

# SLS

## Smart Line Sensor Fault Indicator

For MV Power Distribution Network

# Datasheet

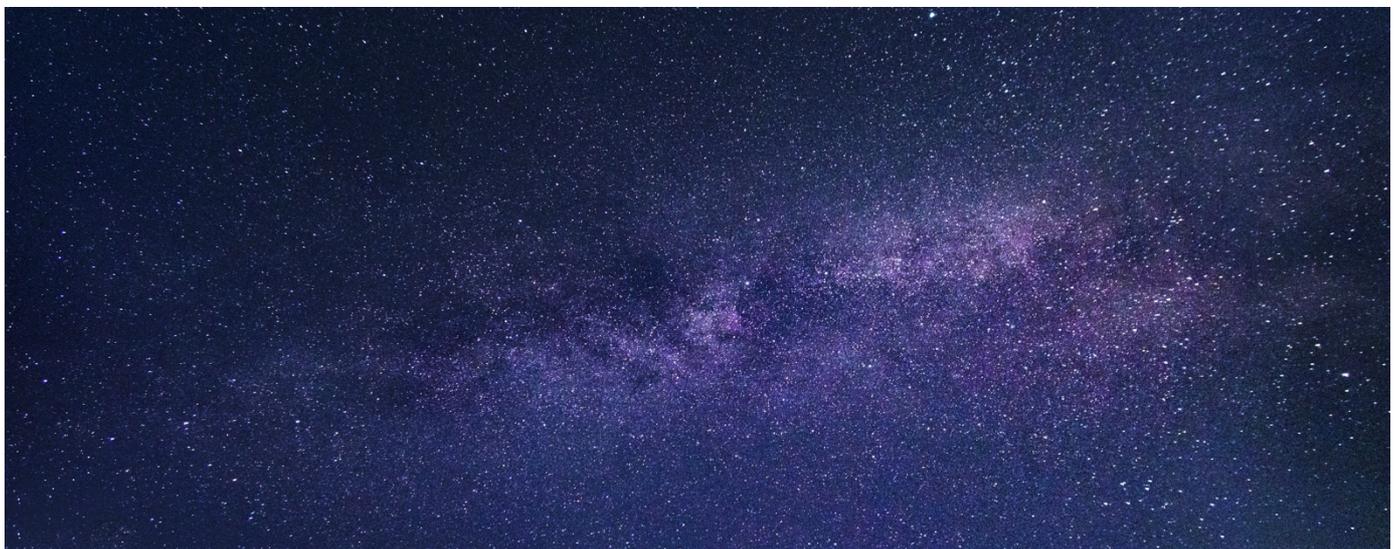
Version 1.0



SLS Indicator



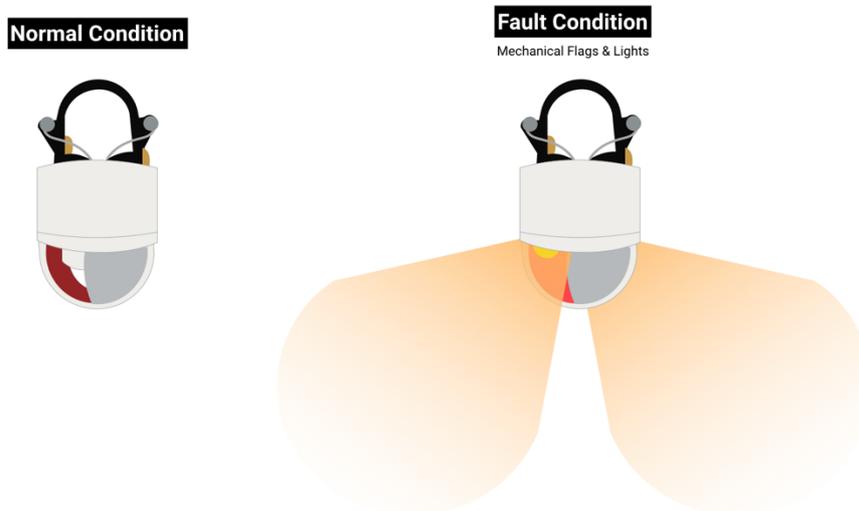
SLS Gateway



### 1. Description

The SLS (indicator) & SLS Gateway (data gateway) Smart Line Sensor fault indicator is used in 5~38KV overhead line networks to enable electricity distribution network engineers to quickly identify faults in the network and restore power supplies to customers on healthy sections in the shortest time possible.

