ALTHEN
SENSORS & CONTROLS

TILTMETER NODE BM-X

Technical Manual

Further information can be found at
www.althensensors.com

Specification

Model	
BM-X	Wireless Tiltmeter Node

Mechanical	
Dimension	100mm x 100mm x 80mm
Weight	0.7kg
Material	Die-cast aluminium

Sensor Measurements	
Sensor	Sisgeo self-compensated MEMS inclinometer
Number of axes	Biaxial
Measurement range	±15°
Accuracy	±0.003° for ±2.5°, ±5.0°, and ±10° range ±0.01° for ±15° range
Resolution	0.0001°
Temperature offset	±0.003°/°C (From -20°C to +80°C)
Specifications for thermistor	Measurement Range: -20°C to +80°C for 3K thermistor Resolution: 0.1°C Accuracy: ±0.5°C (0°C to +50°C)

Interfaces		
Display/Keyboard	LEDs	SYS - System status indication SENS - Sensing status indication
	Buttons	TEST - to test the Node RESET - to reset the Node FORMAT - to do a factory reset of the Node
USB device port	USB 2.0 full speed (Micro B connector) 5V, max 500 mA for mobile OTG	
IDC10 connector	Only for firmware programming	

RG & Mesh Specifications	
Radio band	ISM Band 863 - 870MHz, 902 - 928MHz
Transmit power	Up to 1 W (30 dBm)
Modulation	2-GFSK
Certifications	FCC: 2AT8M-TM-V3X0 IC: 27349-TMV3X0 CE/RED Anatel (Brazil) MoC (Israel)
Antenna	¼ λ stub antenna with SMA connector
Link data speed	50 kbps bitrate
Data security	AES128 encrypted end-to-end data
Hops	Up to 12
Network size	Up to 50 Nodes
Range*	Line-of-sight: Up to 5km Urban: Up to 1km Below ground: Up to 500m

*Ranges are based on a transmission power of 30dbm. Actual transmission distances may vary depending on deployment conditions.

TILTMETER NODE BM-X

Low-power MCU/Peripherals

MCU	Ultra-low power Arm® Cortex®-M3 48MHz 32-bit CPU
Memory	128KB flash, 20KB ultra-low-leakage SRAM
Clock	High-precision RTC self-compensated in temperature (10ppm from -40°C to +80°C)
On-board sensors	Temperature sensor (range: -40°C to +80°C, resolution: 0.01°C, accuracy: ±1.8°C) Barometer sensor (range: 300 to 1100hPa, resolution: 0.18Pa, accuracy: ±1.7hPa)
External flash	8MB

Software and Firmware

Firmware	Long-range low-power mesh networking firmware
Software	Android app for device setup, network monitoring, and troubleshooting

Protection

Circuit protection	Surge protection DC breakdown voltage 60V (± 20%@100V/µs) Impulse breakdown voltage 500V (@5kV/µs) typical Short circuit protection in power outputs Reverse supply protection
ESD	15kV

System power requirements

Supply voltage	2.7V to 4V
Internal non-rechargeable batteries	1 x D-Cell Li-SOCl2 3.6V nominal voltage Recommended capacity 19Ah
Typical current drain	<20µA in system idle <100mA in system RX mode <300mA in system TX mode (depends on output RF power setting)

Environmental conditions

Operating temperature	-40°C to +80°C
Protection	IP67

Lifetime (months)

Model	Sampling Frequency (mins)						
	5	10	15	30	60	360	Battery
BM-X	6	10	12	15	16	18	1 x 19Ah D-Cell Li-SOCl2

Note: Above table is for reference only. Estimation is done under typical Singapore weather conditions. The radio transmission power was set to 21dBm. Battery lifetimes might vary depending on deployment conditions and the formed wireless mesh topology.

Mounting Brackets/Plates

BM-X-PLHV	Horizontal/vertical mounting plate with mounting screws
BM-X-PLR	Rail mounting double plate with mounting screws

BM-X

External view

BM-X

with our **BM-X-PLHV**
horizontal/vertical mounting plate in vertical mount position

BM-X

with our **BM-X-PLHV**
horizontal/vertical mounting plate in horizontal mount position

BM-X

with our **BM-X-PLR**
rail mounting double plate

BM-X1
Inner view

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