



# iCAM™-HD

## High Flow Rate Alpha/Beta Air Monitor



Nuclear



Healthcare



Homeland  
Security  
& Defense



Labs and  
Education



Industrial and  
Manufacturing

### KEY FEATURES

iCAM-HD shares these same great features with the standard iCAM:

- Identical Radon compensation algorithms and detector technology (dual CAM PIPS®)
- Identical amplifiers/bias generator, display and system board/CPU (iCAM Mk3)
- Ability to connect an external G64 detector to allow gamma dose rate monitoring and alarming
- RS-232 port for iConfig setup and configuration
- Dual Ethernet ports with Modbus TCP compatibility
- RS-485 port for networking to Horizon®

### BENEFITS

Benefits of the iCAM-HD include:

- Larger sampling head, larger filter and larger detectors accommodate sampling flow rates up to 120 L/min (7.2 m<sup>3</sup>/hr = 4.2 cfm)
- Incorporates Bayesian time series algorithms to achieve very low alarm levels, while maintaining good response time for rapid releases
- Ideal for high dust load industrial environments

### OPTIONS

- Wheeled cart or wall mounted system
- Full-function area gamma alarm monitor capability using the optional G64 detector
- Moving filter cassette or fixed filter holder
- 2 hour backup battery pack (for monitor only)

### DESCRIPTION

CANBERRA's iCAM-HD alpha/beta Continuous Air Monitor provides robust and reliable monitoring of airborne alpha and beta particulate activity in applications where higher sample flow rate is required than in the standard iCAM. Typical applications might include the upgrade of high sample rate passive stack sampling ports to active monitoring. Whereas standard CAMs sample at up to 60 L/min, the iCAM-HD is capable of sampling from 30 L/min up to 120 L/min, and is capable of sampling for extended periods (>1 week typ.) at >100 L/min. The new Bayesian Time Series algorithms incorporated in the iCAM-HD permit monitoring at previously unattainable low alarm levels, with low false alarm rates yet still allow rapid response to large releases.

The iCAM-HD measures airborne alpha and beta particulate activity using the same patented radon/thoron alpha compensation as the standard iCAM, but with improvements in the beta radon compensation performance. It also provides dynamic gamma compensation of beta measurements.

Air is drawn through the instrument by means of an external pump or vacuum system, and airborne particulate material is deposited on the removable filter. The filter is normally held in an exchangeable moving filter cassette, providing over one year's unattended operation in typical conditions, but an optional fixed filter holder can also be used in the same sampling head mechanism. A 47 mm filter diameter is used to provide low pressure drop even at high flow rate, permitting extended sampling times. The filter is monitored by a CANBERRA CAM1700 PIPS® (passivated ion-implanted planar silicon) radiation detector, which allows simultaneous measurement of both alpha and beta radioactivity in the material deposited on the filter. The air flow is measured directly and reported by the instrument. The design of the stainless steel sampling head is optimized to ensure high air sampling efficiency and high transmission of particles to the filter. A second CAM1700, mounted behind the first, provides gamma compensation of the beta measurement.

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Measurement results are presented on the high contrast graphical display on the instrument's front panel. User setup and diagnostics are via the local keypad and the graphical display, which provide a natural user interface.

Results may be reported via the RS-485 or two Ethernet network connections to a local computer or plant surveillance system. Each instrument stores historical data, typically from the last three months, which may also be transmitted over the network if required.

The historical data includes not only activity readings, updated every five minutes in normal operation, but also alarms, filter changes and user interactions. Each event is logged with its date and time. There is also an option to store alpha spectra at user selectable intervals in the event of an alpha activity alarm.

The primary filter activity measurement uses measurements taken over a user selectable interval of typically five minutes, and this data is updated as on a rolling average basis every 15 seconds. Alpha, beta and gamma dose rate (where applicable) measurement values are each tested against user-set alarm levels. Three alarm levels are provided, for each of the alpha, beta and gamma measurement variables, with levels 1 and 2 being displayed on the main screen.

