

BeanDevice[®] AX-3DS

Wireless accelerometer dedicated to shock measurement
with built-in data logger



2.4
GHZ

DATASHEET

SmartSensor

www.beanair.com

**SCIENCE
GATE**
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Shock Sensor

BeanDevice® AX-3DS

MADE
IN 
GERMANY

Video



Product Video



Featured Video

User Guide



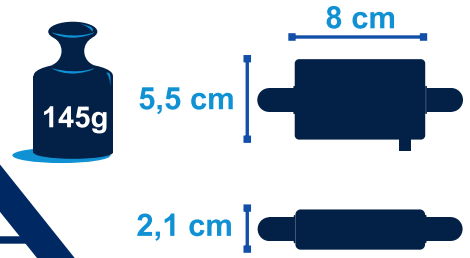
Quick Start



Mechanical Drawing



STEP File



OVERVIEW



Wireless accelerometer dedicated to shock
Scalable measurement range : $\pm 6g/\pm 12g/\pm 24g$
or $\pm 2g/\pm 4g/\pm 8g$



SSD (Smart Shock Detection), wireless
sensor can wakeup on shock detection
(software configurable)



Embedded data logger : up to 1 million data
points (with events dating)



Waterproof IP67 casing (Nema 6)



Integrated Lithium-Ion battery charger



Excellent radio link relying on the radio anten-
na diversity developed by Beanair®

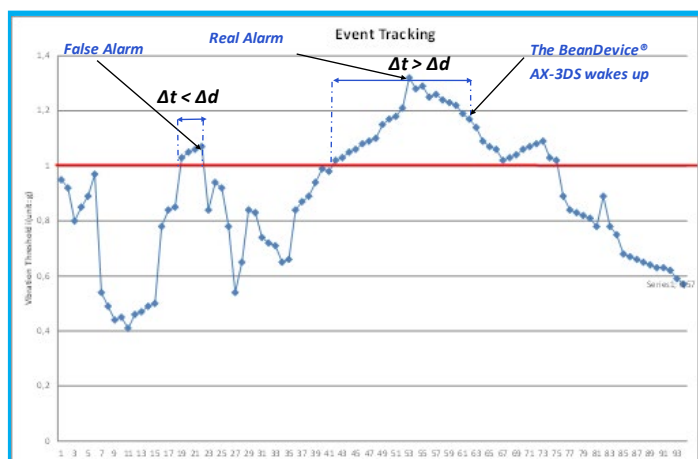
Smart Shock Detection Technology



The **BeanDevice® AX-3DS** integrates a smart shock detection technology which permits to detect & recognize a shock event during the sleeping or deep sleeping mode of the **BeanDevice® AX-3DS**. When the **BeanDevice® AX-3DS** is in sleeping mode, the accelerometer continues to track a shock event with a power consumption of 68 uA in sleeping mode and 28uA in deep sleeping mode.

A hysteresis on the shock event, fully configurable through the **BeanScape®**, allows to avoid false alarm.

EXAMPLE : THIS CURVE SHOWS TWO SHOCK EVENTS, ONE CONSIDERED AS SIGNIFICANT (REAL ALARM) AND ANOTHER CONSIDERED AS NOT SIGNIFICANT (FALSE ALARM).



Δd : shock detection hysteresis.

Δt : Observed duration

If $\Delta t = \Delta d$, the shock event is detected and recognized, the **BeanDevice®** wakes up and start data sampling in “streaming mode”.

The following tables show the accelerometer sampling rate and the hysteresis time value in deep sleeping mode and sleeping mode of the **BeanDevice® AX-3DS**.

Accelerometer sampling rate during deep sleeping mode (in HZ)	Δd max value(s)	Resolution
0.5	128 s	2 s
1	64 s	1 s
2	32 s	500 ms
5	12,8 s	200 ms
10	6,4 s	100 ms

Accelerometer sampling rate during deep sleeping mode (in HZ)	Δd max value(s)	Resolution
50	1,28 s	20 ms
100	640 ms	10 ms
400	160 ms	2,5 ms
1000	64 ms	1 ms

Shock measurement on pantograph



Shock tracking on high-value items



Remote Configuration & Monitoring

BeanScape® Basic

The **BeanScape®** application allows the user to view all the data transmitted by the **BeanDevice® AX-3DS**. With the OTAC (Over-the-Air configuration) feature, the user can remotely configure the **BeanDevice® AX-3DS**.

