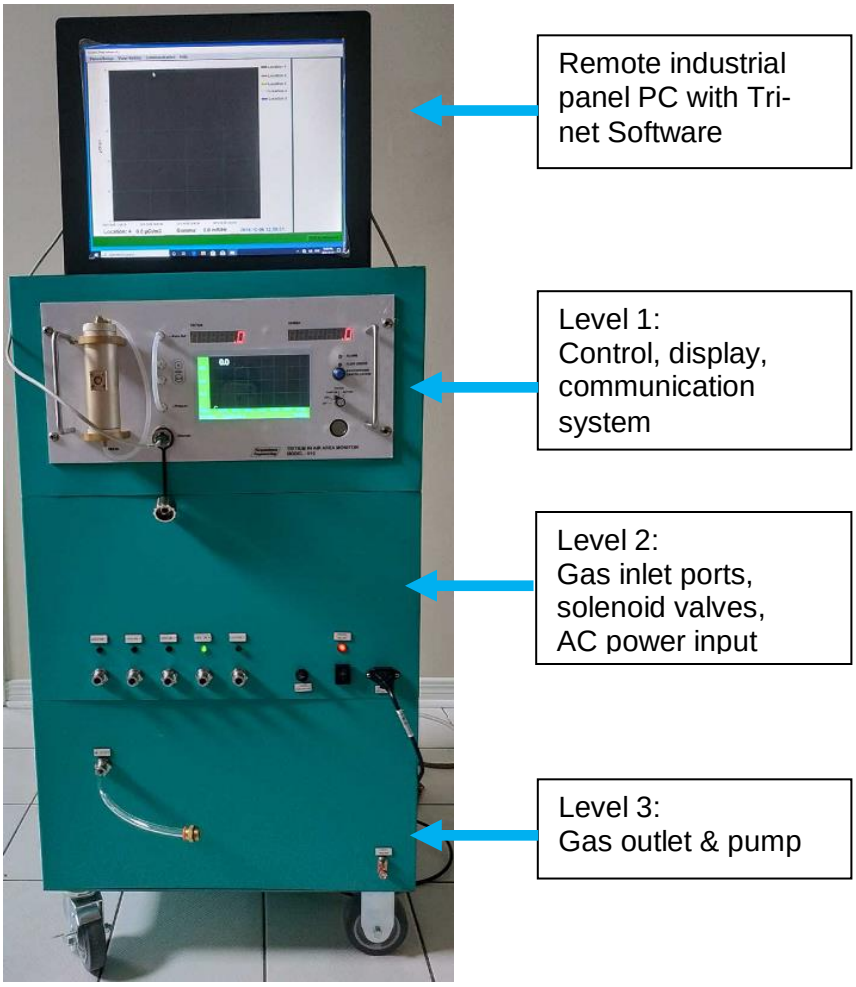
Tritium in Air Area Monitor

Model: 610



610 system overall view

1.0 Application

610 - Sensetecz Engineering Tritium in Air Area Monitor is a cart movable monitoring instrument for multiple locations measurement. The instrument shown in the picture above is designed for 5 locations. A Remote Industrial Panel PC is connected to 610 via Ethernet. All the operation, including instrument operation, status/alarm display, parameters setting, etc. can be accomplished either by 610 control system, or the remote panel PC.

610 is designed to monitor either total tritium, including HTO/HT together, or HTO-tritiated water vapor in air, for assigned location or for multiple locations in sequence. 610 uses single body quadruple cylindrical ion chamber design (U.S. patent No.:10,725,005) to achieve higher grade of gamma and noble gas compensation. An

advanced electrometer circuit is used to measure the tritium in air from 0.2µci/m³ to 1Ci/m³ reliably in nuclear power plants and labs, also a gamma survey meter (a separated GM tube and counting circuit) is built into the unit. 610 monitors tritium and gamma at the same time.

2.0 Advantages

- **Single body quadruple cylindrical ion chamber design (U.S. patent No.:10,725,005)**
  One stainless block with 4 machined hollow cylinders, 2 for measuring, 2 for compensation, to obtain the best volume uniformity and symmetrical orientation, therefore a higher grade of gamma and noble gas compensation is realized. Also reduced the gas leakage and manual assembly errors during the construction.

- **No range switching required, full range noble gas compensation, full range HTO & T_2O measurement**
  Ultra precision/stable electrometer circuit with 24-bit ADC convertor can achieve high & reliable sensitivity of 0.2µci/m³ and wide measuring range from 0.2µci/m³ to 1ci/m³ without range switching. This fixed the saturation problem in high noble gas compensation - With an external drier 651, noble gas compensation within full range can be achieved. Further make 610 achieve HTO/T_2O and elemental $^3H_2$ discrimination within whole measurement range.