Any alarms may be indicated locally by visual and audible signals, remotely by relay circuits, or centrally by connection to a suitable monitoring network. Alarm events are also archived, along with measurement values, faults and (optionally) alpha alarm spectra.

## HARDWARE

The iCAM-HD instrument is packaged in a rugged steel enclosure which provides IP54 environmental protection and EMC screening. The front panel carries the local controls and indicators, including the high visibility graphical display, the local keypad and the various indicator lights. The air inlet and alarm beacons and sounder are mounted on top of the instrument.

When the power supply is switched on, the instrument will perform initialization tests and begin normal operation without any operator intervention. It will begin providing valid measurements within 15 seconds after starting normal operation. It will then update measurements at 15 second intervals.

Air is drawn into the instrument at a preset rate, within the range 30 – 120 L/min (1.1 – 4.22 ft<sup>3</sup>/min), typically about 100 L/min (3.5 ft<sup>3</sup>/min), and particulate material is deposited on a removable filter. The airflow rate is measured directly on board and its value is used to calculate concentration values and integrated concentration values. Low and high flow alarm values can be set by the user. The total air flow since last reset is recorded and reported.



*iCAM-HD can be mounted on an optional cart allowing it to become mobile*

## DETECTORS

A CANBERRA CAM1700 PIPS detector is used for detecting both alpha and beta activity from activity deposited on the filter. A second identical detector is located inside the sampling head very close to the first detector. This second detector is not exposed to the airflow or filter and instead provides the data to make accurate dynamic compensation for the effect of gamma background on the beta measurement.

The measurement range of the instrument extends to over 500 kBq (13.5  $\mu$ Ci) of combined alpha and beta activity deposited on the filter. Calibration and background activity check measurement and display functions are provided, which can be accessed via the front panel controls. The background check may also be used to identify the presence of contamination within the monitor or to assess ambient gamma background values.

## INSTRUMENT ANNUNCIATORS

Five high-brightness indicator lamps on the front panel draw attention to specific conditions as designated in the table below:

Indicator Name	Indicator Color	Indicator On	Indicator Off
Alarm	Red	An activity alarm condition or a gamma dose rate alarm condition has been detected.	No activity alarm condition has been detected.
Muted	Yellow	The audio alarm has been switched off.	The audible sounder has not been switched off.
Fault	Red	An equipment failure alarm condition has been detected.	No equipment failure alarm condition has been detected.
AC Power	Green	The monitor has ac power.	The monitor does not have ac power. (It may still be operating – on the optional internal battery.)
Monitoring	Green	The instrument is in monitoring mode.	The instrument is not in the operating mode.

An audio alarm provides indication of alarm or fault conditions. The audible sounder can be muted by use of the local controls without affecting the other alarm indications.

## DISPLAY

A 240 x 128 pixel (100 x 80 mm) (4 x 3.15 in.) LED-backlit liquid crystal display panel presents operational information, and together with the panel controls, forms a natural interface for the user. It can show ongoing measurement data in various forms, including a live display of the accumulating alpha spectrum. The default display is the measured activity levels in the pre-selected units. Alternatively it can be used, together with the panel controls, to show other information and to perform operational functions including calibration check, self tests, and viewing the archive.



## SCREENS

The display shows the current measurement values in the display units selected via the /Display/Measurements soft key.

After power-up, reboot or reset, the instrument will perform initialization tests and begin normal operation without operator intervention. With a filter in place, the main screen is displayed, showing the activity readings and units. When the instrument is configured as a duct monitor, the units may be in Bq or Bq/hr. The units displayed are user configurable. All are measured and archived, whether displayed or not. The rest of the display shows alarm/status messages, and time and date.