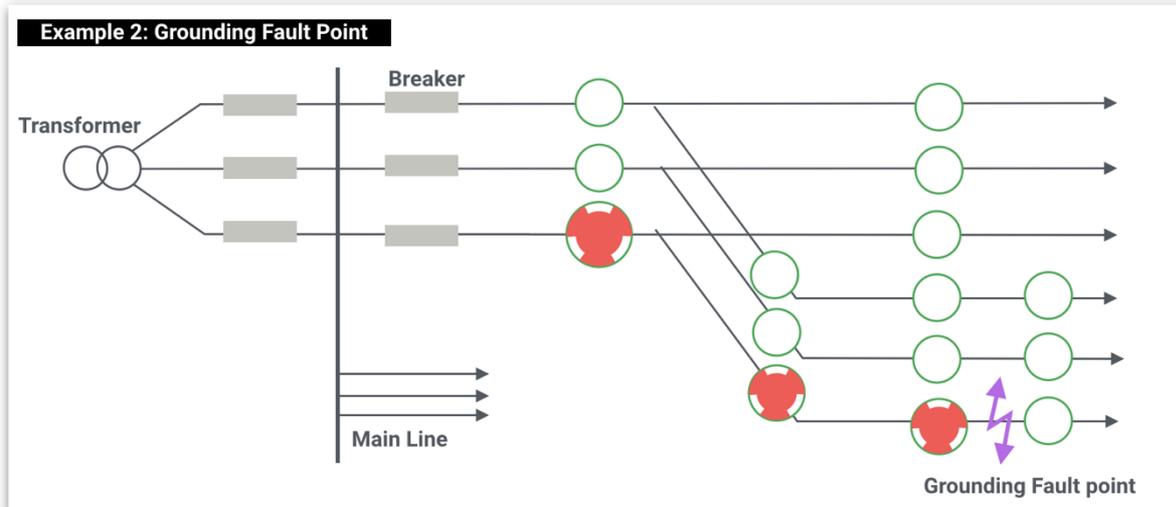
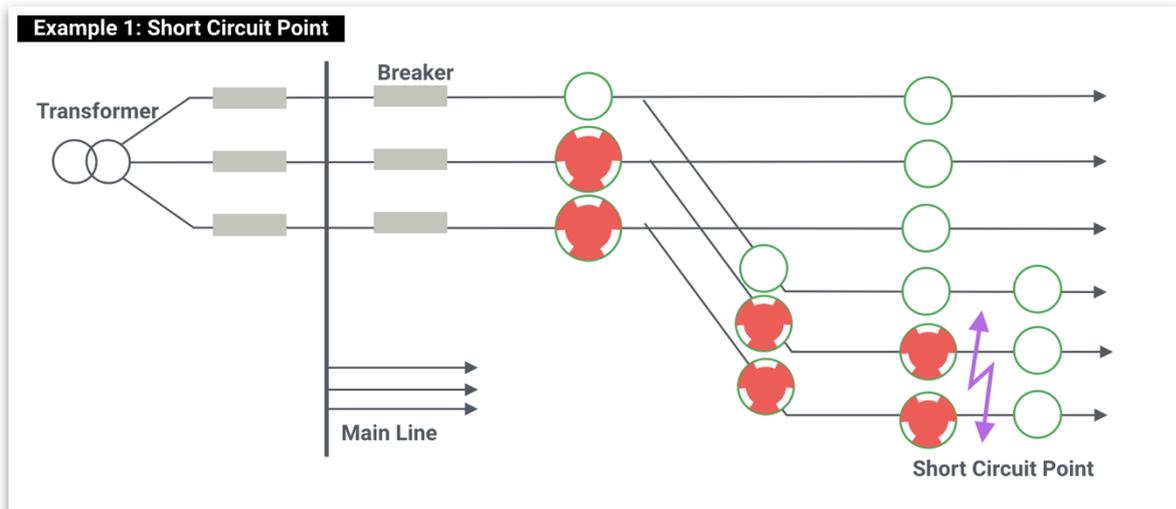
A high accuracy current sensor in the SLS, monitors the phase current flow. When detecting current level exceeds a user-selectable threshold (as the result of a phase-to-phase or phase-to-ground fault), faults are indicated by Mechanical Signals (flags and high-power flashing LED light), and Fault Data Messages which are sent to the SLS Gateway.



