁰cal gas on site at 160-180ug/m³.

Cement Applications

