



Rethinking Sensing Technology

***Load strain transducer integration with
Beandevic[®] AN-mV***

***Berlin - October 2018 / Mathias Grueman –
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ST350 Model from BDI

Model	ST350
Range (Resistance)	350 Ω
Excitation Voltage	+1.0 to +10.0 Vdc (output is ratiometric)
Power Rating Max: Typical: Intelliducer:	300 mW 72 mW @ +5.0 Vdc 13 mW @ +5.0 Vdc*
Circuit	Full Wheatstone bridge with four active 350 Ω foil gages
Strain Range	$\pm 4000\mu\epsilon$ (Calibrated to $\pm 2000\mu\epsilon$)
Force required for 1000$\mu\epsilon$	~ 17 lbs. (~ 76 N)
Typical Sensitivity	$\sim 500 \mu\epsilon/mV/V$ (individually calibrated to N.I.S.T. standards)

Accuracy	< $\pm 1\%$
Effective Gage Length	3.0 in (76.2 mm) [Extensions available for use with R/C structures]
Cable Length	IC-02-187 (0.187 in diameter, 22awg, 2 pair, shielded with drain wire, red PVC jacket) or IC-02-250 (0.250 in diameter, 22awg, 2 pair, shielded with drain wire, blue PVC jacket)
Housing	6061-Aluminum
Weather Proofing	IP67 Rated (waterproof to 70 meters available)
Operating Temperature	-58°F to +185°F (-50°C to +85°C)
Weight	3 oz. (85 grams)
Mounting	BDI mounting Tab and adhesive, mechanical connection





BeanDevice AN-mV – Wireless DAQ designed for strain transducer

- Wireless analog data acquisition system with low voltage inputs (± 20 mV), 4 analog channels
- Ultra-Power and license-free 2.4Ghz radio technology (IEEE 802.15.4E)
- Maximum Radio Range: 650 m (Line of Sight) , 30-100m (Non Line of Sight)
- Excellent radio link budget thanks to our antenna diversity innovative design
- High measurement accuracy: $< 0.08\%$, 16-bit of resolution
- Programmable power supply (4.5VDC to 20VDC) for external sensors
- Maximum sampling rate: 400 samples per second
- Current consumption in sleep mode: < 45 uA @3.3V, external sensor is switched off
- Embedded Data Logger: up to 1 million data points (with events dating)
- Integrated Lithium-Polymer rechargeable battery with industrial battery charger (8-28VDC)
- Watertight (IP65 | Nema 4) aluminum casing



More information here:

<http://beanair.com/wireless-daq-mv-over.html>

*Wiring code (sensor side)
Sensor with analog bipolar output*

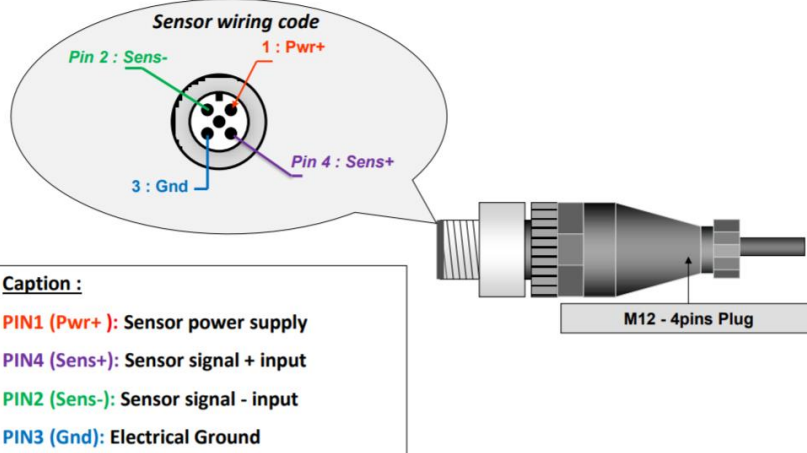


Figure 11: Wiring code (sensor side) – Analog bipolar

M12 Plug	Sensor wiring code
PIN1 – PWR+	
PIN2 – Sensor signal -	
PIN3 - GND	
PiN4 – Sensor signal +	

