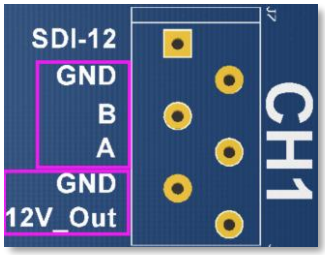
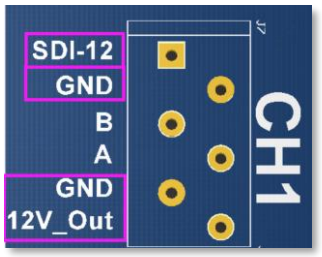
650X Type - WiSenMeshWAN® 1-Channel RS-485 / SDI-12 Interface Node	
Basics	
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.1VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Output Current	Max. 100mA @12V
Local Storage	Min. 1500 Messages during Meshing at Mesh3.0 Protocol
Dimension (L x W x H)	100 x 100 x 60mm
Node Weight	0.45kg
Sensor Type	
Sensor Type	RS485 / SDI-12 interface sensor
No. of Inputs	1 Channel
Primary Sensor	
Please refer to the related sensors that are already compatible in this document. If there are any additional sensors that are requested, please let the Wisen team know.	
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
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
Product Photo	

Figure. 1-Channel RS-485 / SDI-12 Interface Node.

RS485 Connection	
12V_Out	12VDC Power+
GND	Power-

A	RS-485 A	
B	RS-485 B	
GND	Shielding wire (if exists)	
SDI-12 Connection		
12V_Out	12VDC Power +	
GND	Power-	
SDI-12	SDI-12 Signal	
GND	Shielding wire (if exists)	

6502 / 6510 Type - WiSenMeshWAN® 1/4-Channel Laser Distance Sensor Node		
Basics	**6502: 1-Channel**	**6510: 4-Channel** (Please refer to "651X / 652X Type- WiSenMeshWAN® 4-Channel RS-485 / SDI-12 Interface Node" for further node details)
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.1V DC	
Mesh Stop Voltage	2.1V DC	
Battery Connection	Standard Aluminium Battery Holder	
Alternative DC Input	N.A.	7-32VDC@Min.1A 10.8V Battery Unit Solar Unit
Local Storage	Min. 1500 Messages during Meshing at Mesh3.0 Protocol	
Node Dimension (L x W x H)	100 x 100 x 60mm	180 x 140 x 60mm
Node Weight	0.45kg	1.3kg
Laser Distance Unit Dimension (L x W x H)	80 x 75 x 57mm	
Laser Distance Unit Weight	0.37kg, Default cable length: 0.5m (500m when high quality shield cable is used.)	
Cable Gland	Qty. 1 x EMC-CMA14 for external sensor connections (through cable diameter, 4-8mm)	Qty. 4 x EMC-CMA14 for external sensor connections (through cable diameter, 4-8mm)
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	

Applications

Leica Disto laser sensor is used for long term distance monitoring between two specific points, such as horizontal convergence of a tunnel. The external cable can be extended to a 500m range, which gives the interface node a complete freedom to be positioned at better radio location in certain applications.

Note: Both nodes do not contain any tilt readings as in "XFXX Laser Tilt Sensor Nodes".

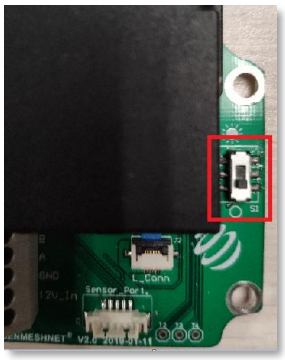
Laser Distance User Notifications

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.

Lase Point Constantly ON:

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



It can be switched on/off before/after a node's power-on.

Note: please do switch it off when an installation is completed. As a power saving mechanism, the laser pointing beam is maximumly on for 20min., then it automatically switches itself off.

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.

Data Fields Interpretations

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. Laser Distance Unit.

Figure. 4-Channel Laser Distance Sensor Node with Qty. 4 x 5000 Type 33m Laser Distance Unit.

