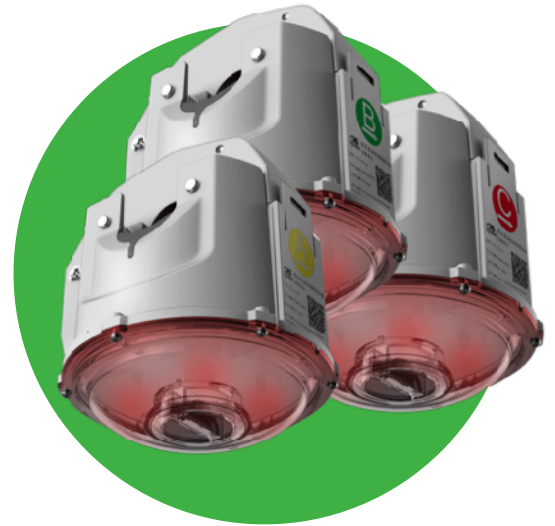


Low-current Harvesting, High-precision Sync,  
High-rate Wave-recording, Live Installation



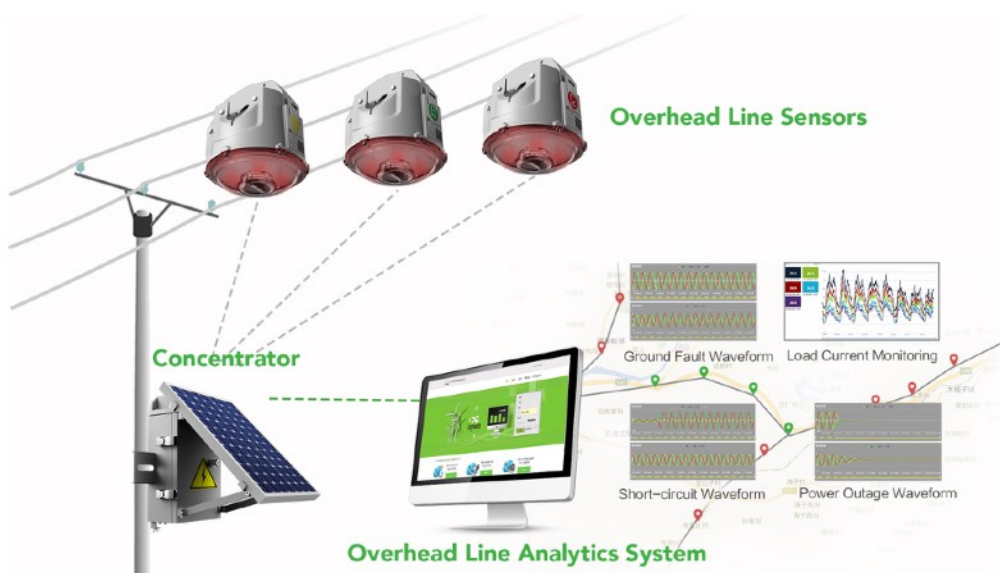
## InHand Wireless Overhead-lines System

# Overhead Line Sensor

Smart power distribution is an important sector of smart grid. One great challenge faces the operation team of distribution networks is how to quickly and accurately locate the faulty section when power line faults, especially low-current ground faults occur. Existing distribution automation, feeder automation, and fault indicating technologies have the problems of high investment, requiring power off for deployment, low accuracy, etc. InHand Wireless Overhead-lines System, the smart distribution lines monitoring system launched by InHand Networks, can accurately identify the type of power line faults and quickly locate the faulty section based on innovative technologies of high-precision measurement and high-speed wave-recording of line currents, thus significantly shorten response and processing time of power line faults, improve power supply reliability.

The Overhead Line Sensor is the acquisition unit and core sensing unit of the system, applicable to 10kV overhead distribution lines. With innovative low current energy harvesting and wireless communication technologies, the Overhead Line Sensor can submit monitoring data in real time to keep the power utility operational staff updated on the operation status of power lines. With big-data based comprehensive analysis of distribution lines status, the system can generate line status analysis, including line faults, line loads, energy quality, etc., and provide solid data support for the structural optimization of distribution network.

