

SIEMENS



Digital Grid Products

SICAM Fault Sensor Indicator (FSI)

The Guardian for your Overhead Line Networks

SICAM Fault Sensor Indicator (FSI)



Description

SICAM Fault Sensor Indicator (FSI) **6MD2314** detects the phase fault and ground fault when it is mounted on the MV overhead line network. The device indicates both the temporary fault and permanent fault via an optical indication.

SICAM FSI (6MD2314) device is developed using the latest generation of hardware technology and is a member of the Siemens SICAM® short-circuit indicator product family.

SICAM FSI is used to improve the distribution grid reliability and reduce the power outages on the MV overhead line.

SICAM FSI can be mounted (in groups of 3 or 6 or 9) on each phase after the branching points and sectionalizer.

The device is available in 2 variants:

- **SICAM FSI (6MD2314 - 1AB10)**
The faults are indicated by LEDs. Depending on the fault type, a specific flashing sequence is generated.
- **SICAM FSI with integrated communication (6MD2314 - 1AB11)**
In addition to local LED display, the phase fault and ground fault events are communicated to the SICAM FCG via a secured short-range radio (wireless) communication.

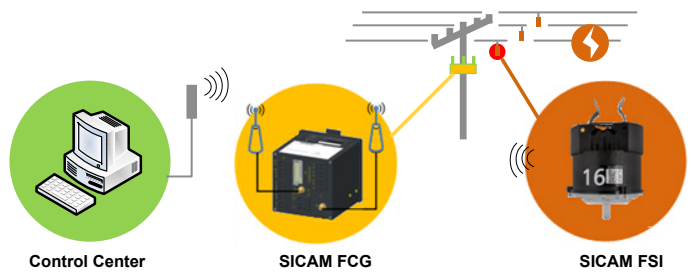
The SICAM FCG communicates fault information to the control center using the IEC 60870-5-104 protocol or via EXTensible Messaging and Presence Protocol (XMPP) over a General Packet Radio Service (GPRS) network.

Features

The salient features of SICAM FSI are:

- **Higher availability of overhead line networks** - Quick fault detection and localization, reduced downtime.
- **Self sustained** - Equipped to harvest power from the MV over headline and further enhancing service life of the device by 8 years (Battery life of 10 years for SICAM FSI and 8 years for SICAM FSI with integrated communication).
- **Secure** - Protection against unauthorized access. Authentication and encryption via AES 128, shared keys.
- **Maintenance free** - Robust design with IP65 and UV resistant housing.
- **Simple configuration** - Easy device configuration with QR code on SICAM FSI and via SICAM FCG Web GUI.
- **High Sensitivity** - Measurement starting from 50 A.

System Diagram of FSI and FCG



SICAM FSI is configurable in coordination with upstream protection system (settings like permanent-fault verification time and auto-reclosure time).

The SICAM FSI with integrated communication uses the short-range radio (wireless) for transmitting the fault information instantaneously to the control center via SICAM FCG. The fault indication can also be reset remotely from the control center. The fault parameters and other settings are remotely configurable.

Applications

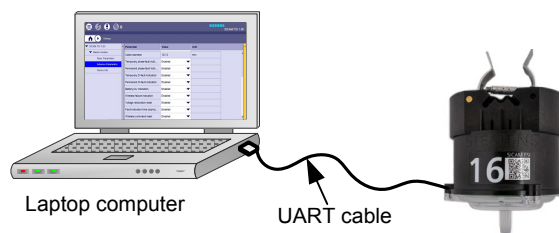
SICAM FSI operates on the MV overhead distribution line.

Operating range	3.3 kV to 66 kV MV overhead distribution line
System frequency	50 Hz or 60 Hz network
Grounding type	Solidly grounded system or resistive star-point grounded systems
Conductor diameter	5 mm to 25 mm

SICAM FSI Configuration

SICAM FSI

Before installing the SICAM FSI on the MV overhead line, configure the basic parameters and advance device parameters by using the SICAM FSI configurator.



Connecting SICAM FSI using the UART cable

SICAM FSI with integrated communication

Before commissioning the SICAM FSI and SICAM FCG, configure the SICAM FSI QR code in the SICAM FCG configuration page. After the configuration, the secured communication channel between SICAM FSI and SICAM FCG is established.