6503 Type - WiSenMeshWAN® 1-Channel Air Temperature Humidity & Pressure Sensor Node			
Basics			
Working Current (DC)	Max. 160mA (Typ. 100mA)		
Primary Sensor			
Sensor Type	Temperature	Humidity	Air Pressure
Range	-40~100°C	0~100%RH	30~1100hPa
Accuracy	±0.3°C	±3%RH	±1hPa
Resolution	±0.1°C	0.1%RH	0.1hPa
Applications			
Outdoor Long term multi meteorological parameters monitoring, including: Temperature, Humidity, Air Pressure, Noise Level.			
Product Photo			

Figure. Air Temperature Humidity & Pressure Sensor Node.

6507/651E Type - WisenMeshWAN® 1/4-Channel YieldPoint Extensometer Sensor Node		
Basics	6507: 1 Channel	651E: 4 Channel (Please refer to "651X / 652X Type- WiSenMeshWAN® 4-Channel RS-485 / SDI-12 Interface Node" for further node details)
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.1V DC	
Mesh Stop Voltage	2.1V DC	
Battery Connection	Standard Aluminium Battery Holder	
Alternative DC Input	N.A.	7-32VDC@Min.1A 10.8V Battery Unit Solar Unit
Local Storage	Min. 1500 Messages during Meshing at Mesh3.0 Protocol	
Dimension (L x W x H)	Node: 100 x 100 x 60mm	Node: 180 x 140 x 60mm
Weight	0.45kg	1.3kg
Cable Gland	Qty. 1 x EMC-CMA14 for external sensor connections (each through cable diameter, 4-8mm)	Qty. 4 x EMC-CMA14 for external sensor connections (each through cable diameter, 4-8mm)
Wire Connection	Spring type wiring terminal	
Primary Sensor (Externally Connected)		
Multiple Sensor Types	Yield Point Extensometer	

No. of Inputs	1 Channel	4 Channels
Parameter	Each channel can host an array of 1 to 6 units of multiple rod extensometer (i.e., d-Exto) manufactured by YieldPoint. Please refer to the link below for the sensor details: https://www.yieldpoint.com/digital/digital-extensometer/ 	

Applications

Each RS485 Interface channel can host 1 array of 1 to 6 units of Rod Extensometer (i.e., d-Exto) from YieldPoint. More details, please refer to the manufacturer.

Note: Full compatibility for the following makers too:

6521 Type- WisenMeshWAN® 4-Channel ***Osprey IPX*** Interface Node

Product Photo

Figure. 6507 Type- 1-Channel YieldPoint Extensometer Sensor Node

&

651E Type- 4-Channel YieldPoint Extensometer Sensor Node.

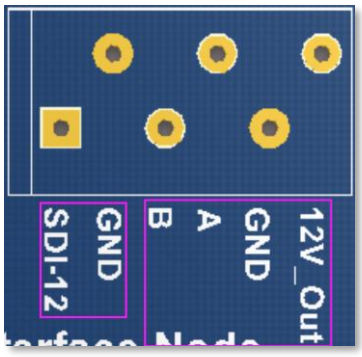


Figure. 1-Channel Connections & 4-Channel Connections for:

RS-485 Terminals – Pink Box on the right @ 12V_Out, GND, RS485 A, RS485 B;

SDI-12 Terminals – Pink Box on the left @ SDI-12, GND.

6508/651C Type - WiSenMeshWAN® 1/4-Channel 3-Axis Smart Shape Interface Node		
Basics	6508: 1-Channel (ONLY Available for WSS Cell & Encardio IPI)	651C: 4-Channel (Please refer to "651X / 652X Type- WiSenMeshWAN® 4-Channel RS-485 / SDI-12 Interface Node" for further node details)

Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Accuracy Stop Voltage	2.1V DC	
Mesh Stop Voltage	2.1V DC	
Battery Connection	Standard Aluminium Battery Holder	
Alternative DC Input	N.A.	7-32VDC@Min.1A 10.8V Battery Unit Solar Unit
Local Storage	Min. 1500 Messages during Meshing at Mesh3.0 Protocol	
Dimension (L x W x H)	100 x 100 x 60mm Plus various dimensions of different IPI sensors	180 x 140 x 60mm Plus various dimensions of different IPI sensors
Weight	0.45kg	1.3kg
Cable Gland	Qty. 1 x EMC-CMA14 for external sensor connections (through cable diameter, 4-8mm)	Qty. 4 x EMC-CMA14 for external sensor connections (through cable diameter, 4-8mm)
Wire Connection	Spring type wiring terminal	

