WiSenMeshWAN®
Product Specification

Wisen Innovation Co., Ltd.

21/01/2021

Table of Content

Revision History and Clarification

Rev.	Issue Date	Version Control	Written by	Revised by
V2.2	21/01/2021	1. Add commonly used products to WiSenMeshWAN® system. (Previously only listed in WiSenMeshNET® system); 2. Minor wording changes.	W.Y.	H.X.Y.
V2.1	15/12/2020	3. Leica laser disto error code description upgrades; 4. In "Alternative DC Input" field of 651Xtypes(e.g., 6510 and 6517), add "3.6VDC" so it becomes "3.6VDC or 7-32VDC@Min.1A".	W.Y.	H.X.Y.
V2.0	15/09/2020	1. Symbols, signs and format unification.	W.Y.	H.X.Y.
V1.9	18/08/2020	1. Add new product types: 6C01 – Voltage Interface Node/6510-Laser Distance Sensor Node/6517-Weather Sensor Node/6A08-4xVW Interface Node; 2. Improvement on the tilt accuracy; 3. Certifications addition on "ACMA (Australia)".	W.Y.	H.X.Y.
V1.8	16/04/2020	1. Distance Range added; 2. Transmit Power& RouteID Commands added.	W.Y.	H.X.Y.
V1.7	01/04/2020	1. Revision of product series name to WiSenMeshWAN®.	S.T.	W.Y.
V1.6	05/12/2019	1. Typo correction in the document; 2. Battery life table added; 3. Add RCM Certificate Radio Feature	W.Y.	H.X.Y
V1.5	11/11/2019	1. 6305/6F07/6F08 tilt orientation and installation notification.	W.Y.	H.X.Y
V1.4	24/10/2019	1. Update all the product names.	H.X.Y.	W.Y.
V1.3	19/08/2019	1. Add 868MHz, 915MHz products; 2. Add new type: 6005, 6305, 6501, 6A07, 6F07/08; 3. Unify the name system of 433MHz, 868MHz, 915MHz into; 4. Radio specification updated; 5. Add Data Format & Remote Commands.	W.Y.	H.X.Y.
V1.2	04/06/2019	1. All the product names are formalised; 2. 2005: Add External Tertiary Power of 3.6V Battery Pack 3. All the related temperature is corrected from (-40 to 80°C) to (-40 to 85°C) except laser related products; 4. "Standard Aluminium Battery Holder" is emphsised to be "Standard Aluminium Battery Holder"; 5. 2305, 2F07, 2F08: Tilt range updated; 6. 2501: Add node weight and sensor weight updated & Resolution updated; 7. 2A07: Working current updated.	W.Y.	H.X.Y
V1.1	14/05/2019	1. Unify 2F07/08 product name to Laser Tilt Sensor Node; 2. Revised features on the Radio Features; 3. 2005 B-Gateway is officially named as C-Gateway.	H.X.Y	W.Y.
V1.0	25/03/2019	1. Establishment of the document; 2. Add: types of 2005, 2305, 2F07/08, 2A07.	H.X.Y	W.Y.

Radio Specification

Point to Point Radio Feature			
Radio Frequency	915MHz System	915MHz System	868MHz System
Certification	FCC	RCM/ACMA	CE
Radio Band	902-928MHz	915-928MHz	865-868MHz
Default Transmit Power	18dBm		14dBm
Transmit Power Range	5-20dBm		
Receive Sensitivity	-112dBm		
Bandwidth	500kHz		
Transmission Speed	19.2kb/s		
No. of Mesh Hop* Supported	6 Hops		
Sampling Interval	1-60mins		
Distance Range	**Over Air (Line of Sight) @ 900MHz:** Open Field (Tx & Rx @ 2m Height): 1.0km+; Tunnels: 400m+.		
	Penetration @ 900MHz: Concrete: 0.5m+; Soil: 0.8m+; Sand: 2.0m+; Lake Water: 2m+.		
Antenna Description	Mesh Antenna	Omni-directional (20cm in length) or Customised	
	2/2.5/3/4G-Antenna	Omni-directional 3.5dBi (20cm in length) or Customised	
	Antenna Connector	SMA (M)	
WiSenMeshWAN® Wireless Sensor Network Protocol Standard			
Electromagnetic Compatibility			
WiSenMeshWAN® system is designed of ISM 868MHz & 915MHz. Notice: Within any electrically noisy environment, nodes with sensors must be ≥ 0.3m away from the source of the noise.			

* E.g., the radio link from a gateway to the 1st layer node is called the 1st hop.

Notice: all the parameters demonstrated in this specification are obtained at 25℃.

Data Format & Remote Commands

Data Format	
Basic Information	Time Stamp: Universal Time Coordinated (i.e., UTC)
	SN and Short ID
Network Information	Gateway includes: 1. Mesh Network Information, i.e., no. of hops, sequential number of transmission, parent node SN, received power strength, transmit power strength. 2. System Information, Sampling Time Interval (T), radio frequency (F), Back_Time, Signal Threshold (radio power strength threshold), Relay_Factor.
	Node includes: no. of hops, sequential number of transmission, parent node SN, received power strength, transmit power strength and no. of messages unsent in a node.
Sensor Information	Node Type
	Sensor Information： 1. Power information includes: battery voltage, key reference voltage, etc.; 2. Sensor parameters.

Remote Commands		
ID	**Descriptions**	**Units applied**
DTU_T	Server Connection Ratio to Time Interval	Gateway
APN Settings	Allowing a customer to change the APN/User Name/Password for the 2/3/4G Network setting.	Gateway
Time Interval	Systematically changing the sampling time interval (T) of the nodes under a gateway.	Gateway & Node
Radio Frequency	Systematically changing the radio channel (F) of the nodes under a gateway.	Gateway & Node
Back_Time	Defining the time taken for all the data from the nodes to reach a gateway.	Gateway & Node
Signal Threshold	Systematically changing the radio power threshold so it can join into a mesh network so a mesh can be optimised.	Gateway & Node
Relay_Factor	Systematically changing the relay time for all the node in a gateway so a mesh can be optimised.	Gateway & Node
Transmit Power	Systematically changing the radio transmit power between 5dBm and 20dBm under one gateway and its nodes, so that: A. the system can be adaptive to different regional maximum radio power restrictions; B. to have one extra tool to optimise the mesh network besides Signal Threshold.	Gateway & Node
Route ID	By applying the same route ID to nodes, the user can manually assign a specific path that one or more nodes can go in a complex mesh network system.	Node

WiSenMeshWAN® Smart Gateway Series

6005 Type - WiSenMeshWAN® Smart Gateway (C-Type)	
Basics	
Primary Battery Power (Internal)	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Battery Connection	Standard Aluminium Battery Holder
Secondary DC Power (External)	7 - 32VDC @ Min. 2A (e.g. 110-240VAC to 12VDC adaptor)
Tertiary Power (External)	3.6VDC Battery Unit or Solar Unit
Mobile Network Stop Voltage	≥ 2.65VDC
Local Storage	8GB (Min. 1.5 Yrs Storage)
L x W x H	180 x 140 x 60mm
Weight	≤ 2.0kg
Cable Gland	Qty. 1 x EMC-CMA12 for external RS232 connection Qty. 1 x EMC-CMA14 for external DC input power connection
Wire Connection	DC In - Spring type wiring terminal
External Interface	
Wireless Module	Compatible with 2G/2.5G/3G/4G of Micro SIM card
Wired Port	RS232
WSN Interface	
Mesh Wireless Interface	WiSenMeshWAN® Protocol
Low Power Mode	T≥5min and Server Connection Ratio DTU_T = [1,99]T
Standard System Parameter	
Temperature	Measurement Range: -40 to 85°C; Accuracy: ±1°C, typical 0.5°C; Resolution: 0.1°C
Voltage	Accuracy: ±0.1V
Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)
Industrial Standard	
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C
Fire Proof	Approved
Certificates	FCC, ACMA
Applications	
A gateway is used as a key unit in Wireless Sensor Network system. It is responsible for the command issuing (such as T modifications) to and data collection from all the nodes involved in a mesh network (L-Series); meanwhile, it forwards the data and system information to the remote server via mobile network or the local server via standard RS232 connections.	
Non-Standard Accessory	
A. RS232 to USB connection cable from a gateway to a PC for local parameter configuration; [Software to use: WiSenMeshWAN® Standard Serial Port Software V3.1.16 or above] B. TTL to USB 1m cable to read the mesh data from a gateway in parallel to the mobile network data	

transmission; [Software to use: WiSenMeshWAN**®** Standard Serial Port Software V3.1.16 or above]

