SIEMENS

SICAM
Fault Passage Indicator

V01.20

Manual

E50417-H1040-C580-A7

NOTE

For your own safety, observe the warnings and safety instructions contained in this document, if available.

Document version: E50417-H1040-C580-A7.00

Edition: 11.2019

Version of the product described: V01.20

Preface

Purpose of the Manual

This manual describes the functions and operation of SICAM FPI device. In particular, you will find:

- Compilation of the Technical Data *3.1.1 Technical Data*
- Information regarding the configuration of the device and a description of the device functions *4.1.1 Device Functions*

Target Audience

Protection system engineers, commissioning engineers, persons entrusted with the setting, testing and maintenance of automation, selective protection and control equipment, and operational crew in electrical installations and power plants.

Scope

This manual applies to SICAM Fault Passage Indicator (FPI) 6MD2310.

Indication of Conformity

CE

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 performed according to the Council Directive and in accordance with the generic standard IEC/EN 61326-1 (for EMC directive) and with the standards IEC/EN 61010-1 and IEC/EN 61010-2-30 (for Low Voltage Directive) by Siemens AG.

The device is designed and manufactured for application in an industrial environment.

RoHS directive 2011/65/EU is met using the standard EN 50581.

The product conforms with the international standards of IEC 61326-1.

Customer Support Center

Our Customer Support Center provides a 24-hour service.

Siemens AG
Customer Support Center
Humboldtstrasse 59
90459 Nuremberg
Germany
E-mail: *support.energy@siemens.com*

Additional Support

For questions about the system, contact your Siemens sales partner.

Training Courses

Inquiries regarding individual training courses should be addressed to our Training Center:

Siemens AG
Siemens Power Academy TD
Humboldtstrasse 59
90459 Nuremberg
Germany

Phone: +49 (911) 433-7415
Fax: +49 (911) 433-7929
E-mail: *poweracademy@siemens.com*
Internet: *www.siemens.com/poweracademy*

Notes on Safety

This document is not a complete index of all safety measures required for operation of the equipment (module or device). However, it comprises important information that must be followed for personal safety, as well as to avoid material damage. Information is highlighted and illustrated as follows according to the degree of danger:

DANGER

DANGER means that death or severe injury **will** result if the measures specified are not taken.

✧ Comply with all instructions, in order to avoid death or severe injuries.

WARNING

WARNING means that death or severe injury **may** result if the measures specified are not taken.

✧ Comply with all instructions, in order to avoid death or severe injuries.

CAUTION

CAUTION means that medium-severe or slight injuries **can** occur if the specified measures are not taken.

✧ Comply with all instructions, in order to avoid moderate or minor injuries.

NOTICE

NOTICE means that property damage **can** result if the measures specified are not taken.

✧ Comply with all instructions, in order to avoid property damage.

NOTE

Important information about the product, product handling or a certain section of the documentation which must be given attention.

Qualified Electrical Engineering Personnel

Only qualified electrical engineering personnel may commission and operate the equipment (module, device) described in this document. Qualified electrical engineering personnel in the sense of this document are people who can demonstrate technical qualifications as electrical technicians. These persons may commission, isolate, ground and label devices, systems and circuits according to the standards of safety engineering.

Proper Use

The equipment (device, module) may be used only for such applications as set out in the catalogs and the technical description, and only in combination with third-party equipment recommended and approved by Siemens.

Problem-free and safe operation of the product depends on the following:

- Proper transport
- Proper storage, setup and installation
- Proper operation and maintenance

When electrical equipment is operated, hazardous voltages are inevitably present in certain parts. If proper action is not taken, death, severe injury or property damage can result:

- The equipment must be grounded at the grounding terminal before any connections are made.
- All circuit components connected to the power supply may be subject to dangerous voltage.
- Hazardous voltages may be present in equipment even after the supply voltage has been disconnected (capacitors can still be charged).
- Operation of equipment with exposed current-transformer circuits is prohibited. Before disconnecting the equipment, ensure that the current-transformer circuits are short-circuited.
- The limiting values stated in the document must not be exceeded. This must also be considered during testing and commissioning.

Selection of Used Symbols on the Device

No.	Symbol	Description
1		Direct current, IEC 60417, 5031
2		Alternating current, IEC 60417, 5032
3		Direct and alternating current, IEC 60417, 5033
4		Earth (ground) terminal, IEC 60417, 5017
5		Protective conductor terminal, IEC 60417, 5019
6		Caution, risk of electric shock
7		Caution, risk of danger, ISO 7000, 0434
8		Protective Insulation, IEC 60417, 5172, Safety Class II devices
9		Guideline 2002/96/EC for electrical and electronic devices
10	EAC	Guideline for the Eurasian Market

Open Source Software

The product contains, among other things, Open Source Software developed by third parties. The Open Source Software used in the product and the license agreements concerning this software can be found in the Readme_OSS. These Open Source Software files are protected by copyright. Your compliance with those license conditions will entitle you to use the Open Source Software as foreseen in the relevant license. In the event of conflicts between Siemens license conditions and the Open Source Software license conditions, the Open Source Software conditions shall prevail with respect to the Open Source Software portions of the software. The Open Source Software is licensed royalty-free. Insofar as the applicable Open Source Software License Conditions provide for it you can order the source code of the Open Source Software from your Siemens sales contact – against payment of the shipping and handling charges – for a period of at least 3 years after purchase of the product. We are liable for the product including the Open Source Software contained in it pursuant to the license conditions applicable to the product. Any liability for the Open Source Software beyond the program flow intended for the product is explicitly excluded. Furthermore any liability for defects resulting from modifications to the Open Source Software by you or third parties is excluded. We do not provide any technical support for the product if it has been modified.

Table of Contents

1 Delivery

1.1 Delivery

Delivery Note

The SICAM FPI device is delivered in a cardboard box.

Contents of Delivery

- 1 SICAM FPI device
- 3 phase sensors
- 1 ground sensor with cable tie
- 4 plastic fibre-optic cables
- 1 Quick reference guide

DANGER

Danger of explosion of the battery.

Noncompliance with the safety instructions means that death, severe injuries, or considerable material damages can occur.

✧ Do not throw the SICAM FPI device containing a battery into a fire.

WARNING

Warning about battery disposal.

Noncompliance with the safety instructions means that severe injuries or considerable material damages can occur.

✧ When discharged or when properly secured against short circuit, lithium batteries can be disposed of through retailers or at depots run by competent organizations (for example, in Germany GRS collection points).

NOTE

SICAM FPI with 1 contained lithium metal cell (0.66 g lithium content) meeting the preconditions of Special Provision SP188 of the UN Recommendations on the Transport of Dangerous Goods, 17th revised edition and is classified according to:

- ADR/RID/ADN/IMDG-Code: UN 3091 lithium metal batteries contained in equipment, 9, preconditions of SP188 met
- ICAO-TI/IATA-DGR: UN 3091 lithium metal batteries contained in equipment, 9, preconditions of Section II PI 970 met

The lithium metal cell for SICAM FPI (as a spare part) is also subject to the special provision SP188 mentioned above, but classified according to:

- ADR/RID/AND/IMDG-Code: UN 3090 lithium metal batteries, 9, preconditions of SP188 met
- ICAO-TI/IATA-DGR: UN 3090 lithium metal batteries, 9, preconditions of Section IB PI 968 met

2 Introduction

2.1 Overview

2.1.1 Device Description

SICAM Fault Passage Indicator (FPI) is a device that is used for detection and signalling of phase-fault (short circuit) and ground-fault on medium-voltage cable networks.

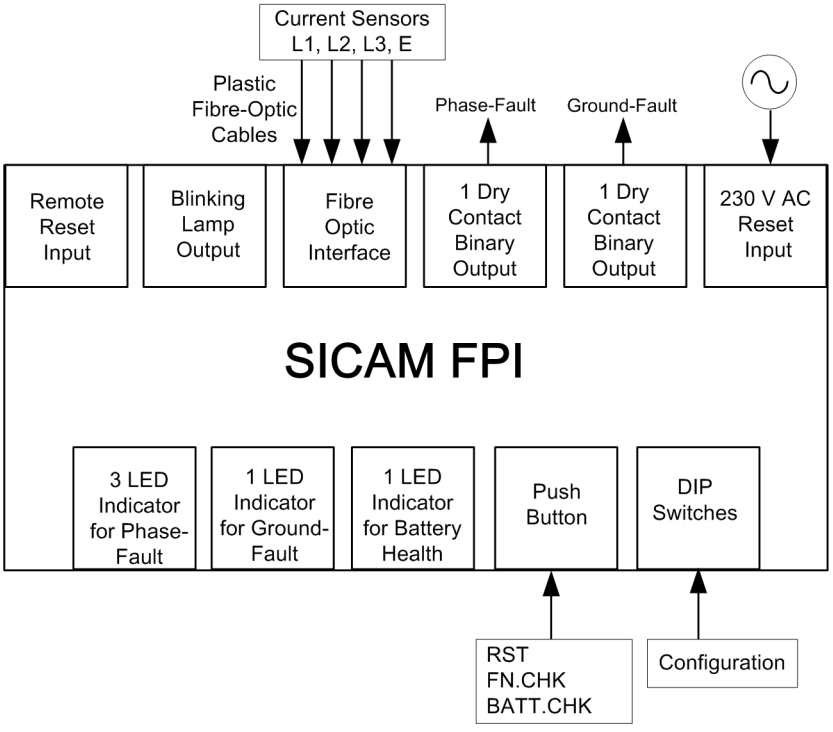
SICAM FPI is available in several variants. The combined phase-fault (short circuit) and ground-fault variant consists of 4 external current sensors to detect the phase faults (L1, L2, L3) and ground-fault (E). The current sensors detect phase-fault and ground-fault current based on the set current threshold and send an optical signal to SICAM FPI.

