

# LB 147 / LB 148

Portable Contamination Monitors



**BERTHOLD**

# PERSONAL CONTAMINATION MONITORS

## Equipment Concept

The Personal Contamination Monitors LB 147 and LB 148 are contamination monitors designed for use in the radiation protection field to detect contamination caused by alpha and beta/gamma radiation. Low-maintenance thin-layer ZnS (Ag) scintillators are used as detectors. The user can interact with the system via a touch panel on a graphical display.

The LB 148 version has four automatically tracked hand detectors that allow both the palms and the back of the hands to be measured simultaneously. With the LB 147 version, an automatic prompt for back of hand measurement can be activated. The LB 147 is also available in a narrow version LB 147 Slim with a different positioning of the hand detectors. There are two variants: the detectors are facing the user (ID 45356-15) or the detectors are facing away from the user (ID 45356-18). The LB 147 and LB 148 are also available as an Alpha Sense version with special modification of the protective grid for lower  $\alpha$ -detection limits. All monitor versions have a detachable probe for clothing measurements.

Each detector has its own calibration factor for each nuclide and its own spill-over factor for each alpha nuclide. More than 50 nuclides with calibration factors according to DIN ISO 7503-1 and A-100 are already stored in the software.

The devices can be operated as monitors for simultaneous  $\alpha$ - and  $\beta/\gamma$ -measurement or only as pure  $\alpha$ - or pure  $\beta/\gamma$ -monitors, whereby the measurement results can be displayed in the unit Bq/cm<sup>2</sup> or cps. The detection limits and characteristic limits are calculated for each measured value in accordance with DIN ISO 11929 and saved together with the measured values.

The ambient radiation is continuously checked separately for each detector and compensated for as a long-term average value during the contamination measurement. The monitors also check for fluctuations in the background immediately before starting the measurement.

The menu navigation is clearly laid out and easy to operate. The built-in power supply unit automatically adapts to the various AC voltage supplies.



LB 147 with signal tower



LB 147 SLIM with averted detectors

## Functions and Accessories LB 147 and LB 148

Numerous service functions permit easy measurements for necessary periodical tests. This includes automatic calibration routines for all detectors and a fast system test. All in- and outputs can be checked very quickly by means of further service functions.

Users can be registered using an optional transponder or magnetic card reader. The HFK programme (optional) can be used to evaluate the personal measurement data and record it in a database.

An optional signal tower can be connected via one of the USB (host) interfaces or via the three relays built into the devices. A door control unit can also be connected here with configuration options in the software.

A remote parameter programme is available for configuring and documenting the monitors. In addition to direct communication, the application can also be used offline to create or edit setting files. The monitors have the following interfaces: 5 USB

(host), 1 USB (device), 1 Ethernet 10/100/1000 Mb, 1 RS232 and 1 RS485. In addition to signal towers, transponders, magnetic card readers or printers can also be connected to the USB (host) interfaces (optional).

Up to 10.000 measurement data can be stored and transferred to external computers via the USB or Ethernet interface. Alternatively, the serial interface can also be used. A comprehensive communication protocol allows integration into a measurement network.

Reading out the measurement data and carrying out software updates on the monitors is quick and easy via one of the five USB (host) interfaces.