C.   Daughter board: 2/3/4G GSM interface board (by default), or Wi-Fi/Ethernet/RS-485 interface daughter board;

D.   Outdoor adaptor, IP68: 110-240VAC to 12VDC@5.0A.
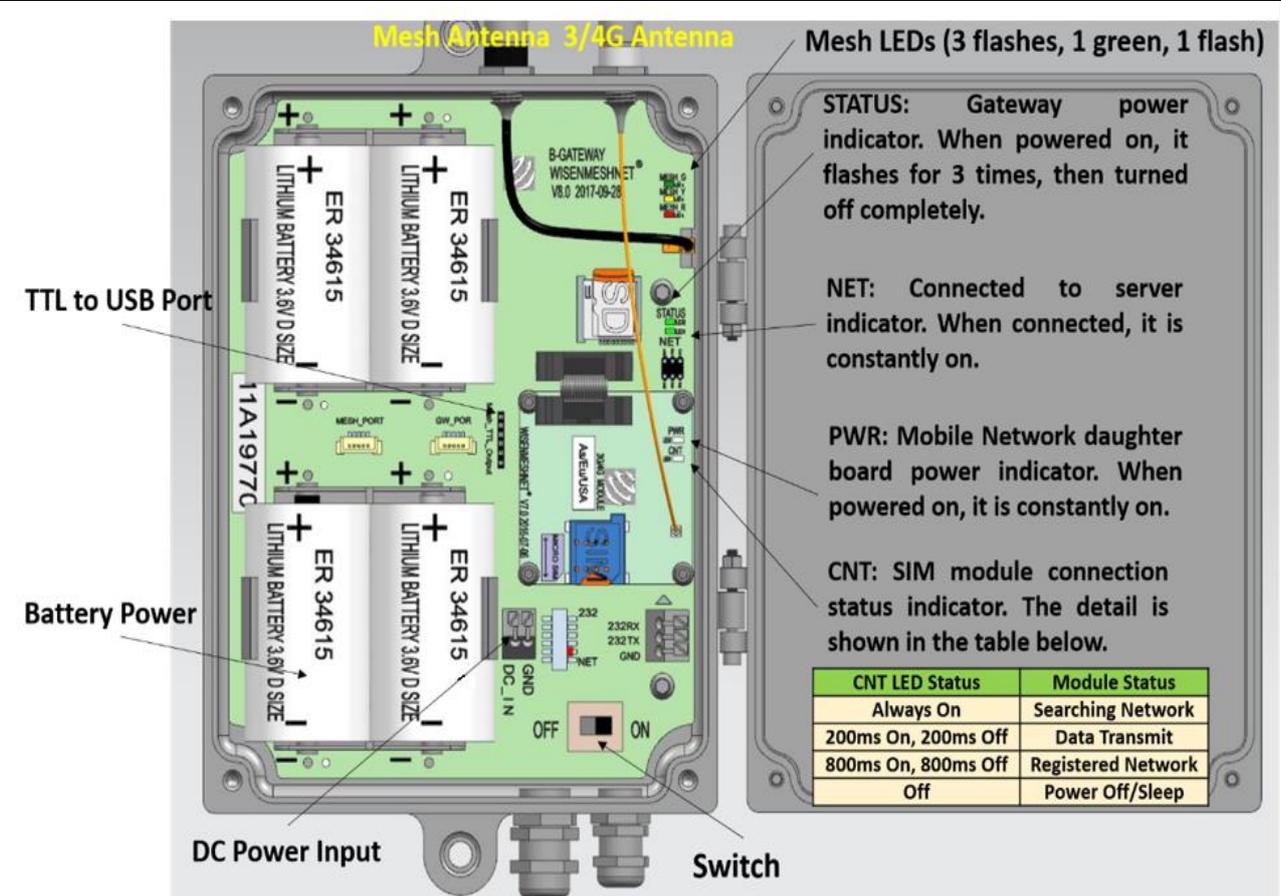
Gateway PCB Layout

Figure. C-Gateway Layout (Subject to the real product).

Highlights

1.   When connected to a remote server, "NET" LED will be constantly on;

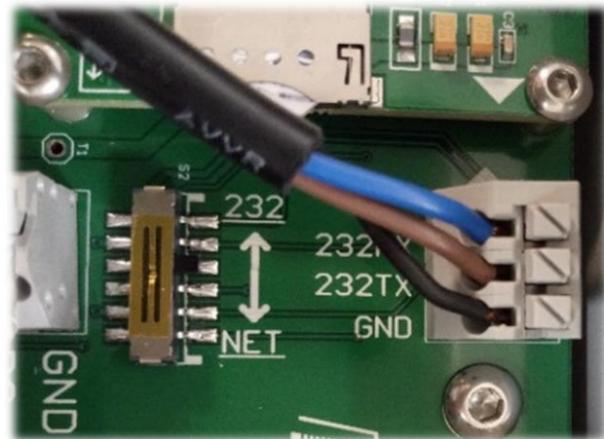Figure. 110-240VAC to 12VDC@5A Adapter Connection.
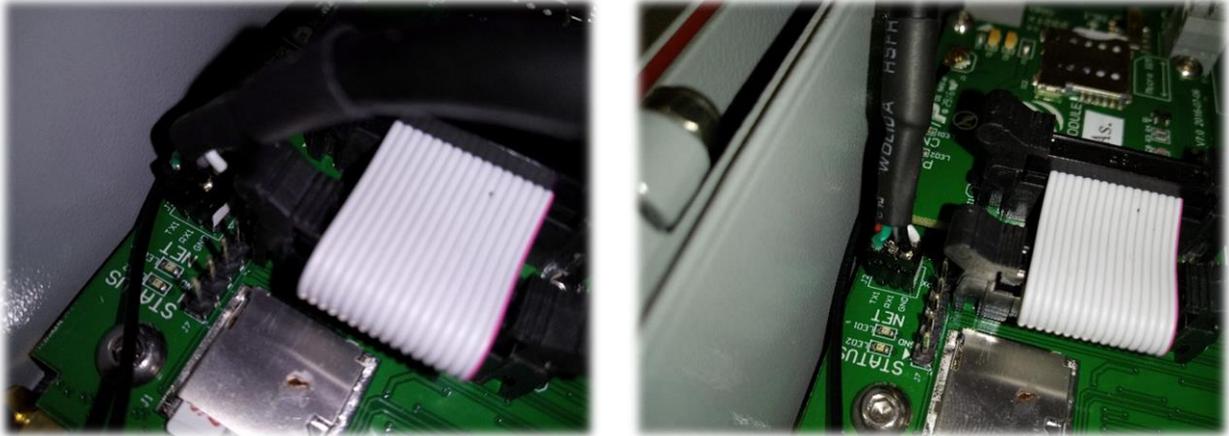

Figure. RS232 to USB Connection.

Figure. TTL to USB Connection.

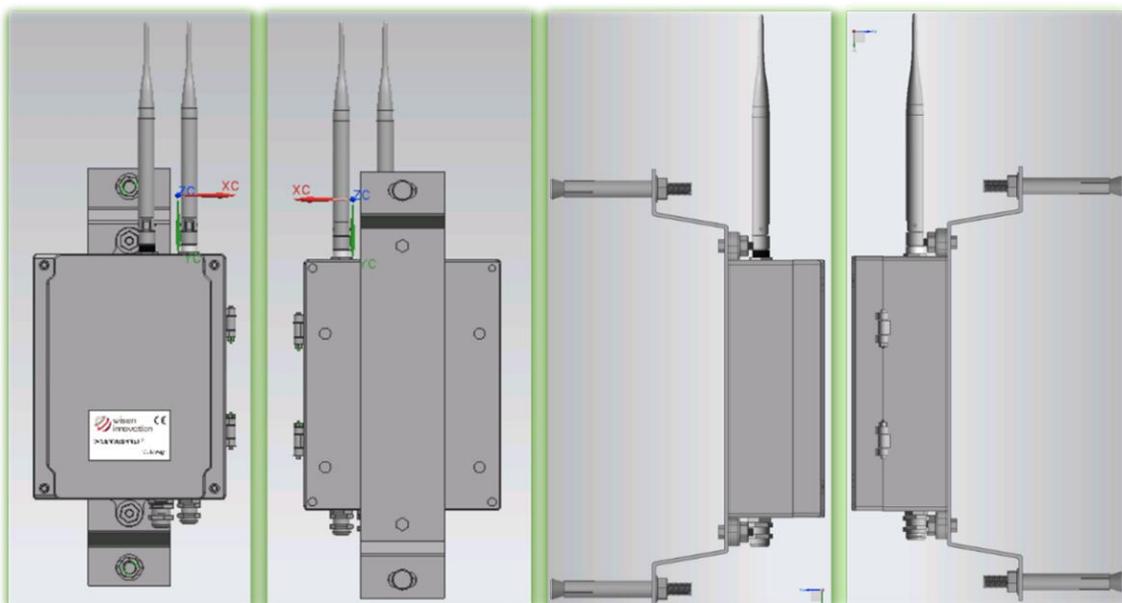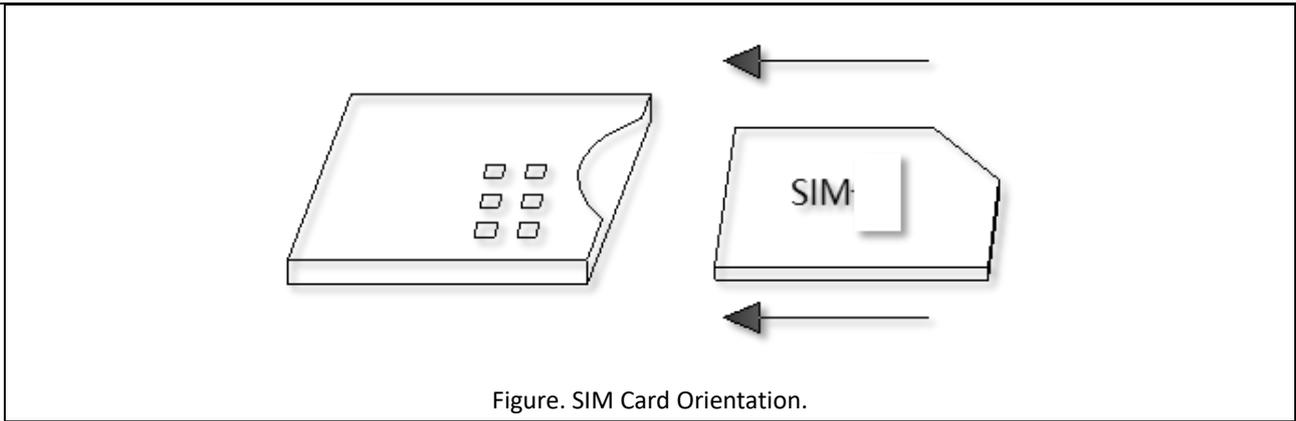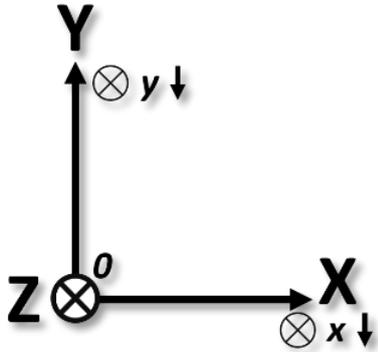**Installation Guidance**

Figure. C-Gateway Product Photos.

