Dual Scintillator Based Alpha & Beta-Gamma Hand, Foot & Clothing Monitor

TYPE: NXG_HFC2_AB

Technical Data

FEATURES:

- Based on NVIDIA Tegra 2 embedded SoC,Cortex A9 dual core CPU at 1GHZ, HDMI.
- Provided with a 10.1" color TFT display for graphical & multi-lingual user interface during measurement mode. Voice languages supported English, Hindi, Marathi, Tamil.
- Uses Dual scintillator detector assemblies for Hand, Foot & Clothing channels for α, β detectors.
- User I/O interface is through Optical Mouse, On screen keyboard Color TFT display.
- Monitor design ensures continuous maintenance free operation in harsh atmospheric conditions in Radiochemical plants.
- Designed in accordance to IEC61098 radiation performance specification for personnel monitors.
- Built-in fault diagnostics for fault location or bypassing.

Alpha & Beta-Gamma Hand,Foot & Clothing Monitor NXG_HFC2_AB manufactured by NUCLEONIX SYSTEMS primarily serve as a personnel monitoring system for checking the contamination of hands, foot & clothing of radiation worker / technicians working in Nuclear Power Plants, reactors, Radiochemical plants and other similar installations.

This instrument has been developed using state of art Uses SoC, based on ARM Cortex A9 dual core CPU at 1GHZ, HDMI & extensive use of pheripheral devices & Ethernet interface has been integrated. GUI & multi-lingual user interface & corresponding voice messages are facilitated by a color TFT monitor with integrated speakers.

Guidance to the user during monitoring in the form of color graphic monitor for left / right hand / foot & status indications during monitoring & at the end of monitoring are a standard feature of this instrument.

Advanced fault diagnostic features facilitate the user to diagnose the problem easily. Also provision for faulty channel bypassing feature has been provided. USB & Ethernet communication for data downloading to PC.

Each Hand & Foot detector assembly shown is modular in construction facilitating easy maintenance in case of problems

Specifications

The Alpha & Beta-Gamma Hand, Foot and clothing monitor shall comprise a set of detectors and an electronic unit.

DETECTORS:

A) Hand probes:

- Number of monitoring channels: 4 (Right hand 1 & 2, Left hand 1 & 2).
- Detector Type: 220x140mm Dual scintillator (plastic & Zns(Ag)) based detection unit .
- Detection Efficiency: > 25% overall for plastic scintillation detector assembly with Am-241, >25 % Sr90.
- Probe Construction: Each channel shall have a 220x140mm Dual scintillator (plastic & Zns(Ag)) detectors. They are fitted in the instrument so that they can be detached easily for maintenance.
- Sensitive Area: 300 Sq.cm Approx. Protection Grill: The whole detector assembly shall be protected by a suitable thin metallic grill. Detector dimensions and performance shall conform to IEC 61098 specifications.

B) Foot Probe :

Number of monitoring channels: 2 (Right foot 1 &, Left foot 2).

- Detector Type: 350x150mm Dual scintillator (plastic & Zns(Ag)) based detection unit.
- Detection Efficiency: >18% overall for AM 241, >20 % Sr90.
- Probe Construction: Each channel shall have a **350x150mm** Dual scintillator (plastic & Zns(Ag)) detectors. They are fitted in the instrument so that they can be detached easily for maintenance.
- Sensitive Area: 524 Sq.cm Approx.
- Protection Grill: The whole detector assembly shall be protected by a suitable thin metallic grill.Detector dimensions and performance shall conform to IEC 61098 specifications.

C) Clothing probe:

- Number of monitoring channels: one
- Detector Type: 175x125mm Dual scintillator (plastic & Zns(Ag)).
- Detection Efficiency: > 25% overall for plastic scintillation detector assembly with Am-241, >25 % Sr90.
- Probe Construction: Hand-held type. It shall be placed on a holder with micro-switch assembly on the side of the monitor. On lifting the detector, the monitoring shall be started.
- User interface during configuration & measurement through the TFT display & optical sensors Counting of pulses from 7 individual detectors.
- Storage of last acqui red data and last contamination data in database.
- Configuration of various parameters like PM time, BG time, BG dwell time, Low BG set point, High BG set point, Alarm set point, IP address, Voice & visual guidance languages, fault diagnostic configuration, detector efficiency, detector status etc.
- Generation of voice guidance messages through stereo O/P sound device during m easurement cycle.
- Initiates / terminates m easurement cycle by sensing optical sensors status.

ELECTRONIC UNIT:

The electronic unit consisting of the following

High Voltage, Pulse Amplifier and Data Acquisition Unit:

This unit essentially comprises of High Voltage module, 7 channel Pulse Amplifier section, FPGA based Data acquisition board and State of Art Single Board Computer unit. DC Voltages required to bias the Electronics are generated by DC-DC convertors located on this board. Signals to/from all PMTs are routed to this unit.

