



SICAM

Fault Sensor Indicator (FSI)

V2.0 Basic Sensor (B-Sensor)

Catalog, Edition 2.0

SIEMENS

SICAM Fault Sensor Indicator (FSI) V2.0 Basic Sensor (B-Sensor)

Catalog

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SICAM FSI V2.0 B-Sensor

Description and Functions

Description

SICAM Fault Sensor Indicator (FSI) V2.0 B-Sensor is developed using the latest hardware technology and is a member of the Siemens SICAM short-circuit indicator product family.

The device is used to improve the reliability and to reduce the downtime on the MV overhead distribution grid.

The device measures the phase current continuously and 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 the permanent fault via optical indication (LED flashing).

The device can be mounted in junction points/branching points and areas of frequent fault.

Applications

- This device is suitable for outdoor applications on MV overhead line.
- Supports application on solidly grounded or resistive star-point grounded systems.
- The device is to be configured in close coordination with the protection systems in the MV network. This results in improved fault detection and localization.
- The device can be mounted in groups of 3, one device on each phase.
- The device uses LED patterns to identify faults quickly, distinguishing between temporary and permanent faults.

Functions

Multiple settings available for fault detection

- Threshold settings, auto-threshold, and di/dt settings.

Auto threshold algorithm

- Self-Adjustment of trip threshold based on phase current.

Inrush restraint

- Avoids false fault detection due to transformer magnetization during the voltage restoration on the MV overhead line.

Auto reclosure restraint

- Blocks the redundant fault detection during the auto-reclosure retries which are made to restore the MV overhead line.

Multiple fault indication reset functionalities

- Voltage restoration in MV overhead line, auto timer reset and magnetic reset

Self-Test

- Self-test by magnetic reset to verify the battery health of the device. The success/failure of self-test is indicated by a specific LED flashing pattern.

Low temperature cutoff

- Built-in with an automatic cutoff feature when the temperature falls below -40°C.¹



[sc_fsi2_deviceimage, 1, -- --]

Figure 1.1/1 SICAM FSI V2.0 B-Sensor

Benefits

Higher availability of overhead line networks

- Quick fault detection and localization, reduced downtime.

Ease of use

- The device is effortlessly powered ON/OFF for installation, storage and transportation using a single switch activation.
- Providing user-friendliness, default auto-threshold function automatically decides threshold values based on nominal current and helps to use the device to detect the fault with minimal configuration of parameters.

Installation

- Supports installation on both insulated and non-insulated overhead lines

Simple configuration

- Easy configuration of device parameters using SICAM FSI Configurator (version 3.03 and above).

Safe mounting

- Safely mountable on the MV overhead line by using a hot stick with shotgun or hot stick (telescopic) with device adaptor.

Long range fault indication visibility

- Fault localization becomes easier with the device's 6 high luminous fault LEDs, which offers visibility for up to 400 m during the day and 800 m during night time¹

Long battery life

- 10 years of battery life, under standard operating conditions.
- Configurable blinking interval of LEDs for optimal battery life.

Maintenance free

- The device housing is weatherproof, UV stabilized, and flame retardant with an IP68 rating for durability.

Conformal coating

- The conformal coating on device electronic modules increases protection against harmful environmental influences such as extreme moisture, corrosive gases and aggressive dust.

¹ Only applicable for B-Sensor Type 2. Refer to [Ordering Information – SICAM FSI V2.0 B-Sensor, Page 10](#) for information on B-Sensor Type 1 and Type 2.

Technical Documentation

Technical Data

Indication of Conformity



This product complies with the directive of the Council of the European Communities on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU) as well as restriction on usage of hazardous substances in electrical and electronic equipment (RoHS Directive 2011/65/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. RoHS directive 2011/65/EU is met using the standard IEC/EN 63000. The device has been designed and produced for industrial use.