LB 148 with detectors for back of hands

Back / electrical connections

# TECHNICAL SPECIFICATIONS

## Technical data LB 147 / LB 148

| Detectors  |  | A: LB 147/LB 148, B: Alpha Sense |       |
|--|--|----------------------------------|-------|
| Radiation detector   | ZnS(Ag) scintillator   |                                  |       |
| Material entrance window   | 2 µm x 3 µm metallized, plastic (0.4 mg/cm <sup>2</sup> )                    |                                  |       |
| Hand Detectors   |  |                                  |       |
| Dimensions entrance window   | 150 mm x 230 mm  |                                  |       |
| Sensitive area   | 345 cm <sup>2</sup>  |                                  |       |
| Zero effect  | α-channel  | about 0.1cps                     |       |
|  | β-γ-channel  | about 15cps                      |       |
| Typ. Efficiencies<br>(according to ISO 7503-1)   |  | A                                | B     |
|  | <sup>241</sup> Am  | 33%                              | 43%   |
|  | <sup>14</sup> C  | 20%                              | 25%   |
|  | <sup>36</sup> Cl   | 49%                              | 70%   |
|  | <sup>90</sup> Sr/ <sup>90</sup> Y  | 52%                              | 66%   |
| Typ. MDA<br>(according to ISO 11929)<br>with 10s measuring<br>time in Bq/cm <sup>2</sup> | <sup>241</sup> Am  | 0.026                            | 0.019 |
|  | <sup>14</sup> C  | 0.649                            | 0.460 |
|  | <sup>36</sup> Cl   | 0.135                            | 0.078 |
|  | <sup>90</sup> Sr/ <sup>90</sup> Y  | 0.126                            | 0.088 |
| Foot Detectors   |  |                                  |       |
| Dimensions entrance window   | 150 mm x 370 mm  |                                  |       |
| Sensitive area   | 555 cm <sup>2</sup>  |                                  |       |
| Background   | α-channel  | ca. 0.2 cps                      |       |
|  | β-γ-channel  | ca. 40 cps                       |       |
| Typ. Efficiencies<br>(according to ISO 7503-1)   |  | A                                | B     |
|  | <sup>241</sup> Am  | 19%                              | 40%   |
|  | <sup>14</sup> C  | 21%                              | 21%   |
|  | <sup>36</sup> Cl   | 54%                              | 71%   |
|  | <sup>90</sup> Sr/ <sup>90</sup> Y  | 43%                              | 64%   |
| Typ. MDA<br>(according to ISO 11929)<br>with 10s measuring<br>time in Bq/cm <sup>2</sup> | <sup>241</sup> Am  | 0.055                            | 0.026 |
|  | <sup>14</sup> C  | 0.954                            | 0.961 |
|  | <sup>36</sup> Cl   | 0.191                            | 0.137 |
|  | <sup>90</sup> Sr/ <sup>90</sup> Y  | 0.254                            | 0.153 |
| Ambient Conditions   |  |                                  |       |
| Temperature range  | - 5 °C bis + 40 °C   |                                  |       |
| Rel. humidity  | 0% bis 90%, non condensing   |                                  |       |
| Mechanical Data  |  |                                  |       |
| LB 147/Alpha Sense   | about 65 x 125 x 80 cm <sup>3</sup> (W x H x D)                              |                                  |       |
| LB 147 Slim  | about 45 x 125 x 90 cm <sup>3</sup> (W x H x D)                              |                                  |       |
| LB 148   | about 85 x 125 x 82 cm <sup>3</sup> (W x H x D)                              |                                  |       |
| LB 147/Slim/Alpha Sense  | approx. 35 kg  |                                  |       |
| LB 148/Alpha Sense   | approx. 45 kg  |                                  |       |
| Electronics  |  |                                  |       |
| Display  | Colour 7" Touch Panel, 800 x 480 Pixel                                       |                                  |       |
| Ports  | 5 USB(Host), 1 USB(Device), 1 Ethernet<br>10/100/1000 Mb, 1 RS 232, 1 RS 485 |                                  |       |
| External signal transmitters   | 3 relays max. 50 V, 5A   |                                  |       |
| Power supply   | 100 - 240 VAC, wide-range input  |                                  |       |
| Power consumption  | approx. 14.5 W, Fuse 2A  |                                  |       |
| Systems  |  |                                  |       |
| LB 147   | 45356-10   |                                  |       |
| LB 147 Slim  | 45356-15 (with facing detectors)   |                                  |       |
| LB 147 Slim  | 45356-18 (with averted detectors)  |                                  |       |
| LB 147 Alpha Sense   | 45356-16   |                                  |       |
| Accessories (optional)   |  |                                  |       |
| Ident. No.   |  |                                  |       |
| Mobile set (only for LB 147)   | 52874  |                                  |       |
| Transponder system (RFID)  | 66164  |                                  |       |
| Chip/Card (RFID)   | 59495/59503  |                                  |       |
| Magnetic card reader   | 66442  |                                  |       |
| Magnetic card  | 34481  |                                  |       |
| Signal tower for LB 147<br>(red/green)   | 65252  |                                  |       |
| Signal tower for LB 148<br>(red/green)   | 65252  |                                  |       |
| Calibration source <sup>36</sup> Cl/ <sup>241</sup> Am                                   | 29336/25509  |                                  |       |
| HFM program  | 42849-042  |                                  |       |
| Stomach and thyroid probe*   | 49950  |                                  |       |
| Stomach probe*   | 53516  |                                  |       |
| Thyroid probe*   | 53517  |                                  |       |
| *only for LB 147, only for export<br>Subject changes without prior notice.               |  |                                  |       |

## TRANSFORMING SCIENCE INTO SOLUTIONS



Experience and expertise are of great importance to be able to ensure safety-relevant measurements properly and reliably. With more than 70 years of experience in planning and design, installation and commissioning, calibration, documentation and service of radiation protection measurement systems, we continue to support our customers in their task to continuously optimize their work processes and to ensure the safety of the environment and personnel.

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