## Application Case



## Features and Advantages

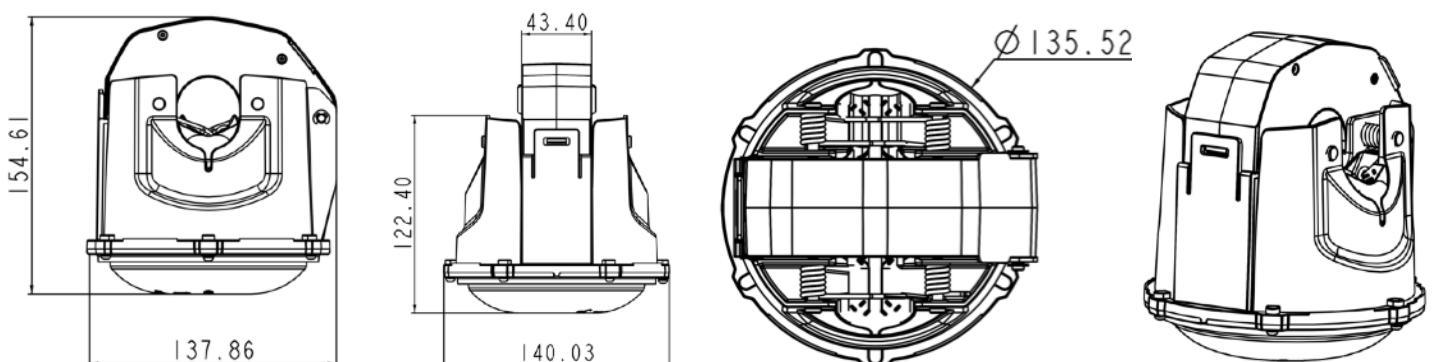
- + Innovative low current (1A) energy harvesting, maintaining stable connection and operation
  - + Advanced electronic current transformer, precision of line current measurement reaching  $\pm 0.5\%$
  - + Electric-field sensor of optimized design, unaffected by multi-circuit lines on one pole, accurately identify voltage fall and power outage
  - + Intelligent trigger of high-rate (12.8kHz, 256 points per wave cycle) wave-recording of line current and line-to-ground electric field, capture the transient waveforms of low-current ground faults
  - + High precision ( $< 20\mu s$ ) wireless time synchronization based sync collection of 3 phase current and line-to-ground electric field waveforms
  - + Low-consumption two-way wireless communication, support remote upgrade and maintenance
  - + Live installation and removal, IP67 protection rating
- **Accurately Identify Line Status, Support Line Current Wave-recording**  
With innovative precision current measurement and line-to-ground electric field detection technologies, the measurement precision with line current between 0~630A reaches  $\pm 0.5\%$ , can detect a  $\pm 0.5\%$  change of amplitude of the line-to-ground electric field, thus can accurately identify the power line status. It further supports wave-recording of line current during faults or batch summon of operation data, for the accumulation of operational experiences and continuous improvement.
  - **Smart Detection of Line Faults, No More Mal-operation or Failure-to-operate**  
Based on accurate identification of line status, the product can detect interphase short circuit, single phase grounding, etc. accurately. With powerful signal processing and micro-computing capabilities, it can auto decide the activation value of fault current alarming, effectively prevent mal-operation or failure-to-operate caused by load fluctuation, reclosing magnetizing inrush, etc.. It supports anti-time limit action, can maximally cooperate with the substation protection action, avoiding transient disturbances and ensuring correct operation.
  - **Provide Abundant Operation Information**  
Provides operational information to main station system, including line current, line-to-ground electric field, fault status, live or not, etc.; also provides auxiliary information like cellular signal strength, battery voltage, etc., to help operational staff to learn the overall operation status of the lines.
  - **Diversified Line Status Indications**  
Super bright LED provides 360° visible status indication, indicates current line status with different combinations of flashing rates. Can auto reset when the fault is removed and power supply recovers; also supports timed reset, and wireless remote set and reset.
  - **Always Online, Keep Track of Line Status**  
Hybrid of short and long range wireless networking, support various complicated line topologies; proactive regular (configurable, default is every 5 minutes) reporting of line status, supporting bi-directional communication confirming and resending function to ensure reliable data transmission. Keep track of real-time line status, putting an end to the "wake up once a day or never wake up" mode of traditional fault indicators, while effectively saving less wireless communication costs.
  - **Innovative Low-current Energy Harvesting Technology, Get Rid of Batteries**  
Though embedded with a large capacity, long-service argon lithium battery, by applying new material and innovative power supply technology, the sensor can continuously harvest energy from the line when line current is between 0~630A. A line current of 1A can meet the minimum requirement for operation, saving the use of batteries and thus effectively extended the product service life.
  - **Maintenance Free, Wireless Remote Upgrade**  
Work autonomously once hanged on line, completely maintenance free. May remote configure parameters, update fault criteria or upgrade the software wirelessly when needed, convenient and flexible, improving operation efficiency.
  - **Live Installation and Removal, Safe and Convenient**  
Use insulated hot stick to live install or remove the device which is safe and convenient.
  - **High Protection Rating, Rugged for Challenging Environments**  
The sensor is ruggedized to ensure long hours of stable operation even under harsh conditions, e.g. storms and typhoons of force 8, featuring high EMC level, extreme wide tolerance of input voltages and operating temperatures, IP67 protection rating, and treated structural parts that are corrosion and rust proof and salt spray corrosion proof.