Application Data

Rated voltage (V_{rated})	6.6 kV, 11 kV, 12.5 kV, 13.8 kV, 22 kV, 25 kV, 33 kV, 34.5 kV, 44 kV, 45 kV, 66 kV, and 69 kV
Maximum operating voltage	83 kV
Maximum operating current	1500 A
Maximum continuous operating current	800 A
Operating current range	0 A to 1500 A
System frequency	50 Hz or 60 Hz network as per IEC 62689-1
Grounding type	Solidly grounded system or resistive star-point grounded systems
Detection of voltage presence/absence	Supported
Fault detection time	2 cycles \pm 1 cycle
Current measurement accuracy	\pm 10 % or \pm 5 A whichever is greater from 0 A to 800 A
Power source	Lithium-thionyl chloride batteries (Each battery: 3.6 V, 19000 mAh). B-Sensor Type 1: 2 batteries, B-Sensor Type 2: 3 batteries 10 years of expected operational life under standard operating temperature of 25 °C
Total fault-indication time	B-Sensor Type 1: 1500 h of LED flashing B-Sensor Type 2: 400 h of LED flashing
Cable overall diameter	5 mm to 40 mm (non-insulated) 15 mm to 40 mm (insulated)
Non-insulated conductor type	Aluminum Conductor Steel Reinforced (ACSR), All Aluminum Alloy Conductor (AAAC)
Insulated conductor type	Single core, aluminum conductor steel reinforced with/without waterblocking, XLPE insulated
Temperature withstand of clamping material	230°C continuous

Fault-Detection Parameters

Fault current threshold (I_{set})	10 A to 1500 A <ul style="list-style-type: none">• 10 A to 100 A (steps of 10 A)• 100 A to 300 A (steps of 25 A)• 300 A to 800 A (steps of 50 A)• 800 A to 1500 A (steps of 100 A)
Auto threshold fault factor	2X to 4X (steps of 1X)
Range change monitoring time (T1)	20 s to 120 s (steps of 10 s)
Range change memorize time (T2)	0 s to 120 s (steps of 30 s)
DI current	5 A to 80 A (steps of 5 A), 120 A, 160 A Starting from 10 A phase current
Fault-indication time	B-Sensor Type 1: 2 h to 16 h (steps of 1 h) B-Sensor Type 2: 2 h to 4 h (steps of 1 h)
Permanent-fault verification time	3 s, 35 s, and 70 s
Inrush restraint time	3 s, 30 s, and 60 s
Auto reclosure time	0.1 s to 99.9 s

Reset Device

Voltage restoration reset	Based on voltage presence detection
Magnet reset	Using magnetic adaptor
Auto timer reset	B-Sensor Type 1: 2 h to 16 h (steps of 1 h) B-Sensor Type 2: 2 h to 4 h (steps of 1 h)

Fault Indication – LEDs

Indication	6 red LEDs
Luminous flux	40 lm
Visibility angle	360° (from ground level)
Visibility range (for fault indication only) ²	B-Sensor Type 1: 100 m at day time, 500 m at night time B-Sensor Type 2: 400 m at day time, 800 m at night time ³
MTBF of LEDs	45000 h

Mechanical Data

Weight	B-Sensor Type 1: approximately 1.04 kg B-Sensor Type 2: approximately 1.15 kg	
Dimensions	Diameter	Height
	116.8 mm	241.4 mm

Environmental Conditions

Outdoor applications as per IEC 61010-1	
Degree of pollution	Category 2
Maximum altitude above sea level	5000 m

² The specified visibility range for the LED indications is based on clear weather conditions.

³ B-Sensor Type 2 to have fault indication visibility range of 400 m at day time and 800 m at night time with 2 s blinking interval only.

This section describes about the type testing performed on SICAM FSI V2.0 B-Sensor according to IEC 61326-1, IEC 62689-1, and IEC 61010-1.