By using the rotary switch available on the individual sensor, you can set the fault-current threshold for phase sensors from 200 A to 1200 A (Type 1 Series), 200 A to 800 A (Type 2 Series) and for ground sensor from 10 A to 100 A (Type 1 Series), 40 A to 300 A (Type 2 Series). When the current exceeds the set threshold level, the current sensor detects the fault threshold and indicates the status to SICAM FPI. In this condition, the corresponding LEDs blink.

SICAM FPI is used as a fault detection and indication unit. SICAM FPI is used in the feeder and distribution automation of secondary medium-voltage systems that ranges from typically 10 kV to 36 kV.

Figure 2-1 represents the 6MD2310-0AX00-0AA0 (X represents the type of sensors) variant of SICAM FPI and the block diagram varies for other variants.

In this manual, SICAM FPI is also referred as **Device**.



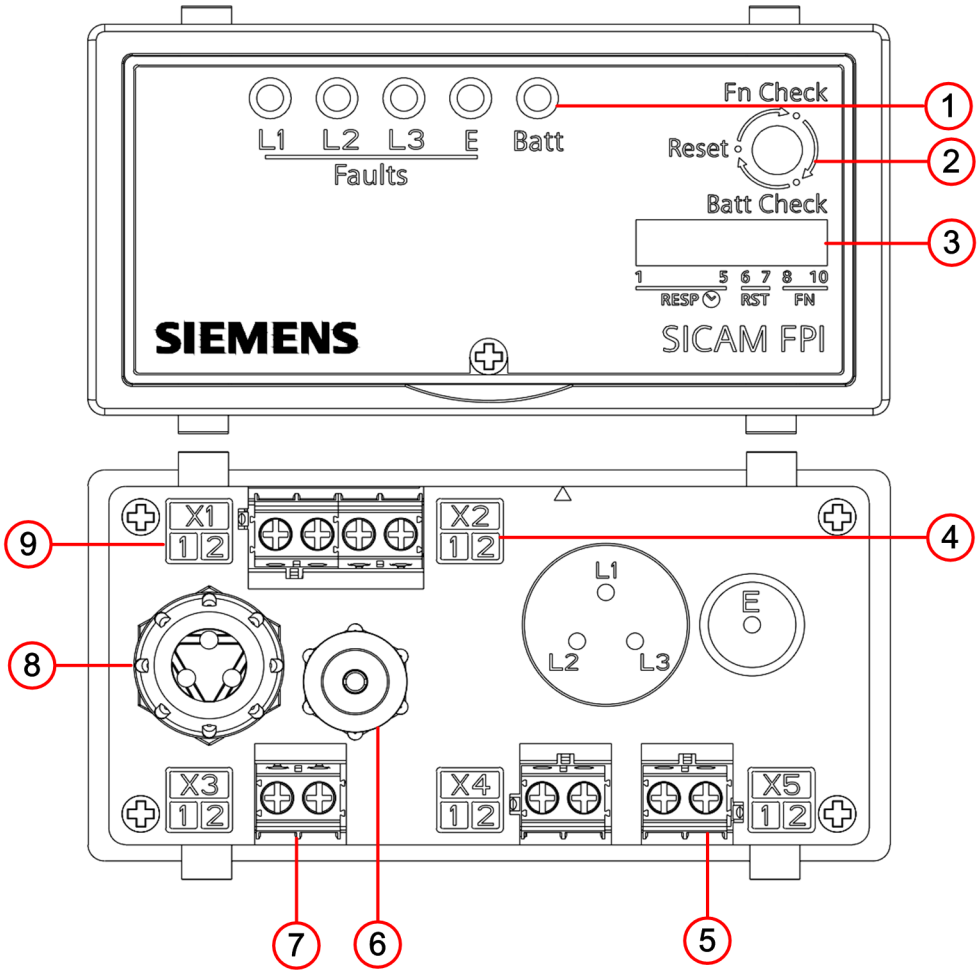
[dw_fpiblkdg-310114, 3, en_US]

Figure 2-1 SICAM FPI Block Diagram

2.1.2 Hardware Components

The device consists of the following hardware components:

- **Optical Inputs/Sensors** - The device consists of 3 optical sensors for phase faults L1, L2, L3, and 1 optical sensor for ground-fault E. The sensor detects the fault current and indicates the status to the device via a plastic fibre-optic cable.
- **LED Indicators** - The device consists of 4 LED indicators for indicating the phase faults L1, L2, L3, and ground-fault E in red color. The status of the battery health is indicated in yellow color. In normal operation, all the LEDs are in **OFF** state.
- **Binary Output** - The combined phase-fault (short circuit) and ground-fault variant consists of 1 or 2 binary outputs for indicating the phase-fault and ground-fault status. The binary output is connected to an RTU to indicate the fault status to a remote monitoring station (SCADA). The binary output 1 operates when the fault is detected in any of the phases L1, L2, L3. The binary output 2 operates when the fault is detected in the ground E. The version with 1 binary output indicates each type of fault.
- **DIP Switch** - The DIP switch is used for configuring the response time, auto reset time, and other settings. For more information about DIP switch, refer to *4.1.3 DIP Switch* .
- **Reset Inputs** - Reset inputs are used for resetting the device via push button, remote reset, or 230 V AC reset. Refer to *4.1.5 Device Reset* .
- **Blinking Lamp Output** - If necessary, the blinking lamp output is connected to an external indicator to indicate phase-fault or ground-fault outside the ring main unit.
- **Push Button** - Push button is used for resetting the device manually (RST) and for executing the function check (FN.CHK) and battery check (BATT.CHK).



[dw_fpihwcomp-310314, 2, en_US]

Figure 2-2 Device Hardware Components

(1) LED indicators
(2) Push button
(3) DIP switch
(4) Blinking lamp supply output X2
(5) AC 230 V reset input X5
(6) Ground-fault E optical input
(7) Binary outputs X3 and X4
(8) Phase faults L1, L2, L3 optical input
(9) Remote reset input X1 (dry contact)

2.1.3 Features

The salient features of SICAM FPI are:

- Self-sustained - Using long-life lithium battery
- Safe - Complies with the IEC 61010-1 safety standards
- Simple - DIP switch based setting for configuration and diagnostic testing
- Configurable binary outputs - For remote indication to SCADA for faults/diagnostics via FRTU/RTU
- Enhanced diagnostics - Self and sensor cable diagnostics is supported

- Local Indication - 3 red LEDs for phase-fault, 1 red LED for ground-fault, 1 yellow LED for battery health condition
- Multiple reset functionalities - Auto reset, remote reset via an external input, and front fascia push button. User Configurable Momentary Fault Override function
- Extended Battery Life - Enhanced power management leading to more than 2000 hours of operation under fault conditions (blinking)
- Sensors - IP 67-compliant self-sustained accurate sensors with a noise immune plastic fibre-optic cable interface to the device indicator unit
- Compact - DIN-compliant form factor ideal for panel flush mounting

2.1.4 Applications

The device is used in the following areas of applications:

- The device is applied in secondary medium-voltage distribution systems ranging from 10 kV to 36 kV.
- The device is used in 50-Hz/60-Hz networks.
- The device is primarily intended for radial or open ring medium-voltage cable networks.

