BEASTEK S.A.C.

TR1000DB-A Handheld Explosives and Narcotics

Trace Detector

NUCTECH COMPANY LIMITED

Contents

TR1000DB-A Technical Specification

1. Product Overview

The NUCTECH™ TR1000DB-A Handheld Explosives and Narcotics Trace Detector works on the latest Ion Mobility Spectrometry (IMS) technology, and is used to pinpoint the presence and type of trace substances of a wide range of explosives and narcotics, which may be collected from sampling on baggage, cargo, container, vehicle and people.

By applying an innovative and patented design of containing dual IMS detectors and single ion source inside, the TR1000DB-A is capable of providing high sensitive and selective performance in both negative and positive ions detection simultaneously, from a single sample and fully collecting ionized molecules.

Featuring with a friendly and efficient user interface of a large 5” TFT touch-screen LCD, the handheld type TR1000DB-A is refined to deliver fast and reliable measurements for portable and field use with lightweight, rugged features and rechargeable Li-ion batteries.

TR1000DB-A Handheld Explosives and Narcotics Trace Detector

2. Technical Features

- High sensitive and selective detection of a wide range of explosives and narcotics, with expandable threats library.
- By adopting an unique and patented design with dual IMS detectors and single ion source in a drift tube, the positive & negative ions can be processed and detected simultaneously and gain the maximum ions collecting efficiency, which is the key factor in determining detection sensitivity.
- Fast substances analysis and identification in 8 seconds typically.
- Clean-up time reduced to the minimal while maintaining accurate measurements.
- Multiple types of automatic analysis results are displayed, such as simple list of detected substance, drift time spectrum, and configurable visual and audio alarm, for easy data readout with minimal interpretation.
- Both particulate sampling with surface swiping, and optional vacuum vapor collection are supported to meet diverse application demands.
- A 5" TFT touch-screen based ergonomic user interface for efficient operating, with minimal training required.
- Industrial onboard computer platform with USB and Ethernet interfaces, expanding data storage, transfer and software update capabilities.
- Multiple user levels with customizable privileges for meeting flexible access control demands.
- Lightweight and rugged feature for portable and field application.
- Low consumables cost for both operating and maintenance.

BEASTEK S.A.C CAL. NATALIO SANCHEZ NRO 244 INT 602, JESÚS MARÍA, LIMA, PERÚ TEL: +51 943 192 231

3. System Structure

3.1 TR1000DB-A Structure and Working Principle

3.1.1 System Structure

The TR1000DB-A design is refined according to state-of-the-art IMS technology and its major components structure and functions are listed in the following table:

Components	Functions
Sample Injector	Sample injection, vaporization by heating, and filtration into drift tube by semipermeable membrane
Drift Tube	Sample molecules ionization, ions concentration in packets, drift in an electric field and signals collection by a detector
Gas Pump	Drawing sample into drift tube, and aiding to separate ions and sweeping residual sample neutrals by generating a counter-flow drift gas in the drift tube
Computer Platform	Detector data collection and algorithm processing, response to the user interface actions, and providing system expandability and connectivity
Touch-screen LCD	Main user interface, delivering the analysis result and graphic control panel
Integrated Printer	Analysis result printing
Control Unit	Power supply to system components, detector data transfer and general electric control

3.1.2 Sample Injector

When a sample swab is fed into the injector, a high temperature heating device will

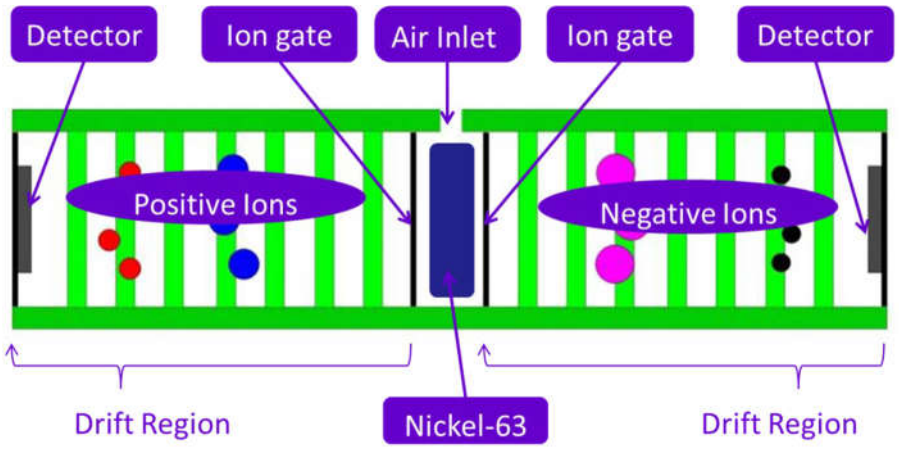
work on vaporizing the sample particulates, and the heating temperature shall be high enough to gain maximum vaporization efficiency while not break down target molecules.