EMI/EMC Tests

Test	Reference Standard	Test Requirement
Electrostatic discharge test	IEC 62689-1, Table 16 IEC 61000-4-2 IEC 61326-1	Severity class 3 6 kV contact discharge, 8 kV air discharge
Power frequency magnetic field immunity 50 Hz/60 Hz	IEC 62689-1, Table 16 IEC 61000-4-8 IEC 61326-1	Severity class 4 30 A/m continuous, 300 A/m for 1 s to 3 s As per IEC 61326; 30 A/m 50 Hz, 60 Hz (magnetically sensitive equipment)
Pulse magnetic field immunity	IEC 62689-1, Table 16 IEC 61000-4-9 IEC 61326-1	Severity class 4 300 A/m peak value; 20 positive and 20 negative
Radiated emission test	CISPR 32 EN 55032 IEC 61326-1	Class A 30 MHz to 1000 MHz (30 MHz to 230 MHz): 40 dB (μ V/m) QP (at 10 m) (230 MHz to 1000 MHz): 47 dB (μ V/m) QP (at 10 m) 1 GHz to 6 GHz (1 GHz to 3 GHz): 56 dB (μ V/m) AV, 76 dB (μ V/m) PK (at 3 m) (3 GHz to 6 GHz): 60 dB (μ V/m) AV, 80 dB (μ V/m) PK (at 3 m)
Damped oscillatory magnetic field test	IEC 62689-1 IEC 61000-4-10	Severity class 4, 30-A/m peak value Oscillation frequency: 0.1 MHz and 1 MHz, \pm 10% Orientation: XYZ Test duration: 2 s or continuous for 1 min
Radio frequency, electromagnetic field immunity	IEC 62689-1 IEC 61000-4-3 IEC 61326-1	Severity class 3 0.08 GHz to 1 GHz 10 V/m, 80% AM 1 kHz, 1 % step 1 GHz to 6 GHz 3 V/m, 80 % AM 1 kHz, 1 % step Dwell time: 2.85 s

Environmental Tests

Test	Reference Standard	Test Requirement
Dry heat test	IEC 62689-1 IEC 60068-2-2	+75 °C Duration: 16 h with device turned OFF 16 h with device turned ON
Dry heat test (storage) ⁴	IEC 60068-2-2	(+85 \pm 2) °C Duration: 16 h
Cold test	IEC 62689-1 IEC 60068-2-1	-40 °C ⁵ Duration: 16 h with device turned OFF 16 h with device turned ON
Cold test (Storage) ⁴	IEC 60068-2-1	(-40 \pm 2) °C Duration: 16 h
Damp heat steady state test	IEC 60068-2-78	40 °C, (95 \pm 3)% Duration: 4 days
Damp heat cyclic test (12 h + 12 h)	IEC 60068-2-30	Lower temperature: 25 °C Upper temperature: 55 °C Relative humidity: 95 %, \pm 3 % No of cycles: 6 cycles
Change of temperature test	IEC 62689-1 IEC 60068-2-14	(-40 \pm 2) °C, (+75 \pm 2) °C Rate of change: (1 \pm 0.2) K/min Dwell at upper and lower temperatures 3 h + 3 h 50 h 25 min OFF + 50 h 25 min ON
Salt mist test	ASTM B117 IEC 60068-2-11	Salt solution: 95 parts distilled water by weight & 5 parts sodium chloride by weight Duration of exposure: 168 h
Exposure to solar radiation	IEC 62689-1 IEC 60068-2-5	1000 W/m ² Duration: 4 h
Exposure to direct sunlight (UV)	ASTM G155-13	Exposure cycle 1 Irradiance for wave lengths: 340 nm/W (m ² · nm) Duration of light: 102 min Total exposure time: 14 days

2.2

⁴ For optimum battery capacity, it is recommended to store the device below 30°C; 30% RH

⁵ Only applicable for B-Sensor Type 2. -25 °C applicable for B-Sensor Type 1.

Technical Documentation

Type Test Specifications

Test	Reference Standard	Test Requirement
Wind pressure test		Withstand wind speed of 200 km/h
Average rainfall test	—	Average rainfall per year: 3500 mm

Mechanical Tests

Test	Reference Standard	Test Requirement
Vibration response test (sinusoidal)	IEC 62689-1 IEC 60068-2-6	Frequency: 10 Hz to 500 Hz 10 m/s ² amplitude 0.075 mm, 23 min Sweep rate: 1 oct./min Number of sweep cycles: 2/axis in 3 directions
Bump test	IEC 60068-2-27	400 m/s ² , 40 g Duration of pulse: 16 ms Number of axes: 3 (X, Y, and Z) Number of bumps: 1000 per direction Number of directions: 2 per axis Total number of bumps: 6000 shocks in 3 axes
Ingress of protection test	IEC 62689-1 IEC 60529	IP68
Mechanical impact test	IEC 62689-1 IEC 62262	IK09, Impact energy: 10 J