Figure. C-Gateway Fixing Bracket.

Figure. SIM Card Orientation.

6003 Type - WiSenMeshWAN® Mini Smart Gateway

Basics	
Primary DC Power	USB 5VDC
L x W x H	52 x 50 x 40mm
Weight	< 80g
Cable Gland	Qty. 1 x USB Connection
Local Storage	N.A.

External Interface	
Wired Port	USB

WSN Interface	
Mesh Wireless Interface	WiSenMeshWAN® Protocol

Standard System Parameter	
Temperature	Range: [-40, 85], Accuracy: ±1°C (Typ. 0.5°C), Resolution: 0.1°C
Voltage	Accuracy: ±0.1V

Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)

Industrial Standard	
Casing and Painting Materials	PC
Operating Temperature	-40 to 85°C

Applications

A gateway is used as a key unit in Wireless Sensor Network system. It is responsible for the command issuing (such as T, F modifications) to and data collection from all the nodes involved in a mesh network; meanwhile, it forwards the data and system information to the local PC via standard USB connection.

Non-Standard Accessory

A. USB connection cable from a gateway to a PC for local parameter configuration. [Software to use: WiSen® Standard Serial Port Software V3.0.11 or above]

Figure. Mini Gateway Product Photo and the relate USB Connection.

WiSenMeshWAN® Sensor Node Series

6305 Type - WiSenMeshWAN® Omni Tilt Sensor Node	
Basics	
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.7VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Working Current (DC)	Max. 65mA (Typ. 50mA)
Local Storage	Min. 450 Messages during Meshing
L x W x H	80 x 75 x 57mm
Weight	0.43kg
Primary Sensor	
Sensor Type	X-axis; Y-axis; Z-axis Tilt Values
Range	-90° to +90°
Accuracy	0.002° (7.2'' or 0.0349mm/m) @ [-2.0°, 2.0°] & Better than 0.01° (36'' or 0.1745mm/m) @ Any 1° over (-90°, 90°)
Resolution	0.0001° (0.36" or 0.001745mm/m)
Standard System Parameter	
Temperature	Range: -40 to 85°C; Accuracy: ±1°C, typical 0.5°C; Resolution: 0.1°C
Voltage	Accuracy: ± 0.1V
WSN Interface	
Mesh Wireless Interface	WiSenMeshWAN® Protocol
Industrial Standard	
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C
Fire Proof	Approved
Certificates	FCC, ACMA
Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)
Tilting Orientation	

1) When holding the Spec paper horizontally, then when X-axis arrow rotates around 0-dot into the paper plane, the readings of "x" decreases; It also applies to both Y/Z-axis;
2) The node fixings must be rigid for the sensor to measure accurate data. Movement in the fixings will affect the readings;
3) The Omni Tilt Sensor Nodes must be oriented with any two axis marked on the label parallel to the horizontal plane, so that the data can be easily interpreted.

Applications

Infrastructure tilting condition monitoring, such as retaining wall, supporting column, river embankment etc.

From the 1st level of data conversion, the movement of one end of a beam/crossbar can be monitored, such as land sliding, railway track monitoring.

With our latest developed mathematical model, we can achieve the Horizontal Convergence of a metro tunnel of 6 segments.

Installation Guidance: The tilt node could be installed in any position.

Figure. Standard Omni Tilt Sensor Node Product Photos (Subject to the final product).
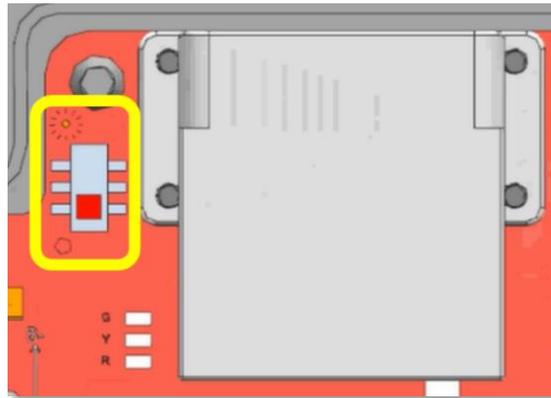
6F07/6F08 Type - WiSenMeshWAN® Omni Tilt & Distance Sensor Node		
Basics	**6F07**	**6F08**
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)	
Accuracy Stop Voltage	2.7VDC	
Mesh Stop Voltage	2.1VDC	
Battery Connection	Standard Aluminium Battery Holder	
Working Current (DC)	Max. 350mA (Typ. 250mA)	
Local Storage	Min. 450 Messages during Meshing	
L x W x H	100 x 100 x 60mm	
Weight	≤ 0.65kg	
Primary Sensor		
Sensor Type	Distance	
Laser Class	Class 2	
Laser Range	0.05m-33m	0.05m-100m
Laser Accuracy	Better than ±1.0mm (Typical 0.5mm)	
Laser Resolution	0.1mm	
Laser Lens Durability	≥ 500Hrs@3Hz@50°C or 2500Hrs@3Hz@25°C	
Standard System Parameter		
Tilt Sensor	X-axis; Y-axis; Z-axis Tilt Values	
Tilt Range	Range: -90° to +90°; Accuracy: 0.002° (7.2'' or 0.0349mm/m) @ [-2.0°, 2.0°] & Better than 0.01° (36'' or 0.1745mm/m) @ Any 1° over (-90°, 90°); Resolution: 0.0001° (0.36'' or 0.001745mm/m).	
Temperature	Range: -40 to 85°C; Accuracy: ±1°C; Resolution: 0.1°C	
Voltage	Accuracy: ±0.1V	
WSN Interface		
Mesh Wireless Interface	WiSenMeshWAN® Protocol	
Re-Calibration Method		
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)	
Industrial Standard		
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)	
IP Rating	≥ IP66	
Operating Temperature	-10 to 50°C	
Fire Proof	Approved	
Certificates	FCC, ACMA	
Applications		
Long term distance monitoring between two specific points, such as horizontal convergence of a tunnel.		
Warning!		

A. This is an automated system, the laser beam must be set to point at an appropriate non-reflective surface;

B. The protection window glass on a node must be kept clear all the time;

C. Distance 0mm starting plane: plane of the protection window glass.

⚠ DANGER
Laser Radiation.
Do Not Stare into Beam.
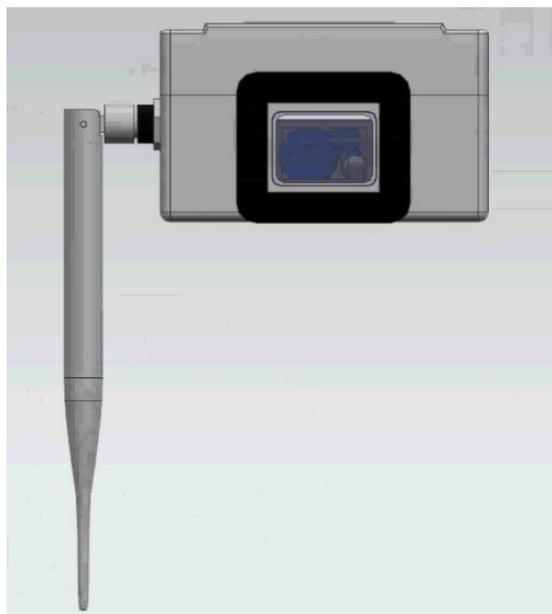Class 2 Laser Product.

Special Notice

Laser_Pointing_Mode Hardware Switch: It sets laser into pointing mode. By default, it is in switched off state (i.e., empty circle sign). Switch location is highlighted in the figure below.

It can be switched on/off before/after a node's power-on. This pointing mode only becomes active after a valid laser reading is achieved.

Note: please do switch it off after an installation is completed, otherwise, the battery life is significantly shortened.

Laser front Lenses Protection Cover: All our laser nodes are shipped with their individual Protection Cover (of a 3M Double Coated Tissue Tape at one side). Once a battery is installed, node is powered on, and lid is screwed on properly. Then glue the cover onto the node as shown in the figure below. It protects the lenses from dust, heat and potential damage.