The vaporized molecules will be carried by air flow and transferred into the drift tube through a semi-permeable membrane, which can greatly reduce interference from non-target substances.

3.1.3 Drift Tube

The drift tube is the most core component in the TR1000DB-A, and all the sample molecules ionization, ions concentration in packets and separation in mobility, and ions current signal detection are processed inside.

In the TR1000DB-A, a solid radioactive nickel-63 is used as ion source, which may involve certain license application and paper work, but it is still most favored for use in IMS system due to its stable and reliable performance. The radioactive ion source design with no moving parts and no requiring of external power supply also brings the advantage of maintenance free.



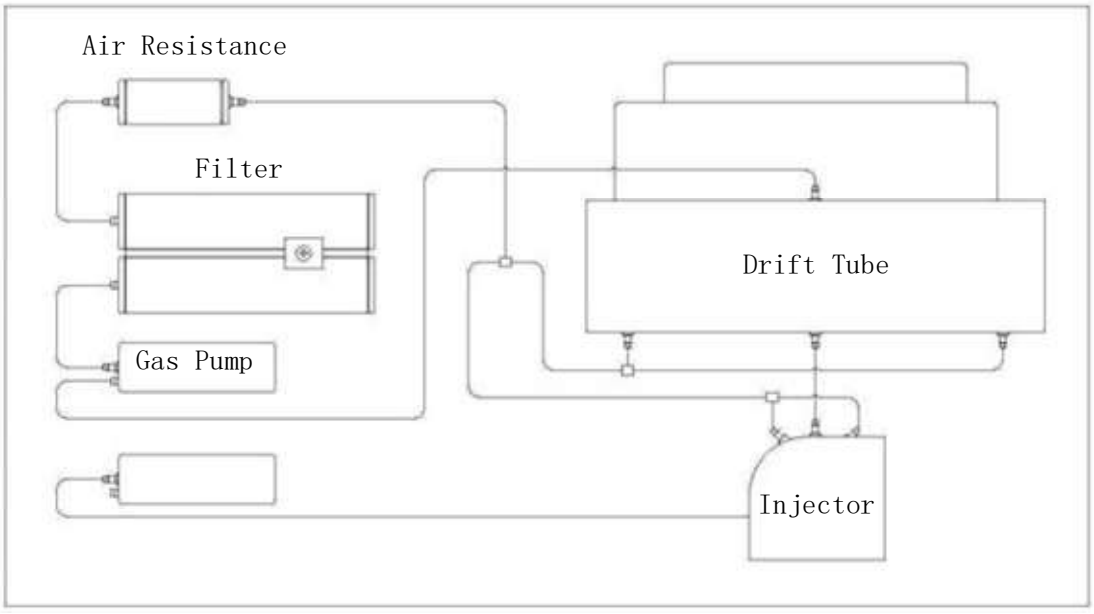
Dual IMS drift regions & detectors for analyzing positive & negative ions simultaneously

To promote the TR1000DB-A sensitivity performance while reduce the analysis cycle

to the minimal, a dual IMS analyzing channels design is applied to maximize the ions mobility and collection efficiency. Each IMS analyzing channel includes an ion gate, a drift region and a detector, but working on different temperatures for optimal response to ions with different polarities, so the patented design is capable of delivering the best positive and negative ions detection performance simultaneously.

3.1.4 Gas Pumps

In the TR1000DB-A, several gas pumps are configured to draw sample molecules into drift tube, and generate a counter-flow drift gas to aid slowing down and separating drifting ions, as well as sweeping away residual sample neutrals that are not affected by the electric field.