For more information about SICAM FCG and SICAM FSI commissioning, refer to the **SICAM Fault Sensor Indicator Manual**.

Technical Data

For full technical data, refer to the technical specification section of the user manual.

Application Data

Rated voltage (V_{rated})	3.3 kV to 66 kV
Power frequency	50 Hz/60 Hz
Cable diameter	5 mm to 25 mm
Measurement cycle period	20 ms (For 50 Hz) 16.6 ms (For 60 Hz)
Voltage presence (%)	0.70 of V_{rated}
Voltage absence (%)	0.45 of V_{rated}
Rated current (I_{rated})	50 A up to 500 A (steps of 50 A)
Current measurement accuracy	$\leq 10\%$ from 50 A to 800 A
Power source	Energy harvesting + lithium - thionyl chloride battery
Total Fault indication time	400 hours of LED flashing

NOTE:

Energy harvesting starts if the phase current exceeds 60 A.

Fault Detection Parameters

di current	5 A to 80 A (steps of 5 A), 120 A, 160 A
Current threshold	$1.5 I_{rated}$ to $3 I_{rated}$ (steps of 0.5)
Fault-indication time	2 h to 16 h (steps of 0.5 h)
Inrush restraint time	3 s, 30 s, and 60 s
Permanent-fault verification time	3 s, 35 s, and 70 s
Auto reclosure time	0.1 s to 99.9 s

Communication

Communication mode	Short-range radio (wireless), Frequency band 2440 MHz (IEEE 802.15.4)
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NOTE:

The communication mode is applicable for the SICAM FSI with integrated communication (6MD2314-1AB11).

Reset (Permanent Faults)

Voltage restoration reset	$V_{rated} > 70\%$
Manual reset	Using magnet adaptor
Remote reset	Via SICAM FCG from the control center (SICAM FSI with integrated communication)
Auto timer reset	-

Fault Indication

Indication	6 high luminous red LEDs
Luminous flux	40 lumens
Visibility angle	360 ° (from ground level)
Visibility range	50 m day time, 300 m night time

Mechanical

Weight	0.7 kg
Dimensions	116 mm dia x 193 mm height



Indication of Conformity

This product complies with the directive of the Council of the European Communities on harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Council Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU).

This conformity has been proved by tests conducted by Siemens AG in accordance of the Council Directive in accordance with the product standard IEC/EN 61326-1 for the EMC directives, and with the standard IEC/EN 61010-1 for the low-voltage directive.

Standards for short-range radio and mobile communication acc. to R&TTE directive:

- EMC testing acc. to EN 301489-1
- Short-range radio (spurious emission) acc. to EN 300 328
- Radio Equipment Directive (RED): 2014/53/EU

The device has been designed and produced for industrial use.

Type Testing

This section describes about the type testing performed on SICAM FSI.

Electrical Tests

Test	Standards	Tests Requirements
Dielectric strength withstand	EN 61010-1	125 kV AC (Achieved via hot tick)
Short-circuit current withstand-ing test	IEEE 495	12.5 kA @ 1 s 25 kA @ 170 ms

EMC Tests for Immunity (Type Tests)

Test	Standards	Tests Requirements
Electrostatic discharge, Level 3	EN 301 489-1, EN 301 489-3, IEC 61000-4-2	8 kV air discharge and 4 kV contact discharge
Radiated Radio frequency electromagnetic field, Level 3	EN 301 489-1, EN 301 489-3, IEC 61000-4-3	80 MHz to 2.7 GHz (10 V/m, criteria A)
Power frequency magnetic field, Level 4	IEC 61000-4-8	30 A/m (continuous) and 300 A/m (short time) on the X, Y, and Z axis of the product

EMC Tests for Noise Emission (Type Tests)

Test	Standards	Tests Requirements
Radiated emission test, Class A	EN 301 489-1, EN 301 489-3, EN 55011	150 kHz to 6 GHz (class A)

Safety Testing

Test	Standards
Safety test	IEC/EN 61010-1

Test Description	Applicable Clause No.
Marking and Documentation	5
Protection against mechanical hazard	7
Resistance to mechanical stresses (shock and impact)	8
Protection against the spread of fire	9
Protection against liberated gases and substances, explosion and implosion	13
Components and sub assemblies	14
HAZARDS resulting from application	16
Risk Assessment	17