2.1.5 MLFB (Ordering Code)

Table 2-1 SICAM FPI Selection and Ordering Data

Description	**Versions**	**Order no.**																
		1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
SICAM FPI, non-directional		6	M	D	2	3	1	0	-	0	□	□	□	0	-	0	A	A	0
											▲ |	▲ |	▲ |					
Type 1 Series **Phase-fault sensor:** AC 200 A to AC 1200 A, 10 % accuracy; **Ground-fault sensor:** AC 10 A to AC 100 A, 10 % accuracy											|	|	|					
Phase-fault and ground-fault indicator with 2 binary outputs (NO), With 3 phase-fault and 1 ground-fault sensors (for L1/L2/L3/E), Plastic fibre-optic cable (3 m in length)											A	A	0					
Phase-fault and ground-fault indicator with 2 binary outputs (NO), With 3 phase-fault and 1 ground-fault sensors (for L1/L2/L3/E), Plastic fibre-optic cable (10 m in length)											A	A	1					
Phase-fault and ground-fault indicator with 1 binary output (NO), With 3 phase-fault and 1 ground-fault sensors (for L1/L2/L3/E), Plastic fibre-optic cable (3 m in length)											D	A	0					
Phase-fault indicator with 1 binary output (NO), With 3 phase-fault sensors (for L1/L2/L3), Plastic fibre-optic cable (3 m in length)											B	B	0					

Description	Versions	Order no.				
Ground-fault indicator with 1 binary output (NO), With 1 ground-fault current sensor (for E), Plastic fibre-optic cable (3 m in length)			C	C	0	
Ground-fault indicator with 2 binary outputs (1 NO + 1 NC), With 1 ground-fault current sensor (for E), Plastic fibre-optic cable (3 m in length)			E	C	0	
Type 2 Series **Phase-fault sensor:** AC 200 A to AC 800 A, 15 % accuracy; **Ground-fault sensor:** AC 40 A to AC 300 A, 15 % accuracy			|	|	|	
Phase-fault and ground-fault indicator with 2 binary outputs (NO), With 3 phase-fault and 1 ground-fault sensors (for L1/L2/L3/E), Plastic fibre-optic cable (3 m in length)			A	E	0	
Phase-fault and ground-fault indicator with 1 binary output (NO), With 3 phase-fault and 1 ground-fault sensors (for L1/L2/L3/E), Plastic fibre-optic cable (3 m in length)			D	E	0	
Phase-fault indicator with 1 binary output (NO), With 3 phase-fault sensors (for L1/L2/L3), Plastic fibre-optic cable (3 m in length)			B	F	0	
Ground-fault indicator with 1 binary output (NO), With 1 ground-fault sensor (for E), Plastic fibre-optic cable (3 m in length)			C	G	0	
Ground-fault indicator with 2 binary outputs (1NO + 1NC), With 1 ground-fault sensor (for E), Plastic fibre-optic cable (3 m in length)			E	G	0	

2.1.6 SICAM FPI Variants

The following tables show the list of SICAM FPI variants that can be ordered based on the standard MLFB.

Table 2-2 SICAM FPI Variants (Type 1 Series)

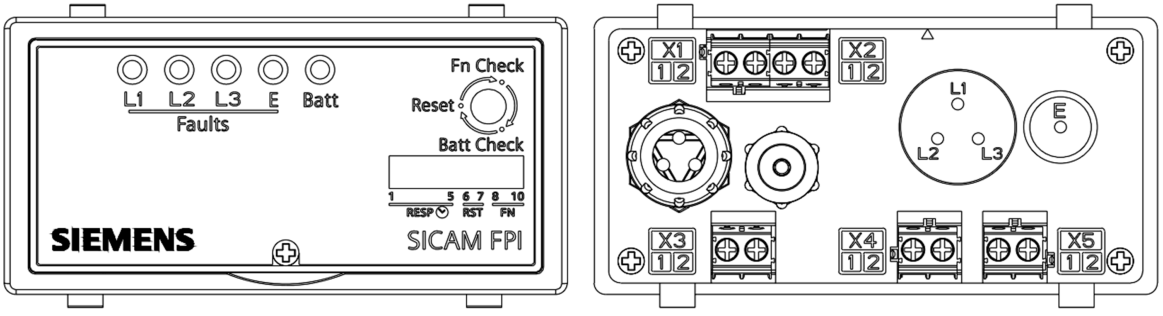
MLFB	Phase Input	Ground Input	BO[1] (Quantity)	Sensor Type
6MD2310-0AA00-0AA0	3	1	2	3 phase + 1 ground
6MD2310-0BB00-0AA0	3	-	1	3 phase
6MD2310-0CC00-0AA0	-	1	1	1 ground
6MD2310-0DA00-0AA0	3	1	1	3 phase + 1 ground
6MD2310-0EC00-0AA0	-	1	2	1 ground

1 Depending upon the MLFB variants, the number of binary outputs, sensor types, and related functionalities are provided in the ordered device.

Table 2-3 SICAM FPI Variants (Type 2 Series)

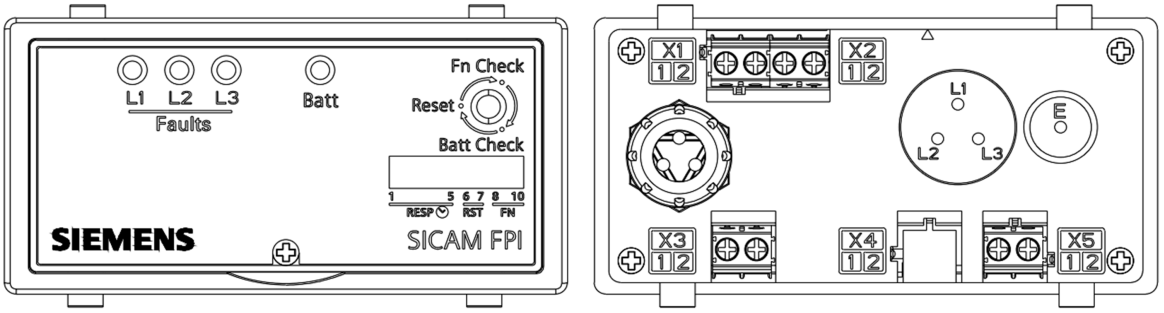
MLFB	Phase Input	Ground Input	BO[1] (Quantity)	Sensor Type
6MD2310-0AE00-0AA0	3	1	2	3 phase + 1 ground
6MD2310-0BF00-0AA0	3	-	1	3 phase
6MD2310-0CG00-0AA0	-	1	1	1 ground
6MD2310-0DE00-0AA0	3	1	1	3 phase + 1 ground
6MD2310-0EG00-0AA0	-	1	2	1 ground

Based on the device MLFB, the front view and rear view of the device varies. The following figures show the SICAM FPI variants.



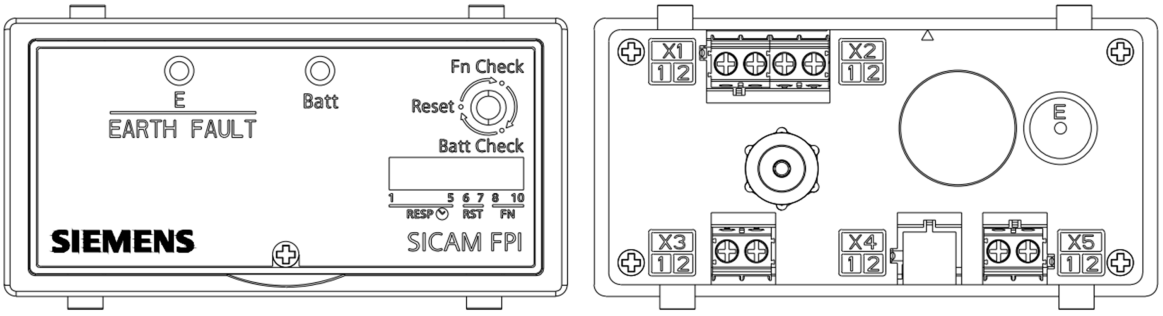
[dw_fpidevvart1-310314, 2, --_--]

Figure 2-3 6MD2310-0AX00-0AA0 - 3 Phase, 1 Ground, 2 Binary Outputs with 3 Phase Sensors and 1 Ground Sensor



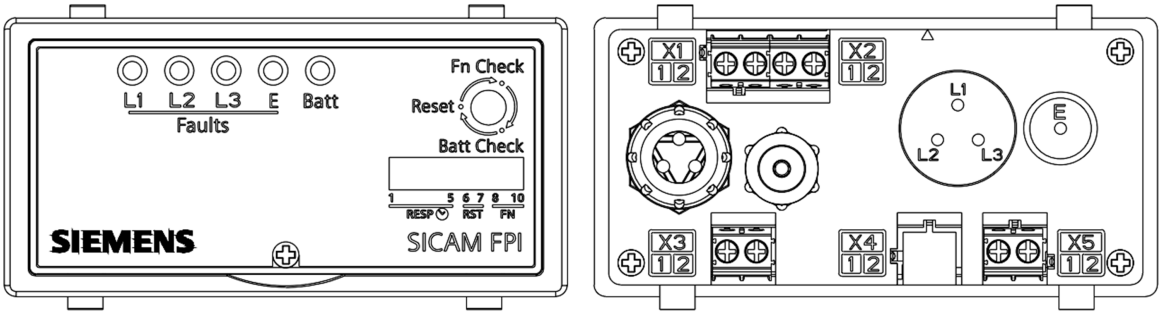
[dw_fpidevvart2-310314, 2, --_--]