Supported Sensor Types

	Power \ Type	WiSen WSS Cell (RS-485, 3-Axis)	Encardio IPI (SDI-12, 3-Axis)	Encardio IPI (RS-485, 3-Axis)	WiSen WSS Cell (RS-485, 3-Axis)	Encardio IPI (SDI-12, 3-Axis)	Encardio IPI (RS-485, 3-Axis)
Max. Number of IPIs Connected	A. Internal Batteries	12	12	12	Single Channel ≤ 40; Total ≤ 160		
	B. Internal Batteries + External Battery Unit	N.A.	N.A.	N.A.			
	C. Internal Batteries + External 12VDC Adapter or Solar Unit	N.A.	N.A.	N.A.	Single Channel ≤ 127; Total ≤ 160	Single Channel ≤ 62; Total ≤ 160	Single Channel ≤ 127; Total ≤ 160

Primary Sensor

Sensor Type	Range	Accuracy	Resolution
WiSen WSS Cell	-90° to +90°	0.001°(3.6” or 0.0175mm/m) @ [-2.0°, 2.0°] & Better than 0.002°(7.2” or 0.0349mm/m) @ Any 1° over (-90°, 90°)	0.000001° (0.0036’ or 0.00001745mm/m)
Encardio IPI (SDI-12)	Please consult the manufacturer due to IPI variants.		
Encardio IPI (RS-485)			

Applications

By connecting the IPI units manufactured from different makers, related deformation can be closely monitored, such as land slide, relative settlement changes.

Full compatibility for the following makers too with our 4-Channel RS-485/SDI-12 Interface Node ONLY:

651D Type - WisenMeshWAN® 4-Channel ***Encardio SDI-12 2-Axis IPI*** Interface Node
651F Type - WisenMeshWAN® 4-Channel ***Geosense RS-485 2-Axis IPI*** Interface Node

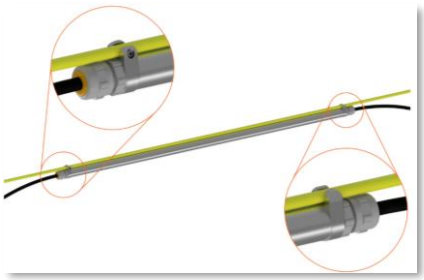
https://www.geosense.com/products/in-place-inclinometer-ipi/

6525 Type - WisenMeshWAN® 4-Channel ***Sisgeo RS-485 2/3-Axis IPI*** Interface Node

1) BH-Profile in-place Inclinometers (photo below on the left)
   https://sisgeo.com/products/ipi-in-place-inclinometers/bh-profile-in-place-inclinometers/
2) MD-Profile array (photo below on the right)
   https://sisgeo.com/products/ipi-in-place-inclinometers/md-profile-system/

6528 Type - WisenMeshWAN® 4-Channel RS-485 TRSR String Protocol Interface Node

1) The 4G Stand Alone unit is referred to “3306 Type - WiSen® 4-Channel Digital Interface Unit”
2) Compatible with:
   A. Osprey IPX, https://ospreymeasurement.systems/products/ipx/



   B. Osprey OTS, https://ospreymeasurement.systems/products/ots/

   C. Geosense IPI-X, https://www.geosense.com/products/ipi-x-in-place-inclinometer-extensometer/

D. Geosense IPI, https://www.geosense.com/products/in-place-inclinometer-ipi/

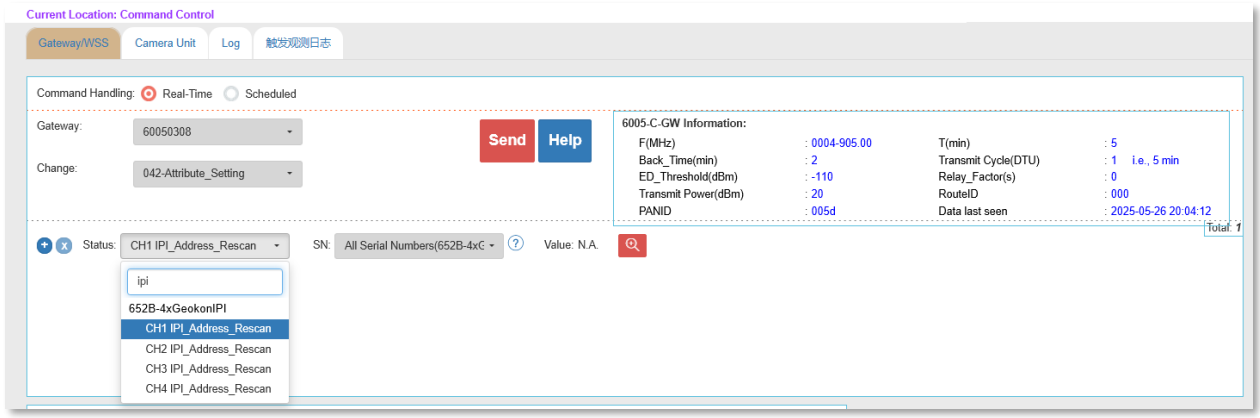
E. RST IPI, https://rstinstruments.com/product/mems-digital-in-place-inclinometer-system/