The SLS Gateway then transmits data to the central monitoring station over the cellular network. Combined with GIS and SCADA, the central monitoring station accurately locates faults and sends the maintenance crew person to the faulty section for troubleshooting.

Faults are located between the last indicator that has been triggered and the first indicator which is still inactive. The path of the fault current from the feeding point to the fault location is marked by the triggered indicators.

## SLS Datasheet—Smart Line Sensor Fault Indicator



Unit reset is optional. It is available either automatically, when power to the line is restored, or after a user-selectable timer period, or manual remote reset from ground level.

The indicator can be mounted under live conditions with the help of an adapter and a hot stick. The indicator could be self-sustained by the monitored network from a current flow of 10A upwards. The indicator also has built-in lithium battery that can power the indicator for more than 10 years.

## 2. Product Features

- Real time remote monitoring the current status

## SLS Datasheet—Smart Line Sensor Fault Indicator

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- Remote management of indicator and data concentrator
- LED indication with 360 degrees of visibility
- Dual indication (High-Visibility Flag & High-Power LEDs)
- Remote monitoring the line current status
- Mounting can be performed while equipment is energized
- Hot-stick Line-mountable
- User-selectable fault trip level
- User-selectable fault response time
- User-selectable reset time after power return
- Manual remote reset from ground level

### 3. System Composition

The Smart Line Sensor system is composed of SLS (overhead line indicators) & SLS Gateway (data gateway), Monitoring Central Server.