Error Code Instructions		
Code_Info	**Description**	**Notice (Shown in Web Portal)**
00	Node is working in a good condition	-
01	Target moving too fast or beam interrupt	Repeat measurement, use tripod (@E260)
02	Signal too low or distance out of range	Use special target plate (@E255)
03	Signal too high	Avoid high reflecting surfaces (@E256)
04	Time out on reply	Bad physical connection on laser module or far out of laser range (e.g., pointing to sky) (Wisen)
05	Single reading achieved	Single success on the sampling procedure.
06	Max-Min>2xError Tolerance	The difference of sample values is too large, repeat measurement or use tripod. (Wisen)
07	Unknown command or wrong parameter	Use correct syntax (@E203)
08	Error on serial communication	Check communication (@E220)
09	Temperature too high	Cool down module (@E252)
10	Temperature too low	Warm up module (@E253)
11	Voltage supply too low	Improve voltage supply quality (@E254)
12	Too much background light	Protect target against sunlight (@E257)
13	Laser error	Laser module defect (@E284)
14	APD-voltage can't be adjusted correctly	Laser module defect (@E288)
15	Flash configuration error	Power down and up again (@E289)
16	Unknown command or wrong parameter from laser module	Change to a new battery or Laser module defect (Wisen)
24	Checksum error	Change to a new battery or Laser module defect (@E224)
74	No EEPROM detected, code has to be loaded by GSI	Change to a new battery or Laser module defect (@E274)
76	Read of code from EEPROM wrong	Change to a new battery or Laser module defect (@E276)
78	EEPROM error which appears if something goes wrong during the flashing of the firmware	Change to a new battery or Laser module defect (@E278)
90	Calibration signal out of range	Change to a new battery or Laser module defect (@E290)
Laser Time	The time period (in the unit of seconds) that a laser module has been switched on at each T. Typically, of value: 2-3s.	
Sampling Status	The number of samples that has been successfully measured. Typically, of value: 5.	
Tilting Orientation		

1) When holding the Spec paper horizontally, then when X-axis arrow rotates around 0-dot into the paper plane, the readings of "x" decreases; It also applies to both Y/Z-axis;
2) The node fixings must be rigid for the sensor to measure accurate data. Movement in the fixings will affect the readings;
3) The Omni Tilt Sensor Nodes must be oriented with any one axis marked on the label parallel to the horizontal plane, so that the data can be easily interpreted.
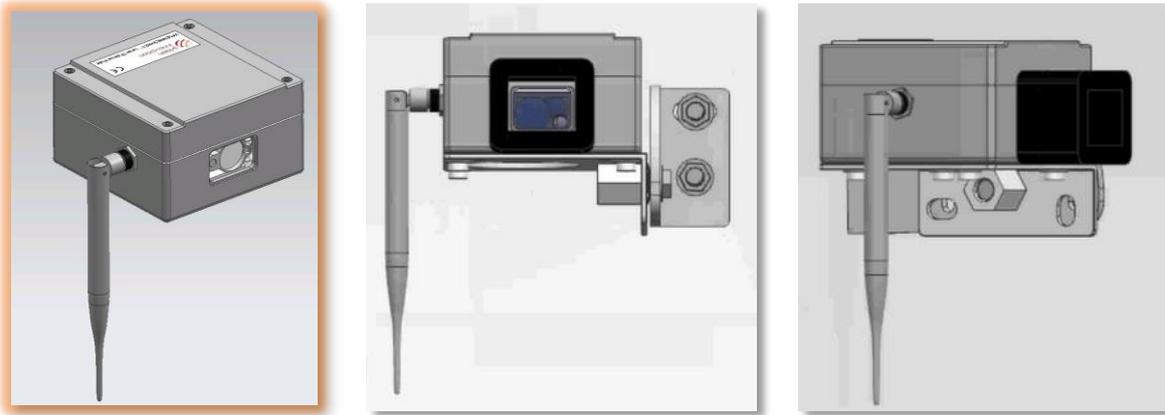
Installation Guidance

Figure. Laser Tilt Sensor Node Fixing Bracket (Please refer to the actual brackets in the shipment as the final).

6501 Type - WiSenMeshWAN® Liquid Level Settlement Sensor Node

Basics

Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.7VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Working Current (DC)	Max. 160mA (Typ. 100mA)
Local Storage	Min. 450 Messages during Meshing
L x W x H	Interface Node: 100 x 100 x 60mm Liquid level settlement sensor: depending on the measurement range in mm.
Node Weight	0.45kg
Sensor Weight	Range: 100mm, Approx. 3kg; Range: 200mm, Approx. 4kg; Range: 300mm, Approx. 5kg.(Excluding the brackets and liquid tubes)

Primary Sensor

Sensor Type	Vertical Settlement
Range	100/200/300/400/500mm
Accuracy	1.0mm (Typical 0.5mm)
Resolution	0.001mm

Standard System Parameter

Temperature	Range: -40 to 85°C; Accuracy: ±1°C; Resolution: 0.1°C
Voltage	Accuracy: ±0.1V

WSN Interface

Mesh Wireless Interface	WiSenMeshWAN® Protocol

Re-Calibration Method

Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)

Industrial Standard

Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C
Fire Proof	Approved
Certificates	FCC, ACMA

Applications

Ground settlement monitoring: A minimum of two settlement sensor nodes are applied, with one as the reference point and other(s) as the vertical movement measurement point.

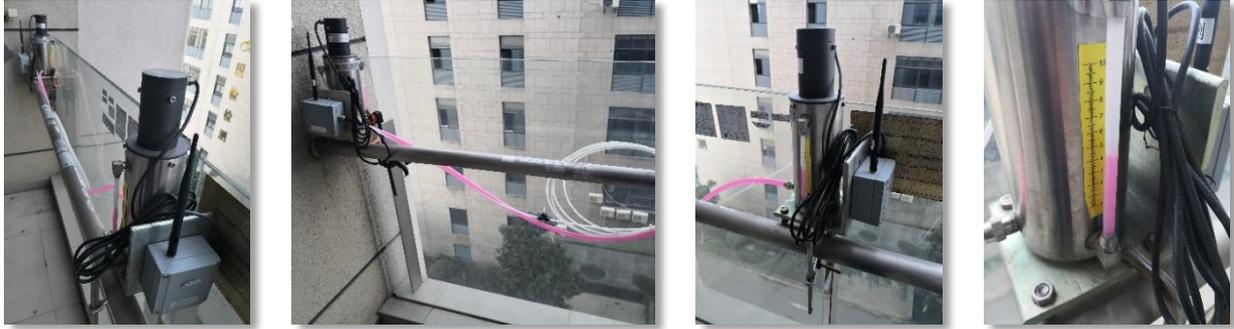Sensor compatible: http://www.bsil.com.cn/english/view.php?id=15

Product Photo

Figure. Liquid Level Settlement Node.

6510 Type - WiSenMeshWAN® 4-Channel Laser Distance Sensor Node

Basics	
Battery Power	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.7VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Working Current	Max. 380mA (Typical: 150mA)
Alternative DC Input	3.6VDC or 7-32VDC@Min. 1A
Local Storage	Min. 450 Messages during Meshing
L x W x H	4 Channel Interface Node: 180 x 140 x 60mm; Laser Distance Unit: 80 x 75 x 57mm
Node Weight	1.3kg
Laser Distance Unit	0.37kg x Qty. 4 (excluding brackets and cables) Default cable length: 0.5m (800m when high quality shield cable is used.)
Cable Gland	Qty. 4 x EMC-CMA12
Wire Connection	Spring type wiring terminal
Primary Sensor	
Sensor Type	Distance
Laser Class	Class 2
Laser Range	0.05m-33m
Laser Accuracy	Better than ±1.0mm (Typical 0.5mm)
Laser Resolution	0.1mm
Laser Lens Durability	≥ 500Hrs@3Hz@50°C or 2500Hrs@3Hz@25°C
Standard System Parameter	
Temperature	Range: -40 to 85°C; Accuracy: ±1°C; Resolution: 0.1°C
Voltage	Accuracy: ±0.1V
WSN Interface	
Mesh Wireless Interface	WiSenMeshWAN® Protocol
Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)
Industrial Standard	
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-10 to 50°C
Fire Proof	Approved
Certificates	-
Sensor Output Voltage	

"Vcc_Out Hardware Switch" is used to control the Vcc_out voltage to be 5V, 9V and 12V cross all 4 channels simultaneously. However, for 6510 type, 12V must be used as power supply voltage to the laser sensors.

Hardware Switch	Vcc_Out Output	Demo Photo
0	5V	
1	9V	
2	12V (Default)	
3	5V	

Table. Vcc_Out Switch Setting.

Applications

4 sets of laser sensors can be hosted in this product, each can be used for long term distance monitoring between two specific points, such as horizontal convergence of a tunnel.

Note:

1. Vcc_Out Switch must be set as Switch = 2, i.e., 12V for the laser sensors to work;

2. It does not contain any tilt readings as in 6Fxx laser tilt series.

Warning!

D. This is an automated system, the laser beam must be set to point at an appropriate non-reflective surface;

E. The protection window glass on a node must be kept clear all the time;

F. Distance 0mm starting plane: plane of the protection window glass.

Special Notice

Laser_Pointing_Mode Hardware Switch: It sets laser into pointing mode. By default, it is in switched off state (i.e., empty circle sign). Switch location is highlighted in the figure below.

It can be switched on/off before/after a node's power-on. This pointing mode only becomes active after a valid laser reading is achieved.

Note: please do switch it off after an installation is completed, otherwise, the battery life is significantly shortened.

Laser front Lenses Protection Cover: All our laser nodes are shipped with their individual Protection Cover (of a 3M Double Coated Tissue Tape at one side). Once a battery is installed, node is powered on, and lid is screwed on properly. Then glue the cover onto the node as shown in the figure below. It protects the lenses from dust, heat and potential damage.