652B Type - WisenMeshWAN® 4-Channel ***Geokon RS-485 2-Axis IPI*** Interface Node

A. Model 6140 (Left Photo) https://www.geokon.com/6140
B. Model 6180 (Right Photo) https://www.geokon.com/6180

Operations on Wisen Platform:

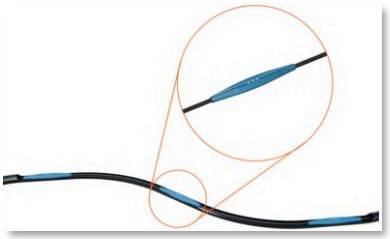
1. Set a gateway running at T = 1min;
2. Connect the Geokon IPI sensors (of 6140 / 6180 model) into the interface node;
3. Power on the node, view the node data on Wisen Platform;
4. Send the corresponding channel command as shown in the screenshot below, wait for 3 Ts after the command is sent.



5. Refresh "/Data/Show Table" page to see the IPI readings.

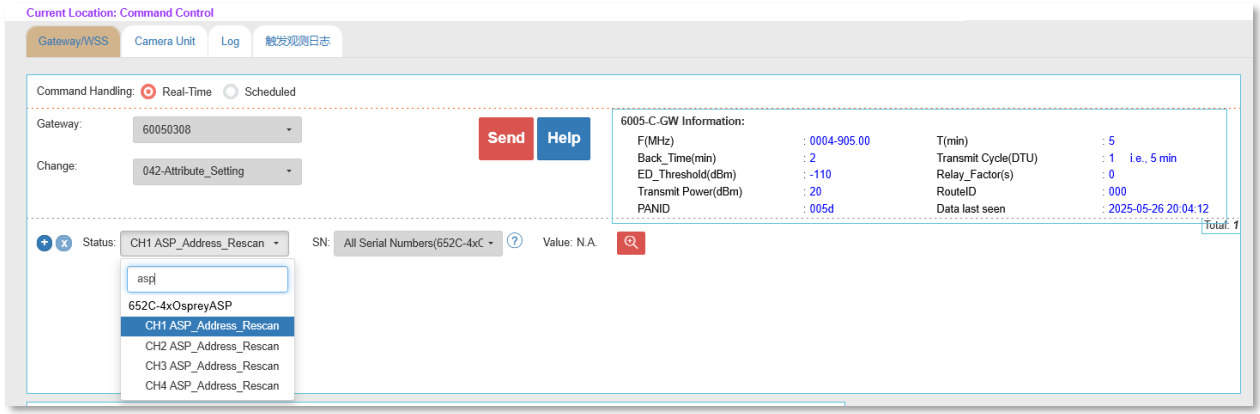
652C Type - WisenMeshWAN® 4-Channel ***Osprey ASP*** Interface Node

https://ospreymeasurement.systems/products/asp/



Operations on Wisen Platform:

1. Set a gateway running at T = 1min;
2. Connect the Osprey ASP sensors into the interface node;
3. Power on the node, view the node data on Wisen Platform;
4. Send the corresponding channel command as shown in the screenshot below, wait for 3 Ts after the command is sent.



5. Refresh "/Data/Show Table" page to see the ASP readings.

Product Photo

Figure. 6508- 1-Channel Smart Shape Interface Node & 651C 4-Channel Smart Shape Interface Node.

Figure. 1-Channel Smart Shape Interface Node.