#### 3.1. The Smart Line Sensor System includes:

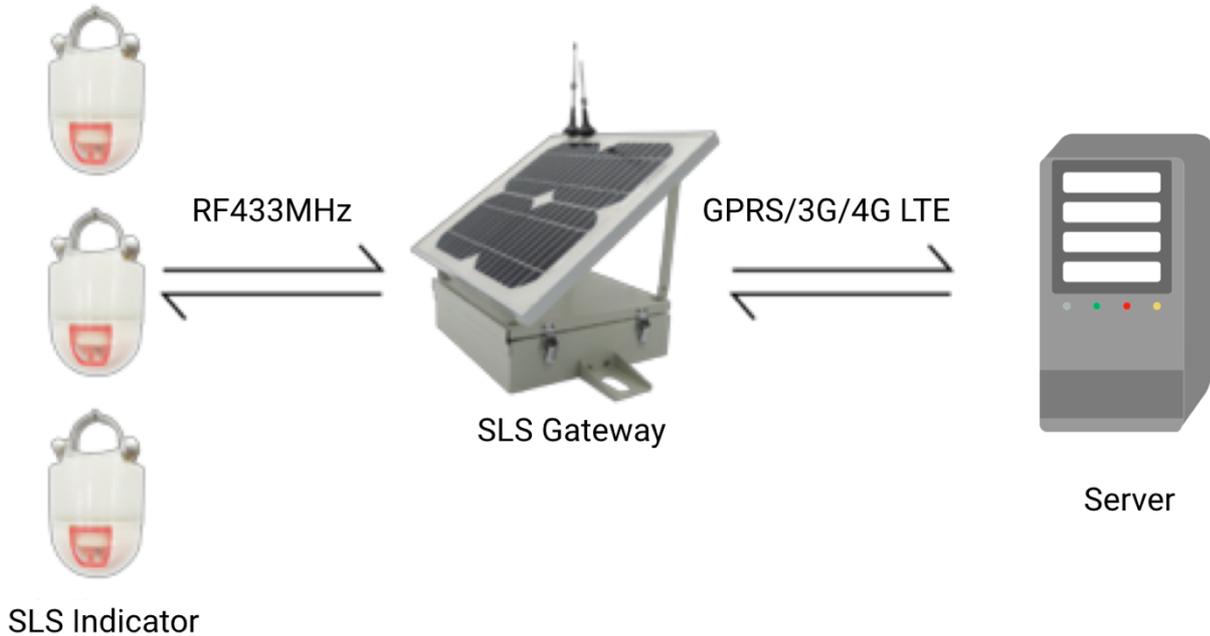
**3.1.1 SLS Indicator:** 3pcs/SET. Respectively installed on three **R, Y, B** phase overhead cables to send and receive signals of line fault. When short-circuit or earth faults are detected, the indicator triggers a mechanical flag, flashing LED and sends out fault messages to the SLS Gateway unit via wireless RF 433MHz.

**3.1.2 SLS Gateway Unit:** The Gateway unit is installed on the wire-pole, one Gateway unit receives data from nearby three-line fault indicators and sends data to server by GPRS/3G/4G LTE cellular network. The SLS Gateway Unit is mainly composed of the solar panel and industrial modem.

#### 3.2. Server:

Data is sent by the SLS Gateway Unit to either a local or cloud server. Local servers are typically in power utility offices, power substation, etc. When the server receives fault messages from the SLS Gateway unit, combined with GIS system, the maintenance crew personnel can quickly locate the fault site and trouble-shoot.

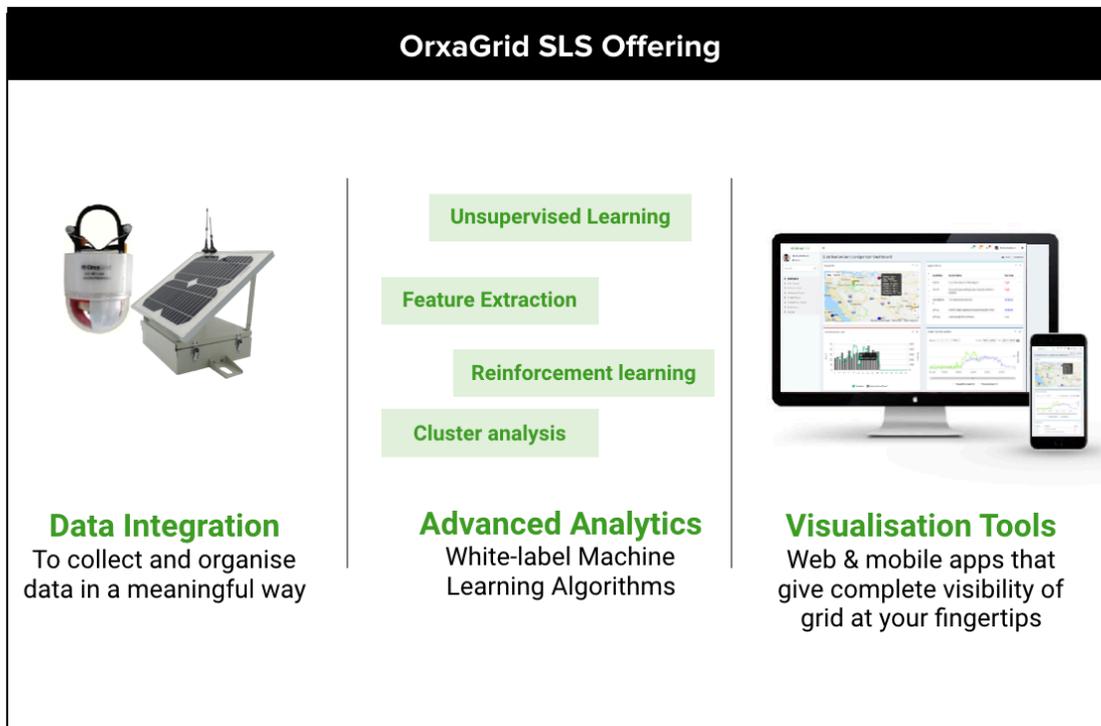
## SLS Datasheet—Smart Line Sensor Fault Indicator