The lowest line of the main example display indicates the status of the four soft keys. Archive display may be selected by pressing the archive soft key. It allows the internal measurement and event archive to be inspected on the instrument display. The archive can hold enough entries of normal complexity, for up to three months' data. It includes activity measurements taken at (typically) five minute intervals, user actions such as reset, filter change or calibration, and records all activity and fault alarms. A variety of archive formats are available with varying amounts of detail included, to suit the users application.

The calibration, check and setup screens are protected by an optional password and allow selected operators to conduct instrument checks, which can confirm satisfactory operation according to normal plant operating procedures.

The setup screens allow supervisors or designated staff to configure the instrument parameters to match the facility's operating procedures.

## ALARMS

iCAM-HD provides visible indication for activity alarms by means of a four color beacon stack (red, amber, green, white) and an audio sounder. An optional internal battery pack can provide backup for the complete instrument operation (excluding pump), including alarm indication and reporting functions of the instrument for 2 hours after the loss of mains power. The light stack features a green light that indicates that the systems is fine with no alarms or faults.

The amber and red beacons then indicate alarm and fault conditions according to the table below. There is also a white Test beacon indicating that the system is in Test mode.

The local annunciation of activity alarms may be enabled or disabled (they are enabled at all levels by default). Irrespective of the annunciator assignment, the panel lights and message display screen also indicate alarm and fault conditions.

In responding to alarms or faults, use of the Reset and Mute functions can be open to all staff (the default) or access to these can be restricted by password control, depending on facility operating procedures. This choice can be made in configuration mode.

Alarm conditions may be latching (default) or non latching. Latched alarms persist until cleared by user intervention; non-latching alarms automatically reset if the alarm condition no longer exists. Indication of an alarm condition ceases on operation of the reset control. If the alarm condition persists, indication of the alarm will recur as soon as it is recognized.

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Fault	Monitor State	Beacon State			
		Green	Amber	Red	White
None	Initialization following power on	FLASHING	OFF	OFF	FLASHING
None	Filter change in progress or background measurement (opt 1)	OFF	ON	OFF	OFF
None	Filter change in progress or background measurement (opt 2)	OFF	OFF	OFF	ON
None	System OK: activity < alarm levels and no faults	ON	OFF	OFF	OFF
None	Alarm Level 1 < Activity < Alarm Level 2	OFF	ON	OFF	OFF
Fault	Alarm Level 2 < Activity	OFF	OFF	ON	OFF
Fault	Fault – see display for fault type	OFF	ON	OFF	OFF
Fault	Alarm Level 1 < Activity AND Fault	OFF	ON	OFF	OFF
Fault	Alarm Level 2 < Activity AND Fault arisen AFTER the Alarm trip	OFF	OFF	ON	OFF
Fault	Alarm Level 2 < Activity AND Fault arisen BEFORE the Alarm trip	OFF	ON	OFF	OFF
Fault	Computer card Out of Service	OFF	FLASHING	OFF	OFF
	TEST in progress: Green, Amber and Red undefined	Undefined	Undefined	Undefined	ON

## ALARMS

### Activity/Dose rate Alarms

Two alarm levels may be defined for each measurement type; i.e., two alpha activity alarm levels, two beta activity alarm levels, and two levels for gamma dose rate, if appropriate.

When an activity alarm occurs:

- **The cause** of alarm (alpha, beta, gamma) and the alarm level appear on the display.
- **Alarm relays** will open or close as programmed for the specific alarm condition.
- **A status report** may be obtained via the network port which identifies the alarm condition and cause.
- **The alarm indicator** is illuminated (see table) and an audio alert will sound.
- **An alarm entry** is added to the archive.

### External Dose rate Alarms

The external dose rate measured by the optional G64 gamma detector head is computed and tested against the two user-set gamma alarm levels at intervals of one second.

### Self Check and Equipment Failure Alarm

The instrument will recognize and alarm on any of the following fault (equipment failure) conditions, each of which can be individually enabled or disabled:

- Low air flow or high air flow (user settable limits).