Gas flow diagram in the TR1000DB-A

3.1.5 Computer Platform and Touch-Screen LCD

An industrial grade single board computer, working with Windows CE operation

BEASTEK S.A.C CAL. NATALIO SANCHEZ NRO 244 INT 602, JESÚS MARÍA, LIMA, PERÚ TEL: +51 943 192 231

system, provides a reliable computer platform in the TR1000DB-A, and its main functions include:

- Graphic user interface
- Detection result display
- Most operating and administration functions by the running application software.
- Detector data collection.
- Algorithm processing with detector data and threats identification.
- USB/RJ-45 Ethernet/VGA/COM ports support for system expandability and connectivity.

3.1.6 Control Unit

The functions of the control unit include acquire detector signals from the drift tube, control the heating, gas pump, status indicators and fans and provide power supply.

.

4. Detection Performance

Adopting the most advanced IMS detector technology, combined with optimum spectra analyzing algorithm, the TR1000DB-A is capable of providing an outstanding sensitive and selective detection of trace explosives and narcotics.

4.1 Technical Standards and Certificates

The TR1000DB-A is in accordance with the following widely used technical standards and regulations:

- Explosives Trace Detection System for China Aviation Security
- GA/T 841-2009 General specification for trace narcotics/explosives detectors based on Ion Mobility Spectrometry

4.2 Detectable Explosives and Narcotics

By employing a dual IMS detectors technology and working in both positive and negative ions detection modes, the TR1000DB-A can identify a wide range of explosives and narcotics.

Threat Category	Detectable Substance
Explosives	TNT, C4, Tetryl, DNT, NG, PETN, RDX, Semtex, HMX, HMTD, H-6, AN, TATP and black powder, etc.
Narcotics	Cocaine, Heroin, Morphine, Amphetamine type stimulants (Amphetamine, MA, MDMA, MDA), THC, PCP, LSD, Procaine, Ketamine and Dolantin, etc.

The threat library is expandable to follow the growing needs of new threats detection demands.

From the detectable substances, the user administrators can customize the range of threats required to be identified and alarmed.

4.3 Detection Limit

Threat	Detection Limit
Explosives	Nanogram level
Narcotics	Nanogram level

4.4 Analysis Time

On condition of maintaining a high sensitivity detection performance, the analysis time cost of the TR1000DB-A is reduced to a minimal of around 8 seconds typically, by introducing the dual IMS analyzing channels design.

BEASTEK S.A.C CAL. NATALIO SANCHEZ NRO 244 INT 602, JESÚS MARÍA, LIMA, PERÚ TEL: +51 943 192 231

5. Technical Specifications

General Specifications	
Technology Principle	Ion Mobility Spectrometry, IMS
Ion Source	^{63}Ni
Sampling Method	Particulate swiping & vapor collection
Warm-up Time	20 minutes typical
Explosives & Narcotics Detection Performance	
Positive & negative ions detection mode	Simultaneous positive & negative ions detection with dual IMS detectors inside
Detectable explosives	TNT, C4, Tetryl, DNT, NG, PETN, RDX, Semtex, HMX, HMTD, H-6, AN, TATP and black powder, etc.
Detectable narcotics	Cocaine, Heroin, Morphine, Amphetamine type stimulants (Amphetamine, MA, MDMA, MDA), THC, PCP, LSD, Procaine, Ketamine and Dolantin, etc.
Detection Limit	Nanogram level
Analysis Time	8 seconds typical
Functions and Configurations	
User Interface	5” TFT touch-screen
Readout	Automatic Pass/Alarm with credibility indicator Detected substances list Substances identification with characteristic drift time spectrum display Configurable visual and audio alarm
Data Storage Capability	Up to 10,000 sets
Communication Interface	USB and Ethernet LAN
Installation Data	
Dimensions	403mm(L)×164mm(W)×197mm(H)
Operating Temperature	-5℃～+45℃

BEASTEK S.A.C CAL. NATALIO SANCHEZ NRO 244 INT 602, JESÚS MARÍA, LIMA, PERÚ TEL: +51 943 192 231

Weight	4Kg (with standard battery)
Power Supply	100VAC～240VAC, 50Hz/60Hz
Power Consumption	70W