Figure 2-4 6MD2310-0BX00-0AA0 - 3 Phase, 1 Binary Output with 3 Phase Sensors



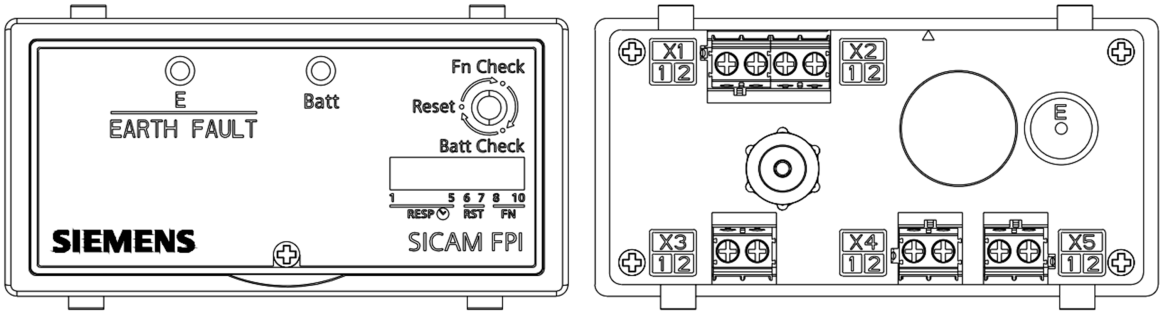
[dw_fpidevvart3-310314, 2, --_--]

Figure 2-5 6MD2310-0CX00-0AA0 - 1 Ground, 1 Binary Output with 1 Ground Sensor



[dw_fpidevvart4-310314, 2, --_--]

Figure 2-6 6MD2310-0DX00-0AA0 - 3 Phase, 1 Ground, 1 Binary Output with 3 Phase Sensors and 1 Ground Sensor



[dw_fpidevvart5-140814, 2, --_--]

Figure 2-7 6MD2310-0EX00-0AA0 - 1 Ground, 2 Binary Outputs with 1 Ground Sensor

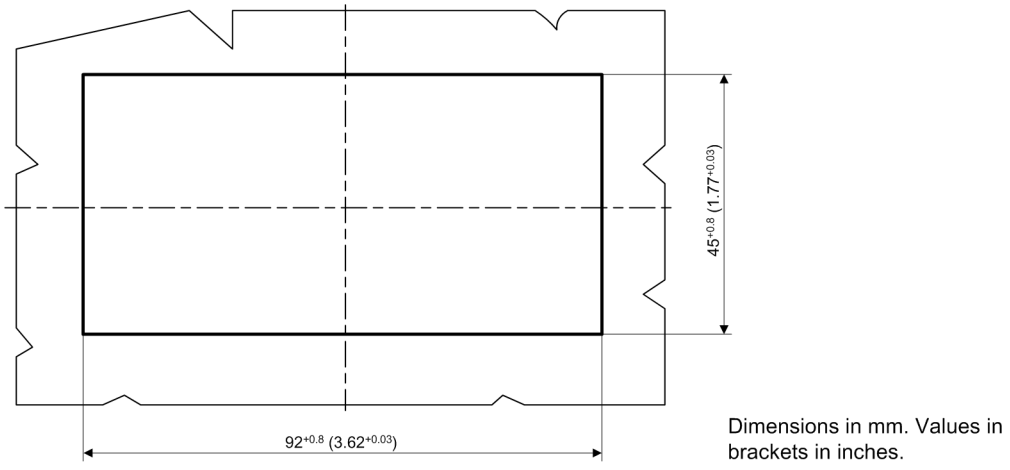
X represents the type of sensors ordered as per the MLFB ordering code.

2.1.7 Device Installation

The SICAM FPI device is intended for indoor installation in an RMU panel.

Execute the following procedure to install and mount the device in RMU:

✧ Create a slot of dimensions measuring 92+0.8 mm x 45+0.8 mm (W x H) to house the device in RMU panel.

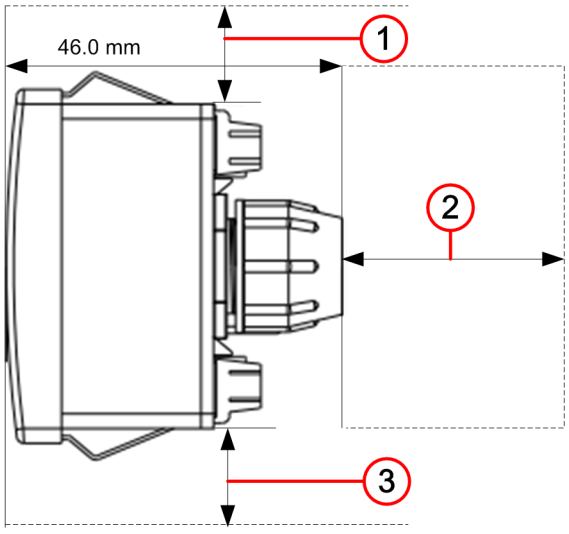


[dw_sicam-fpi_pnlcut, 1, en_US]

Figure 2-8 RMU Panel Cut-Out

✧ Flush the rear side of device into the cut-out.

- ✧ In the rear terminal of the device, execute the wiring process as mentioned in the scheme requirements. For more information about the terminal connector diagram, refer to *Table 2-4* for connection, recommended lugs, and cable types.
- ✧ In the rear terminal of the device, execute the wiring process for binary outputs, AC 230 V reset input, remote reset input, and blinking lamp output.
- ✧ Maintain a minimum clearance from the device as shown in *Figure 2-9* to ensure safety and to avoid accidental damage to the plastic fibre-optic cable.



[dw_fpiinstall-280314, 1, en_US]

Figure 2-9 Clearance for Terminal Wiring

(1) 3 cm clearance for cable
(2) 15 cm clearance for plastic fibre-optic cable
(3) 3 cm clearance for cable

NOTE

The torque required for tightening the metal to metal screws is 0.46 ~ 0.55 Nm.
The torque required for tightening the plastic to plastic parts is 0.5 Nm. For example, plastic locknut.

2.1.8 Commissioning

Execute the commissioning tests if the following criteria are satisfied:

- ✧ The device has not been damaged in transit (material damage).
- ✧ The device has been correctly connected and installed.

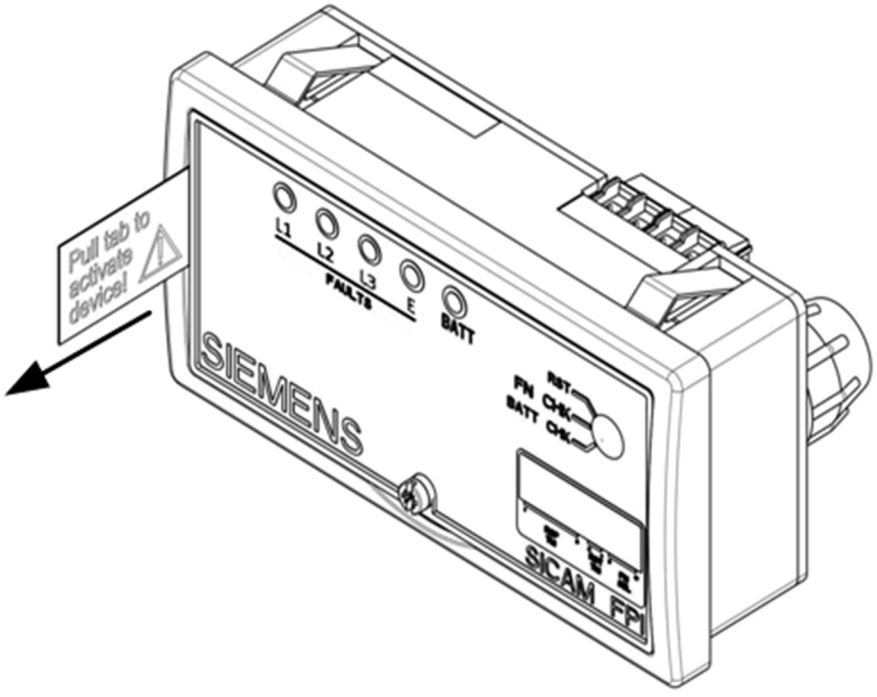
NOTE

Confirm that the correct DIP switch settings have been configured to meet the application requirements.

2.1.9 Post-Installation and Commissioning

Procede as follows after installation and commissioning of the device.

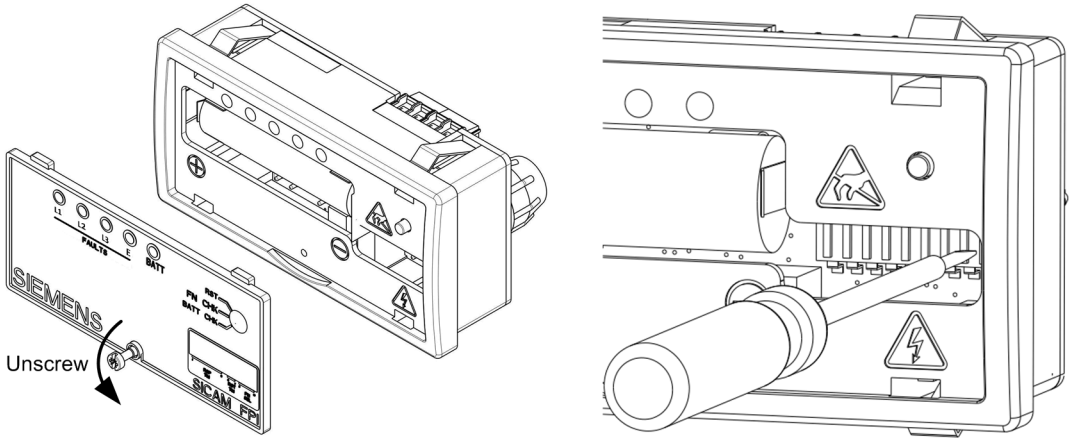
- ✧ To use SICAM FPI for the first time, pull out the battery isolation tab to activate the device as shown in *Figure 2-10*.