- Instrument configuration fault (clock, parameter store, archive).
- Low differential pressure across the filter.
- Detection fault – low count rate (alpha/beta, internal gamma, external gamma detector).
- AC power failure.
- Battery and power supply failure.

When an equipment failure alarm occurs:

- The green beacon on the light stack is extinguished and the amber light is lit and the audio alarm sounds a continuous tone.
- If configured, the equipment failure relay de-energizes to send a signal to external equipment.
- The equipment failure indicator is illuminated.
- The cause of failure appears on the integral display.
- A status report may be requested via the serial communications port, which identifies the equipment failure alarm condition and cause.
- An equipment failure alarm entry is added to the archive.

### Test Pulsar

- Built-in pulsar tests entire counting electronics chain every 15 s for enhanced reliability.
- User can control pulsar for alarm trip testing.
  - Every 15 s, normal counting is suspended for 10 ms and a built-in test pulse generator fires a burst of pulses into the amplifier input.

If these pulses are not correctly detected and counted then a detection fault is signaled, but if the test is passed then normal counting resumes. This test is completely transparent to the user and greatly enhances reliability as it regularly tests the entire counting electronics chain. In addition the test pulse can be remotely controlled via the iConfig software, to inject test pulses at a user defined rate anywhere into the alpha energy spectrum. This function can be used for alarm level testing.

### Relays

Multiple relays are used to indicate status and alarm conditions to external systems. Three relays are allocated to alpha/beta alarm functions and three to the external gamma probe as follows:

- Relay 1: Alpha and Beta measurements fine (no alarms)
- Relay 2: Alpha or Beta Alarm Level 1
- Relay 3: Alpha or Beta Alarm Level 2
- Relay 4: Ambient Gamma measurement fine (no alarms)
- Relay 5: Gamma Alarm Level 1
- Relay 6: Gamma Alarm Level 2

Three additional relays are provided to indicate the following operational conditions:

- 1: Filter advancing
- 2: Unit in Test mode
- 3: Alarm or Fault condition acknowledged

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## Data Archive

The iCAM-HD stores historical data at user-definable intervals. Measurement data, records of the filter changes, alarms and user actions are recorded. Each entry in the archive is marked with the date and time when it was created. Battery protection allows the internal archive data to be retained for at least five years after loss of mains power.

## Air Flow Rate Monitoring

The iCAM-HD electronically measures the air flow rate through the instrument, and the measured value is used in activity calculations. The air flow rate will normally be within the working range of 30 – 120 L/min (1.1 – 4 ft<sup>3</sup>/min), and is usually adjusted to be about 100 L/min (3.7 ft<sup>3</sup>/min) using the (optional) air flow regulator valve. Via the 4 -20 mA input the iCAM-HD can take in a stack flow velocity/rate signal and can use this signal to calculate the activity discharged and the discharge rate of activity from the duct or stack.

## Calibration

iCAM-HD provides facilities to assist and partially automate calibration and the routine checks required by plant procedures to confirm proper operation of such instruments. These facilities are accessed under password control via the Maintenance button on the main screen display.

## Screen Hierarchy

The screen hierarchy is shown below:

Filter	Current	Archive	Maintenance
The soft key options lead to a hierarchy of screens as shown in the table	Display options		Password check
Advance	Alarm Help HW Error Diags	Events Trends Spectra	<b>Parameter configuration</b> Alarm levels Fault alarm configuration Measurements and beta compensation Activity measurement units Concentration measurement units Gamma measurements units Duct measurement units Air flow measurement units 4–20 mA current outputs Other parameters  <b>User-initiated instrument check</b> Background check/source/gamma balance Alpha calibration Beta calibration Air flow calibration Test & Diagnostics
	Info		

## Source Calibration and Testing

Activity measurement calibration checks are performed using test sources in place of the filter holder.