Switch Mode power Supplies unit: An AC-DC converter +24V output.It is also provided with a line filter & other EMC suppression components.

Pre-amplifier section: This unit comprises of individual pre- amplifier corresponds to each scintillation detector. HV bias to the scintillation detectors is fed through the preamplifier unit. Each pre-amp segregates the α & β pulses for counting.

Counting Range:
0 to 9999 counts
0 to 9999 cps
0 to 999.9 Bq
0 to 99999 cpm
0 to 999.9 Bq/cm^2

Timing range:
Pre-settable from 1 to 99 seconds in 1 sec steps for COUNTS, Bq, CPS or CPM modes for Hand and Foot monitoring. Time constant for checking the Clothing monitoring is 5 seconds with display being refreshed every second.

HUMAN MACHINE INTERFACE:

Indications & controls:

Mains switch: The mains switch shall be provided Rear sider the cabinet of the monitor.

Optical sensor: The monitor shall be provided with optical sensors inside the detector cavities for sensing personnel and initializing the counting automatically.

Visual alarm :
Each channel color visual mimic indication is provided on the colour LCD TFT display.

Audio Alarm: Loud audio tone.

Audio Instructions :
Audio instructions shall be generated for clear, contaminated, instrument fault, monitoring in progress and incomplete operation. Voice messages shall be played back in English.

Signal Processing and display unit:

The signal processing & display unit comprising of an SBC & large TFT display perform data acquisition & control. It carries out the following functions of :

Operational Guidance: Operational guidance messages shall be displayed Before monitoring, On Clear, On Contamination and On Incomplete operations shall be generated in English.

Incomplete operation:
Multi-lingual textual indications accompanied by audio alert are generated when counting is interrupted.

Clear Indication: LCD mimic indicator will be ON when all the channels are clear.

Counting in progress Indication:
Busy indication will be shown while Counting is ON and Time left is displayed.

Visual display:
10.1" colour TFT display.

Given below is a partial list of the functions being carried out by the visual display.

- Display normal status messages.
- Visual display of monitoring in progress (including countdown of time in seconds).
- Display of individual channel readings.
- Alarm annunciation
- Background checking and display
- Instructions for use.
- Self-explanatory, language independent symbols / user instructions.

Computer Interface : The monitor has a Ethernet 10/100Mbps port for interfacing with a remote Windows PC. The features supported by Ethernet port are given below.

The PC & HFM unit will operate in Client / Server configuration and the software protocol will be MODUS_TCP

The PC Software will send queries & HFM will carry out various functions in response to the queries.

RJ 45 Connector for Ethernet Port.

Power supplies:
The monitor shall have a High voltage power supply unit for the detectors and a low voltage power supply unit which supplies the DC power supplies required for the Electronic unit.
It shall have a very good line voltage and load regulation for all the supplies. It shall be fitted with Mains line filters to avoid line interferences.

The High voltage output shall be adjustable by handheld configurator or host PC and EHT should be displayed on the display on demand.The EHT shall adjustable from 300 V to 1500 V DC.

Instrument fault indication: Fault diagnostics are carried out periodically and any failures are reported on the display like LV,HV and detector failures. Fault indications shall be cleared automatically if normal status is resumed.

Self diagnostics :

The monitor has built-in self diagnostics. On being powered it shall perform tests to ensure that all components and sub systems are functioning properly. It shall check for the Power supply, High Voltage Supply, Detector, Counting and measuring circuits, Alarm Systems, Display Systems and communication port.

Test points shall be provided for checking the EHT voltage and for connecting external input pulse signals.

HOUSING:

- Most of the modules of the Electronic unit and detectors shall be integrated into a column shaped cabinet with castor wheels.
- The hand probes shall be fitted so that both the hands can be inserted and the optical sensors inside the cavities are activated when hands are placed to start monitoring.
- The modules shall be plug in type with all the controls and display on the front panel.
- The cabinet shall be rat- proof, rugged & elegant.

Input Power:
85-264VAC, 47-63Hz, single phase supply. Power ON/OFF indication is provided with an indicator LED.

Dimensions:

(a) Foot assembly dimensions:
Width: 600 mm.
Height: 111 mm.
Depth: 806 mm.

(b) Vertical Column Height: 1252 mm.

(c) Hand Assembly (dimension):
Width: 700 mm.
Height (without TFT): 186 mm.
depth: 327 mm.

Weight: 90Kg

Overall Dimensions:
1687H x 729W x 895D mm.

Environment:
The instrument shall be able to withstand temperature upto 50°C and relative humidity upto 90% in radiation areas.