SEVERAL DATA ACQUISITION MODES ARE AVAILABLE ON THE BEANDEVICE® AX-3DS :

- **Low Duty Cycle Data Acquisition mode (LDCDA)** : the data acquisition is immediately transmitted by radio. The transmission frequency can be configured from 1s to 24h.
- **Survey Mode**: the measured value is transmitted by radio whenever an alarm threshold (fixed by the user) is detected (4 alarms threshold levels High/Low). Meanwhile, the device sends frequently a beacon frame informing its current status.
- **Streaming Packet Mode** : all measured values are transmitted by packet within a continuous flow at 3 kbps/s maximum

BeanScape® Premium+

The **BeanScape® Premium+** integrates an OPC DA server (Data Access). OPC DA is particularly well suited for real time measurement and data sharing.

Each data/measurement can be associated to a tag or its attributes and shared with one or many OPC clients.



For further information about the different data acquisition modes:
TN-RF-008 – “Data acquisition modes available on the BeanDevice®”

Antenna diversity

While the vast majority of wireless sensors show their limits in harsh industrial environment, the **BeanDevice® AX-3DS** integrates an innovative antenna diversity design, boosting the radio link quality in environments subject to random and diverse disturbances. Antenna Diversity improves both the quality and reliability of a wireless link by 30%.



Embedded data logger up to 1 million data points

The **BeanDevice® AX-3DS** integrates an embedded data logger, which can be used to log data when a Wireless Sensor network can not be easily deployed on your site. All the data acquisition are stored on the embedded flash and then transmitted to the **BeanGateway®** when a Wireless Sensor Network is established.

The data logger function is compatible with all the data acquisition mode available on your **BeanDevice® AX-3DS** :

- LowDutyCycle Data Acquisition
- Survey
- Shock detection
- Streaming packet

EXAMPLE : SHOCK DETECTION ON A TRAIN



Train Moving

Datalogger function is enabled on the :

BeanDevice® AX-3DS

The Train stops at a Train Station

BeanGateway (WSN Coordinator)

Request for logs transmission

Transmits all the data logs

AX-3DS

- In standalone operation, the **BeanDevice® AX-3DS** stores all the measurements on its embedded datalogger. Thus, a direct connection with the **BeanGateway®** is not needed.
- When the train is moving, all the acquired measurements are stored on datalogger.
- Data logs can be transmitted to the **BeanGateway®** on request. Once a successful transmission is done, the user can choose to erase automatically the logs from the datalogger memory, so new ones can be stored.



For further information about the Datalogger, please read the following technical note : [TN-RF-007 – “BeanDevice® DataLogger User Guide”](#)

TECHNICAL SPECIFICATIONS

Product reference

BND-AX3DS -MR-PS-SCM

MR – Measurement Range (1g = 9806.65 mm/s ²)	PS - Power Supply
24G : ±6/12/24g measurement range	RB : Built-in rechargeable Lithium-Polymer battery 2Ah
8G : ±2/4/8g measurement range	XT : External Power supply

MO - Mounting Option **SCM** - Screw Mounting Lid **MM** - Magnet Mounting Lid

Example n°1: BND-AX3DS-24G-RB, Wireless Accelerometer with ±6/12/24g measurement range , rechargeable battery

Example n°2: BND-AX3DS-8G-RB-SCM, Wireless Accelerometer with ±2/4/8g measurement range , rechargeable battery, screw mounting option

Sensor specifications

Accelerometer Technology	Low power MEMS technology
Scalable measurement range	24G Version:±6g / ±12g/ ±24g 8G Version:±2g / ±4g/ ±8g
Measurement resolution	24G Version:3 mg/digit @±6g , 6 mg/digit @±12g , 12 mg/digit @±24g 8G Version: 1mg/digit @±2g , 2 mg/digit @±4g , 3.9 mg/digit @±8g
Typical non-linearity	±0,15%
Sensitivity change Vs temperature	±0,01% /°C
Zero-g level change vs temperature (max delta from 25°C)	24G Version:±0,4 mg/°C 8G Version:±0,1 mg/°C
Typical zero-g level offset accuracy	24G Version: ±70 mg 8G Version: ±20 mg
Analog to Digital converter	12-bit with temperature compensation
Noise spectral density @ BW 10Hz	24G Version: 650 µg/√Hz 8G Version: 218 µg/ √Hz
Anti-aliasing filter	Butterworth 2th order filter