## Product Specifications

IWO-C Hardware Specifications			
IWO-C-CL (Basic Version)			
IWO-C-CA (High-performance Version)			
Applicable Power System			
Rated Frequency	50Hz & 60Hz	Rated Voltage	10-35kV
Working Current	0 ~ 630A	Applicable Wire Diameter	9 ~ 26.8mm (35 ~ 240mm <sup>2</sup> )
Neutral Earthing Mode	All earthing modes		
Measurement Range and Precision			
Line Current	Measurement range: 0 ~ 630A Measurement precision: 0 ~ 100A, ±0.5A; 100 ~ 630A, ±0.5%		
Line-to-ground Electric Field	0 ~ 4095, ±1%		
Amount of Energy Harvesting	0 ~ 100%, ±0.5%	Battery Voltage	0 ~ 3.6V, ±2%
Fault Detection			
Identifiable Fault Types	Interphase short circuit, single-phase grounding; momentary faults and persistent faults	Minimum Re-closing Identification Time	0.2S
Line Status Indication			
Types of Indication	Super bright LED (Luminous intensity of single LED > 13000mcd)	Continuous Flashing Duration after Power Outage	≥ 2000h
Visible Distance	Daytime: 200m	Visible Angle	360°all directions
Fault Reset Methods	Auto-reset when power supply recovers, Timed auto reset, Remote manual reset	Timed Reset Period	Between 0 ~ 48h, default is 24h
Short-range Wireless Communication			
Communication Distance	≤ 100m	Transmission Power	≤ 10mW (10dBm)
RX Sensitivity	≥ -90dBm	Transmission Rate	250kbps
Directionality	All directions	Network Topology	Star

Power Supply			
Energy Harvesting	IWO-C-CL (Basic Version): line current > 3A IWO-C-CA (High-performance Version): line current > 1A		
Battery	3.6V, 8.5Ah		
Mechanical Specs			
Dimensions	120x129x173mm (W x H x D)		
Weight	IWO-C-CL (Basic Version): < 1.0kg IWO-C-CA(High-performance Version): < 1.5kg		
Protection Rating	IP67	Mechanical Resistance	Vibration: level 1 Slanted falling: 1m
Tensile Strength of Line-clamp Structure	Vertical: 50N no shifting Horizontal (along the line) :50N no shifting		
Endurance to Installation & Removal	No damage for >50 times		
Operating Environment			
Working Temperatures	-40 ~ +70 °C	Storage Temperatures	-40 ~ +70 °C
Ambient Relative Humidity	5% ~ 95% (non-condensing)		
Safety and EMC			
Tolerance to Impact of Short Circuit Current	25kA/2S	Adjacent Interference Test	100mm
Damped Oscillatory Electric Field Immunity	Level 5	Rapid Transient Pulse Train Immunity	Level 4
Fire Danger Rating	Level 5	ESD Immunity	Level 4
RF Field Radiation Immunity	Level 4	Surge Immunity	Level 4
Power Frequency Magnetic Field Immunity	Level 5		
Service Life			
Service Life	> 8 years		
MTBF	27.3 years (whole system, incl. sensors and concentrator)		

## Dimensions (mm)



## Ordering Guide

Model code: IWO-C-<C/U/M/S><5/6><A/L>				
Overhead Line Sensor Model	<C/U/M/S>: Short-range Frequency	<5/6>: Line Frequency	<A/L>: Version	Remarks
IWO-C-<C/U/M/S><5/6><A/L>	C: 470-510MHz China, Thailand			When the Concentrator needs to support 3 groups of line sensors:
	U: 915-928MHz North America, New Zealand	5: 50Hz	A: AI L: LT	Phase-A: IWO-C1/C4/C7-<C/U/M/S><5/6><A/L>
	M: 866MHz Middle East	6: 60Hz		Phase-B: IWO-C2/C5/C8-<C/U/M/S><5/6><A/L>
	S: 919-923MHz Malaysia			Phase-C: IWO-C3/C6/C9-<C/U/M/S><5/6><A/L>
Example:	IWO-C-U6A: overhead line sensor, short-range communication frequency is 470-510MHz, applicable to 60Hz 10KV power lines of North America and New Zealand.			

## About Us

InHand Networks is a global leader of Industrial IoT, with a record of tremendous success following groundbreaking innovation since our inception in 2001.

InHand serves world-class partners and customers with industrial M2M routers, gateways, industrial Ethernet switches, rugged computers and IoT management platforms. We provide IoT solutions for various vertical markets including Smart Grid, Industrial Automation, Remote Machine Monitoring, Smart Vending, Smart City, Retail and more.

Proudly bearing the marks of AWS Select Technology Partner, Schneider Electric TPP Certified Technology Partner, and Rockwell Automation Encompass Product Partner in Asia-Pacific, InHand Networks defines industrial innovation and reliability.



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