

# TECHNICAL SPECIFICATIONS

## bDAS—An industrial, fully digital data acquisition system

### INTRODUCTION

bDAS, BrightSpec Digital Acquisition System, is a general purposes **digital acquisition system** or instrument for performing multiple radiation counting measurements in a synchronized and centralized way. bDAS is particularly suitable for performing accurate measurements that involves methods or studies that use radiotracers in natural environments or industrial processes.

Radiotracers are widely used in many fields and applications:

- for the measurement of the flow rate of liquids, gases, and solids in many industrial systems.
- throughout oil refineries worldwide.
- for troubleshooting inspection and process analysis in chemical and petrochemical plants;
- in minerals processing plants
- for efficiency testing of wastewater treatment installations.

Just to site a few.

The bDAS is made up of the following components:

- Probes
- Connection cables
- Control unit or case
- Software
- (optionally) Injector

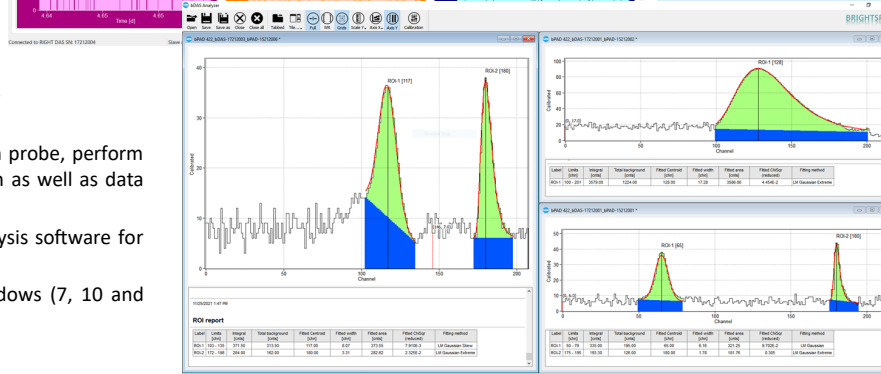
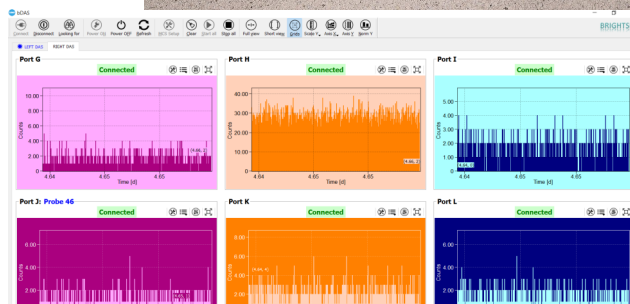
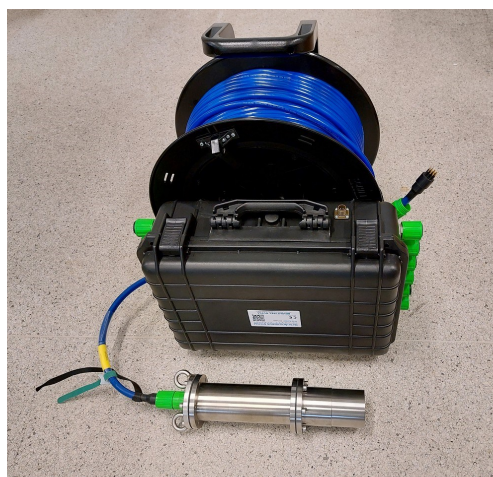
Up-to twelve (12) individual probes can be connected to a single control case and simultaneously set up, powered, managed and set on data acquisition.

The connected probes are automatically recognized and set up.

bDAS software allows to setup each probe, perform data acquisition and its visualization as well as data management.

bDAS software includes a data analysis software for data off-line analysis.

bDAS software package is MS Windows (7, 10 and 11) and Linux compatible.