**Note on Integration:** If customers are using their own software system, then it should offer the OrxaGrid software data communication protocol format so that the SLS Gateway can communicate with the software system.

### 3.3. OrxaGrid Smart Solutions:

In addition to Smart Line Sensors and server, OrxaGrid offers a proprietary web enabled application and Machine Learning that allows users to easily track and display SLS fault data and predictive alerts. Alternatively, SCADA or other software platforms could be used. Contact the OrxaGrid team for more information



## 4. Operation worked example

### 4.1 Local indication

On the detection of faults above the selected fault sensitivity threshold and for the minimum required duration the SLS indicator will respond both by mechanical Flag Indicate, and flashing, high-power LED indicate.



Indicator in ready status



Indicator in flag & flashing status

### 4.2 Remote Indication

With the server, the maintenance crew can easily locate the fault section via the GIS in the software system, thus saving time for troubleshooting.

## SLS Datasheet—Smart Line Sensor Fault Indicator

Fault Status	Fault tag	Location	Customers Affected	Severity	Start Time	End Time	Duration	Fault Type
LIVE	6238	Factory	0	3	14 Mar 2019 14:45	01 Jan 0001 00:00		Transient
LIVE	6236	Factory	1	3	14 Mar 2019 10:31	01 Jan 0001 00:00		Transient
LIVE	6237	Factory	1	3	14 Mar 2019 14:45	01 Jan 0001 00:00		Transient
Historic	6212	Factory	1	3	13 Mar 2019 16:49	13 Mar 2019 16:54	5	Transient
Historic	6214	Factory	1	3	13 Mar 2019 17:33	13 Mar 2019 17:41	8	Permanent
Historic	6215	Factory	1	3	13 Mar 2019 17:45	13 Mar 2019 17:56	11	Permanent
Historic	6211	Factory	1	3	13 Mar 2019 16:26	13 Mar 2019 16:48	22	Permanent
Historic	6209	Factory	1	3	13 Mar 2019 15:12	13 Mar 2019 16:15	63	Permanent
Historic	6210	Factory	1	3	13 Mar 2019 16:16	13 Mar 2019 16:21	5	Transient
Historic	6213	Factory	1	3	13 Mar 2019 17:23	13 Mar 2019 17:32	9	Permanent
Historic	6216	Factory	1	3	13 Mar 2019 18:07	14 Mar 2019 09:57	950	Permanent
Historic	6206	Factory	1	3	12 Mar 2019 11:09	12 Mar 2019 11:32	23	Permanent
Historic	6207	Factory	1	3	12 Mar 2019 11:44	13 Mar 2019 14:59	195	Permanent
Historic	6201	Factory	1	3	11 Mar 2019 14:26	01 Jan 0001 00:00		Transient
Historic	6169	Factory	1	3	05 Mar 2019 12:03	05 Mar 2019 12:14	11	Permanent

Easily locate the fault sections in the OrxaGrid software with embedded with Google maps

### 4.3 Indication period & reset

The indication period is user-selectable. The default value is 12 hours flag & flashing when a fault is detected.