[dw_fpipostinstl-global, 1, en_US]

Figure 2-10 SICAM FPI Device Activation

✧ Refer to *Table 4-8* for default factory settings. If changes are required in default factory settings of DIP switch, unscrew the front-cover plate and set the DIP switch settings with the help of a tool as shown in *Figure 2-11*.



[dw_fpidipswtool-global, 1, en_US]

Figure 2-11 Changing DIP Switch Settings

✧ At the rear side of SICAM FPI, remove the stickers placed on the locknut of the optical inputs (L1, L2, L3, and E).

✧ If SICAM FPI is not responding even after pulling out the battery isolation tab, this may be due to passivation property of the lithium thionyl chloride battery or because the battery is exhausted. Refer to section *Battery De-Passivation, Page 23* to de-passivate the battery.

✧ Fix the front cover again and screw it to the housing.

The following table shows the recommended mechanical tools required for installation and commissioning of the device.

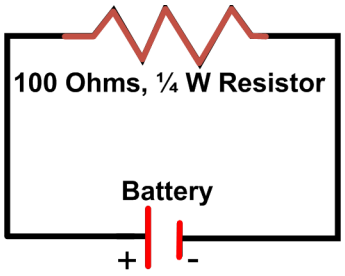
Mechanical Components	Tools Specifications	Manufacturer/Part number
Screws for front cover, terminal blocks	Flat screwdriver	Taparia (Product No. 933) or equivalent
DIP switch settings and battery removal	Flat screwdriver	Taparia (Product No. 933) or equivalent
M4 nut and M5 nut for sensor clamp	7 mm/8 mm wrench	Standard manufacturer

Battery De-Passivation

To de-passivate the battery proceed as follows:

✧ Remove the battery from the device.

✧ Connect a 100 ohms 1/4 W resistor to the positive (+) and negative (-) terminals of the battery and keep it for 10 minutes.



[dw_fpiposnegterm, 1, en_US]

Figure 2-12 Resistor Conneted to Battery Terminals

✧ Disconnect the battery from the resistor.

✧ Insert the battery in the device.

✧ Perform the self-test using the push button.

Alternatively, the battery can be de-passivated as follows:

✧ Insert the battery into the device and keep it there for about 6 hours.

✧ After 6 hours, observe the device functionality by performing the self-test using the push button.

If the self-test is passed, the battery has recovered and the device is ready for operation.

NOTE

The recommended method of de-passivation does not have any effect on the battery life.
However, the alternative method of de-passivation may have a nominal effect on the battery life.

2.1.10 Preparing the Sensors for Installation

The 3 phase sensors and 1 ground sensor shipped with the device as per the ordering code must be mounted on L1, L2, L3 phase conductors core cable and 3-core cable respectively.

NOTE

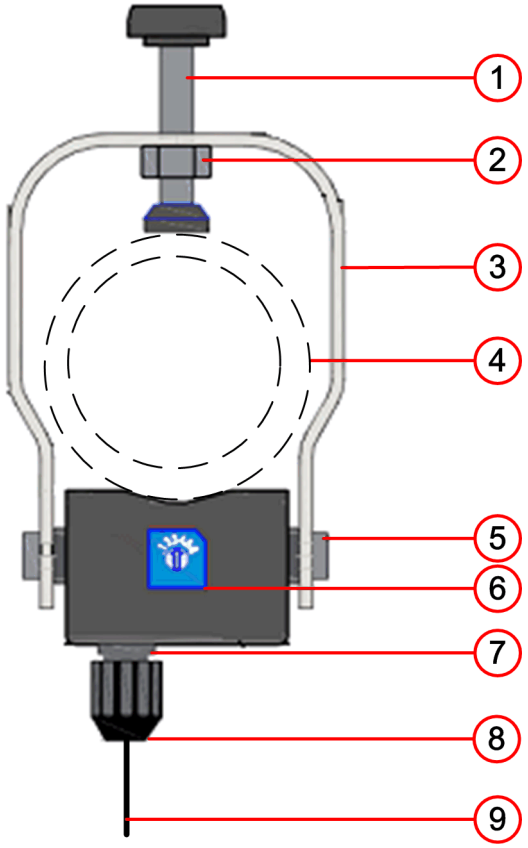
Before installing the sensors on the underground cables, disconnect the power to the respective cables.

2.1.11 Installation of Phase Sensors

To install the phase sensor, follow the procedure:

✧ Loosen the M4 fixing bolts on both sides using a 7-mm wrench.

- ✧ Mount the open bracket around the core cable.
- ✧ Place the sensor in final position and fix the bolts on both sides of the sensor and tighten them.
- ✧ Fix the phase sensor using the locking screw.
- ✧ In the phase sensor and rear side of the device, loosen the locknut and insert the plastic fibre-optic cable into the gland.
- ✧ By using a screwdriver, turn the rotary switch on the phase sensor and set the fault-current threshold limit.



[le_phase_sensor, 1, --_--]

Figure 2-13 Phase Sensors Installation

(1) M5 locking screw
(2) M5 nut
(3) Flux concentrator bracket
(4) Core cable
(5) M4 fixing bolts
(6) Rotary switch for selecting fault-current threshold limit
(7) Gland
(8) Locknut
(9) Plastic fibre-optic cable

- ✧ Repeat the procedures mentioned before for installing the other phase sensors.

NOTE

The measuring accuracies are achieved only in the following conditions:

- The M4 fixing bolt and M5 locking screw should be tightened by applying torque of 3 Nm to 3.5 Nm and 0.6 Nm to 0.8 Nm respectively. It ensures that the whole bracket surface is fitted tightly with the steel bolts of the housing.
- The plastic fibre-optic cable should be inserted into the gland till it contacts the internal component at both the ends of sensor and the device. The locknut should be fixed tightly.

NOTE

Siemens recommends using the following color sequence for the strip color fibre-optic cables supplied along with the SICAM FPI.

- Red (Phase L1)
- Yellow (Phase L2)
- Green (Phase L3)
- Black (Ground)

NOTE

Always ensure that the cable is not damaged or twisted during the installation and the bend radius of plastic fibre-optic cable should not be less than 5 cm.

NOTE

The claimed accuracy of the device is for the sensors mounted on XLPE cable suitable for 11 kV to 33 kV medium-voltage systems and mounted on the cable with diameter from 25 mm to 45 mm for Type 1 series phase sensors, 30 mm to 45 mm for Type 2 series phase sensors and from 80 mm to 105 mm for ground sensors.

2.1.12 Installation of Ground Sensor

To install the ground sensor, follow the procedure:

✧ Loosen the fixing bolt and unmount the steel belt from one side of the housing. For more information, refer to the latest version of the **SICAM FPI User Manual**.

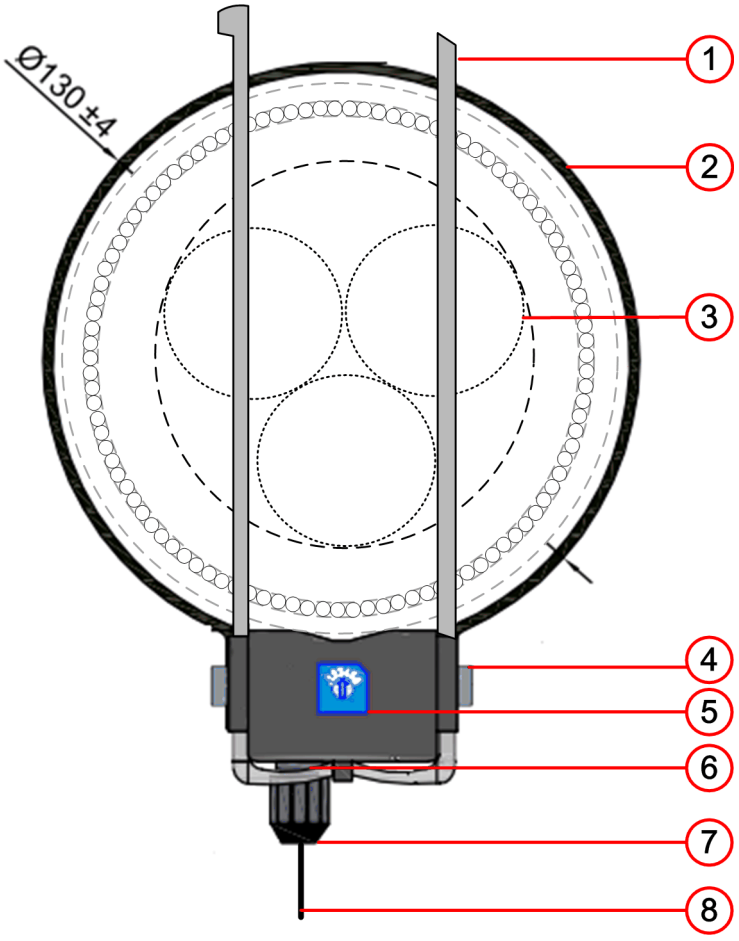
✧ Place the belt around the 3-core cables.

