

## Radioactivity Measurement System *Micro-controller Go-NoGo version*

*Conveyor belt including the option sample input/output at the front*

The Radioactivity Measurement System (RMS) is an industrial monitoring tool developed to check cast samples for radioactive contaminants emitting gamma radiation with an energy between 50 keV and 2 MeV.



### Features

- a robust floor standing aluminum structure with adjustable working height
- NaI(Tl) scintillation detector + PMT tube base with integrated HV/PREAMP/AMP/SCA to transform the gamma radiation into electrical pulses
- 7 cm lead shielding with extra shielding over the PMT tube base to improve detection limits
- electrically driven conveyor belt with slides to sort Contaminated/Non Contaminated samples
- OR
- pneumatic drawer for sample input/output
- mechanical design adjustable according to customer's specifications
- human interface for alarm visualization and resetting
- micro-controller based Go-NoGo version with user friendly parameter configuration through LCD screen and on-board keyboard
- serial interface for communicating sample ID and measurements results
- dynamic background subtraction
- detection limit better than 0,1 Bq/g Co60-equivalent for a 100g sample and a measurement time of 60 seconds
- a Co-60 standard is included to check the system at regular times

December 2007

## Operating principle

The RMS is equipped with a NaI(Tl) scintillation crystal that is connected to a photomultiplier tube (PMT) that converts the scintillation pulses into electrical pulses of which the amplitude is proportional to the energy that the photon deposited into the detector.

The NaI(Tl) scintillation detector is connected to a special scintillation detector base with integrated DC High Voltage, Preamplifier and SCA that produces TTL pulses. These pulses are being sent to the micro-controllers counter input.



The micro-controller performs a global counting, meaning that isotope identification is not possible. Therefore the result is expressed in CPS (Counts Per Second), this is the number of pulses the detector registers per second (this value is a measure for the radiation intensity of photons).

At start-up the system performs an initial background measurement.

Although the detector is shielded by a 7 cm thick lead castle, some ambient radiation still reaches the detector and causes a constant background signal that needs to be subtracted from the measurement value. As the level of this background radiation is not constant, it needs to be updated continuously. So whenever there is no sample present, the Radioactivity Measurement System (RMS) is performing dynamic background measurement.

Whenever a sample is put on the RMS and a 'Start Measurement'-command is given (automatically through an optical sensor, by a start-pushbutton, by remote start of a master PC, ...), the sample is put underneath the NaI(Tl) scintillation crystal and is being measured for a predefined preset time.

After the measurement, the background value is subtracted from the measurement value and the result is evaluated against the alarm threshold.

Measurement result, background level and alarm level are displayed on the LCD screen of the micro-controller.

Sample ID and measurement results can be send to a printer (1 line/measurement) or to a PC (RS232 serial interface).

## Samples

A variety of cast samples can be measured on the RMS:



A large number of these Radioactivity Measurement Systems have been integrated in the most important European steel producing factories.