METRON

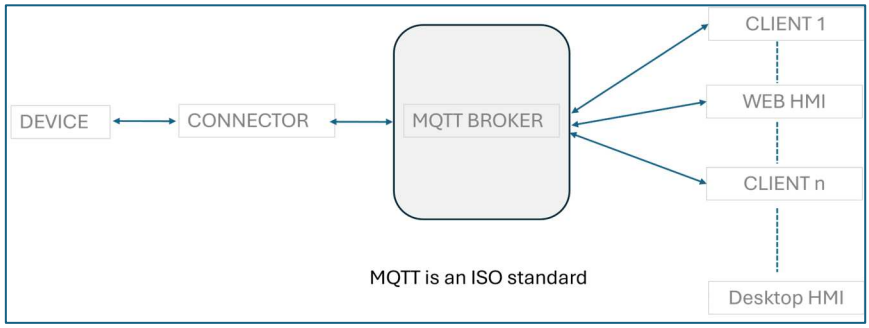
ENVIRONMENTAL RADIATION AND MULTI PARAMETER MONITORING SYSTEM

RadioPharma

An ISO9001 company

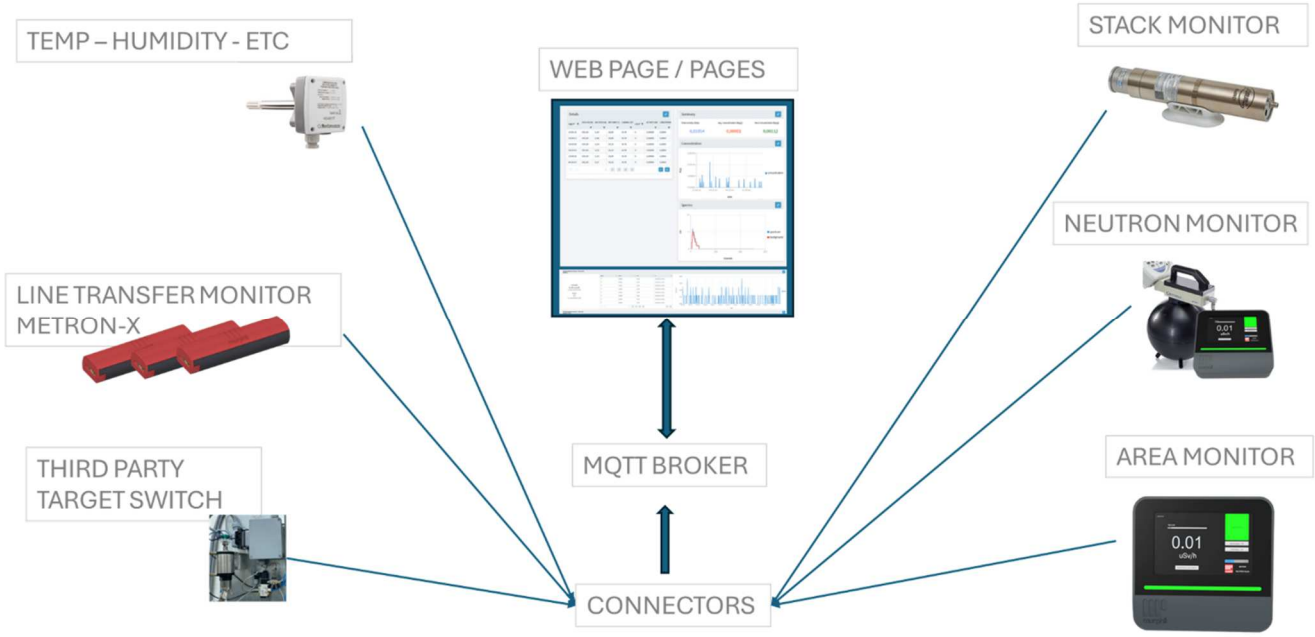
METRON Full facility monitoring system

METRON Monitoring System is meant to provide full facility monitoring of relevant parameters according to the latest connectivity technologies.
Due to this approach, even if METRON is focused on monitoring radiation levels of facility areas and of exhaust Air, it can be easily interfaced with virtually any monitoring device.
The software, installed on a PC, collects data from probes and shows any possible anomaly. The Web Based interface, realized using virtual maps, makes easier the event visualization. The system is meant to provide environmental activity level measurements in PET-Cyclotron Facilities and can be installed also in GMP laboratories.
The peculiar construction of the area gamma probes allows easy cleansing and installation with no visible cables
All probes, reliable, accurate and rugged, do not need any maintenance; they allow both gamma and neutron field (if present) radiation level measurement. The system can also measure and quantify air radioactivity concentration level coming out the facility.
Also the system is able to manage all probes installed inside hot cells.



Latest CONNECTIVITY technologies

The METRON monitoring system uses the latest MQTT connecting techologies to allow ease of system integration, to assure data integrity and to increase several different device integration over one system



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METRON-AM AREA MONITORING

METRON-AM is a new generation gamma area monitor family for gamma activity dose rate measurement.
It can be installed in all facilities whereas continuous dose-rate detection is required. Due to its design, it can be installed both as a stand-alone unit or in connection with a complete Environmental Monitoring System.
Great attention is given to GMP installation in clean rooms; the device design allows installation without visible cables. This, together with the peculiar shape and the absence of any recess, avoids dust deposit and allows great cleanliness.

The device configuration **METRON-AM-ID** foresees

- dual-microprocessor electronics
- internal High Voltage generation
- four relays output
- RS485 ready protocol
- three relays indicating the status of the device (good functioning, pre-alarm, alarm)
- a high visibility, large area touch screen display
- **n. 1 integrated probe with energy compensated GM tube model ZP1201**.