✧ Connect the ground sensor housing with the steel belt again by reinserting and tightening the fixing bolt.

✧ Fix the sensor in the right position using the provided plastic cable tie.

✧ In the ground sensor and rear side of the device, loosen the locknut and insert the plastic fibre-optic cable at gland.

✧ By using the rotary switch on the ground sensor, set the fault-current threshold limit. For phase-fault current and ground-fault current range, refer to *Phase-Fault Current Range (Type 1 Series), Page 34*.

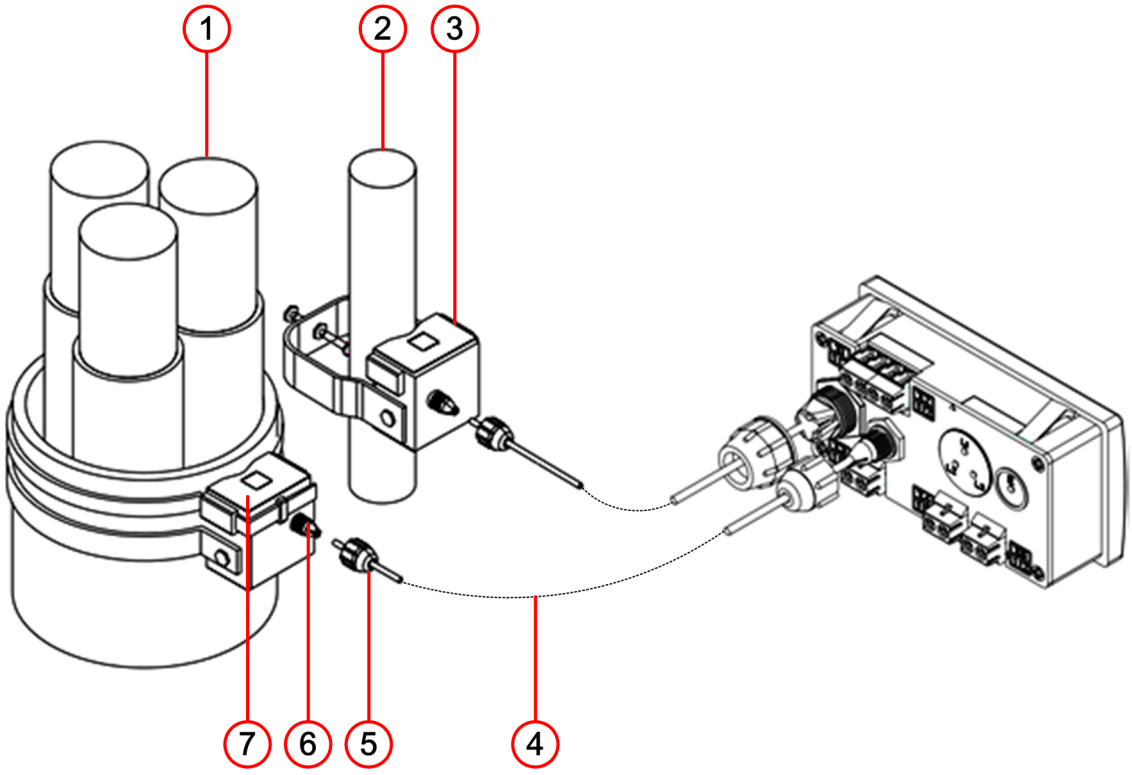


[le_earth_sensor, 1, --_--]

Figure 2-14 Ground Sensor Installation

(1) Cable tie for fitting
(2) Flux concentrator bracket
(3) 3-core cable
(4) M4 fixing bolts
(5) Rotary switch for selecting fault-current threshold limit
(6) Gland
(7) Locknut
(8) Plastic fibre-optic cable

The following figure shows how SICAM FPI is connected with phase sensors and ground sensor via the plastic fibre-optic cable.



[dw_fpiphaearsens-280314, 2, --_--]

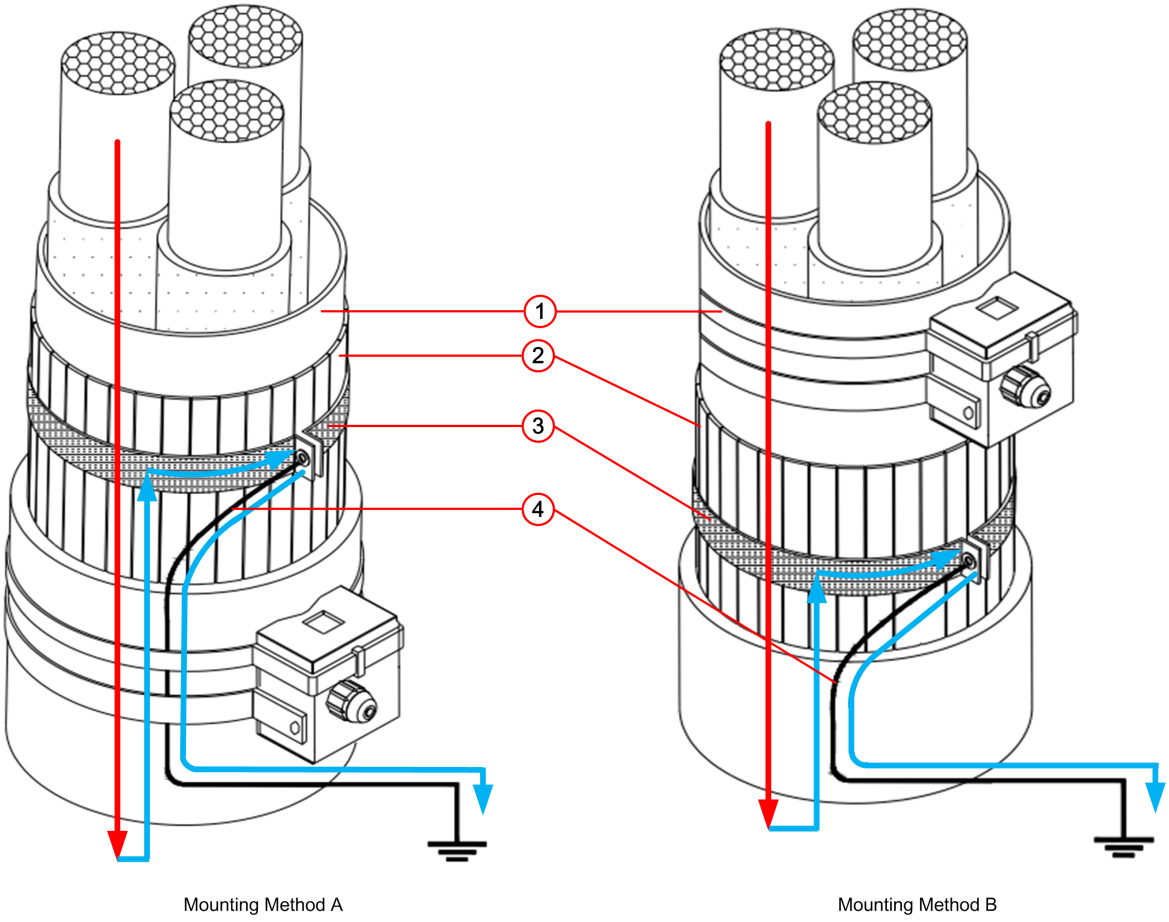
Figure 2-15 SICAM FPI Connected with Phase and Ground Sensors

(1) Phase conductor in a 3-core cable construction
(2) Phase conductor
(3) Phase sensor
(4) Plastic fibre-optic cable
(5) Locknut
(6) Gland
(7) Ground sensor

2.1.13 Mounting of Ground Sensor on Shielded Cable

The ground sensor is used to measure the current unbalance between the 3 phases. For the proper measurement of the ground current, ignore the current flowing through the shield and it is achieved by using the following mounting methods:

- ✧ **Mounting Method A** - The sensor is mounted on the shielded part of the cable. To neutralize the current flowing through the shield, expose the shield and mount a conductive clamp with an insulated wire and pass the wire back through the sensor and connect to ground. Refer to *Figure 2-16*.
- ✧ **Mounting Method B** - The sensor is mounted on the unshielded cable. Refer to *Figure 2-16*.