Error Code Instructions		
Code_Info	**Description**	**Notice (Shown in Web Portal)**
00	Node is working in a good condition	Node is working in a good condition
01	Target moving too fast or beam interrupt	Repeat measurement, use tripod (@E260)
02	Signal too low or distance out of range	Use special target plate (@E255)

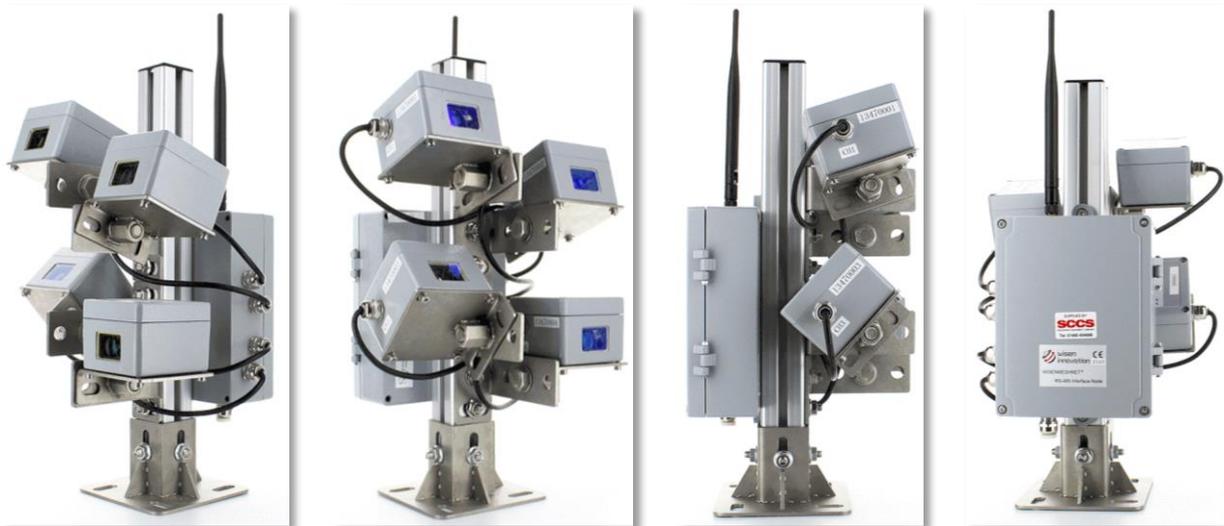| 03	Signal too high	Avoid high reflecting surfaces (@E256)
04	Time out on reply	Bad physical connection on laser module or far out of laser range (e.g., pointing to sky) (Wisen)
05	Single reading achieved	Single success on the sampling procedure.
06	Max-Min>2xError Tolerance	The difference of sample values is too large, repeat measurement or use tripod. (Wisen)
07	Unknown command or wrong parameter	Use correct syntax (@E203)
08	Error on serial communication	Check communication (@E220)
09	Temperature too high	Cool down module (@E252)
10	Temperature too low	Warm up module (@E253)
11	Voltage supply too low	Improve voltage supply quality (@E254)
12	Too much background light	Protect target against sunlight (@E257)
13	Laser error	Laser module defect (@E284)
14	APD-voltage can't be adjusted correctly	Laser module defect (@E288)
15	Flash configuration error	Power down and up again (@E289)
16	Unknown command or wrong parameter from laser module	Change to a new battery or Laser module defect (Wisen)
24	Checksum error	Change to a new battery or Laser module defect (@E224)
74	No EEPROM detected, code has to be loaded by GSI	Change to a new battery or Laser module defect (@E274)
76	Read of code from EEPROM wrong	Change to a new battery or Laser module defect (@E276)
78	EEPROM error which appears if something goes wrong during the flashing of the firmware	Change to a new battery or Laser module defect (@E278)
90	Calibration signal out of range	Change to a new battery or Laser module defect (@E290)
Laser Time	The time period (in the unit of seconds) that a laser module has been switched on at each T. Typically, of value: 2-3s.	
Sampling Status	The number of samples that has been successfully measured. Typically, of value: 5.	

Product Photo

Figure. 4-Channel Laser Distance Sensor Node.

6517 Type - WiSenMeshWAN® Weather Sensor Node

Basics

Battery Power	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.7VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Working Current	Max. 570mA (Typ. 210mA). Note: External 12VDC is strongly recommended.
Alternative DC Input	3.6VDC or 7-32VDC@min. 1A
Local Storage	Min. 450 Messages during Meshing
L x W x H	4 Channel Interface Node: 180 x 140 x 60mm Sensor: 600 x 300 x 250mm
Node Weight	1.3kg
Sensor Weight	3.0kg
Cable Gland	Qty. 4 x EMC-CMA12
Wire Connection	Spring type wiring terminal

Primary Sensor

Channel Choice	CH2 ONLY							CH4 ONLY
Sensor Type	Temperature	Humidity	Light Intensity	Air Pressure	Noise Level	Wind Speed	Wind Direction	Rainfall/T
Range	-40~100°C	0~100%RH	0~200000Lux	30~1100hPa	30~130dB	0~45m/s	0~359°	0~6553.5mm/T
Accuracy	±0.3°C	±3%RH	±4%F.S.	±1hPa	±3dB	±(0.3+3%xSpeed) m/s	±3°	±1mm
Resolution	±0.1°C	0.1%RH	1Lux	0.11hPa	0.1dB	0.1m/s	1°	0.2mm

Standard System Parameter

Temperature	Range: -40 to 85°C; Accuracy: ±1°C; Resolution: 0.1°C
Voltage	Accuracy: ±0.1V

WSN Interface

Mesh Wireless Interface	WiSenMeshWAN® Protocol

Re-Calibration Method

Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)

Industrial Standard

Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C (excluding rainfall sensor)
Fire Proof	Approved
Certificates	-

Sensor Output Voltage

"Vcc_Out Hardware Switch" is used to control the Vcc_out voltage to be 5V, 9V and 12V cross all 4 channels simultaneously. However, for 6517 type, 12V must be used as power supply voltage to weather sensors.

Hardware Switch	Vcc_Out Output	Demo Photo
0	5V	
1	9V	
2	12V (Default)	
3	5V	

Table. Vcc_Out Switch Setting.

Applications

Outdoor Long term multi meteorological parameters monitoring, including: Temperature, Humidity, Light Intensity, Air Pressure, Noise Level, Wind Speed, Wind Direction and Rainfall per T.

Note:

1. CH2 must be connected with the combined weather sensors; CH4 must be connected with the rainfall sensor;

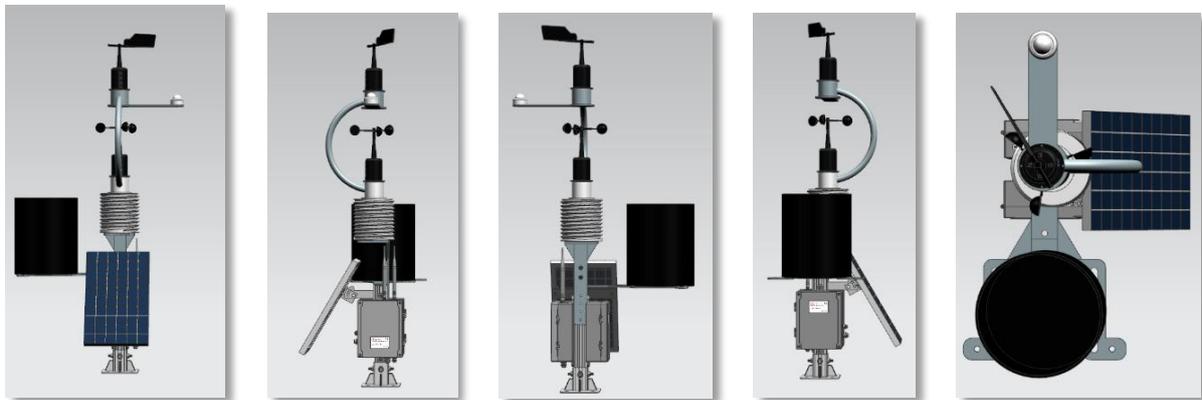2. Vcc_Out Switch must be set as Switch = 2, i.e., 12V for the weather sensors to work.

Product Photo

Figure. Weather Sensor Node.

WiSenMeshWAN® Interface Node Series

6A07/6A08 Type - WiSenMeshWAN® 1/4-Channel Vibrating Wire Interface Node		
Basics	**6A07: 1 x VW Interface Node**	**6A08: 4 x VW Interface Node**
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)	Qty. x 2 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.1VDC	
Mesh Stop Voltage	2.1VDC	
Battery Connection	Standard Aluminium Battery Holder	
Working Current (DC)	Max. 60mA (Typ. 48mA)	
Local Storage	Min. 450 Messages during Meshing	
L x W x H	100 x 100 x 60mm	180 x 140 x 60mm
Weight	0.60kg	1.20kg
External Sensor Size and Weight	Depending on the specific VW sensor connected (external cable length ≤ 1.1km)	
Cable Gland	Qty. 1 x EMC-CMA12 for external VW sensor connection	Qty. 4 x EMC-CMA12 for external VW sensor connections
Wire Connection	Spring type wiring terminal	
Externally Connected VW Sensor		
Sensor Type	Vibrating Wire Typed	
No. of Inputs	1 Channel	4 Channels
Sensor Connection	VW Type of 5 wires: VW+, VW-, T+, T-, GND. Note: Temperature wires (or a 3kΩ resistor) must be connected to the T+ & T- terminals so VW node can work properly; Ground wire between a node and a sensor must be connected.	
Parameter	Resonant Frequency (Hz)	
Range	400 to 6000Hz	
Accuracy	0.015% at Any Reading	
Sensitivity	0.002Hz@400Hz or 0.05Hz@6000Hz	
External Thermistor Sensor		
Parameter	Thermistor Resistor of 3kΩ @25°C	
Range	0.052kΩ to 113.096 kΩ	
Accuracy	0.12kΩ or 2°C	
Standard System Parameter		
Temperature	Range: -40 to 85°C, Accuracy: ±1°C, typical 0.5°C; Resolution: 0.1°C	
Voltage	Accuracy: ±0.1V	
WSN Interface		
Mesh Wireless Interface	WiSenMeshWAN® Protocol	
Re-Calibration Method		
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)	
Industrial Standard		

Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C
Fire Proof	Approved
Certificates	FCC, ACMA

Applications

WiSenMeshWAN® VW interface node is Compatible with all different brands & types of high quality Vibrating Wire sensors, therefore it can be applied in all different related monitoring projects.