The device configuration **METRON-AM-RD** foresees

- dual-microprocessor electronics
- internal High Voltage generation
- four relays output, RS485 ready protocol
- three relays indicating the status of the device (good functioning, pre-alarm, alarm)
- a high visibility, large area touch screen display
- **n. 1 remote probe with energy compensated GM tubes models ZP1201, ZP1313**
- **n. 1 cables kit for remote probe**

The device configuration **METRON-AM-R1** foresees

- dual-microprocessor electronics
- internal High Voltage generation
- four relays output
- RS485 ready protocol
- three relays indicating the status of the device (good functioning, pre-alarm, alarm)
- a high visibility, large area touch screen display
- **n.1 integrated probe with energy compensated GM tube model ZP1201**

- **n.1 remote probe with energy compensated GM tubes models ZP1201, ZP1313**
- **n.1 cables kit for remote probe.**

The device configuration **METRON-AM-R2** foresees

- a dual-microprocessor electronics
- internal High Voltage generation
- four relays output
- RS485 ready protocol
- three relays indicating the status of the device (good functioning, pre-alarm, alarm)
- a high visibility, large area touch screen display
- **n. 2 external probes each with energy compensated GM tubes model ZP1201, ZP1313**
- **n. 2 cables kits for remote probe.**

The **METRON-AM-ID** device is ideal for all application such area monitoring in facilities, radiopharmacy, preparation room, etc, while other models (**METRON-AM-RD**, **METRON-AM-R1, METRON-AM-R2)** with the high range probe are ideal for applications such as cyclotron vault monitoring and installation inside hot cells. Also external probe design is meant to be the best in terms of GMP installation, since it can be installed in direct contact with the wall or the ceiling, thus greatly increasing cleanability.

CODE	**INTERNAL PROBE** DETAILS	**REMOTE PROBE** DETAILS	**CONFIGURATION**
METRON-AM-ID	ZP1201	NONE	N. 1 INTEGRATED PROBE
METRON-AM-RD	NONE	ZP1201+ZP1313	N. 1 REMOTE PROBE N. 1 CABLES KIT FOR REMOTE PROBE
METRON-AM-R1	ZP1201	ZP1201+ZP1313	N. 1 INTEGRATED PROBE N. 1 REMOTE PROBE N. 1 CABLES KIT FOR REMOTE PROBE
METRON-AM-R2	NONE	2 x (ZP1201+ZP1313)	N. 2 REMOTE PROBES N. 2 CABLES KITS FOR REMOTE PROBE

1. BASIC CONFIGURATION DETAILS

- ✓ Dual-microprocessor electronics
- ✓ High contrast, high visibility 7” colour display with touch screen
- ✓ Four relays output for interfacing with external systems
- ✓ RS-485 communication port for connection to monitoring system software
- ✓ Three-color LEDs for system status
- ✓ Acoustic alarm signal
- ✓ Two configurable alarm threshold
- ✓ Password protected software
- ✓ Four selectable unit of measurement: cps, CPM, Sv/h, R/h
- ✓ 24 Vdc Power supply included (as stand alone system)
- ✓ Probe as indicated in the product code description

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TECHNICAL SPECIFICATIONS

Detector	Halogen Quenched GM Tube - Centronics ZP1201, ZP1313 or LND 71210, 7149
Radiation type	gamma
Energy range	50 keV – 1.5 MeV
Energy Dependence	± 15%
Measurement range for ZP1201 GAMMA PROBE	0.1 µSv/h ÷ 10 mSv/h (0.01 mR/h ÷ 100 mR/h)
Measurement range for ZP1201+ZP13013 GAMMA PROBE	0.1 µSv/h ÷ 1 Sv/h (0.01 mR/h ÷ 100 R/h)
Accuracy	± 15%
High Voltage	hardware settable, Typical 500V
Display	7" colour display with touch screen
Factory Calibration sheet	as per ISO9001, with a NIST traceable calibration source (Cs-137 typical)
Response time	2-5 sec
Alarm indication	On-board LED: • GREEN LED: normal goof functioning status • YELLOW LED: pre-alarm threshold overcome • RED LED: alarm threshold overcome • ACOUSTIC SIGNAL: alarm threshold overcome
Faulty condition	LEDs are off and faulty indication is displayed over the display
Controls	• alarm acknowledge (mutable acoustic signal) • High voltage switch on/off control
Output	4 settable relays (free-voltage contacts)
Communication protocol	RS485 with proprietary protocol MQTT over TCP (OPTION METRON-TCP)
Power	110/230 Vac, 50/60 Hz
Dimensions and Weight	210 mm width x 175 mm height, 47 mm depth
Operative Relative humidity range	0 ÷ 90 %
Operative Temperature range	0 ÷ 50 °C

METRON-N

Neutron detector for application in neutron monitoring in cyclotron installations. It is installed outside the cyclotron vault.
Detector:

- ✓ He3 detector with moderator
- ✓ Energy field of the neutrons: Thermal to approximately 20 MeV
- ✓ Dose-rate range:
- ✓ 100 nSv/h ÷ 100 mSv/h
- ✓ Sensitivity: Typically, 3.15 counts/nSv, for E=3 MeV