[dw_fpiearsenshield-300614, 1, en_US]

Figure 2-16 Ground Sensor Mounted on Shielding and Ground Sensor Mounted on Insulated Conductor

(1) Insulation
(2) Ground shield
(3) Conductive clamp
(4) Braided wire

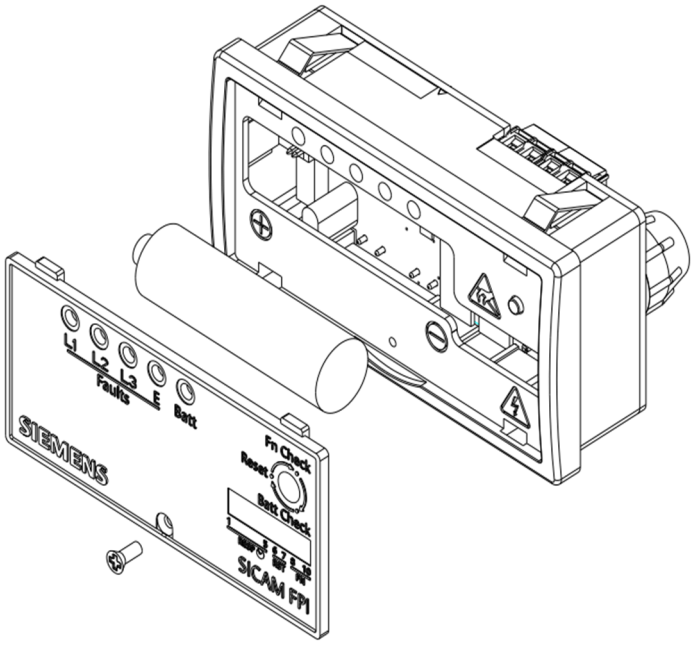
NOTE

Always ensure that the exposed shield area is sealed to avoid any damage and stress.

2.1.14 Replacing the SICAM FPI Battery

You can replace the SICAM FPI battery when it is damaged or exhausted. To replace the battery, procede as follows:

- ✧ Remove the SICAM FPI front cover with the help of a screwdriver.
- ✧ Remove the damaged or exhausted battery from the battery clip with the help of a screwdriver.
- ✧ Insert the new battery in the battery clip, with the correct polarity; the polarity is indicated in the device housing.
- ✧ Fit the front cover again and screw it to the housing.



[dw_fpibatrp-210114-01, 2, --_--]

Figure 2-17 Battery Replacement

2.1.15 Environmental Protection Hints

Disposal of Old Equipment and Batteries (Applicable only for European Union and Countries with a Recycling System)

The disposal of our products and possible recycling of their components after decommissioning has to be carried out by an accredited recycling company, or the products/components must be taken to applicable collection points. Such disposal activities must comply with all local laws, guidelines and environmental specifications of the country in which the disposal is done. For the European Union the sustainable disposal of electronic scrap is defined in the respective regulation for "waste electrical and electronic equipment" (WEEE).

The crossed-out wheelie bin on the products, packaging and/or accompanying documents means that used electrical and electronic products and batteries must not be mixed with normal household waste.

According to national legislation, penalties may be charged for incorrect disposal of such waste.

By disposing of these products correctly you will help to save valuable resources and prevent any potential negative effects on human health and the environment.

NOTE

Our products and batteries must not be disposed of as household waste. For disposing batteries it is necessary to observe the local national/international directives.

Disposal of Mobile Storage Devices (e.g. USB Sticks and Memory Cards)

When disposing of/transferring mobile storage devices, using the **format** or **delete** functions only changes the file management information and does not completely delete the data from your mobile storage device. When disposing of or transferring a mobile storage device, Siemens strongly recommends physically destroying it or completely deleting data from the mobile storage device by using a commercially available computer data erasing software.

REACH/RoHS Declaration

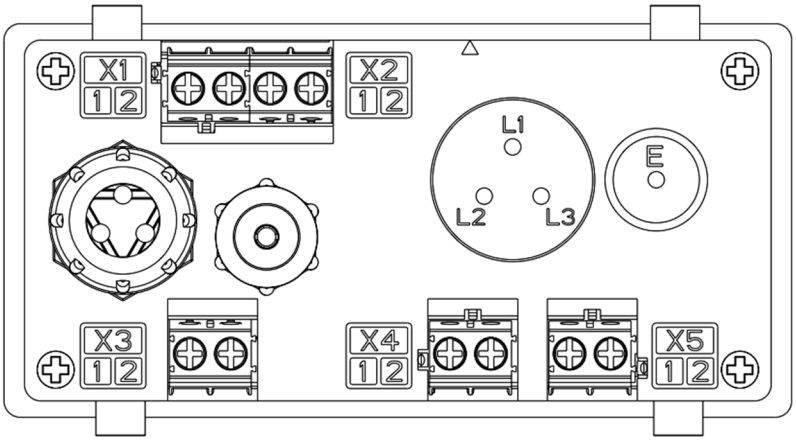
You can find our current **REACH/RoHS** declarations at:
https://www.siemens.com/global/en/home/products/energy/ecotransparency/ecotransparency-downloads.html

NOTE

You can find more information about activities and programs to protect the climate at the EcoTransparency website:
https://www.siemens.com/global/en/home/products/energy/ecotransparency.html

2.1.16 Terminal Diagram

The terminal diagram shows the terminal number and terminal blocks of the 6MD2310-0AX00-0AA0 (X represents the type of sensors) variant of SICAM FPI.



[dw_fpirearv-210114-01, 2, --_--]
Figure 2-18 Terminal Diagram

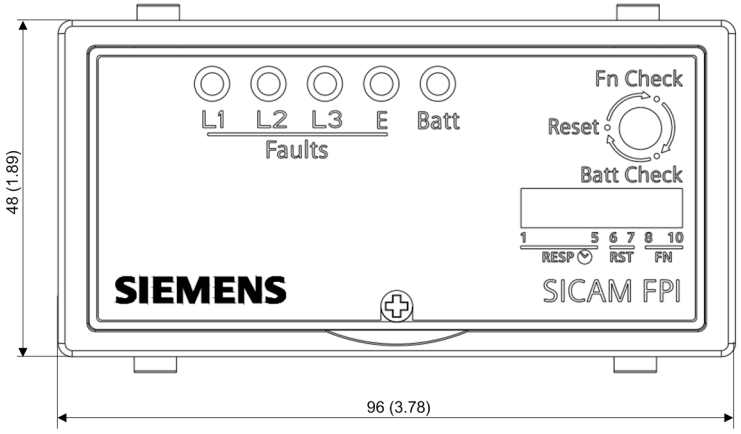
Table 2-4 Terminals Specification and Recommended Lugs

Terminal Block - Numbers	Terminal Description	Type/Cable Specifications	Manufacturer/Part Number
X1-1, 2	Remote reset input (dry contact)	Pin type lug/1.8 mm, Ferrule - AI 1, 5 - 8 BK	Phoenix/32000 43 or equivalent
X2-1, 2	Blinking lamp supply output		
X3-1, 2 - Phase-fault latching type binary output	Normally open contact		
X4-1, 2 [2] - Ground-fault latching type binary output	Normally open contact [3]		
X5-1, 2 - 230 V AC reset input	230 V AC reset input		
L1	Terminal connector for phase L1		
L2	Terminal connector for phase L2		
L3	Terminal connector for phase L3		
E	Terminal connector for ground E		
Plastic fibre-optic cable	-	Plastic fibre-optic cable	Siemens Supplied

2 For separate ground-fault indication, binary output X4 is available only for product variant (6MD2310-0AA00-0AA0).
3 Normally closed contact for 6MD2310-0EC00-0AA0 and 6MD2310-0EG00-0AA0.

2.1.17 Dimensional Drawings

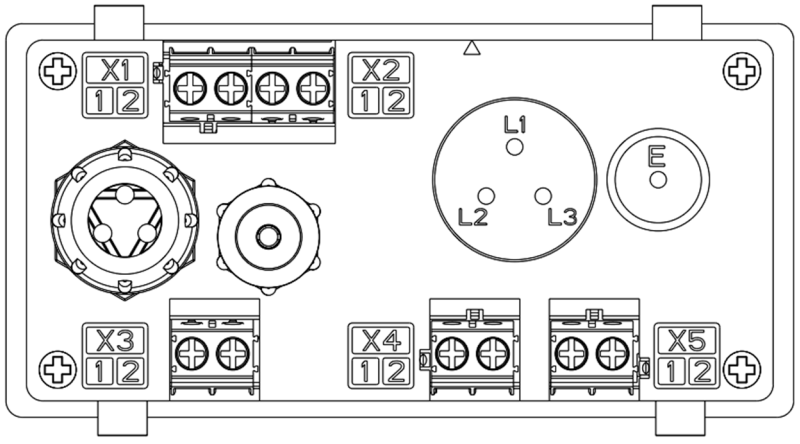
This section shows the dimensional drawings and different views of SICAM FPI.



Dimensions in mm. Values in brackets in inches.