Examples of VW sensors: Strain Gauge; Displacement Transducers; Piezometers; Settlement Sensors; Pressure Cells; Load Cells. Suggested VW sensor supplier: http://www.soilinstrument.com/

Installation Guidance

Figure. 1-Channel VW Interface Node Product Photos.
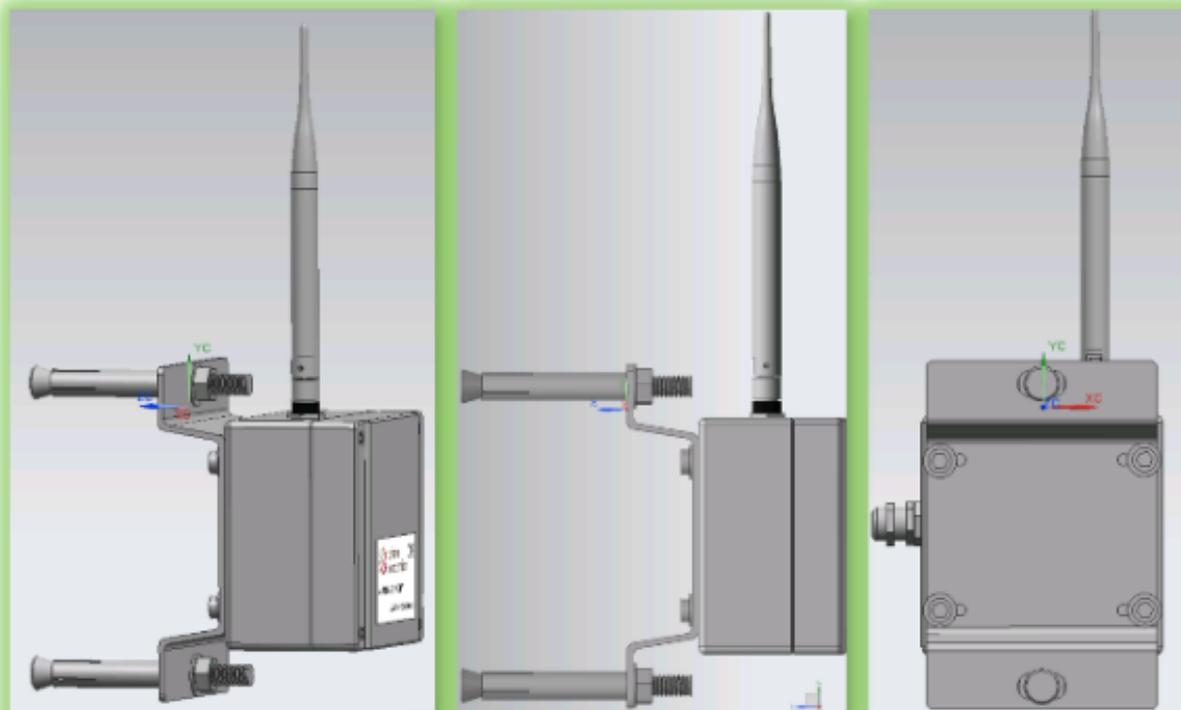
Figure. 1-Channel VW Interface Node Brackets.

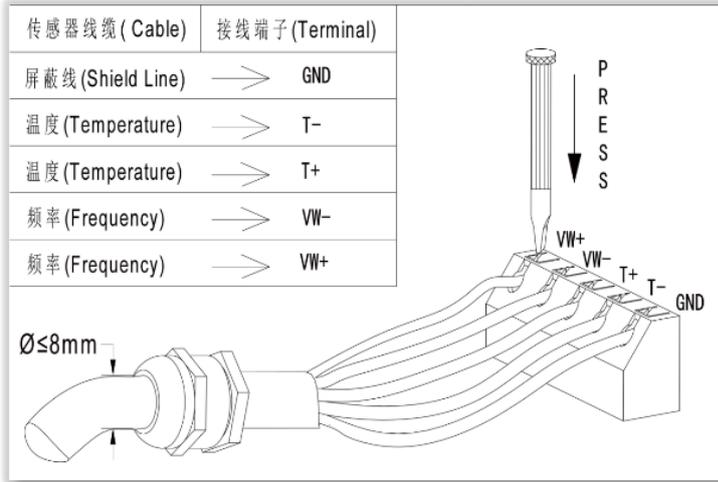| 传感器线缆 (Cable)	接线端子 (Terminal)
屏蔽线 (Shield Line) →	GND
温度 (Temperature) →	T−
温度 (Temperature) →	T+
频率 (Frequency) →	VW−
频率 (Frequency) →	VW+

Figure. VW Sensor Connections (VW+, VW-, T+, T-, GND).
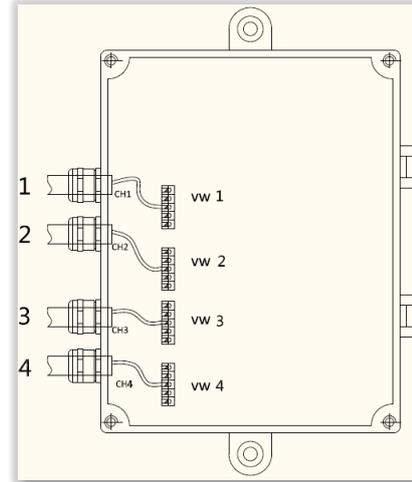
Figure. 4 x VW relate Sensor Connection.

6C01 Type - WiSenMeshWAN® Voltage Interface Node

Basics

Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.7VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Working Current (DC)	Max. 210mA
Local Storage	Min. 450 Messages during Meshing
L x W x H	Interface Node: 100 x 100 x 60mm
Weight	0.6kg
External Sensor Size and Weight	Depending on the specific sensor connected (external cable length ≤ 1.0m)
Cable Gland	Qty. 1 x EMC-CMA12 for external sensor connection
Wire Connection	Spring type wiring terminal

Primary Sensor

	Signal Output Range (0 to Vcc_Out)	Power Input Voltage (Vcc_Out) @ max. 100mA
Sensor Type	0-1.8V	1.8V±0.05V
	0-2.5V	2.5V±0.05V
	0-3.3V	3.3V±0.05V
	0-5.0V	5.0V±0.05V
	Notice: Power On Time to External Sensor: 1s power on before samples are taken. Please confirm the sensor stable time before use.	
Accuracy	0.05%F.S.	
Resolution	0.18mV	

Standard System Parameter

Temperature	Range: -40 to 85°C; Accuracy: ±1°C; Resolution: 0.1°C
Voltage	Accuracy: ±0.1V

WSN Interface

Mesh Wireless Interface	WiSenMeshWAN® Protocol

Re-Calibration Method

Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)

Industrial Standard

Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C
Fire Proof	Approved
Certificates	-

Sampling Range Selection

"Vcc_Out Hardware Switch" is used to select the option of:

   A.   sampling "Voltage Signal Output Range" from an external sensor;

B. providing "Input Power Voltage" to an external sensor, e.g., for 6C01 type, "Vcc_Out Switch" of 2.5V must be selected so that the EC-5 soil moisture sensor can be powered at 2.5V and also the node can sample between 0 and 2.5V from the sensor.

Notice: For any other sensors, please check against the sensor specification before the setting is completed！

| Hardware Switch	Vcc_Out Output	Demo Photo
0 (default)	1.8V (default)	
1	2.5V	
2	3.3V	
3	5.0V	

Figure. Vcc_Out Switch Setting.

Wire Connections
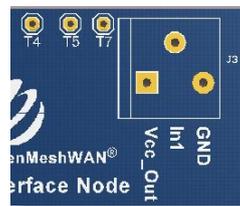
Applications

A. Voltage typed sensors of Vin = 1.8V/2.5V/3.3V/5.0V, Current required ≤ 100mA, Sensor Vout Signal ≤ Sensor Vin;

B. Sensor example:

    a. High precision moisture Sensor:

       https://www.metergroup.com/environment/products/ec-5-soil-moisture-sensor

    b. Displacement Sensor: http://www.miransensor.com/english/cpzx/32/list_1633.html

Product Photo

Figure. Voltage Node (From left to right: EC-5 Soil Moisture in %, Displacement in mm, Noise Level in dB).

WiSen External Power Units

M101 Type - WiSen® Solar Unit (for B-Gateway & 4-20mA Interface Node)	
Basics	
Battery Power	Rechargeable Package (LiFePO4)
DC Output Voltage	11.2V-14.6V
Capacity when fully charged	5AHr
Solar Panel	10W
Single Re-charging Duration	8-12Hr
L x W x H	180 x 140 x 60mm (without bracket)
Weight	2.2kg

B-Gateway Operating Duration

	Time Interval(T/min)	Working Days*
	1	2
	5	5
	15	15
	30	28
	60	52**

* Assumption: we assume that the local mobile 3G/4G networking is covered properly;

** Notice: to further extend the operating duration, please consult with our engineers.

*** Notice: Solar package must have the 4 internal ER34615 batteries installed as a backup UPS to avoid continuous strong sun light day or cloudy days.