[For more info about the sensor wiring code :](#)

http://beanair.com/wa_files/UM-RF-02-ENG-ProcessSensor-Wireless-DAQ.pdf



Load strain transducer combines with the Beandevise AN-mV



Load strain sensor reacting to a traction effort



BeanAir *Sensor configuration from BeanScape® software*

Bipolar Polarity, Excitation Voltage : 5V, Sensor warm-up time : 40 ms

The screenshot displays the BeanScape software interface. On the left, the 'BeanDevice System Profile' shows identity (Mac ID: 00158D0000E0D3D, Pan ID: 3A50, Net. Id: 0004, Label: MAC_ID : 0 x 00158D0), version (Hard. vers.: V1R8, Soft. vers.: V6R9), and power supply diagnostic (Temperature: 20.125 °C, Power supply: Bat, Power mode: active, Battery Voltage: 4.148 V, Battery level: Good, DiagDate: 10/28/2018 10:13:02). The 'Data Logger' section shows Platform: AN mV, Status: Ready, Memory option: Stop DAQ recording, and Memory used: 0%. The 'Listening Mode Status' shows Config. frame is: Waiting, Sent, Deleted. The 'Current data acquisition mode' shows DAQ Status: Started, Data Acq. mode: LowDutyCycle, Data Acq. cycle: 00:00:10, Sampling rate: NA, and Data Acq. duration: NA. The 'DAQ Info' section shows Meas. Range: -20.000 / +20.000 mV, Polarity: Bipolar mode, Sensor Voltage: 5.000 V, and Wake up duration: 40 ms. The 'System' section shows Diagnostic cycle: 00:00:50 and Listening ratio: 5. The 'Configuration Area' is open, showing DAQ Polarity: Bipolar mode, External sensor configuration (Excitation voltage: 5, Warm up time: 40), and DAQ Alarm configuration (Enable IIR Filter: unchecked).

DAQ Info Area

Configuration Area



Applying calibration settings on BeanScape® software (1/2)



Do not change DAQ Calibration Settings

Use GFF Value displayed on BDI calibration file

BDI DATA. REFINED RESULTS.

Transducer Model: BDI ST350

Serial Number: B7181
General Gage Factor: 525.3 $\mu\epsilon/mV/V_{exc}$
Initial Offset Voltage: -0.129 mV/V_{exc}

Table 1 – Representative Calibration Data

Excitation Voltage (VDC)	Transducer Output (mV)	Initial Offset Voltage (mV)	Transducer Output (mV)
5.000	3.231	-0.129	3.231

This example is using a ST350 with a supplied GGF = 525.332 $\mu\epsilon/mV_{out}/V_{exc}$. The BeanDevice AN-mV supplies a +5VDC excitation voltage. The current reading on the data acquisition system is

3.2312 mV

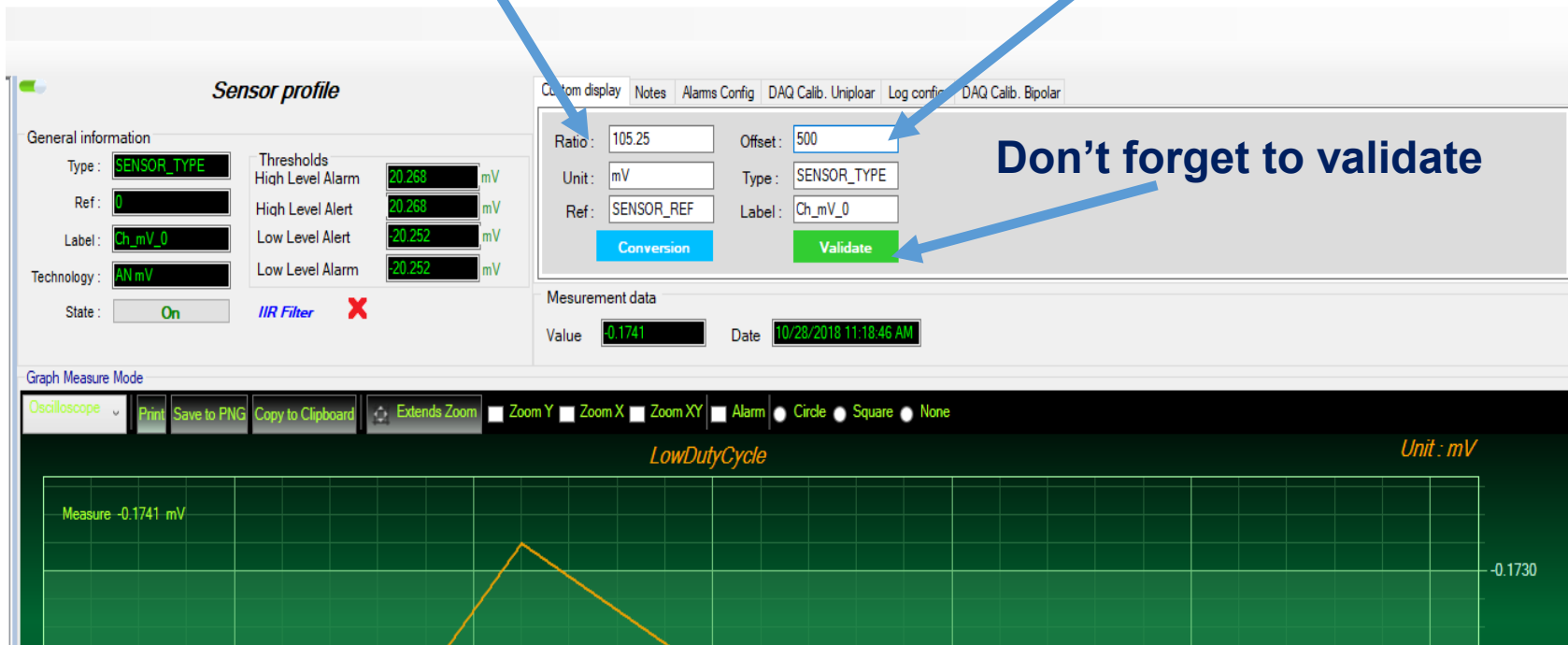
If the Excitation Voltage is 5VDC , GGF ($\mu\epsilon/mV$) = 525.3/5VDC = 105.6 $\mu\epsilon /mV$

