Air Monitoring

Content

FHT 59 Si
Alpha-Beta Aerosol Monitor

FHT 59 S
Beta Aerosol Monitor

FHT 59 S-2
Beta Aerosol Monitor
with delayed measuring position

FHT 59 N3/NE3
Nuclide-Specific Gamma Aerosol Monitor

FHT 59 E
Noble Gas Monitor

FHT 59 S2-J
Combi-Monitor
Beta Aerosol- Iodine Monitor

Introduction

Radioactive nuclides are distributed in the atmosphere as aerosols, precipitation or as gaseous components. The monitoring of radioactivity in the atmosphere is a mission, which get more and more a high priority all over the world. Therefore the monitoring of radioactive aerosols and gases in the ambient atmosphere (environmental monitoring) and in the stack releases of nuclear facilities (stack monitoring) is one of our core competences for a long time.

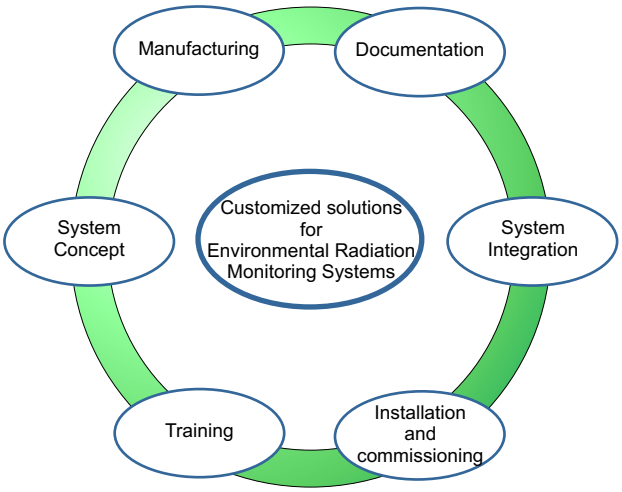
The product range comprises systems for monitoring of airborne particulates, iodine, noble gas and tritium. Environmental monitoring systems should provide a sensitive detection of a wide range of radio nuclides. Besides detection of „only“ the total Alpha-, Beta- or Gamma activity of the atmospheric aerosol, a more and more relevant application is the nuclide-specific monitoring of the atmospheric aerosol.

Additionally the monitoring systems should also have a focus on appropriate sampling techniques, e.g. isokinetic sampling techniques for monitoring the release from stacks.

A second focus is the workplace monitoring using mobile monitor systems for personal protection.

Further monitoring systems are available for monitoring the emission of airborne positron emitters from PET centers as well as detection of water contamination.

Complete Overall Service Concept



In summary environmental radiation monitoring of the atmosphere is a helpful activity to make the world cleaner, safer, and healthier.

Aerosol Monitor FHT 59 Si , FHT 59 S, FHT 59 S-2

Overview:

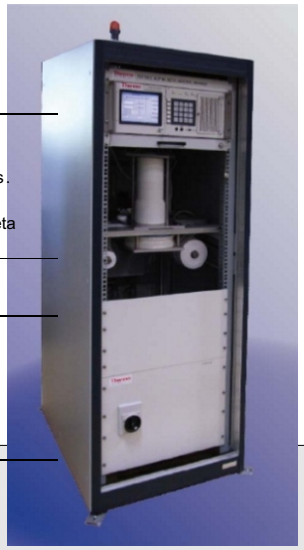
The Aerosol Monitors FHT 59 Si, FHT 59 S, and FHT 59 S-2 are applied for the continuous automatic detection and early warning of aerosol-bound radio nuclides in the air.

A special compensation method eliminates the influence of high concentration levels of natural aerosol-bound radioactivity on the measured values of artificial radioactivity in the air. The use of an Ion-implanted silicon detector or ZnS-coated plastic scintillation detector allows detecting alpha and beta radiation simultaneously. The artificial beta activity concentration is determined by means of the alpha beta ratio method.

The aerosols suspended in the air are collected on a special filter tape that is transported by a tape feed mechanism. After a pre-defined measurement period of 30 minutes the aerosol deposition spot is transported further by the tenth of the diameter (5 mm).

The Radon/Thoron equilibrium is maintained during a filter step by forwarding the filter tape by only 10 % of the filter diameter spot. A pump primes a constant air flow through the filter tape whereby the aerosol-bound activity is accumulated on the filter. The detector is mounted right above the particulate collection chamber and measures the activity simultaneously during deposition. The results are obtained in units of Bq/m³.

The FHT 59 S-2 is equipped with a second measuring position. After 48 transport steps the second detector performs a further measurement of the deposited spot. The second detector only can detect the long living artificial activity because of the decay resulting in the delay of 24 hours.