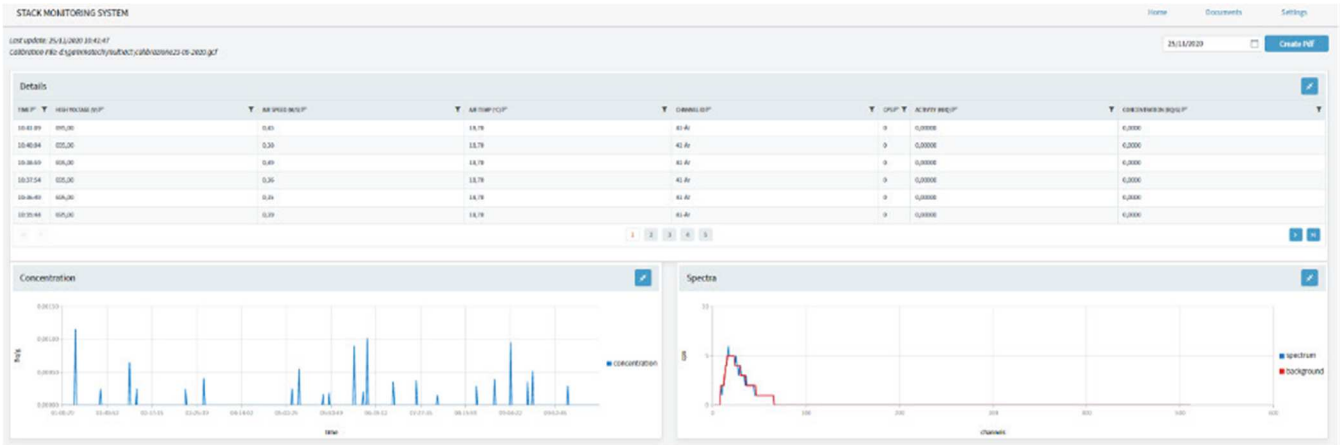
- ✓ Background: 0.05 cps
- ✓ Data communication: RS485
- ✓ Data storage: database
- ✓ Working temperature range: 0-45°C
- ✓ Relative humidity range: 0-75%
- ✓ LCD display acquisition unit:
  - GREEN LED (good functioning)
  - YELLOW LED (pre-alarm)
  - RED LIGHT (alarm)

METRON-AIR

METRON-AIR system allows accurate quantification of air activity concentration in nuclear facilities where continuous monitoring is required.
The system can be easily installed in the air exhaust stack and is composed by the following devices:

- Sodium Iodide probe with integrated Multi Channel Analyzer (MCA)
- Flowmeter for air speed measurement
- Web-based control software

The quantitative software permits both energy and efficiency probe calibration. Once calibrations are executed, the system can run in continuous data acquisition modality, in order to calculate both relased activity (in a particular time frame) and the corresponding total air volume or weight.
Measurement results, together with generated reports, are clearly shown on a modern web-based interface, via graphical representation of acquired spectra, data tables and report online viewer.
All measurement data and spectra are permanently stored in order to facilitate backup or data recovery for offline analysis.
Furthermore, the detection system has been validated with Monte Carlo simulation, in order to facilitate efficiency calibration factor calculation for several installation layouts.



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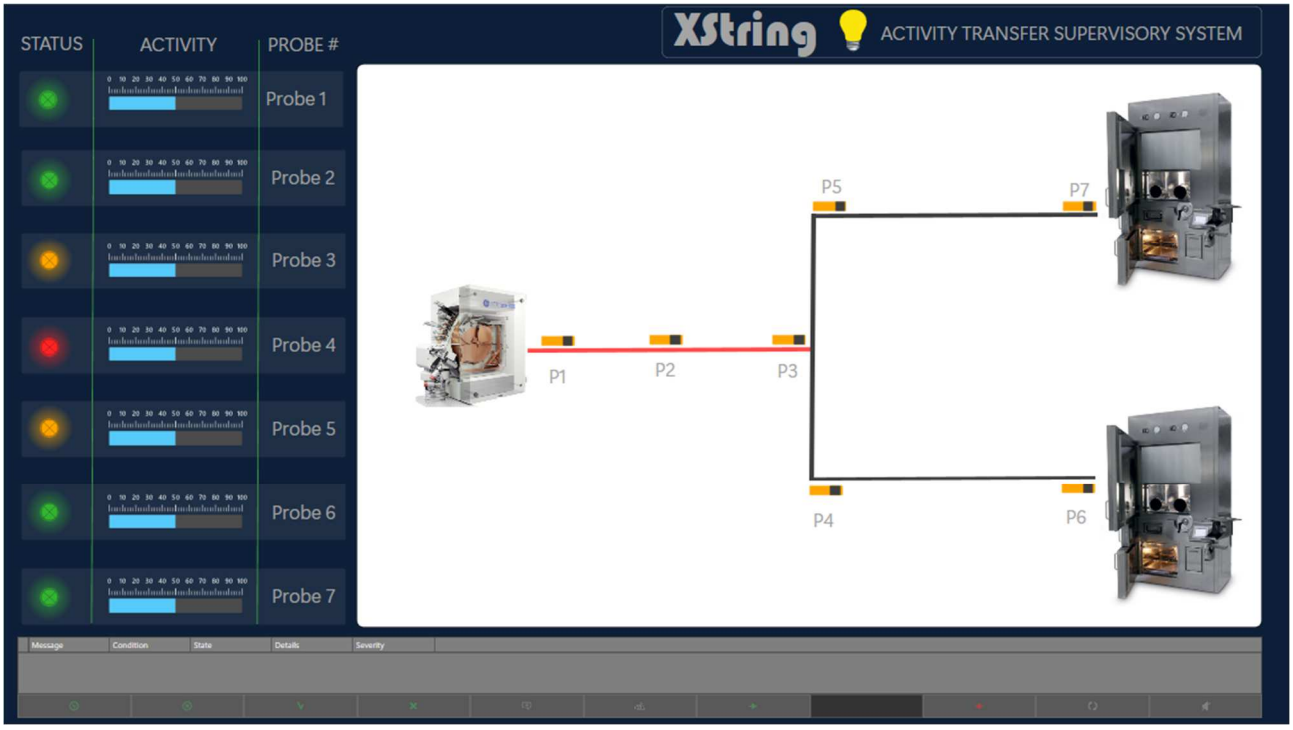
Component	Specifications	Installation	Communication
Activityprobe 	• NaI(Tl) crystal • Standard crystal 2”x2” and 3”x3” uponrequest • Integrated MCA • Integrated high-voltage generator • RS485 or ETHERNET (OPTIONAL) output • Integrated gain stabilizer (OPTIONAL) • Energy resolution <7% per Cs-137 • Typical sensitivity (cps/Bq/cm^3) in Marinelli configuration: - Approx 10.00 for 2”x2” probe - Approx 39.00 for 3”x3” probe • Integrated web server with energy calibration function (only for ETHERNET version)	Inside stack duct with dedicated mounting flange (included)	• RS485 • ETHERNET (OPTIONAL)
Flowmeter	Measurement range: 0-20m/s		• RS-485
Control software	• Software service for data acquisition fromprobe and flow meter • Software service for web data presentation • Automatic E-mail alarm notification	In control zone, up to1 km from probe andflowmeter	• Serial and ETHERNET communication routines

