



SENSITIVE CONTINUOUS AEROSOL MONITORING FOR HIGH SAMPLE VOLUMES

The LB 150 D-R Alpha-Beta Fixed Filter Monitor

REAL ONLINE MONITORING

Continuous aerosol monitoring with high sensitivity.



True online monitoring

The LB 150 D-R is a fixed filter monitor for the simultaneous measurement of aerosol-bound artificial alpha- and beta-particulates with high sensitivity. The system enables the compensation and measurement of natural radioactivity.

The LB 150 D-R is a true online monitor, as dusting, measurement and evaluation are done simultaneously. It is equipped with self-monitoring of the most important functions, which reports faults and/or limit value violations.

DESIGNED FOR HIGH SAMPLE VOLUME APPLICATIONS

The alpha-beta-particulates monitor LB 150 D-R high air flow rate of up to 40 m³/h enables representative sampling, both for direct monitoring of room or workplace air and for monitoring the exhaust air from the stack using isokinetic sampling.

Typical areas of application include:

- ▣ Nuclear facilities: Nuclear fuel cycle and fission product production
- ▣ Storage and processing of nuclear waste products
- ▣ Hot Cell Labs
- ▣ Monitoring of alpha emitting (transuranic) substances

LB 150 D-R benefits at a glance

Detect even small quantities of artificial radioactive particles in the presence of natural activity:

- ▣ Simultaneous measurement of artificial alpha- and beta-particulates
- ▣ Efficient compensation and measurement of natural radioactivity (Radon/Thoron daughters)

Representative sampling in high sample volume applications:

- ▣ Air flow rate of up to 40 m³/h
- ▣ Collection of airborne particulates on a large 200 mm Ø glass fiber filter

Your reliable partner:

- ▣ 3-fold large area surface proportional counter with high alpha- and beta efficiency
- ▣ Continuous measurement and alarm threshold monitoring
- ▣ Isokinetic air flow, considering known particle loss factors



Figure 1: LB 150 D-R Alpha-Beta Fixed Filter Monitor with opened drawer of the particulates collection unit.

RELIABLE RESULTS

Sensitivity and security hand in hand.

Extensive status monitoring functions

The system is equipped with self-monitoring functions for all critical operating parameters, which report any exceeding of the alarm threshold or any error condition:

- ▣ Pump function monitoring
- ▣ Filter load monitoring
- ▣ Frequency control unit monitoring
- ▣ Sampling unit monitoring
- ▣ Monitoring for detector failure of the alpha, beta and gamma detector
- ▣ Exceeding of pre-alarm and alarm thresholds

Measuring principle and methods

The LB 150 D-R was developed to reliably detect even small amounts of artificial radioactive particles in the presence of natural activity (radon - thoron daughters). Depending on location, season, day or night and weather conditions (rain), these concentrations can range from 1 Bq/m³ to several hundred Bq/m³. Hence, an efficient compensation mechanism against natural radioactivity is required.

Therefore, the system uses the alpha-beta pseudo coincidence difference method (ABPD), enhanced by alpha energy range discrimination (AERD), to provide powerful performance compensation against natural radioactivity in the air sample.



Figure 2: Particulates Sampling Unit of the LB 150 D-R Alpha-Beta Fixed Filter Monitor with 200 mm Ø filter supports sinter plate with drawer mechanism

The collected air is passed through a GF 8 glass fibre filter with 200 mm Ø. The detector, a large proportional counter with a thin entrance window, is located directly above the collection area at a distance of 7 mm and measures the radiation intensity from alpha and beta decays.

By means of a frequency regulator the sample air flow can be regulated proportional to a stack flow or be kept constant, i.e. independent of the dust loading on the filter. Therefore, there are 3 different configuration options:

- ▣ Unregulated flow rate
- ▣ Constant flow regulation (optional): Sample airflow is regulated proportional to the filter dust loading
- ▣ Proportional regulation (optional): The airflow through the monitor is regulated proportional to the stack release flow.



TECHNICAL SPECIFICATIONS

Pump	Silent Turbine pump Type SV 5.130/2 with max. 40 m ³ /h sample flow rate		
Filter Disk	Glas fiber filter, GF 8, Ø 200 mm or equivalent		
Ambient Conditions	Ambient temperature	0 to 50 °C	
	Sample air temperature	up to 85°C	
	Humidity	max. 80 % rel. humidity	
	Sample air pressure	0.7 to 1.2 bar absolute	
Detector	Type	3-fold proportional counter tube GFDZ 200 in sandwich construction	
	Lead shield	4 pi 2 cm (5 cm optional)	
	Counting gas	P10 or ArCO ₂ 90/10 or 82/18	
	Gas consumption	appx. 2 l/h	
	Background	Alpha: typ. 0.7 cps ; Beta: typ. 2.25 cps; Guard: typ. 5.0 cps	
Measuring Range	Radon compensation	Effective to at least 500 Bq on the filter	
	Alpha range (w. ABPD Method)	max. 29000 cps at 30 % dead time loss; corresponds to approx. 4.8 kBq/m ³ room activity and 143 kBq on the filter with dead time correction	
	Beta range (w. ABPD Method)	max. 145000 cps at 30 % dead time loss; corresponds to approx. 24.5 kBq/m ³ room activity and 735 kBq on the filter with dead time correction	
Efficiencies <small>(Measured with 200 mm Ø flat surface emission sources)</small>	Alpha	Am-241: appx. 23 % U _{nat} : appx. 16 %	Cal. Factor kf = 4.4 Bq/cps Cal. Factor kf = 6.3 Bq/cps
	Beta	Sr-90+: appx. 21 % U _{nat} : appx. 11 % Co-60: appx. 11 %	Cal. Factor kf = 4.8 Bq/cps Cal. Factor kf = 9.1 Bq/cps Cal. Factor kf = 9.1 Bq/cps
Noble gas influence <small>(data from KFA-Jülich, Germany)</small>	Kr-85	appx. 24.8 kBq/m ³ /cps	
	Xe-133	appx. 69.0 kBq/m ³ /cps	
Particulates Losses <small>(data from CEA-IPSN, Paris - France)</small>	Collection unit	particle diameter in µm:	loss in %:
		2 neutral 2 (3000 µ+/part.) 4 neutral 10 neutral	appx. 4 appx. 8.6 appx. 6.6 appx. 10.2
Detection Limits <small>(in accordance to ISO 11929 with a measuring time of 1 h and 30m³/h flow rate)</small>	without the presence of radon/thoron:	Alpha < 0.003 Bq/m ³ Beta < 0.02 Bq/m ³	
	with the presence of radon/thoron:	Alpha < 0.25 Bq/m ³ (at up to 180 cps nat. alpha count rate) Beta < 0.4 Bq/m ³ (at up to 300 cps nat. beta count rate)	
Ordering Infos	90965	LB 150 D-R Alpha-Beta Fixed Filter Monitor	
	17012	Optional 5 cm lead shielding	
	5952	Glass Fiber Filter GF 8, Ø 200 mm, 100 pieces	

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