Main Application	Continuous automatic detection and early warning of radioactive alpha and beta aerosols in the ambient air and stack gas.	
Features	Automatic compensation of the natural activity concentration by special evaluation routines. Reliable filter tape feed mechanism. Long intervals of maintenance due to large reserve of filter tape. Omni-directional detector shielding including the particulate collection chamber. Compact design in 19"-technique.	
Benefit:	FHT 59 Si:	Discrimination of natural and artificial alpha - and beta components.
	FHT 59 S:	Discrimination of natural and artificial beta components.
	FHT 59 S-2:	Discrimination of natural and artificial alpha - and beta components, more reliable determination of artificial beta radiation at second measuring position.
Detector	FHT 59 Si:	ion-implanted Si-detector (PIPS)
	FHT 59 S, S-2:	ZnS coated plastic scintillation detector
Measuring range	FHT 59 Si:	Alpha: 0.05 – 10^6 Bq/m³ Beta: 0.3 – 10^6 Bq/m³
	FHT 59 S:	Alpha: 0.3 – 10^6 Bq/m³ Beta: 0.3 – 10^6 Bq/m³
	FHT 59 S-2:	Alpha: 0.3 – 10^6 Bq/m³ Beta: 0.2 – 10^6 Bq/m³
Detection limit, according ISO 11929 Measuring cycle 30min, Full measuring time: 2h	FHT 59 Si:	art. Alpha: 0.05 Bq/m³ art. Beta: 0.3 Bq/m³
	FHT 59 S:	art. Beta: 0.3 Bq/m³
	FHT 59 S-2:	art. Beta: 0.2 Bq/m³
Efficiency	FHT 59 Si:	Am-241: 15 ± 2 % Sr-90/Y-90: 20 ± 3 %
	FHT 59 S, S-2:	Am-241: 10 ± 2 % Sr-90/Y-90: 20 ± 3 %
Aiflow:	Approx. 10 m³/h, non-regulated	
Dimensions: height x width x depth	FHT 59 Si, S:	1600 x 600 x 800 mm
	FHT 59 S-2:	1600 x 800 x 800 mm
Weight, net, without packing	FHT 59 Si, S-2:	230 kg
	FHT 59 S:	200 kg

Nuclide-specific Gamma Monitor FHT 59 N3/NE3

Overview:

The nuclide specific monitor FHT59N3 or NE3, with E denoting the electric cooling version, is designed to monitor the nuclide specific activity concentration of aerosol-bound artificial and natural radionuclides in air, continuously.
The aerosols suspended in air are collected on a special filter tape that is transported by a tape feed mechanism. A pump sucks a constant air flow of app. 10 m³/h through a filter tape whereby aerosol-bound activity is accumulated in the filter.

The gamma quanta emitted by the accumulated aerosols are detected by a high-purity germanium detector and are stored as an event in the related energy channel of a multi-channel data acquisition module. After elapse of the adjustable aerosol accumulation time (typical 4 h) the filter tape is advanced moving a fresh filter section into the aerosol collection point.

Technical Detector Data

Parameter	Min.	Typ.	Max.	Unit	Condition/Note
High Purity Germanium Detector		GEM15P4			
Energy resolution		825 1.85		eV keV	FWHM @ 122 keV FWHM @ 1.33 MeV
Peak to Compton ratio		46:1			
Peak-Form Parameters:		1.90		FWTM/FWHM	
Detector Cooling		LN2			Optional: Electric cooling
Dewar		30		L	

Iodine Monitor FHT 1700, Noble Gas Monitor FHT 59 E

Overview:

The iodine monitor FHT1700 is applied for the automatic monitoring and early warning of I-131 in ambient air or stack gas.
The sample air is sucked through a filter cartridge in Marinelli-beaker geometry filled with iodine adsorbent. Elementary as well as organically bound iodine is precipitated. The filter cartridge is exchanged manually. A NaI-detector located in the center of the filter cartridge continuously measures the accumulated activity within the iodine window. Additionally, a second energy window with thresholds above and below the iodine window is measured to determine the background count rate (trapezoid method). The measurement is done during the accumulation. The results are displayed in units of Bq/m3.

The noble gas monitor FHT 59 E is applied for the automatic monitoring and early warning of noble gas in ambient air or stack gas. The measurement sequences are controlled and supervised by the measuring channel FHT 8000. In extension to the kernel routines the software containes diagnostic modules identifying and signalling possible errors. Finally, a test module for repeated functional checks of the monitor has been implemented.
Two permanently filled large area proportional counter tubes serve to achieve the required minimum detectable activity concentration. Varying gamma dose rate levels are compensated for by a duplicate Anticoincidence circuit.