Over-the-air configuration (OTAC) parameters

Data Acquisition mode (SPS = sample per second)	Data Acquisition mode (SPS = sample per second) Alarm & Survey mode: 1s to 24 hour Streaming Mode Shock detection
Shock detection function	<ul style="list-style-type: none">· Shock threshold in mg· Data acquisition sample rate in sleeping mode· Data acquisition sample rate after the shock detection· Shock detection hysteresis
Sampling Rate (in streaming packet mode)	Minimum: 1 SPS Maximum: 3 kSPS per axis (one axis enabled) 1.5 kSPS per axis (2-axis enabled) 1 kSPS per axis (3-axis enabled)
Alarm Threshold	High and Low alarms threshold
Power Mode	Sleep & Active

RF Specifications

Wireless Protocol Stack	Ultra-Power and license-free 2.4Ghz radio technology (IEEE 802.15.4E)
WSN Topology	Point-to-Point / Star
Data rate	250 Kbits/s
RF Characteristics	ISM 2.4GHz – 16 Channels. Antenna diversity designed by Beanair®
TX Power	+18 dBm
Receiver Sensitivity	-104dBm
Maximum Radio Range	650m (Line of Sight) , 30-100m (Non Line of Sight)
Antenna	Omnidirectional radome antenna with antenna diversity Gain : 3 dBi Waterproof IP67

Embedded Data logger

Storage capacity	up to 1 millions data points
Wireless data downloading	3 minutes to download the full memory (average time)

Environmental and Mechanical

Casing	Aluminum & Waterproof casing
	Dimensions in mm (LxWxH): 100x55x21 mm
	Weight (battery included) : 155g
IP NEMA Rating	IP67 Nema 6
Shock resistance	100g during 50 ms
Operating Temperature	-20 °C to +65 °C
Norms & Radio Certifications	· CE Labelling Directive R&TTE (Radio) ETSI EN 300 328
	· FCC (North America)
	· ARIB STD-T66 Ver 3.6
	ROHS - Directive 2002/95/EC

Power supply

Integrated battery charger	Integrated Lithium-ion battery charger with high precision battery monitoring : <ul style="list-style-type: none">· Overvoltage Protection, Overcurrent/Short-Circuit Protection, Undervoltage Protection· Battery Temperature monitoring
Current consumption @3,3V	<ul style="list-style-type: none">· During data acquisition : 20 to 30 mA· During Radio transmission : 60 mA @ 18 dBm· During sleeping mode: 68uA· During deep sleeping mode : 28 uA
External power supply	8-28VDC
Rechargeable battery	Capacity 1.25 Ah

Option(s)

External Power Supply	Wall plug-in, Switchmode power Supply 12V @ 1,25A with sealed M8 Plug (IP67/Nema 6) Ref: M8-PWR-12V
M8 extension cable for external power supply	Molded cable with M8-3pins male plug Material: PVC with shield protection IP Rating : IP67 Nema 6 Cable length: 2 meters , Ref: CBL-M8-2M Cable length : 5 meters, Ref: CBL-M8-5M Cable length: 10 meters, Ref: CBL-M8-10M
Calibration certificate	Calibration certificate provided by Beanair GmbH A static calibration method is used on a granite surface plate DIN876

Getting started with a Wireless Sensor Networks

The **BeanDevice® AX-3DS** operates only on our Wireless Sensor Networks, you will need the **BeanGateway®** and the **BeanScope®** for starting a wireless sensor Network.

The diagram illustrates the required hardware and software for a wireless sensor network. It features the BeanAir logo, the BeanDevice AX-3DS sensor, two versions of the BeanGateway (Indoor and Outdoor), the BeanScope software running on a laptop, and the Scilab software. A 2-year warranty is also indicated. The OPC FOUNDATION logo is present with the note: "**OPC server is only available on the BeanScope® Premium**".

i For further information about BeanDevice® battery life :
 TN-RF-002 Current consumption in active & sleeping mode
 TN-RF-012 Beandevide autonomy in Streaming and Streaming Packet Mode

Beandevic® AX-3DS Front View



Product specifications are subject to change without notice. Contact Beanair for latest specifications.

Options and Accessories



Molded Cable with M8 plug


Ref: CBL-M8-2M (cable length: 2meters)

- CBL-M8-5M (cable length : 5 meters)
- CBL-M8-10M (cable length : 10 meters)



Mounting Option

- Screws Mounting
- Magnet Mounting
- Bracket 90°



AC/DC Power supply with M8 Plug

Ref: M8-PWR-12V

- Wall plug-in power supply, Output: 12VDC, M8-3Pins plug
- AC Power plug: Europe/UK/ Northamerica /China/Australia
- Waterproof - IP67



X-SOLAR (Solar Charging Controller)

High efficiency Solar Panel with Solar Charging Controller and Lead-acid battery