METRON-X Transfer line supervisory system

This system allows real time monitoring of the activity transfer from cyclotron to hot laboratories, by means of a set of compact and efficient detecting probes that can be dislocated all along the transfer line/s; this allows to achieve full control over the line for ease failure detection, with no radiation exposure risk for time-consuming manual search of losses.
All signals and power supply of the probes runs in a single 4-wire cable with no need closed loop circuit. This represents the most efficient configuration for very tiny installation spaces and long transfer lines layout.
Probes have long-life built, avoiding use of GM tubes which are not suitable for high activity reading.
Probes are microcontroller based and includes all necessary electronics to perform analog measurement from sensor, A/D conversion and communication.
Data are shown in real time over a rich HMI and alarm are shown in an alarm table, stored permanent database and notified to site responsible person via e-mail.
The system can work either as a stand alone system, either integrated into METRON monitoring system.

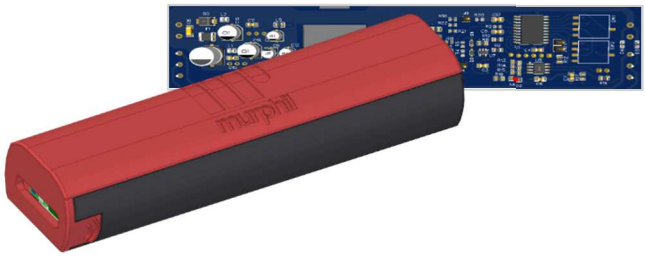
Supervisory system for activity transfer:

- Allows to detect leakage
- Measures transfer speed
- Used in synergy with 2C-TYPE
- Easy installation (1 cable) in transfer shielded lines
- Integration capability with third-parties target switch



PROBE SPECS

- Scintillation type detector directly coupled to high efficiency photodiode
- Direct coupling to high efficiency amplifying circuitry
- Very compact design due to the use of transimpedance amplifier with no feedback resistors
- No high voltage required for operation
- Smart probe: a microcontroller manages the amplifying circuitry determines digital measurement and communicate activity measurement over a serial.
- Power supply: 24 Vdc
- Communication over RS485 line
- Only one cable for connection
- Dimensions: approx. 22 mm diameter x 100 mm length
- Measurement unit: Sv/h, Gy/h
- Up to 128 probes over 1 line
- Up to 1 km distance with no signal repeater