Main Application	Continuous automatic detection and early warning of radioactive noble gas or iodine I-131 in the ambient air and stack gas.	
Features:	Prevention of aerosol contamination of the sampling unit using a H12 aerosol filter.	
	FHT 59 E:	Calibration of the monitor for Kr-85, Xe-133 by an independent institute.
	FHT 1700:	online background compensation by trapezoid method. Correction of the radioactive decay of I-131 Heating of air intake
Detector	FHT 59 E:	2 gas-filled proportional counter tubes FH 427 F
	FHT 1700:	NaJ(Tl) scintillation detector
Measuring range	FHT 59 E:	up to 3.7×10^8 Bq/m^3, related to Xe-133
	FHT 1700:	$0.5 - 10^4$ Bq/m^3
Detection limit, according ISO 11929	FHT 59 E:	Xe-133: 2.5 kBq/m^3 Kr-85: 1.25 kBq/m^3
	FHT 1700:	I-131: 0.5 Bq/m^3
Efficiency	FHT 59 E:	XE-133: 5.5 % Kr-85: 11 %
	FHT 1700:	I-131: 4 ± 1 %
Aiflow:	FHT 59 E:	Approx. 0.6 m^3/h
	FHT 1700:	Approx. 5 m^3/h
Dimensions: height x width x depth	1600 x 600 x 800 mm	
Weight, net, without packing	FHT 59 E:	220 kg
	FHT 1700:	310 kg

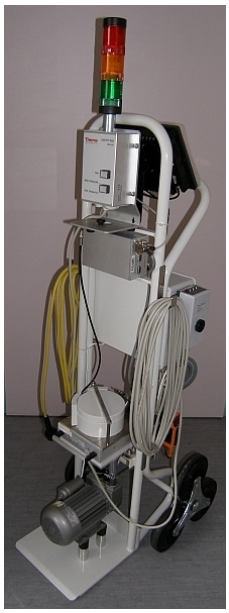
Mobile Workplace Monitor FHT 58L, FHT 57L, FHT 1702L

Overview:

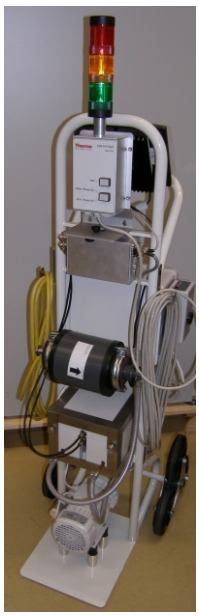
The mobile Environmental Monitors can be used for various applications in the field of air contamination monitoring as well as for work place and effluent monitoring measurements.
Dependent on the measured quantity (noble gas, aerosols, iodine) the appropriate monitor can be selected.

Alpha-Beta Aerosol Monitor FHT 58 L

Parameter	Min.	Typ.	Max.	Unit	Condition/Note
Measuring Range	10^0		10^5	Bq / m^3	related to 60 min sampling time
Minimum Detectable Activity Concentration for ^{90}Sr (acc. to ISO 11929) ambient dose rate level of 100 nSv/h with a natural radon level of up to 30 Bq/m^3 present					
	1		4	Bq / m^3	τ_1 = 5 min τ_2 = 30 min
Efficiency					
^{241}Am		2.5		%	alpha channel
		5.0		%	beta channel
^{90}Sr		< 0.01		%	alpha channel
		12		%	beta channel
Background at 100 nSv/h		0.05		cps	alpha channel
		0.5		cps	beta channel



Noble Gas Monitor FHT 57 E-L



Parameter	Min.	Typ.	Max.	Unit	Condition/Note
Measuring Range	10^4		10^9	Bq / m^3	For ^{133}Xe
Minimum Detectable Activity Concentration acc. ISO 11929; amb. DR level approx. 100 nSv/h; t_b = 30 min., t_0 = 60min.,					
For ^{133}Xe		5		kBq / m^3	
for ^{85}Kr		2.6		kBq / m^3	
Efficiency		1.17×10^4		Bq/m^3×s	^{85}Kr
		2.00×10^4		Bq/m^3×s	^{133}Xe
		8.03×10^3		Bq/m^3×s	^{41}Ar
Cross-sensitivity		3		cps / μSvh^{-1}	Uncompensated

Iodine Monitor FHT 1702 L

Parameter	Min.	Typ.	Max.	Unit	Condition/Note
Measuring Range	10^0		10^5	Bq / m^3	
Minimum Detectable Activity Concentration for ^{131}I (acc. to ISO 11929)		1		Bq / m^3	t_1 = 5min., t_2 = 30min., amb. DR level approx. 100nSv/h
		40			amb. DR level approx. 100 µSv/h (^{60}Co)
Efficiency		0.05		Cps / Bq	^{131}I
Cross-sensitivity		10		Cps / μSvh^{-1}	without compensation in the ^{131}I energy window (^{137}Cs)