Environmental Tests

Test	Standards	Tests Requirements
Operating Temperature		
Dry cold test (4 days)	IEC 60068-2-1	-25 ° C
Dry heat test (4 days)	IEC 60068-2-2	+70 ° C
Damp heat steady (4 days)	IEC 60068-2-78	25 ° C to 40 ° C; 95% RH
Damp heat cyclic (6 days)	IEC 60068-2-30	25 ° C to 40 ° C; 95% RH (6 cycles with 12 h + 12 h)
Storage temperature	IEC 60068-2-48	- 25 ° C to 70 ° C
Rainfall	-	750 mm
Exposure to direct sunlight (UV)	ASTM G155	-
Wind resistance	-	200 km per hour
Salt spray test	ASTM B117	
Ingress protection	IEC 60529	IP65

Mechanical Tests

Test	Standards	Tests Requirements
Vibration response test, Class 1	IEC 60068-2-6	Sinusoidal Frequency: 10 Hz to 500 Hz Displacement: 0.7 mm peak to peak from 10 Hz to 59 Hz Amplitude: 5 g from 59 Hz to 500 Hz Sweep rate: 1 oct./min Number of sweeps: 01/axis Number of axes: 3 (X, Y, and Z)
Bump test	IEC60068-2-27/ IEC60068-2-29	Acceleration: 40 g Duration: 6 ms Number of sweeps: 2000 positive and 2000 negative shocks Number of axes: 3 (X, Y, and Z)

Short-Range Radio (Wireless) Testing

Test	Standards	Tests Requirements
Spurious emission	EN 300 328	Transmitter unwanted emissions in the spurious domain and receiver spurious emissions Operating frequency range: 2400 MHz to 2480 MHz No. of channel: 16 Modulation: Other than FHSS (DSSS) Channel Spacing: 5 MHz

Certifications

Test	Standards	Tests Requirements
WPC ETA certification	-	2405 to 2480 MHz WPC ETA certification is performed as per R&TTE/RED directive

Optical Tests

Test	Standards	Tests Requirements
Lumens test	LM79	40 lumens
Goniometry test	LM79	360 ° visibility

Ordering Information - Device

Use the following MLFB series to order the SICAM FSI (SICAM FSI and SICAM FSI with integrated communication) devices:

6MD2314-1AB10	SICAM FSI <ul style="list-style-type: none"> • Phase fault detection • Ground fault (di/dt) detection • UV stabilized polycarbonate IP65 rated housing • Visual fault indication of 40 lumens by 6 high luminous red LEDs
6MD2314-1AB11*	SICAM FSI with integrated communication* <ul style="list-style-type: none"> • Short-range radio (wireless) communication for current measured values and fault status • Phase fault detection • Ground fault (di/dt) detection • UV stabilized polycarbonate IP65 rated housing • Visual fault indication of 40 lumens by 6 high luminous red LEDs

* SICAM FSI with integrated communication along with SICAM FCG (6MD2340-3JM71-8AA2) should be ordered when the communication with control center is required.

Ordering Information - Spares

Use the following MLFB series to order the SICAM FSI spares:

6MD2318 - 4BB00	Primary (non-rechargeable) Lithium metal Thionyl Chloride (Li/SOCl ₂) cell (Make: Tadiran, part number: TL-5930/SMNS)
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Ordering Information - Accessories

Use the following MLFB series to order the SICAM FSI accessories:

6MD2318 - 4AA00	UART cable for the device configuration (Recommended make: FTDI Chip, part number TTL-232R-RPi) 
6MD2318 - 4MA01	Hot stick with shotgun for FSI mounting, 4 m (Recommended make: Ritz, Cat.No: RC403-0295 or equivalent) 
6MD2318 - 4MA04	Magnet adaptor for device reset, accessory for hot stick with shotgun 
6MD2318 - 4MA02**	Hot stick (telescopic) for FSI mounting, 12 m (Recommended make: Ritz, VTT-1/9) 
6MD2318 - 4MA05**	Device adaptor for SICAM FSI mounting via hot stick (telescopic), accessory for hot stick (telescopic) 