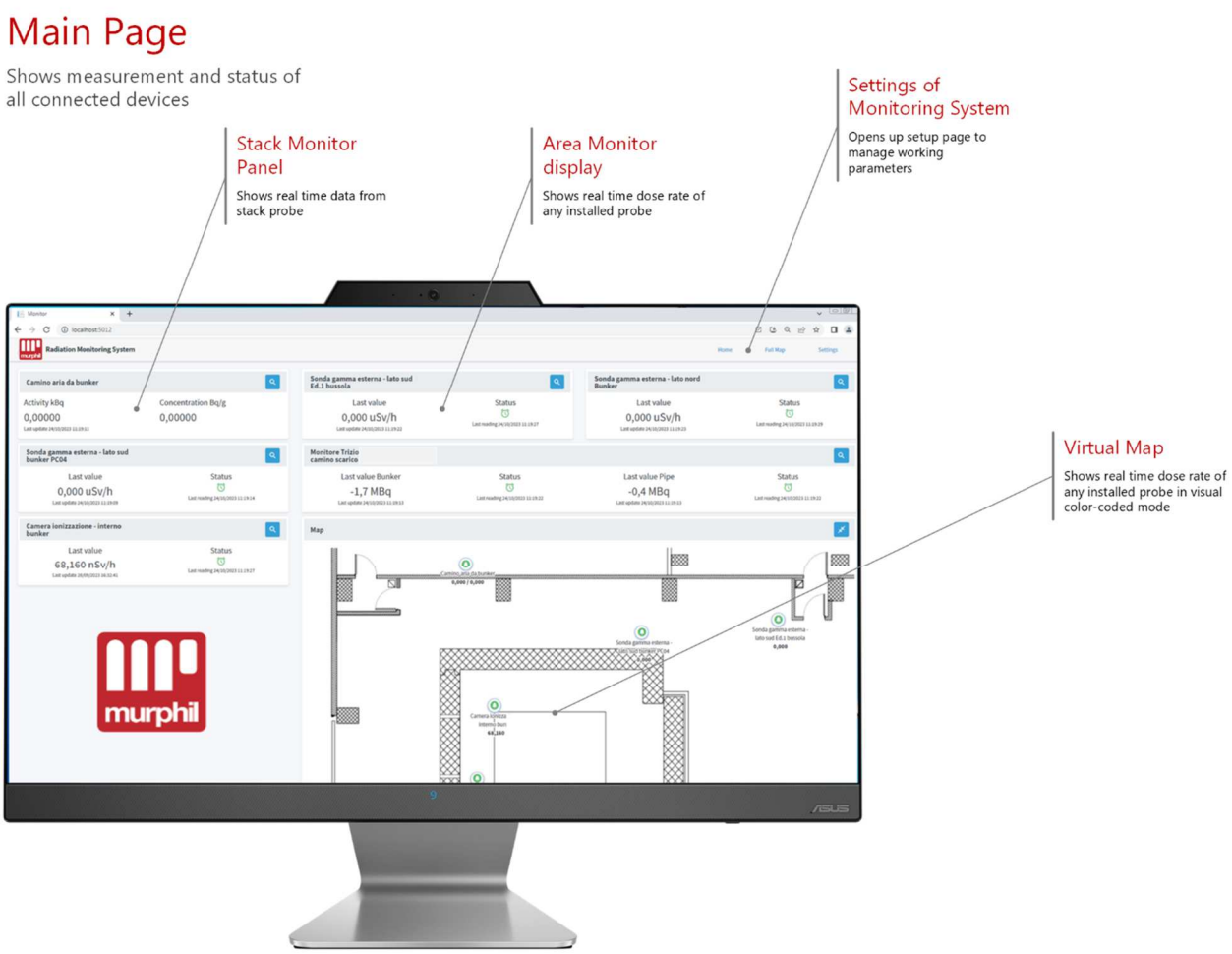


METRON-PC

Central Unit PC		
	Tasks	To control the entire system, to print reports
	Remote assistance	The remote control allows Murphil's technical personnel to control the system via Ethernet, in case of system malfunctions. A second Ethernet board is included in the PC configuration
	Service and diagnostic tools	1 year remote assistance
	Software main specifications	User-customized web-based interface software Customer-defined virtual map Real time data display Redundant alarm notification (text and color coded messages, acoustic alarm) Remote configuration of all connected probes SQL database Scheduled and manual data backup Graphical and tabular data display Automatic and manual report generation Routines for output interface to other systems (i.e. safety systems) Remote access ready
	Password hyerarchy	2-level password protection (+1 level for assistance)

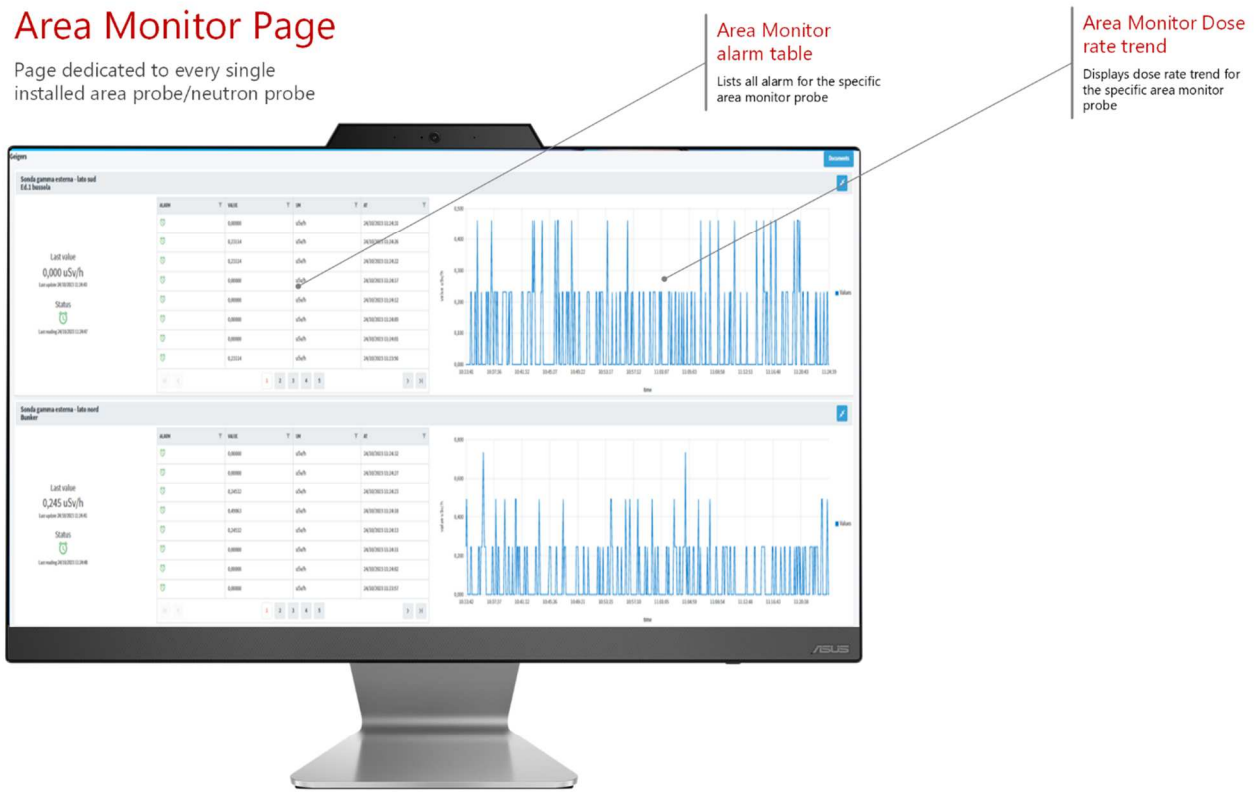
Central Unit Electric box		
	Tasks	Powering up all probes connected to the system Concentrating data from probes Visualization of system status via alarm column
	Characteristics	Luminous indicators of power status On board visual and acoustic alarm column The electric box is provided with a general switch
	Indicators	Indicator of low voltages presence inside the box; if a probe with automatic turn-off is requested, another indicator will shows the probe's power status
	Cables connection	By the upper side of that box
	Free voltage contacts	Settable 7 (for interlocks, safety systems,..)