Electrical Test

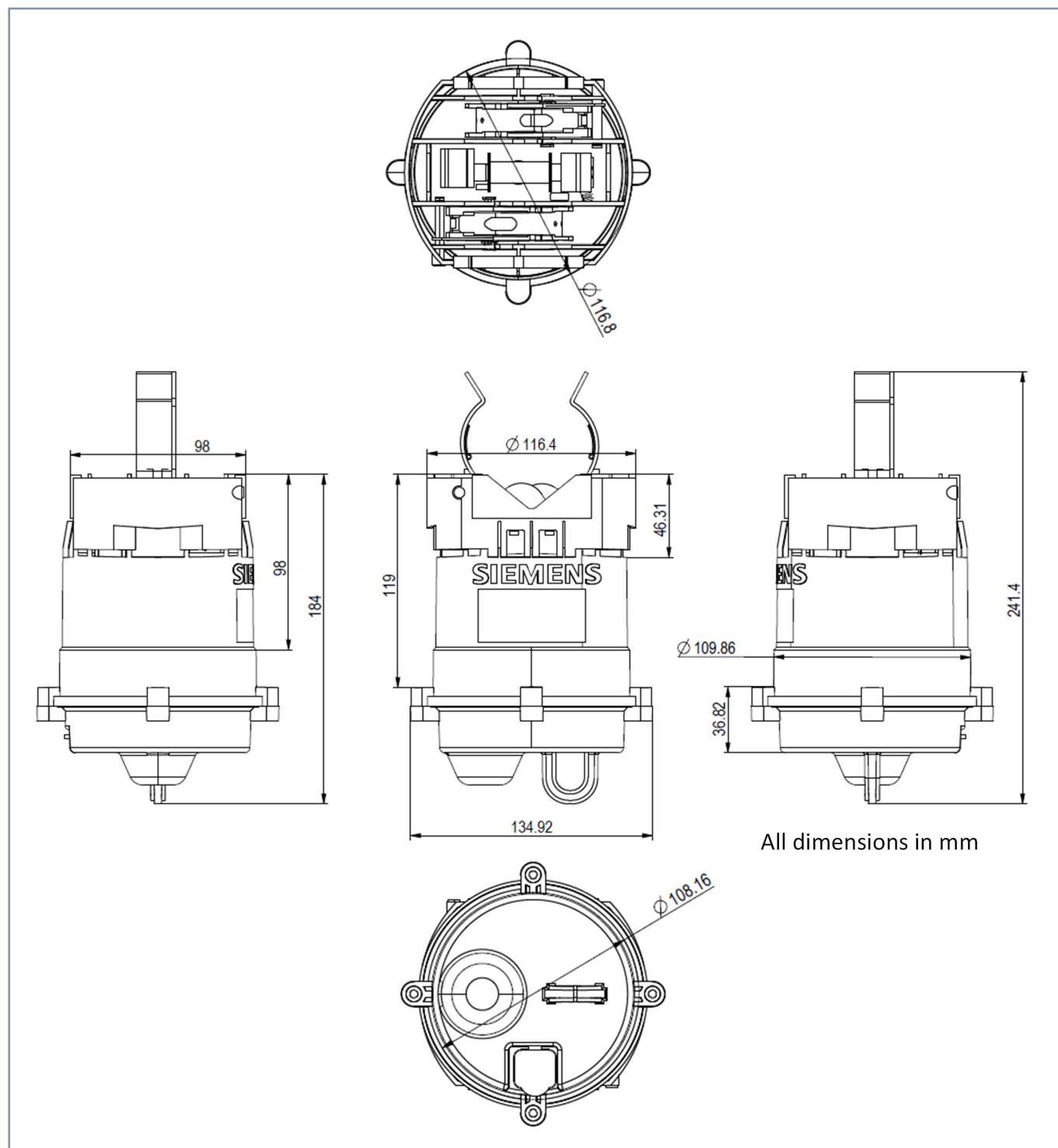
Test	Reference Standard	Test Requirement
Dielectric withstand	IEC/EN 61010-1	125 kV with the help of hotstick
Overvoltage	IEC/EN 61010-1	Category IV
Degree of pollution	IEC/EN 61010-1	Category 2
Maximum altitude above sea level	IEC/EN 61010-1	5000 m
Short-circuit current withstand test	IEC 62689-1 IEEE495	12.5 kA @ 1 s and 31.25 kA peak 25 kA @ 170 ms and 62.5 kA peak
Short time current/ Dynamic test		25 kA RMS for 3 s and 62.5 kA peak 40 kA RMS for 1 s and 100 kA peak
Switching impulse test	IEC 60060-1	250 kV peak 2500 µs, no of shots: 5
Lightning impulse test	IEC 60060-1	350 kV peak 50 µs, no of shots: 5