- **Measurement for multiple locations**
  610 is designed to monitor either for assigned location or for multiple locations in sequence.

Software integrates all devices together

- Drier Monitoring by a humidity sensor
  A drier fault will be generated when the humidity of compensation chamber is higher than the setting. This ensures the safer noble gas compensation.

- Measuring/Compensation chamber's pressure is monitored.
  Since there is pressure drop on the air flow path, the computer will compensate the pressure difference between Measuring and Compensation chamber to improve the noble gas compensation.

- Data logging
  All the readings are Time-stamped and logged into 512kbytes EEPROM.

Industrial Panel PC with Tri-net software

- An industrial panel PC with Tri-net software operates, controls 610, shows all the data, diagrams, trends and provides alarms simultaneously with 610 itself.

Performance enhancement

- High precision and stable current measurement circuit has been used to measure as low as 0.05fA current. Lab gas calibration and temperature stability test shows better than 1% accuracy of tritium measurement from temperature 0 ºC to 50 ºC.
- Measuring/Compensation chamber's pressure are monitored. Since there is pressure drop on the air flow path, the computer will compensate the pressure difference between Measuring and Compensation chamber to improve the noble gas compensation.
- Built-in ion trap into each ion chamber with high electrical field to reduce charged particle interference.
- Fast response, less than 10 seconds to reach 90% of reading.
- Radon compensation by electronic circuit and software filter.
- Environmental gamma reading by optional GM tube.
- Ion Chamber Decontamination by cartridge heater.
- LEDs and LCD background to indicate the alarm and warning states.
- Ultra-low power consumption free-scale MKL25 microcontroller is used for the control/display.
- Data logging - all the readings are Time-stamped and logged into 512kbytes EEPROM.
- Multiple locations monitoring in sequence or the location assigned with a PLC.
- Remote control and display with an industrial panel

Specification-610 tritium in air area monitor

Performance:

- Sensitivity: Better than 0.2µci/m³
- Accuracy: 1µci/m³ from 1 to 100 µci/m³,
< 3% from 100 to 1Ci/m^3
- Measuring range: Full measuring range 0.2µci/m³ to 1Ci/m^3
- Compensation range: Full measuring range 0.2µci/m³ to 1µCi/m^3
- Flow Rate: 0 to 25L/min, without tubing
- Response time: < 10S
- Gamma measurement: 0.1mR/Hour to 10R/Hour
- Zero Stability: Better than 2µci/m³ from 0 to 50 °C
- Stability with long term: <±3% per 24 hrs and <±10% per 30 days
- Gamma compensation: <10µci/m³ at 10mR; <10% within 20mR/HR
- Tritium Discrimination: Elemental tritium in air, HTO & T_2O discrimination
via Silicon Gel Dryer and software computation

- Noble Gas Cancellation: Full Measuring range, Passive Silica gel drier Is placed on the front panel, flowing air samples between measuring chambers and compensation chambers
- Radon Compensation: Software discrimination and elimination
- Background Cancellation: Noble gas compensation ratio: > 150:1. Gamma compensation:<10µci/m^3 at 10mR/Hr, <10% within 20mR/HR

Construction:

- Ion Chambers: 4 ion chambers, 2 for measuring and 2 for compensation, 500mL for each chamber
- Ion Chamber Volume: 1L: measuring, 1L: compensation
- Ion Trap: Yes, built-in for each chamber
- Gas Ports: 3/8" OD stainless steel push to connect
- Gas Filter: Built in, replaceable
- Ion Chamber Purging: Yes, via cartridge heater for ion chamber decontamination and condensation prevention
- Control Panel Display: 7 Inch TFT LCD touch screen for numerical and graphical mode LED for digital data and rate bar graph
- Digits LED Display: 0.56" LED display both for tritium and Gamma
- Measuring location: Multiple in sequence or assigned location

Output and communication:

- Communication: RS232, RS485, Ethernet TCP Modbus
- Analog Output: 4-20mA and 0.5-2.5Vdc
- Audio and Visual Alarm: Low and high alarm within 30 seconds
- Data Logging: Yes, frequency varies from 1s to 1hr, user settable

Power, operational conditions and dimension:

- Power Supply: 220/110VAC @ 50/60HZ

- Power Consumption: < 1A
- Warm-up time: no need
- Operational Humidity: 95%RH
- Operational Temperature: 0 to 50 °C
- Dimension: W21.5”x H41.5” x D22.5” or customized
- Weight: 75 Kgs