Reading($\mu\epsilon$) = GFF*Vout(mV)/5 = 105.6 x 3.2312 = 341.21 $\mu\epsilon$

Applying calibration settings on BeanScape® software (2/2)

Enter here GGF ($\mu\epsilon/mV$) = 105.6 $\mu\epsilon /mV$

Drop your sensor on a flat surface and avoid to apply a load on it.
Enter Initial Offset in $\mu\epsilon$ here



Don't forget to validate

General information

Type: **SENSOR_TYPE**

Ref: **0**

Label: **Ch_mV_0**

Technology: **AN mV**

State: **On** *IIR Filter* **X**

Thresholds

High Level Alarm	20.268	mV
High Level Alert	20.268	mV
Low Level Alert	-20.252	mV
Low Level Alarm	-20.252	mV

Measurement data

Value **-0.1741** Date **10/28/2018 11:18:46 AM**

Graph Measure Mode

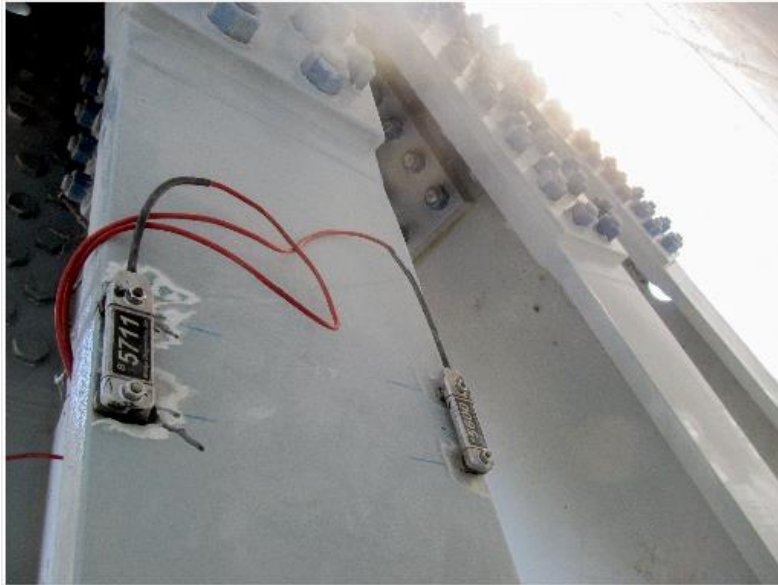
Oscilloscope **Print** **Save to PNG** **Copy to Clipboard** **Extends Zoom** **Zoom Y** **Zoom X** **Zoom XY** **Alarm** **Circle** **Square** **None**

LowDutyCycle *Unit: mV*

Measure **-0.1741 mV**

-0.1730

How to mount the Load transducer



Glued on steel structure



Mounted with a bracket



Strain Transducer extension