If the fault section restore power sooner than the default value (let's say, 12 hours), then the indicator will return to the ready state (flag return from red to white, LED not flash); If the fault section still not be able to restore power after the default value (12 hours), then the indicator still will return to the ready state.

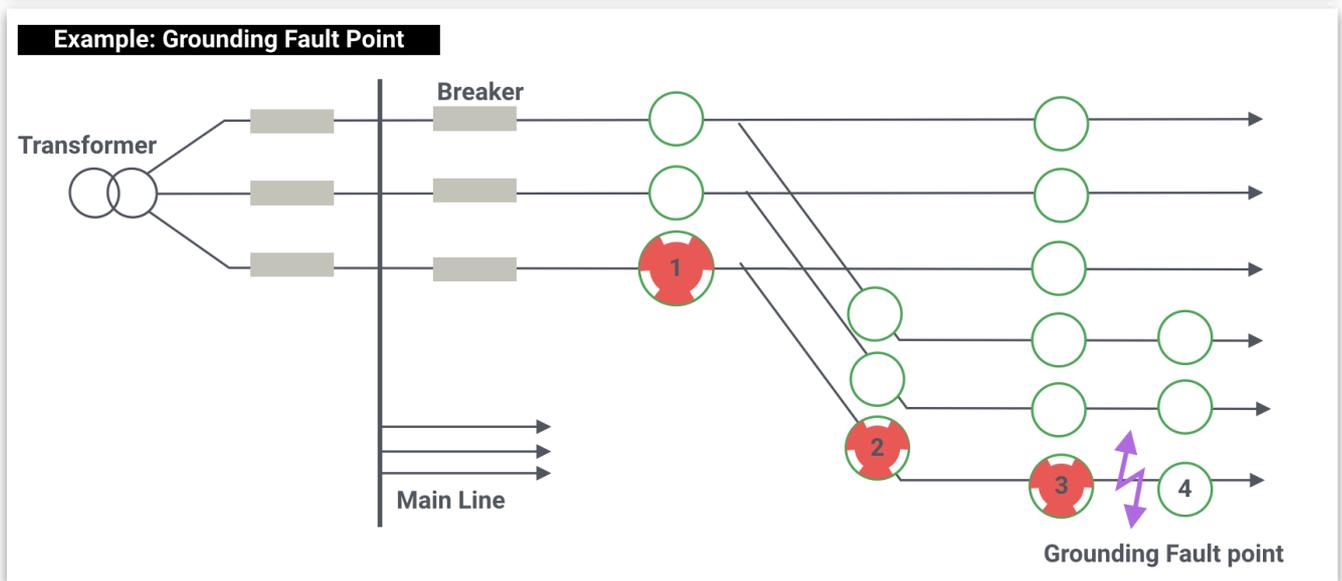
Also, the reset could be manually achieved by the software system.

### 4.4 Identify the fault section

#### 4.4.1 local identification

The fault is located between the last indicator that has been triggered and the first indicator which is still inactive. The path of the fault current from the feeding point to the fault location is marked by the triggered indicators.

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**Note:** The diagram above indicate that the fault section is between the point 3 and point 4.

### 4.4.2 Remote identification

Fault Monitoring 14 Mar 2019 18:58

Division: SOL Division 1 | Location: SOL Div1 Asspt1 | Feeder: SOL SLS1

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localized the fault section showing in the software system