Wiring Sequence

Note: For the un-used sensor wires, please ensure to isolate from any potential contacts.

Node Terminal	WiSen WSS Cell Wire Sequence	Encardio IPI (SDI-12) Wire Sequence	Encardio IPI (RS-485) Wire Sequence
12V_Out	12VDC Positive	12VDC Positive	12VDC Positive
GND	GND	GND	GND
A	RS485-A	-	RS485-A
B	RS485-B	-	RS485-B
SDI-12	-	SDI-12	-

IPI Configuration (after each Power On/Reboot)

Preparation:

1) Both gateway and nodes must be running with Mesh 3.0 firmware;
2) Mesh is running at T=1min, Refactor = 5 or above;
3) All external IPI sensors are correctly connected, power on the node, ensure it joins into the mesh network and running for at least 5T;

   Note: after each Power On or Reboot, node is always at “No IPI Configuration” default status. The mesh data will contain:

A. Battery Voltage, External DC Voltage, Reference Voltage, Temperature, etc.;

B. No IPI data (shown as CCCC).

Configuration:

1) Visit "/Setup/Remote Command Control" page on Wisen Visualisation Platform;

2) Select the gateway SN that the node is working with;

3) Select Command- 042;

Note:

A. Content in 042 Command must be absolutely correct, otherwise IPI sensor data can only be shown as CCCC and the node will suffer from higher power consumptions;

B. At each Power On or Reboot on a node, ensure 042 Command is re-sent after the "Preparation" stage.

4) Select "Digital IPI Configuration";

5) Select the node SN;

6) Define the IPI types connected at each channel;

7) Click "Send";

8) The time to execute 042 Command is depending on:

A. the number of channels connected;

B. the IPI types;

C. the total number of IPIs

it is normally 3 to 15min (if T=1min), or 6 T (if T is relatively large) for IPI types, Communication addresses and real IPI data to be returned. During this period:

a. 6508 will be out of mesh and automatically rejoin;

b. 651C will stay in mesh and return data as EEEE.

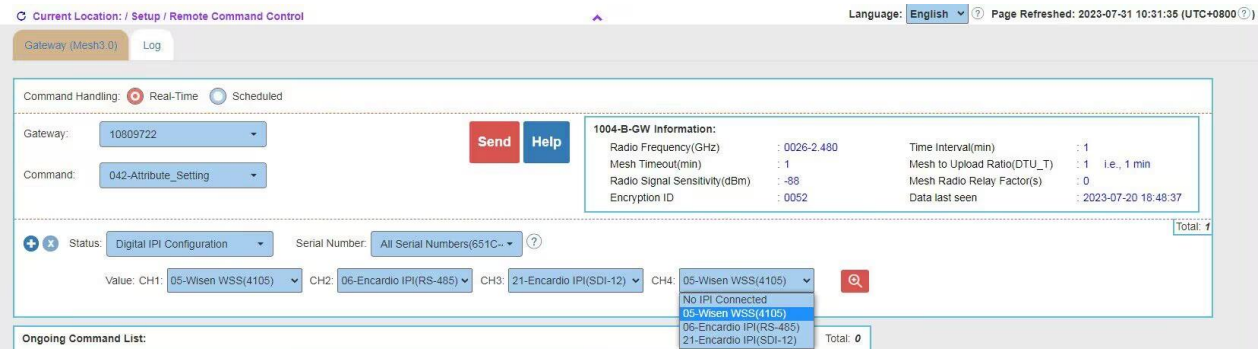


Figure. IPI configuration on Wisen Visualisation Platform.

650B Type - WiSenMeshWAN® High Accuracy Air Temperature & Humidity Sensor Node	
Basics	
Battery Power	Qty. x 1 (3.6V Lithium primary D-Cell ER34615)

Accuracy Stop Voltage	2.1VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminium Battery Holder
Output Current (DC)	Max. 30mA @12V
Local Storage	Min. 1500 Messages during Meshing at Mesh3.0 Protocol
Dimension (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
Primary External Sensor	
Sensor Type	Air Temperature, Humidity
Range	-40 to 125°C, 0-100%RH
Accuracy	±0.1℃, ±1.5%RH
Applications	
This node outputs a set of highly accurate air temperature and air relative humidity, which is used for environmental monitoring.	
Product Photo	

Figure. High Accuracy Air Temperature & Humidity Sensor Node.