Industrial Standard

Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-35 to 65°C

Installation Guidance

Notice: Take special attention when handling the high capacity battery package;

Installation Procedures:

1. Ensure that the output switch on a solar unit is in "OFF" status before any operation of wiring.

2. Ensure the "+" and "-" wires are connected absolutely correct to the "+" and "-" terminals in the unit, including:

    A. PCB Recharge "+" & "-" terminals to Rechargeable Battery Unit "+" & "-" plug;
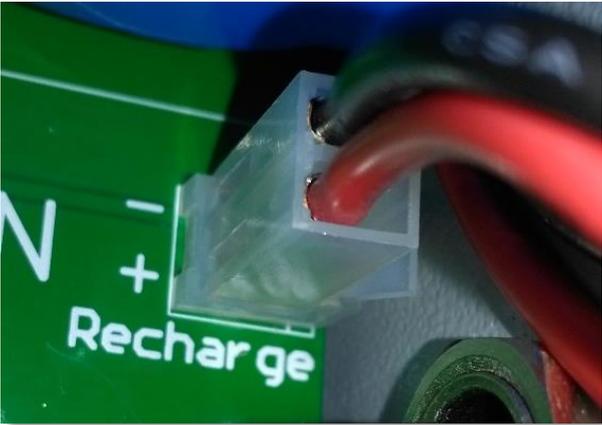
B. PCB Power_Out "+" & "-" terminals to B-Gateway "+" & "-" terminals;

C. PCB Solar_In "+" & "-" terminals to External solar panel "+" & "-" terminals.

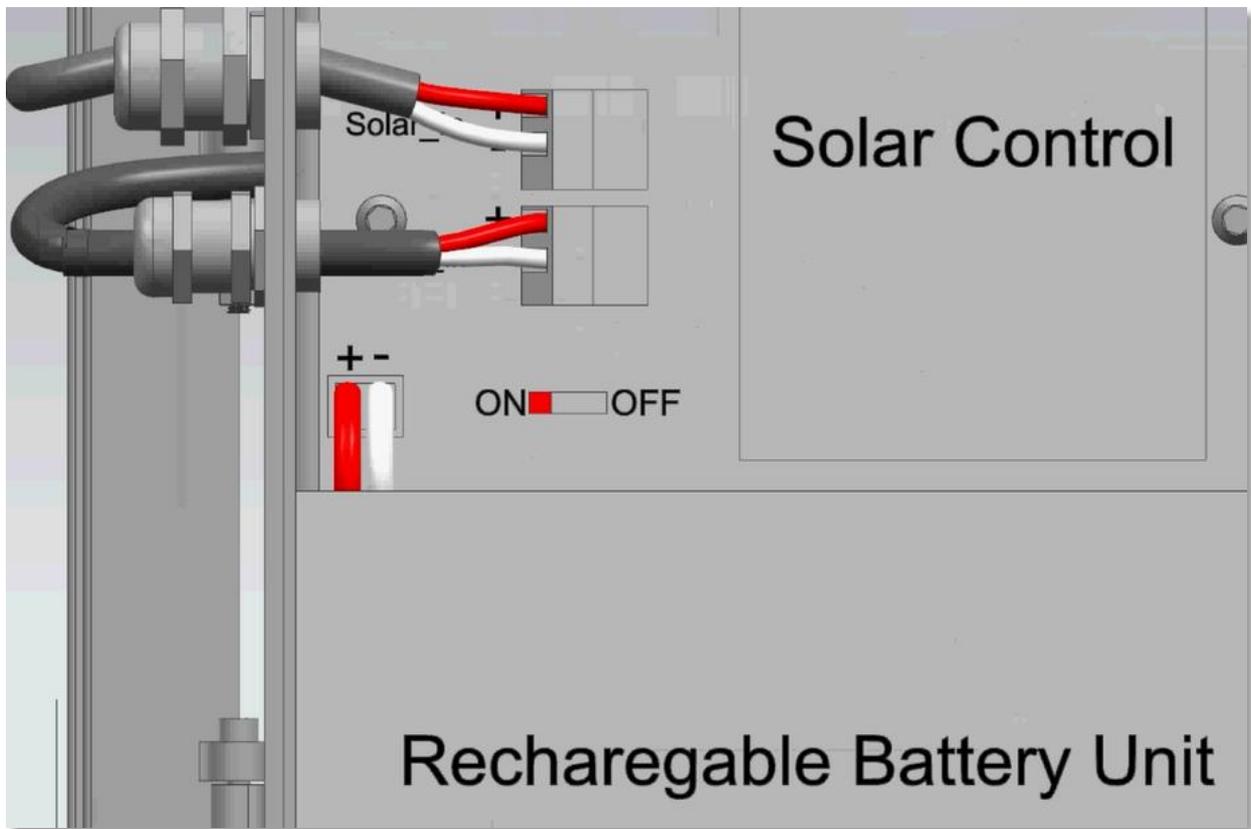3. When the wirings are checked, ensure the unit is switched "ON", so the power output is activated.

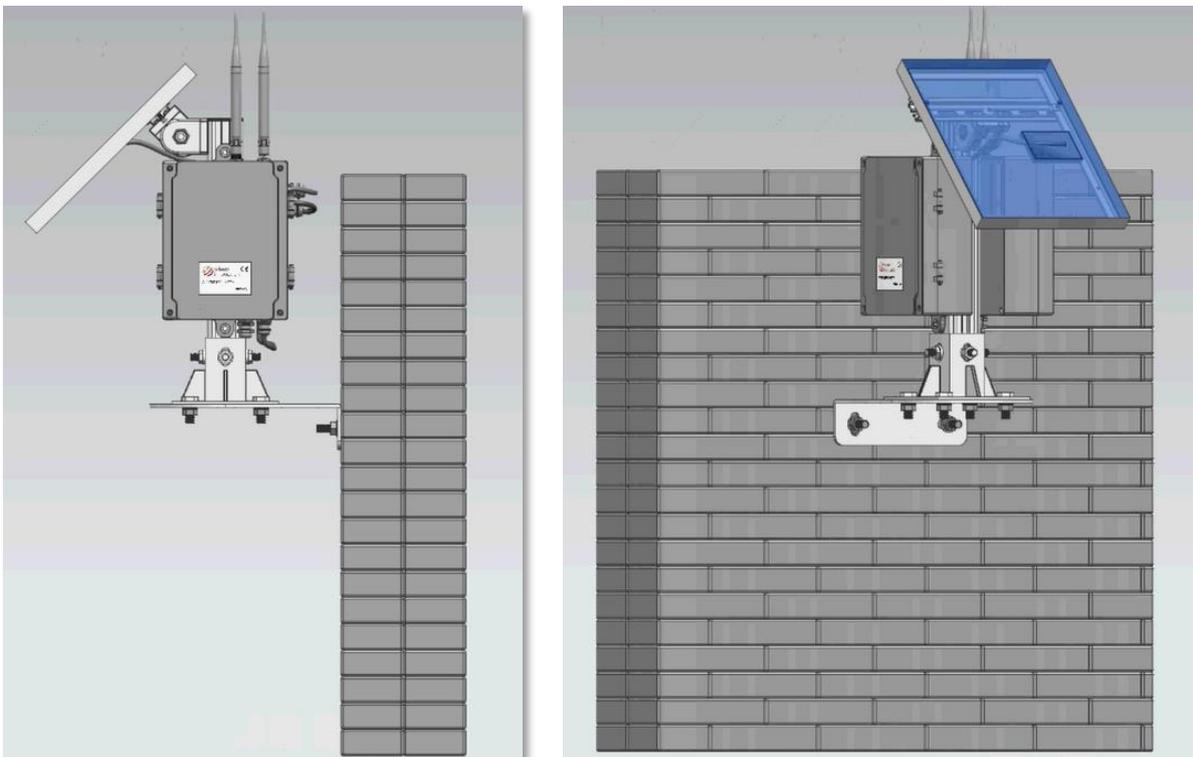Figure. Solar unit – wiring and ON/OFF switch.

Figure. Solar unit – Overview.