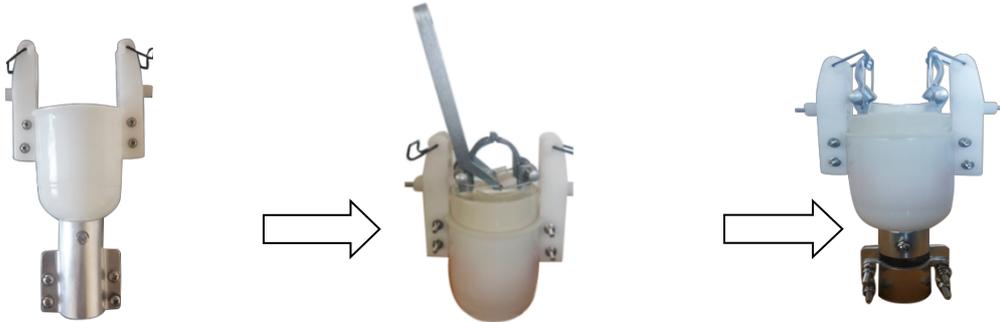
## 5. Installation

### 5.1 Indicator installation

Call: +44(0)7842 745460  
 email: info@orxagrid.com  
 www.orxagrid.com

## SLS Datasheet—Smart Line Sensor Fault Indicator

The indicator can be mounted under live conditions with the help of an adapter and a hot stick. OrxaGrid offers adapter below on request. Hot stick is not offered as it is universal.



Put the indicator into the adapter and fix the spring of the indicator with the hook of the adapter.

## 6. Specification

### 6.1 General

#### 6.1.1 SLS (indicator)

Applicable voltage range	5~38KV
Applicable current range	0~600A
Applicable power frequency range	45~60Hz
Angle of visibility	360° flashing insight
Fault flashing interval	5s
Duration of flashing	50ms
Sensitivity & accuracy	0A~100A: ±3A
	100A~600A: ±3%
Static power consumption	less than 20uA
Auto reset time	1~48h user-selectable
Identification of fault current duration	20ms~40ms
MTBF	more than 70000h
Impulse current with stand	31.5kA for 2s
Degree of protection	IP67
Weight	less than 500g
Outline dimension	Φ75mm * 115mm

#### 6.1.2 SLS Gateway

Short circuit fault upload	Receiving and upload fault information and fault current
Ground fault upload	Receiving and upload fault information and fault current
Load current	Upload load current value, Timing or out-of-limit upload

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6.2

Low battery alarm	Receiving and upload Low battery alarm function
Heartbeat function	Timing upload heartbeat information
Fault indicator Status measurement	Active measurement switch status and load current
Remote management	Remote management fault indicator, such as parameters, reset etc.
Local and remote maintenance	Have local and remote upgrade function
Stability mechanism	WDT design, to ensure the stability of system
Identification of fault current duration	20ms~40ms
IEC support	Support IEC60870-5-101
Shell	304 stainless steel+ RAL7305
protection class	IP67
Outline dimension	Φ355*293*255mm
Weight	5Kg

EMC

Electrostatic discharge	Can withstand the GB/T 17626.2 of the IV level of electrostatic discharge interference test Contact discharge: + 8KV Air discharge: + 15KV
EFT/B immunity test	Can withstand the GB/T 17626.12 of the IV class fast pulse group interference test Voltage peak value: 2KV Frequency: 5KHz & 100KHz
Radiated susceptibility	Can withstand the GB/T 17626.3 of the IV level RF electromagnetic field immunity Field strength: 30V/m
Surge immunity	Can withstand the GB/T 17626.5 of the IV level surge (impact) interference test Common mode voltage: 4KV ± 10% Differential mode voltage: 2KV ± 10%
Power frequency magnetic field immunity	Can withstand the GB/T 17626.8 of the V level power frequency magnetic field immunity interference test Magnetic field intensity: 100A/m
Damped oscillatory magnetic field immunity	Can withstand the GB/T 17626.10 of the V level damping oscillation magnetic field immunity test Damped oscillatory magnetic field intensity peak value: 100A/m

6.3

## Environmental

Environment temperature	Operation temperature : -35°C~80°C(-31~+176°F) Storage temperature : -40°C~85°C(-40~+185°F)
Relative humidity	5~95% (No condensing)
Altitude	≤4000m