SOFTWARE HMI



The HMI of METRON Monitoring System is web based. It is customized for each installation, since it is conceived to be configurable and modular. A setting page allows to insert and define all connected devices, then all data are shown in a friendly dashboard type interface.

A visrtual plant can be positioned over the main page in order to give an immediate view and understanding of the system's status, while specific buttons allows to show dedicated pages to each probe hystory and status.

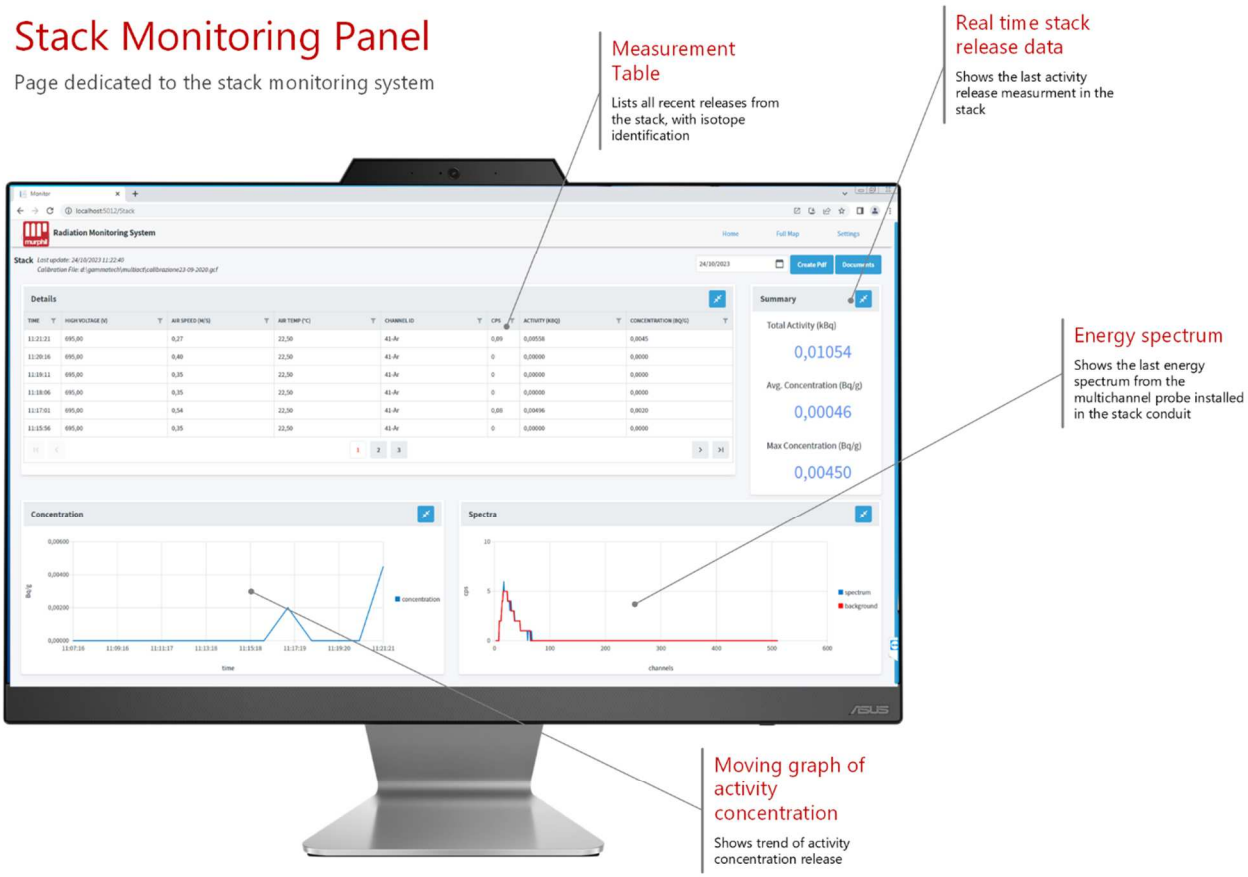


Every area monitor has its own dedicated page. In area monitor page the following informatin is shown:

- Alarm table
- Data trend
- Current measurement
- Current status of area monitor probe