### FEATURES

- Rugged, industrial-grade, subsea grade, 1.5 mm thick stainless-steel (SS-316) probes
- Probes include the radiation detector (38 x 58 mm scintillator crystal and photomultiplier) and the Single Channel Analyzer (bPAD)
- RS422/485 communications to control case
- Each probe, standardly provided with 50-meter long, subsea-grade data cable rolled into a drum for easy transportation and deployment
- Rugged, carry-on control case, provides power and instant connection, setup and data acquisition management for up to 12 probes simultaneously.
- Control case with internal air flow and central power management unit.
- PC controlled data acquisition with DAS software, compatible for MS Windows and Linux.

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## bDAS Probes

*High-grade stainless steel envelopes with 1.5 mm thickness and anti-shock padding.*

*The envelope houses the scintillator detector and the single channel analyzer electronic module, bPAD.*

*The bPAD devices are tube base, compact and fully digital Single Channel Analyzers (SCA) which provide the necessary power for operating the scintillator detector as well as the photon-counting and data transmission to the central unit.*



## PROBES

The probes are the heart of the bDAS system. The probes are stainless steel encapsulation for the radiation detector and its electronics.

The probe encapsulations or envelopes are made of high-grade stainless steel (SS-316) and are hermetically sealed for sub-sea operations. The envelopes includes extra padding and antishock protection for the detector crystal and electronics.

The probe envelope consists of two detachable parts for easy servicing and disassemble.

Precisely, the probe envelope houses:

- The radiation detector: a 38x58 mm (1.5 x 2 inches) scintillator detector with standard photomultiplier
- The electronic processing unit, which is a compact, tube-base digital Single Channel Analyzer (SCA) bPAD-422.

## Detectors

bDAS uses a scintillator type radiation detector. Standardly a 1.5 x 2 inc NaI(Tl) crystal coupled to a Bialkali photomultiplier is used and placed inside the antishock protected area of the probe envelope.

The detector includes a 0.65 mm thick magnetic shielding material.

The Typical energy resolution of such detector is less than 7.5 % on the 661.7 keV emission of <sup>137</sup>Cs.

## Probe electronics

The pulses out of the scintillator detector are directly processed by a digital Single Channel Analyzer, bPAD.

The bPAD is a compact fully digital and tube-base SCA and therefore can be directly connected into the 14-pin socket of the detector's photomultiplier.

The bPAD also provides the necessary high voltage BIAS to the scintillator detector inside the probe envelope.

The bPAD uses RS-422/RS-485 for transmitting data to the central unit as well as for its operational setup.

The bPAD itself is powered via 9—36 DC volts and uses a pair of cables included into the multi-core cable connection of the probe envelope.

The bPAD is a low-consumption device and, standardly consumes less than 1 Watt.

Since the bPAD is a fully digital device, the SCA settings can be easily setup via software using "pseudo-spectrum" mode.

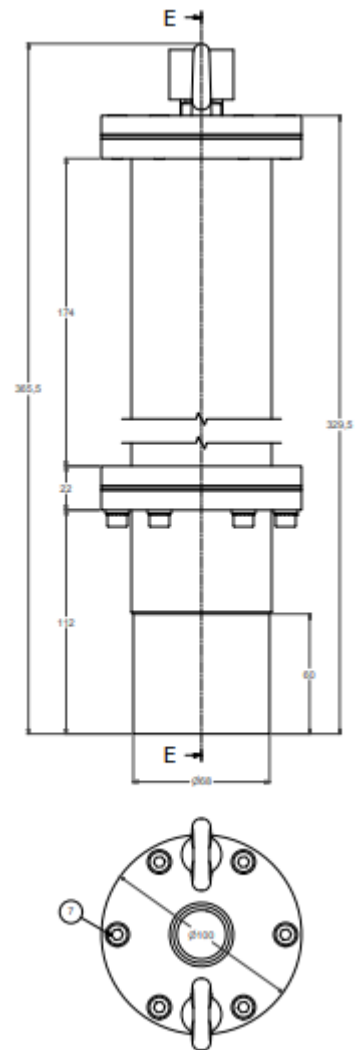
## CABLES

Each probe comes standardly with a multi-core, rugged and sub-sea grade connection cable. Only one cable is needed for power and data communication for an individual probe.