The sources are mounted on stainless steel carriers of similar dimensions to the filter, allowing easy insertion. The recommended calibration test sources are manufactured by Eckert & Ziegler, with the activity homogeneously incorporated in a thin anodized layer on an aluminium disc. Self-absorption is small and the sources are classified as thin sources according to ISO 2919.

The recommended calibration sources are:

	Alpha	Beta
Product Code	HDSOURCE	HDBSOURCE
Nuclide	<sup>241</sup> Am	<sup>36</sup> Cl
Nominal Emission	500 α/sec	750 β/sec
Nominal Activity	1 k Bq (27 nCi)	1 k Bq (27 nCi)
E&Z product code	AMRB05022	CIRB05022

A source holder (code HDSR) is required to perform an activity calibration check. Calibration check information and instructions are shown on the LCD and a contamination check, alpha calibration check and beta calibration check can all usually be completed within about 10 minutes.

The background check allows the alpha, beta and gamma background levels to be measured. Raised background levels may indicate the presence of contamination. The background check function is presented at the start of the calibration check operation, and may be bypassed if not required.

Both alpha and beta instrument calibration checks may be performed locally (under password access) using the control buttons and display, and calibration sources which are inserted in a source holder in place of the filter holder.

Detection efficiency, alpha spectrum position and (beta) discriminator settings are confirmed. Calibration operations are recorded as part of the historical data. The 'Monitoring' indicator turns off during calibration and remains off until normal operation is resumed.

Any G64 gamma detector which may be fitted is calibrated separately.



## AIR FLOW CALIBRATION

Each iCAM-HD is supplied with its individual calibration of air flow. This can be checked and reset in plant by a simple procedure involving fitting a calibrated air flow meter in series with a flow regulator valve and the instrument. The iCAM software leads the user through a sequence of successfully setting, measuring and monitoring five values of airflow rate over the 30-120 L/min (1-4 ft<sup>3</sup>/min) measurement range. These values are used to (re)calibrate the scale of the internal electronic mass airflow meter.

## CHANGING THE FILTER CASSETTE OR HOLDER

The iCAM-HD can operate with either a moving filter cassette or a fixed filter holder. The moving filter cassette is loaded with a 15 m long x 75 mm wide roll of filter material, whereas the fixed filter holder can accept either 75 x 75 mm pieces of filter material or a filter mounted in a special 71 x 64 mm card mount. Both filter holders are located inside the iCAM-HD as part of the air sampling mechanism and are accessed by opening the front door of the unit. To insert/remove a filter holder a spring loaded lever in the sampling head is pressed down opening the sampling head. The holder can then be inserted or removed and the lever released to seal the mechanism.

## COMMUNICATIONS

The instrument is compatible with the CANBERRA HORIZON monitoring system and other surveillance systems. The surveillance system gathers information from the monitoring instruments (including measurement data, alarm conditions, instrument status reports and archive data) can adjust instrument configuration parameters.

iCAM-HD provides both Ethernet and multi-drop RS-485 network capability, allowing measurement data to be accessed via a network cable connection. It also provides an RS-232 communications port, which allows connection to a local terminal (e.g., a laptop PC) for configuration and control. All ports use the same interface protocol, which is fully compatible with CANBERRA's Horizon surveillance system software. Additionally the Modbus TCP protocol is available via the Ethernet ports.