Stack Monitoring Panel

Page dedicated to the stack monitoring system

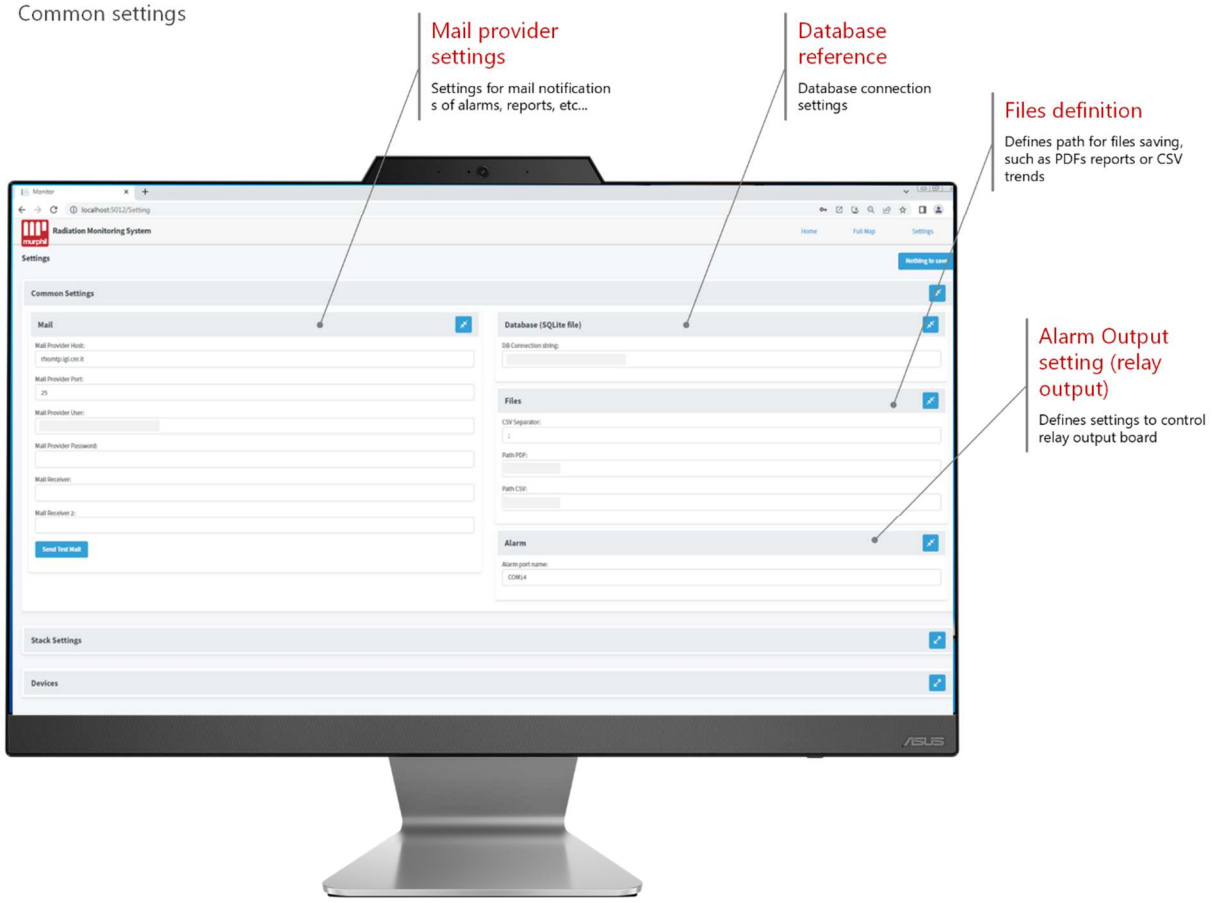


The stack monitoring panel is a dedicated oage showing all detailed informatin about the stack monitor:

- A table reporting all activity concentratino data of recent measuring
- Current measuring data (activity concentration in Bq/g, total integrated activity in Bq, max activity concentration released)
- Current energy spectrum acquired
- Moving trend of activity concentration released from the stack

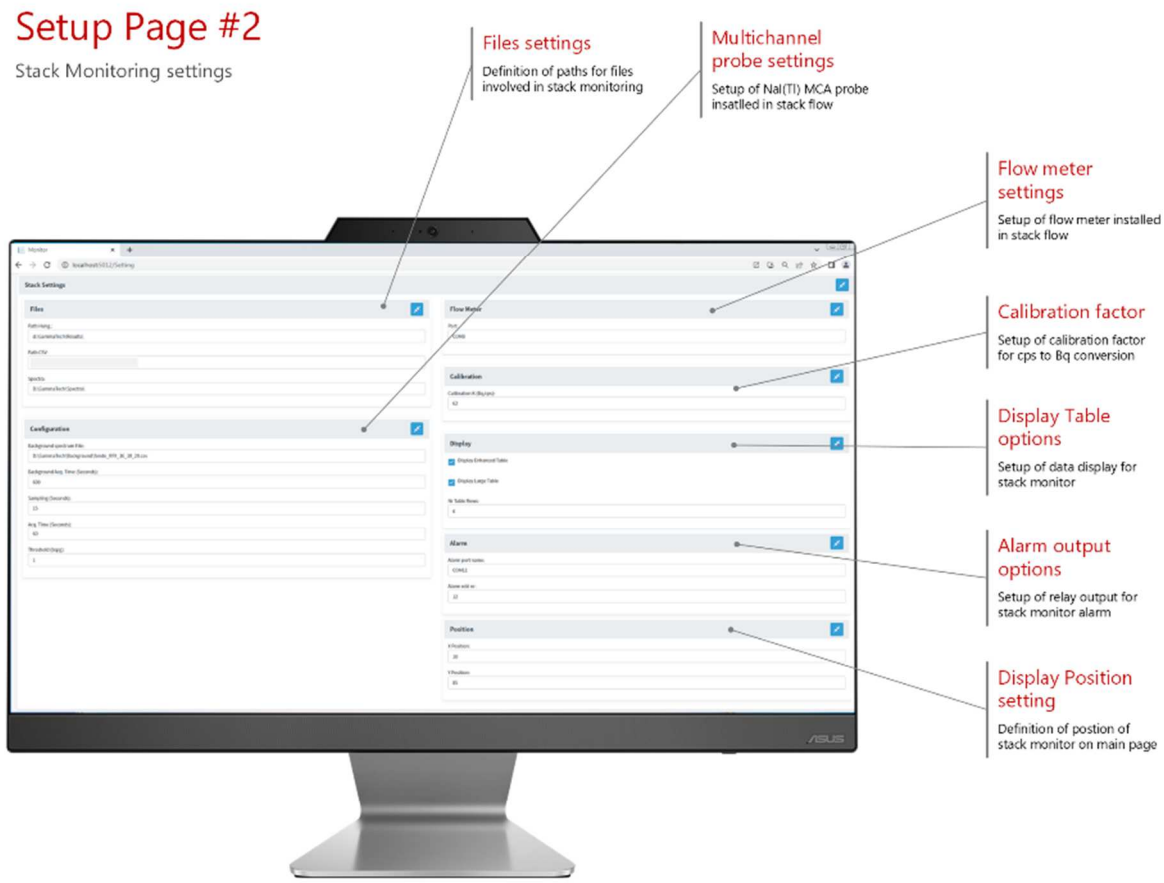
Setup-page #1

Common settings



The setup page allows all general purpose setting for the web application:

- Setting related to mail provider, in order to send alarm and report notifications via email to facility responsible personnel
- Setting related to database connection for permanent data saving
- Settings related to file structure for connectin with reference files and folders
- Relay output definition for alarm status notification (to alarm columns, external safety systems, etc..)