The cable comes with high-industrial grade multi-pole connectors qualified for sub-sea operations.

Standardly, each probe's cable is delivered with 50 meters length, but the cables can be easily chained for larger distances.

Each probe's cable set is provided with an industrial-grade rolling system or cable drum for easy transportation and deployment



## CONTROL CASE

The bDAS instrument has a device that centralizes and concentrates all the necessary electronics and elements to provide power to the connected probes, as well as to perform independently and asynchronously all the data acquisition and data collection. This device is the probe's control case and it's made of a rugged plastic case for easy transportation and deployment.

The "bDAS control case" is made of hard plastic (industrial grade Polypropylene plastic or PP), specially designed for transportation of delicate equipment, tools, and electronics under harsh environments, including humidity.

The case has been engineered to include:

- Air ventilation system
- bDAS electronic modules
- power adaptors, connectors, and electronics necessary to provide power to the whole system
- frame plates for secure and strong fixation of all components inside the case, as well as inclusion of a working plate for operating a notebook.
- Data splitters and connectors for data interconnection between probes-bDAS boards-PC.
- Switches and indicators

Each bDAS control case houses two DAS boards. Each DAS board can power and perform asynchronous data acquisition from up-to six independent probes.

Therefore the control case has twelve (12) independent probe connection ports. Six (6) on each side of the rugged case.

The control case can be powered via a AC/DC power block of 12-24 volts or external batteries. The power consumption with 12 probes connected is approximately of 2 Amps.

The case includes air flow and thermalization using DC ventilators; therefore it can be left operating fully closed.

A single USB connection provides data connection to the PC or notebook.

A notebook can be conveniently fixed onto the control case and left inside (even closed) functioning.

The control case has a single power switch and can be locked for security on long term acquisitions.

## SOFTWARE

The bDAS software is provided for:

- Probe's setup
- Data acquisition and visualization
- Data storage
- Off-line data analysis

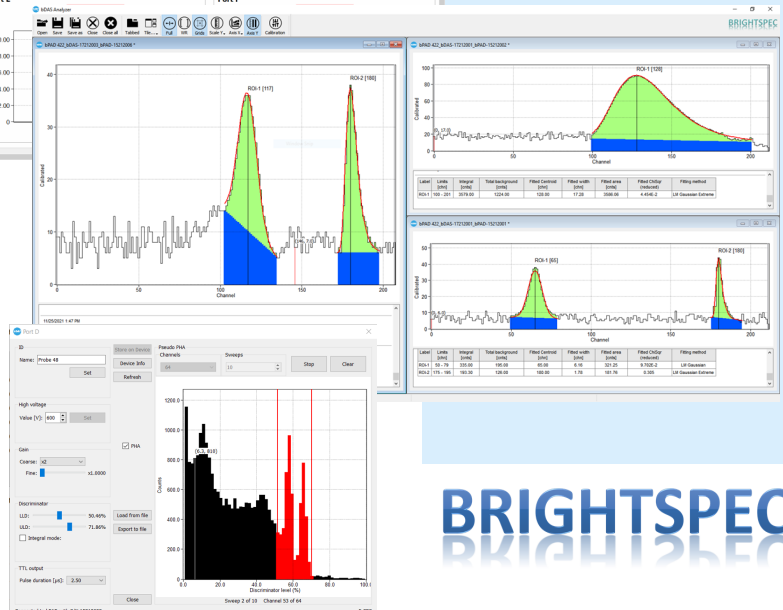
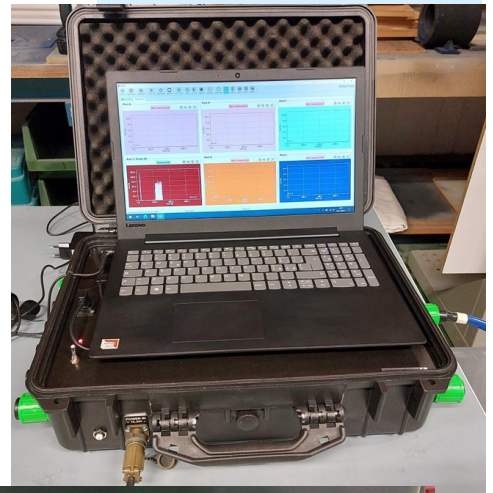
Among other functionalities.