Data available via the network connection includes:

- Real-time alpha and beta activity measurement data
- Real-time gamma dose rate (if G64 head fitted)
- Real-time gamma count rate
- Instrument alarm state
- Instrument operational status
- Archive data and spectra
- Configuration parameters
- Calibration state and parameters

## iCAM-HD CONFIGURATION

A set of configurable parameters define alarm levels, measurement quantities and units, constants used in determining compensated activity levels, calibration source details and password choices for function access. These can be adjusted to suit individual requirements. Parameter values are retained in nonvolatile memory within the iCAM-HD instrument. All configurable parameters are available via the Ethernet, RS-485 and RS-232 network connections. A selection of more commonly required parameters is available for review and change directly via the instrument controls and display. These include alarm levels, measurement units, relay assignments and fault alarm configuration. Access is password controlled.

iCAM-HD instruments are supplied with a Windows®-based configuration program for the host computer which provides access to all instrument parameters and allows basic real-time remote monitoring of instrument readings, alarm state and fault status. The configuration program communicates with iCAM-HD using a standard network communications protocol. The software is normally used on a laptop PC and operates with Windows XP and Windows 7 64-bit. Connection is usually to the front panel RS-232 port, although the same protocol can be used via the RS-485 port wired via the internal connector block or via the Ethernet ports.

iCAM-HD is able to respond independently to the data gathering functions of the configuration software (reading the archive, viewing parameter functions, etc.) which do not interfere with its operation. Configuration functions which alter the characteristics of the instrument (e.g., changing parameter values) cause it to cease normal operation until completion of the configuration changes.

All iCAM-HD instruments provide simultaneous monitoring of both alpha and beta activity. Where alpha-only or beta-only measurement is required, the instruments can be configured to report just these measurements. The user can restore the instrument to provide simultaneous alpha and beta measurement reporting at any time.

## SPECIFICATIONS

### FEATURES

#### Measurement Range:

- In excess of 500 kBq (13.5 µCi) of combined alpha and beta activity deposited on the filter.

#### Measurement Performance:

- Efficiency For Alpha Detection – 21% for all alpha up to 5.7 MeV.
- Efficiency For Beta Detection – 22% for <sup>36</sup>Cl or <sup>90</sup>Sr.
- Minimum Alarm Level
  - Capable of L1 alpha alarm level of 0.074 Bq/m<sup>3</sup> in 40 Bq/m<sup>3</sup> Radon progeny background
  - Capable of L1 beta alarm level of 4 Bq/m<sup>3</sup> in 40 Bq/m<sup>3</sup> Radon progeny background and 0.1 µSv/hr gamma background

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## Detectors:

- 2 x CAM1700ASV PIPS detectors, one for alpha/beta filter measurement, one for gamma compensation.

## Sampling Area:

- 47 mm dia disc.

## Filter Media:

- 15 m x 75 mm wide roll of Millipore® FSLW Membrane filter (in removeable cassette) or
- 75 x 75 mm square of FSLW filter in fixed filter holder or
- Card mounted filter (47 mm active dia) in fixed filter holder.

## Displayed Units (User Selectable):

- Activity on the filter in Bq,  $\mu\text{Ci}$  or counts/second (as CPS).
- Integrated airborne activity concentration in Bq-hr/m<sup>3</sup>,  $\mu\text{Ci-hr/L}$  or DAC-hr.
- Airborne activity concentration in Bq/m<sup>3</sup>,  $\mu\text{Ci/L}$  or DAC.
- Duct/stack monitoring discharge and discharge rate Bq and Bq/hr (or  $\mu\text{Ci}$  and  $\mu\text{Ci/hr}$ ).

## Background Compensation Schemes:

- An auto-adaptive radon and thoron compensation scheme for both alpha and beta is provided based on alpha spectrometry.
- Dynamic gamma compensation is provided by the second CAM1700ASV PIPS detector.

## Airflow:

- Measurement: Electronic mass flow meter, of range: 15-120 L/min (0.5 - 4.2 ft<sup>3</sup>/min).
- Typical indicated flow rate: 100 L/min (3.5 ft<sup>3</sup>/min), controlled by optional manual flow control valve.
- Low and high flow rate limits adjusted by user.
- Low differential filter pressure alarm 50 mm Hg (25 in. WG).

## Air Supply (Required):

- External, capable of maintaining a flow-rate of at least 60 L/min (2.1 ft<sup>3</sup>/min) against a differential pressure of at least 150 mm Hg (80 in. WG).