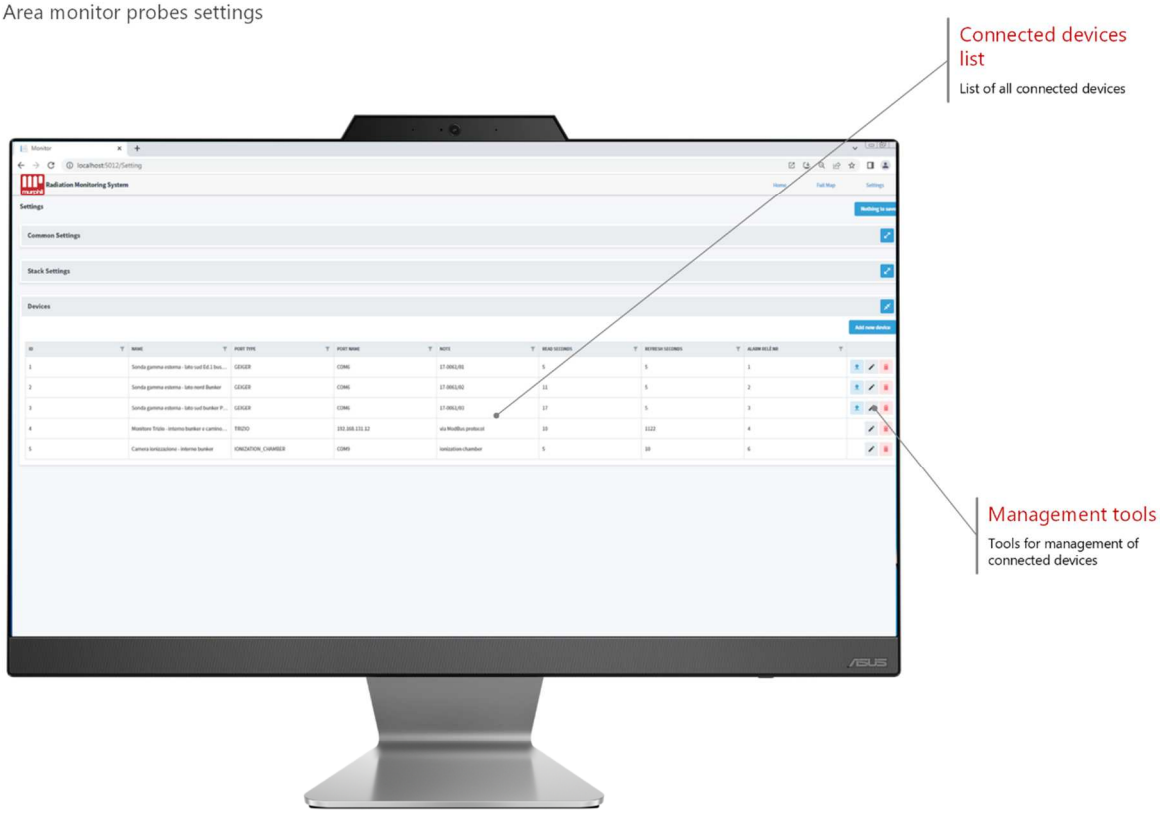


The setup page allows all settings related to the air stack monitoring system:

- Settings related to file structure for connectin with reference files and folders
- Settings related to the probe installed in the stack (NaI(Tl) probe + Multichannel Analyzer)
- Setting related to the flow meter installed in the stack for air speed measurement
- Relay output definition for alarm status notification (to alarm columns, external safety systems, etc..)
- Settings related to display options of the stack panel on the main page
- Relay output definition for alarm status notification (to alarm columns, external safety systems, etc..)
- Calibration settings (cps to Bq/g conversion)

Setup Page #3

Area monitor probes settings



This setup page allows to manage all connected area monitor devices:

- Tools for adding and deleting connected probes
- Tools for connection settings of connected devices
- Tools for alarm threshold settings for connected area monitors
- Tools for id definition of connected area monitors

CONFIGURATIONS

METRON-PC	**Central unit PC + electric box + application software**	
METRON-AM-ID	**Area Monitor with:** • **n.1 integrated probe**	
METRON-AM-RD	**Area Monitor with:** • **n. 1 remote probe** • **n.1 cables kit for remote probe**	
METRON-AM-R1	**Area Monitor with:** • **n. 1 integrated probe** • **n. 1 remote probe** • **n. 1 cables kit for remote probe**	
METRON-AM-R2	**Area Monitor with:** • **n. 2 remote probes** • **n. 2 cables kits for remote probe**	
METRON-N	**Neutron Monitor**	

METRON-AIR	**Air stack measuring system**	
METRON-X	**Transfer line supervisory system**	
METRON-TH	**Temperature-humidity interface connector**	

OPTIONS

METRON-AL	Alarm column	Additional alarm column
METRON-AR	Remote assistance	The remote control allows Murphil's technical personnel to control the system via Ethernet, in case of system malfunctions.
METRON-RL	Outputs	It's possible to add a dedicated electronic board in order to supply 7 relay outputs, programmable
METRON-UPS	UPS	UPS for METRON-PC
METRON-HC	Hot cell GM interfacing connector	Software interfacing over HMI
METRON-CC	Certificate of calibration for METRON-AM	Calibration certificate from accredited laboratory
METRON-TCP	MQTT over TCP	PoE capability for METRON-AM-ID, METRON-AM-RD, METRON-AM-R1, METRON-AM-R2, METRON-N. Communication protocol MQTT over TCP with the central PC

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