MODEL 593.2
ULTRA LOW LEVEL TRITIUM IN AIR MONITOR

PURPOSE
Specifically designed to meet monitoring requirements for the accurate determination of ultra low levels of airborne tritium.

SENSITIVITY AND RANGE
The 593.2 features an extremely wide measurement range, spanning 6.5 decades with a resolution of 0.1 kBq/m³ or 0.003 µCi/m³.

SENSITIVE TO ONLY TRITIUM
A semipermeable membrane is used to isolate tritium oxide before measurement. All other sample constituents, including pollutants, radioisotopes (i.e., noble gases), aerosols, and particulates are removed and eliminated from measurement.

MEASURES HTO OR TOTAL TRITIUM
A catalytic oxidizer can be provided so that elemental tritium can be converted into HTO for total tritium measurement (HT + HTO). If not included, then the Model 593.2 will measure HTO only.

GAMMA COMPENSATED
Gamma compensation is required to be able to measure ultra low concentrations of tritium. The 593.2 uses both electronic signal processing to distinguish tritium signals from background, and a second, sealed proportional counter to measure and compensate for external gamma fields.

Furthermore, lead shielding around the counter tubes reduces background gamma and improves the statistical signal to noise ratio to enhance sensitivity.

FULLY AUTOMATIC OPERATION
Except for routine replacement of the counting gas cylinders, the operation of the instrument is fully automatic and requires no operator attention.

The instrument features a large color touch-screen LCD display and is housed inside an industrial IP54, NEMA 13 rated cabinet with a polycarbonate window door and key locking latch on door.

Includes custom software that allows you to view multiple display tabs, configure alarm settings, generate graphs, view trends, monitor and display malfunction and alert conditions, and log all data and events.

PRINCIPLE OF OPERATION
The Model 593.2 employs a dual measurement system with automatic solenoid valve control to direct sample flow to the appropriate detector: 1) for measuring ultra low concentrations which require a long response time, and 2) for higher concentrations with a fast response time. A semipermeable diffusion membrane filters HTO from other sample constituents.

High level measurement: A pair of 2L ionization chamber detectors are utilized for measuring the tritium when levels exceed 1 MBq/m³ in order to provide a fast response time of 10 minutes and employ instrument air as the purge gas to save on P-10 usage. Compensation chamber is used to measure gamma and filtered radioactive gases in a differential mode.

Low level measurement: When tritium levels are <1MBq/m³, P-10 gas is used as the counting and purge gas and the sample is directed to the proportional counting detector with a typical response time of 40 minutes to reach 90% of the final value.

Ultra Low Level Resolution: 0.1 kBq/m³ (0.003 µCi/m³)
Extremely Wide Range: 1 kBq/m³ to 2,000 MBq/m³ (0.01 to 19,999 µCi/m³)
TECHNICAL SPECIFICATIONS

The Model 593.2 employs two balanced proportional gas flow counter tubes together with a diffusion permeation system for slow, ultra low level tritium specific measurements and a pair of ionization chamber detectors for fast, high level tritium measurement. The following specifications apply to the standard unit. Consult the factory for variations.

MEASUREMENT RANGE
a) 1 kBq/m³ to 2,000 MBq/m³
b) 0.01 µCi/m³ to 19,999 µCi/m³

RESOLUTION
0.1 kBq/m³ (0.003 µCi/m³)

DISPLAY
10” Color Touch-Screen LCD

TIME RESPONSE
Low level measurement (1 kBq/m³ to 10 MBq/m³): 40 minutes to reach 90% of final value
High level measurement (0.1 to 2,000 MBq/m³): 10 minutes to reach 90% of final value

MEASUREMENT, INTERFACE OUTPUTS
i) 0 - 10 V, linear
   ii) Ethernet

PROPORTIONAL COUNTERS
Balanced pair of copper clad acrylic counter tubes, 1.5 liters total volume each, surrounded by 1” of lead shielding

IONIZATION CHAMBER
Dual 2L ionization chambers on one axis with sample flow through both for differential tritium measurement

ELECTRIC FUNCTIONS
ALARMS, MALFUNCTION
i) instrument air low flow
   ii) P-10 gas low
   iii) chamber or power supply malfunction
   iv) oxidizer temperature
   v) low sample flow

ALERT CONDITIONS
Background high level, tritium loss of signal, background loss of signal, tritium low counts, and background low counts

ALARM CONDITIONS
i) Tritium alert level
   ii) Tritium high level

ALARM INTERFACE
i) fail safe relay closures
   ii) Ethernet

PNEUMATIC SYSTEM
COUNTER GAS
P - 10 (90% Argon, 10% Methane)
Supply pressure: 10-14 PSIG (69-97 KPa)
Usage: 400cc per minute @ atmospheric pressure

SAMPLE FLOW SYSTEM
Brushless Dual Bearing Diaphragm Pump, flow rate 5 lpm typical

FLOW METER
P-10 Gas Flow & Instrument Air Flow Adjustable 0-500 cc/min, Manual set-point 400cc/min

MASS FLOW METER
Sample Flow, range 0-250 cc/min, electronically controlled set-point 200cc/min

ENCLOSURE SIZE
70.9” [1800mm] High x 23.3” [600mm] Wide x 23.3” [600mm] Deep floor mounted painted steel enclosure with polycarbonate window door and key locking latch on door. Rear hinged door and hinged side panels. IP-54, NEMA 13 Rated

WEIGHT
630 lbs (286 kg)

POWER
115/230V 50/60 Hz, 100 W max.

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