The software is composed of two (2) main programs:

bDAS software, which operates the instrument itself, set up the probes, visualizes and manages the data acquisition

And bDAS-Analyzer, which performs data analysis and peak fitting on the acquired data

The software is MS Window (versions 7, 10 and 11) and Linux compatible.





## BRIGHTSPEC

is a dynamic technological and engineering company with novel designs and innovative solutions in the field of nuclear electronics and software development for radiation detection.



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## TECHNICAL SPECIFICATIONS

### Probe specifications

- ♦ Stainless steel (SS 316) , sealed envelope with two parts for easy disassembling
- ♦ 1.5 mm thick stainless steel in the area around scintillator crystal
- ♦ One single connector for cable and power communication. Sub-sea grade connector with locking mechanism
- ♦ Probe padding and anti-shock mechanism
- ♦ Holding rings (2) for maneuver and fixation

### Detector and electronics

- ♦ 38 mm (1.5 inch) diameter x 58 mm (2 inch) thick scintillator detector with internal anti-shock protection. Typically, NaI (TI) crystal is used but other scintillator materials can be used upon request.
  - ♦ Typical energy resolution < 7,5 % at  $^{137}\text{Cs}$
- ♦ Standard photomultiplier (PMT) of 51 mm diameter and 0.64 mm internal magnetic shield.
- ♦ Tube base, digital single channel analyzer (SCA), model BrightSpec bPAD-422
  - ♦ Includes Pre-Amplifier, Amplifier, SCA and detector BIAS high Voltage of up to + 1500 Volts in 4096 steps

### Cable

- ♦ (standardly) 50 meters long multi-core, sub-sea grade cable with matching connectors and sealed locking mechanism. Cable drum included for easy transportation.

### Data communication

- ♦ RS422/485.
- ♦ SCA count-rates via RS422
- ♦ Data connection between control case and PC via USB. Connection cable provided.

### Control case

- ♦ Rugged transportable case made of " " is made of hard plastic (industrial grade Polypropylene plastic or PP), specially designed for transportation of delicate equipment, tools, and electronics under harsh environments, including humidity
- ♦ Twelve connection ports with water-tight connectors. Six (6) ports on each side.
- ♦ Air flow and thermalization. Case with notebook inside can be operated completely closed and locked.
- ♦ Automatic probe connection recognition
- ♦ Power: 12-24 DC Volts. Power via AC/DC power adaptor or external batteries. AC/DC power adaptor supplied.
  - ♦ Military grade power connector with overvoltage surge protection

### Physical

- ♦ Probe size: Height 330 mm, with no connector and Diameter of 100 mm (external rings)
- ♦ Weight: Approximately 4 kg
- ♦ Thickness: 1.5 mm SS-316 stainless steel thickness on the part around the detector crystal
- ♦ Cable length: (standardly) 50 meters with matching connectors on each end. Cables can be chained.
- ♦ Control case sizes (WxDxH): 460x360x175 mm

### Data acquisition

- ♦ "Pseudo-spectrum" mode for easy setup of the probe's single channel analyzer (SCA).
- ♦ 512 Kbytes memory per probe connection. MCS mode from milliseconds to days.
- ♦ Automatic data swapping method for storing data acquired longer than physical memory.

### Software

- ♦ bDAS software for setup, management and data acquisition from probes.
- ♦ bDAS Analyzer for peaks fitting and analysis
- ♦ Software compatible with MS Windows (7, 10 and 11) and Linux OS.

### Certifications

- ♦ The instrument and probes are CE compliant

CE  
CERTIFIED