** The MLFB: 6MD2318 - 4MA02 and 6MD2318 - 4MA05 is currently not available for ordering.

Case Dimensions

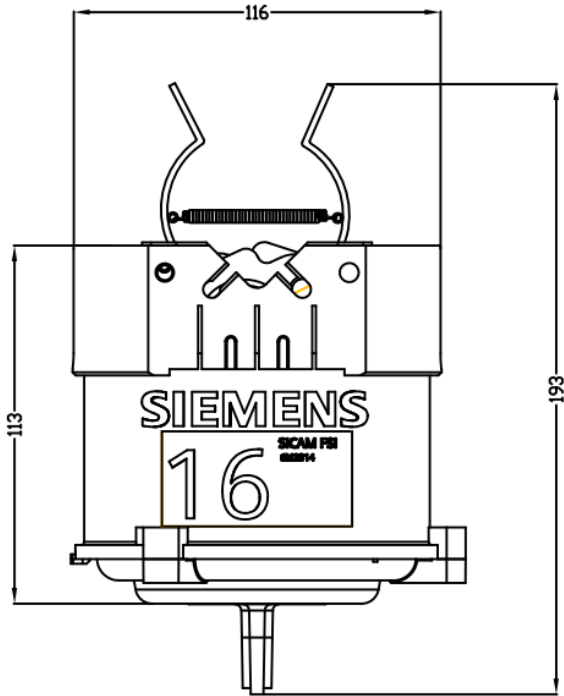


Fig 4. Front View

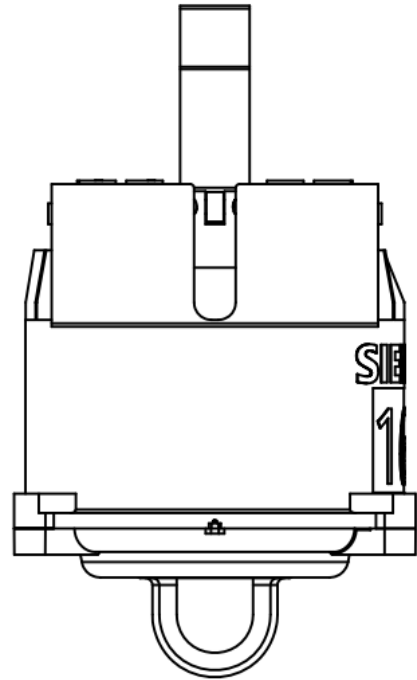


Fig 6. Side View

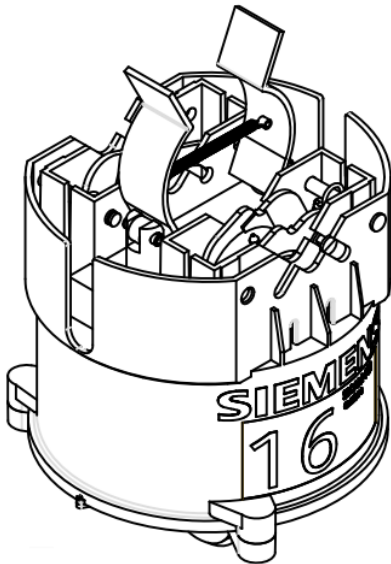


Fig 5. Isometric View

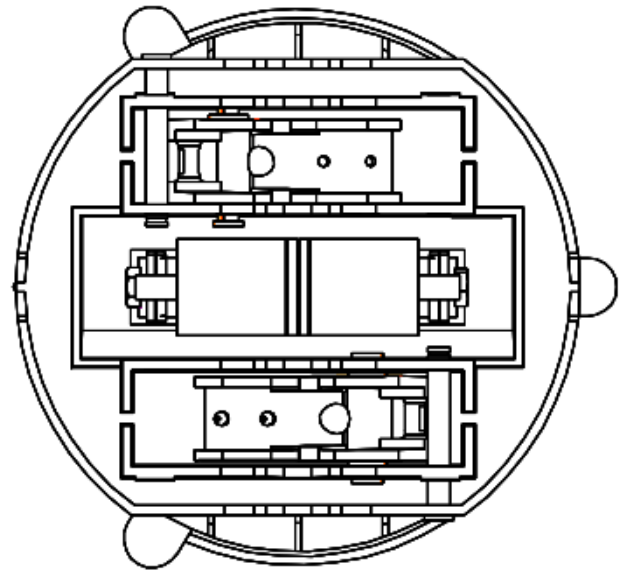


Fig 7. Top View

NOTE: All the dimensions are in mm

E50417-K1040-C587-A2

For any technical queries, please contact our customer support center

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