## Alarm Annunciators:

- Red Beacon – LED, 240 flashes per minute in the event of a level 2 activity alarm.
- Amber Beacon – LED, flashes at 80 flashes per minute in the event of a level 1 activity alarm. On for fault.
- White Beacon – LED, Continuous illumination to indicate a maintenance condition including test or initialization.
- Green Beacon – LED, Continuous illumination indicates system is fine and no alarms – Flashing at 80 flashes per minute during initialization.
- All beacons and sounder continuously checked for presence/function.
- Sounder – There are separate tones for activity and fault alarms.

## OUTPUTS AND COMMUNICATIONS

### Serial Interfaces:

- Network – RS-485: 19200 – 115 200 bits/s.
- Configuration Unit – RS-232: 9600 – 115 200 bits/s.
- Ethernet ports (2) – Modbus TCP protocol or CANBERRA proprietary.

### Analog current loop signals (3):

- 4-20 mA, user selectable.
- Galvanically Isolated – output voltage compliance 22 V typical, 17 V minimum.
- Logarithmically scaled, 12 bits resolution.

### Relay outputs:

- Nine relays in total.
- Three “safety” relays are allocated to alpha/beta measurement (OK, Alarm L1, Alarm L2) (type 2PCO).
- Three “safety” relays are allocated to gamma measurement status (OK, Alarm L1, Alarm L2) (type 2PCO).
- One relay is allocated to the filter advance function. (type 1PCO).
- One relay is allocated to the test status function. (type 4PCO).
- One relay allocated to ‘Alarm/Fault Acknowledged’ (type 4PCO).
- Normal State – Relay energized, contacts closed.
- Alarm State – Relay de-energized, contacts open.

## Contact Ratings (switched):

- Maximum: 6 A at 48 V ac or 24 V dc.

## Remote Gamma Probe Interface:

For optional G64 remote head or compatible detector. Includes:

- RS-422 pulse train signal input.
- Positive voltage supply 14.3–10.25 V (depending on power state: mains or battery).

## Additional Input/Output Functions:

- 4-20 mA current loop input for stack flow rate signal input.

## Network Functions:

- User configuration of all configurable parameters and settings.
- Download archive data.
- Download live spectrum data.
- Download store spectra.
- Real time measurement and alarm status display.
- Adjust date and time.

## Indicators Front Panel:

- Liquid Crystal Display – 240 x 128 pixels graphical display with backlight.
- Status Lamps:
  - AC POWER – Green
  - MONITORING – Green
  - ACTIVITY ALARM – Red
  - MUTED – Yellow
  - FAULT – Red

## CONTROLS

### Accessible externally:

- Reset alarm push-button, also restarts measurement sampling period.
- Mute alarm push-button.
- Soft Keys – four push-buttons whose function varies according to the instrument’s status.
- The LCD shows the current function of each soft key.

### Accessible internally:

- Release Filter Cassette lever.

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## Accessible via soft keys:

- Instrument information, operating parameters, alarm level settings and fault status.
- Archive – Events readout, spectrum display, graphical display of recent measurement history.
- Current – Measurement values (in all measurement units).
- Filter advance.
- User configuration of common instrument parameters and settings (password access).
- Background check, alpha and beta calibration checks and gamma compensation balancing (password access).

## POWER

### Power Requirements:

- AC Mains Frequency – 50-60 Hz.
- Voltage – 100-240 V ( $\pm 10\%$ ).
- Power Consumption – 60 VA.
- Mains Fuses (internal) mains protection: rating: 2.0 A, time lag HRC 250 V rating.
- Optional Battery Back-Up (for full instrument functionality excluding pump): Nickel-Metal Hydride battery 12 V, 4.5 Ah; typical endurance: 2 hours – fitted with associated battery management board.