Safety Test

Test	Reference Standard	Test Requirement
Product safety test	EN/IEC 61010-1	Tests as per clause no. 4 Marking and documentation as per clause no. 5 Protection against electric shock as per clause no. 6 Protection against mechanical hazard as per clause no. 7 Resistance to mechanical stresses (shock and impact) as per clause no. 8 Protection against the spread of fire as per clause no. 9 Equipment temperature limits and resistance to heat as per clause no. 10

Device Dimensions

2.3



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Figure 2.3/1 Device Dimensions

Ordering Information

Ordering Information - SICAM FSI V2.0 B-Sensor

Ordering Information – SICAM FSI V2.0 B-Sensor

Description	Versions	Order no.												
		1	2	3	4	5	6	7	8	9	10	11	12	
		6	M	D	2	3	1	4	-	2	B	□	□	
SICAM FSI V2.0 B-Sensor												▲	▲	
B-Sensor Type 1	<ul style="list-style-type: none"> • Phase-fault detection • Ground-fault (di/dt) detection • UV stabilized polycarbonate IP68 rated housing • Operating temperature range: -25°C to +75°C • Fault indication visibility: 100 m during daytime, 500 m during night time 											B	2	
B-Sensor Type 2	<ul style="list-style-type: none"> • Phase-fault detection • Ground-fault (di/dt) detection • UV stabilized polycarbonate IP68 rated housing • Operating temperature range: -40°C to +75°C • Fault indication visibility: 400 m during daytime, 800 m during night time 											C	3	
Spare parts and accessories		6	M	D	2	3	1	8	-	4	□	□	0	□
Spare part											▲	▲		▲
	SICAM FSI V2.0 B-Sensor Lithium-thionyl chloride battery set (pack of 6)										B	B		1
Accessories											□	□		
	Magnet adaptor for device reset, accessory for hot stick with shotgun										M	A		4
	Device adaptor for SICAM FSI V2.0 mounting via hot stick (telescopic)										M	A		6
Accessory Description														
Hot stick with shotgun for SICAM FSI V2.0 B-Sensor mounting, 4 m	Recommended brand: Terex hot stick with shotgun, Ritz, catalog number: RC403-0295 For more detailed information visit: http://www.terexutilities.com.br													
Hot stick (telescopic) for SICAM FSI V2.0 B-Sensor mounting, 12 m	Recommended brand: Hubbell hot stick with shotgun, catalog number: C4030295 For more detailed information visit: https://www.hubbell.com/hubbellpowersystems/en/													
USB Type C cable for SICAM FSI V2.0 B-Sensor configuration	Standard USB Type-A to Type-C communication cable for device configuration using FSI configurator.													

Table 3.1/1 SICAM FSI V2.0 B-Sensor Selection and Ordering Data

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Article No: E50417-X8940-C657-A2

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The information given in this document only contains general descriptions and / or performance features which may not always specifically reflect those described or which may undergo modification in the course of further development of the products.

The requested performance features are binding only when they are expressly agreed upon in the concluded contract.