M001/ M002 Type - WiSen® Battery Unit (for B-Gateway)

Basics	M001 (Unit for 1004-B-Gateway)	M002 (Unit for 1005-C-Gateway)
Battery Power	Qty. x 6 (3.6V Lithium primary D-Cell ER3461)	
Battery Connection	Standard Aluminium Battery Holder	
DC Output Voltage	8V-10.8V	2.6V-3.6V
Capacity when fully charged	29AHr	80AHr
L x W x H	180 x 140 x 60mm	
Weight	2.2kg	

B-Gateway Operating Duration		
	Time Interval(T/min)	Working Days*
	1	15
	5	38
	15	112
	30	212
	60	401**

* Assumption: we assume that the local mobile 3G/4G networking is covered properly;

** Notice: to further extend the operating duration, please consult with our engineers.

Industrial Standard		
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)	
IP Rating	≥ IP66	
Operating Temperature	-40 to 85°C	

Installation Guidance

Notice: Take special attention when handling the high capacity battery package;

Installation Procedure:

1. Ensure that the output switch on a solar unit is in "OFF" status before any operation of wiring.

2. Ensure the "+" and "-" wires are connected absolutely correct to the "+" and "-" terminals in the unit;

3. When the wirings are checked, ensure the unit is switched "ON", so the power output is activated.
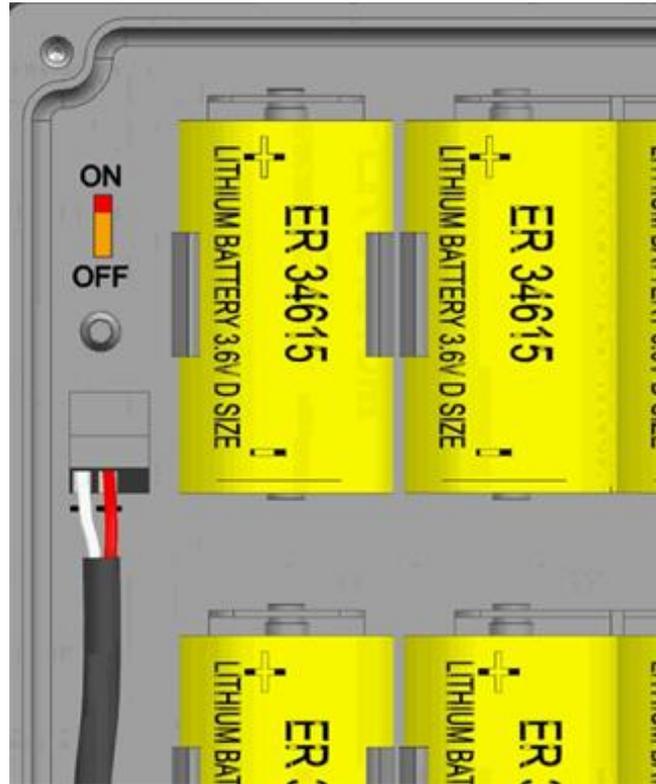
Figure. Battery unit - internal layout.

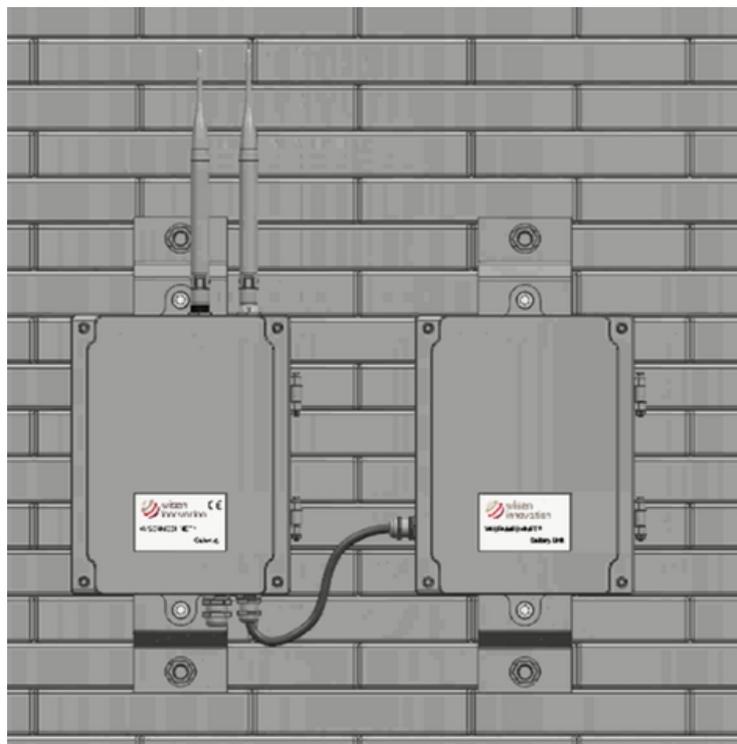Figure. Battery unit – wiring and ON/OFF switch.

Figure. Battery unit – Overview.

Wisen Camera Series

3002 Type – WiSen® Vision Unit

Basics

Primary Battery Power	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Secondary DC Power	7 - 32VDC @ Min. 2A (e.g. 110-240VAC to 12VDC adaptor) or Solar Unit
4G Network Stop Voltage	2.1V
Local Storage	≥180 days @T=10min, i.e., 26000 Images
L x W x H	180 x 140 x 60mm
Weight	≤ 2.0kg
Cable Gland	Qty. 1 x EMC-CMA12 for Camera connection; Qty. 1 x EMC-CMA14 for external DC input power connection

Camera Mode (Factory Default Setting: Active Mode @ T=5min @ Lower Power LED Status)

Passive Mode & Battery Life	Photo is not taken until a Photo-Taken command is sent, more specifically: - At T < 5min, a photo comes back at close to real time, internal battery life ≈ 10 days; - At T ≥ 5min, a photo comes back with a delay of 1-2Ts, internal battery life ≈ 44 days @T=5min.

Active Mode & Battery Life (@ 4G Connection)

Photo is automatically taken at every T.

Sampling Time Interval - T	No.
1min	3d
5min (Default Setting)	16d
15min	53d
30min	91d
60min	162d
24hr (@Low Power Green Mode)	5Yrs+

Sampling Time Interval T	[1min, 1day]. Notice: at both Active and Passive modes, 1. The bigger the T value is, the more delay a user has when getting a photo; 2. The bigger the T value is, the less power consumption a node is, i.e., internal battery life can last longer.

Camera Image

Image sensor	CMOS 2MP Colour
Image resolutions	1920 x 1080
Image compression	JPEG
Angle of view	Horizontal Plane 85°/ Vertical Plane 45°
Lens	3.6mm
External Cable Length	1.0m
Night vision image	Black & White
Night Vision Distance	1.0 to 8.0m

LEDS/Buzzer and On-Site Warning Issuing

Volume	Max. 90dB@10cm

No. of LEDs	LED x 3 of Green/Blue/Red Colours + Low Power LED x 1 of Green	
LED Flashing/Buzzer Frequency	Red + Buzzer Warning (the highest warning level)	Twice at every 2s
	Blue + Buzzer Warning	Once at every 3s
	Green/Low Power Green Mode (normal level) No Buzzer	Once at every 4s

External Interface	
Wireless Module	ONLY Wisen 7600E or plus Daughter Board @ Micro SIM card, WiFi module
Wired Port	RS232, Ethernet module

WSN Interface	
Mesh Wireless Interface	WiSen® Protocol

Standard System Parameter	
Temperature	Range: -40 to 85°C; Accuracy: ±1°C; Resolution: 0.1°C
Voltage	Accuracy: ±0.1V

Industrial Standard	
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	≥ IP66
Operating Temperature	-40 to 85°C
Fire Proof	Approved
Certificates	-

Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)

Applications

1. When a Vision Unit is deployed at Control centre/Data centre, the LED warnings can be configured with one or more projects. So that a visual and auditory warning system can be established in the centre. This frees the operators from frequent checking of warning emails;

2. When a Vision Unit is deployed on site: A. the image data can help on illustrating the progress of the construction works; B. the LED and Buzzer warnings can present a systematic visual and auditory warning to the on-site team so that the maximum safety can be achieved.

Note: Vision Unit relies on a stable 4G connection, so its image data can be transferred smoothly and furthermore, the LED warnings can be received from a remote control centre.

Non-Standard Accessory

1. RS232 to USB connection cable;
2. Outdoor adaptor, IP68: 110-240VAC to 12VDC@5.0A.

Highlights

1. When a Vision Unit connects to a remote server, "NET" LED on the PCB board will be constantly on;
2. Please do not stare at the flashing LEDs at close distance；
3. Night vision tips:
   A. For the best quality under night vision mode, please ensure the camera is not installed close to any object (e.g., trees, poles, etc.). Otherwise, strong infrared flashing will be reflected causing the distant object not clearly seen;
   B. As the maximum distance under night vision is approximately 8m, a user can stick Leica reflectors on the most concerned points, then a reflector (of 8cm x 8cm) can be seen from 100m+. This gives the user extended range of monitoring.

Installation Demo

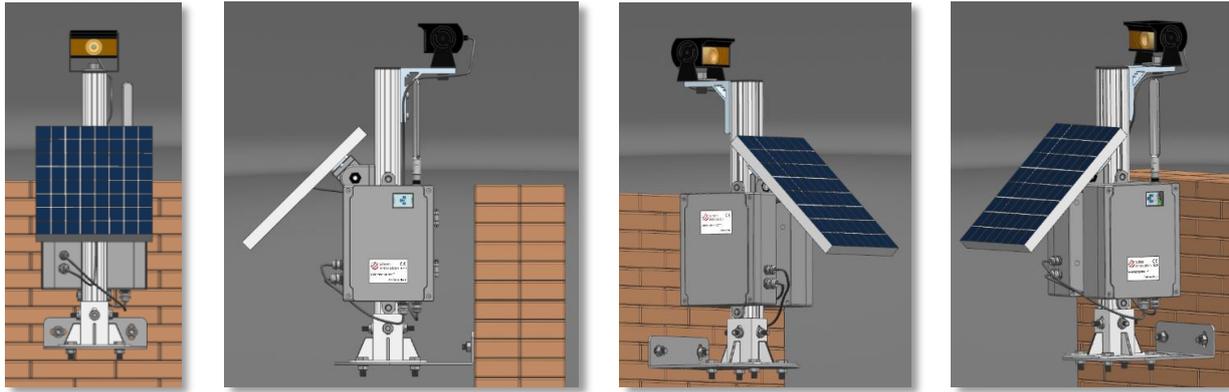Figure. Vision Unit.

Figure. Image taken during daytime.

Figure. Image taken during night time.

End of the Specification.