## ENVIRONMENTAL

### Temperature Range:

- 0 °C to +50 °C (32 °F to 122 °F).

### Humidity Range:

- 5% to 95% RH, non-condensing.

### IP Rating:

- IP54 excluding the open air sampling intake.

## PHYSICAL

- Size – 450 x 828 x 295 mm (17.7 x 32.6 x 11.6 in.) (W x H\* x D).  
\*Including the light stack.
- Weight – 30 kg (66 lb) without vacuum pump or wall mounting bracket.

## QUALIFICATIONS

### Radiological:

(temperature range limited to 0 °C - 40 °C)

- IEC 60761, parts 1 & 2
- IEC61578
- ANSI 42.17B

### EMC/Electrical:

- EN 61326-1:2013
- EN 61326-2-1:2013
- IEC 61010-1 (3rd Edition)
- UL 61010-1:2012
- CAN/CSA C22.2 No. 61010-1:2012

## ACCESSORIES

### Supplied with the iCAM-HD:

- User Guide Installation Guide and Quick Start Guide (on CD).
- iConfig configuration software for PC.
- Connection cable for laptop PC.
- iCAM-HD moving filter cartridge with filter roll.
- iCAM-HD fixed filter cartridge.
- Door key.
- Wall mounting bracket.

## ORDERING INFORMATION

- iCAM-HDEN – HIGH FLOW RATE ALPHA/BETA AIR MONITOR ENGLISH supplied with fixed 2 m AC power cord with UK plug English labeling and firmware. NB Rittal door locks fitted.
- iCAM-HDFR – HIGH FLOW RATE ALPHA/BETA AIR MONITOR FRENCH supplied with fixed 2 m AC power cord with European plug French labeling and firmware. NB Ronnis keylocks fitted.
- iCAM-HDUS – HIGH FLOW RATE ALPHA/BETA AIR MONITOR ENGLISH supplied with fixed 2 m US AC power cord with US plug English labeling and firmware. NB Rittal door locks fitted.

## Options and Accessories:

- HDCASS – SPARE CASSETTE FOR iCAM-HD Spare moving filter cassette for iCAM-HD to allow rapid exchange of filter cassettes. Does not include filter roll – see code HDROLL.
- HDFF – FIXED FILTER HOLDER FOR iCAM-HD Fixed filter holder to fit in place of the moving filter cassette. 47 mm dia. sampling area. Uses custom filter card or 75 x 75 mm cut piece of filter roll.
- HDSRC – CALIBRATION SOURCE HOLDER FOR iCAM-HD Source holder to fit in place of cassette or fixed filter holder in iCAM-HD. Allows use of E&Z QSA 60 mm dia x 3 mm thick calibration sources (50 mm active diameter).
- HDASOURCE – Alpha calibration source – see table on page 6.
- HDBSOURCE – Beta calibration source – see table on page 6.
- HDT110 – HD Trolley/Cart with 110 V ac power/breaker box Wheeled trolley/cart for mobile use of iCAM-HD and pump, fitted with RCD/MCB box for pump (not included). 110 V ac version.
- HDT240 – HD Trolley/Cart with 240 V ac power/breaker box Wheeled trolley/cart for mobile use of iCAM-HD and pump, fitted with RCD/MCB box for pump (not included). 240 V ac version.
- HDPUMP110 – 110 V ac High flow rate pump for use with iCAM-HD 110 V ac version.
- HDPUMP240 – 240 High flow rate pump for use with iCAM-HD 110 V ac version.
- HDROLL – FILTER ROLL FOR iCAM-HD FSLW 3 micron filter on 15 m x 75 mm roll supplied singly.
- HDBATT – Optional internal backup battery pack (12 V 4.5 Ah NiMh) to provide min. 30 min backup for iCAM-HD.
- HDCARD3 – Filter card for use in HDFF fixed filter holder 71 x 64 mm with 58 mm filter aperture. Box of 100.



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