[dw_sicam-fpi_frbtv, 1, en_US]

Figure 2-19 Front View



[dw_fpirearv-210114-01, 2, --_--]

Figure 2-20 Rear View

3 Product Specification

3.1 Technical Data

3.1.1 Technical Data

Technical Data

Medium-voltage distribution	10 kV to 36 kV
Frequency range	50 Hz/60 Hz
Internal battery	Lithium battery (Li-$SOCl_2$) type Standard AA cell size/3.6 V/2400 mAh Expected shelf life of the SICAM FPI with battery installed is at least 10 years, including > 2000 hours of flashing time in active mode (fault indication mode) All battery-related technical specifications made in this manual refer to the following type of battery: TL-4903, manufacturer: Tadiran. Siemens recommends replacing the battery only with this type.

Inputs and Outputs

Current sensor inputs	Phase current inputs: L1, L2, L3 (via a plastic fibre-optic cable) Ground inputs: E (via a plastic fibre-optic cable)
Binary inputs (for reset functions)	AC 230 V reset input (range AC 35 V to AC 275 V), 50 Hz/60 Hz Remote reset input from dry contact
Binary outputs	Number: 2 Type: Potential-free contacts [4] Maximum switching voltage: AC 250 V/DC 220 V Maximum rated current: 2 A Maximum switching current: 0.25 A, AC 250 V/0.13 A, DC 220 V

Operating Temperature

Operating temperature	-30 °C to +70 °C

Phase-Fault Current Range (Type 1 Series)

Phase-fault current range	AC 200 A/400 A/500 A/600 A/800 A/1000 A/1200 A
Accuracy	≤10 % of the selected range (cable ∅ 25 mm to ∅ 45 mm)

Phase-Fault Current Range (Type 2 Series)

Phase-fault current range	AC 200 A/300 A/400 A/500 A/600 A/700 A/800 A
Accuracy	≤15 % of the selected range (cable ∅ 30 mm to ∅ 45 mm)

4 In the variant 6MD2310-0EX00-0AA0, 1 NO and 1 NC contact is available. The maximum switchover delay between the two binary output contacts is < 15 ms.

Ground-Fault Current Range (Type 1 Series)

Ground-fault current range	AC 10 A/20 A/30 A/40 A/60 A/80 A/100 A
Accuracy	≤10 % of the selected range (cable ∅ 80 mm to ∅ 105 mm)

Ground-Fault Current Range (Type 2 Series)

Ground-fault current range	AC 40 A/80 A/120 A/160 A/200 A/260 A/300 A
Accuracy	≤15 % of the selected range (cable ∅ 80 mm to ∅ 105 mm)

Response Time

Response time	40 ms, 60 ms, 80 ms, 160 ms, 200 ms, 300 ms, 500 ms

Auto Reset Time

Auto reset time	1 h, 2 h, 4 h, 8 h

Dimensions

Type of fixing	Flush mounting, plug-in (screw less), IEC 61554
Cut-out (W x H)	92+0.8 mm x 45+0.8 mm
Overall depth (D)	46 mm
Mounting position	Horizontal
Weight	≤ 300 g

Environment

Humidity range	0 to 95 %, non-condensing
Altitude above sea level	Maximum up to 2000 m

General

Minimum and maximum operating temperature of connected plastic fibre-optic cable	-55 °C and +85 °C

3.2 Type Testing

3.2.1 Type Testing

This section describes about the type testing performed with SICAM FPI under different environmental conditions.

Table 3-1 Electrical Tests

Type Test	Reference	Requirement
Dielectric test	IEC 60950-1 IEC 61010-1	AC 3 kV RMS for 1 min
Impulse voltage withstand	IEC 60950-1 IEC 61010-1	4 kV (5+ve and 5-ve pulses)
Electrostatic discharge (ESD)	IEC 61000-4-2	Class III, 8 kV air discharge and 6 kV contact discharge
Radiated radio frequency electromagnetic field (RS)	IEC 61000-4-3	80 MHz to 1.0 GHz (10 V/m, criteria A) 1.4 GHz to 2.7 GHz (3 V/m, criteria A)
Electrical fast transient (EFT)	IEC 61000-4-4	Input output ports: 2 kV, burst frequency 5 kHz (Class III)

Table 3-2 Insulation Test According to IEC EN 61010-1

Test Circuits	Dielectric Voltage
Between binary input (BI1), binary output (BO1 and BO2), and battery terminals	AC 3.0 kV, 1 min [Double Insulation]

Terminal 1	Terminal 2	Voltage Level	Duration	Category
BO1 and BO2	BI1	3.0 kV, 50 Hz	1 min	Cat. III
BO1 and BO2	Battery terminals shorted	3.0 kV, 50 Hz	1 min	Cat. III
BI1	Battery terminals shorted	3.0 kV, 50 Hz	1 min	Cat. III

Test Circuits	Dielectric Voltage
Between binary input (BI1), binary output (BO1 and BO2), and battery terminals	AC 3.510 kV, 5 s [Double Insulation]

Terminal 1	Terminal 2	Voltage Level	Duration	Category
BO1 and BO2	BI1	3.5 kV, 50 Hz	5 s	Cat. III
BO1 and BO2	Battery terminals shorted	3.5 kV, 50 Hz	5 s	Cat. III
BI1	Battery terminals shorted	3.5 kV, 50 Hz	5 s	Cat. III

SICAM FPI is classified into overvoltage category III and pollution degree 2 as per the device safety standard IEC 61010-1.

Table 3-3 Environmental Test

Type Test	Reference	Requirement
Temperature		
Dry cold test	IEC 60068-2-1	-30 °C, 96 h
Dry heat test	IEC 60068-2-2	+70 °C, 96 h
Damp heat test, cyclic	IEC 60068-2-30	6 days at 95 % RH and +25 °C to +40 ° C (12 h + 12 h cycle)

Type Test	Reference	Requirement
IP Tests		
IP 50	IEC 60529	SICAM FPI indicator front
IP 20		SICAM FPI indicator rear
IP 67		SICAM FPI sensor - phase and ground

Table 3-4 Routine/Production Test

Type Test	Reference	Requirement
Production test	IEEE 495	Clause number. 4.2.1 and 4.2.2

4 Device Functions

4.1 Description

4.1.1 Device Functions

This section describes the functions of SICAM FPI.

4.1.2 Fault Detection

Phase Detection

Single Fault - In the L1, L2, L3 phase, if single fault is detected and the fault current persists for greater than or equal to the set response time, the respective LED blinks to indicate a single fault (1 blink/s) and the phase binary output contact changes its state from open contact to close contact.

Double Fault - The double fault condition is declared based on the following criteria:

- A single-fault condition exists on any of the phase.
- The fault current reaches to zero or less than the fault set limit in phase current sensor and persists for more than 100 ms.
- If it is followed by another fault that persists for greater than or equal to the set response time, the respective LED blinks twice indicating a double fault (2 blinks/s).

Ground Detection

Fault - For ground E, the fault is detected when the fault current is greater than or equal to the set current limit in the sensor and when the fault current persists for greater than the response time set in the device. The Ground LED blinks to indicate a single-fault condition (1 blink/s). The ground binary output contact changes its state from open contact to close contact.

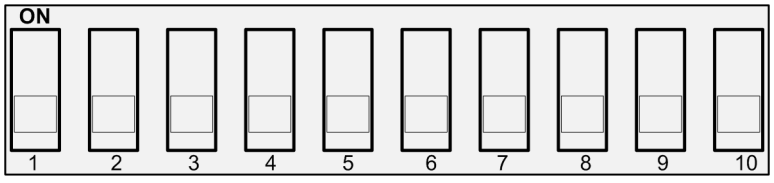
Continuous Fault - If a continuous fault is present, the ground LED displays a double blink (2 blink/s) as long as the fault persists. If there is no fault condition, the ground LED reverts to single blink.

4.1.3 DIP Switch

DIP switch is used for configuring the different parameter settings such as response time, auto-reset time, low-battery status on binary output, and optical input test. By default, the DIP switch is in **OFF** position.

The DIP switch label is located on the rear side of the front fascia cover and indicates the configuration of DIP switch.

The DIP switch settings can be viewed through the front fascia.



[dw_fpidipsw-310114, 1, en_US]

Figure 4-1 DIP Switch

NOTE

After changing the DIP switch setting, execute the functional check by pressing the push button for <3 s to apply the changes.

A DIP switch is **ON** when it is positioned towards the top.

In factory settings, the DIP switch from DIP 1 to DIP 10 are set to zero position.

Momentary Fault (MF) Reset

A momentary or transient fault is a fault condition typically caused by a temporary fault on a power line. The device detects such momentary faults and automatically restores back to monitoring mode if the fault current does not persist and this is done in conjunction with the AC 230 V reset input. In this case, connect the upstream circuit breaker NC contact to the AC 230 V reset input.

For more information, refer to *Figure 4-2*.

If such momentary fault condition occurs, the device indicates the fault for predetermined time and automatically resets to normal state to indicate the restored healthy condition.

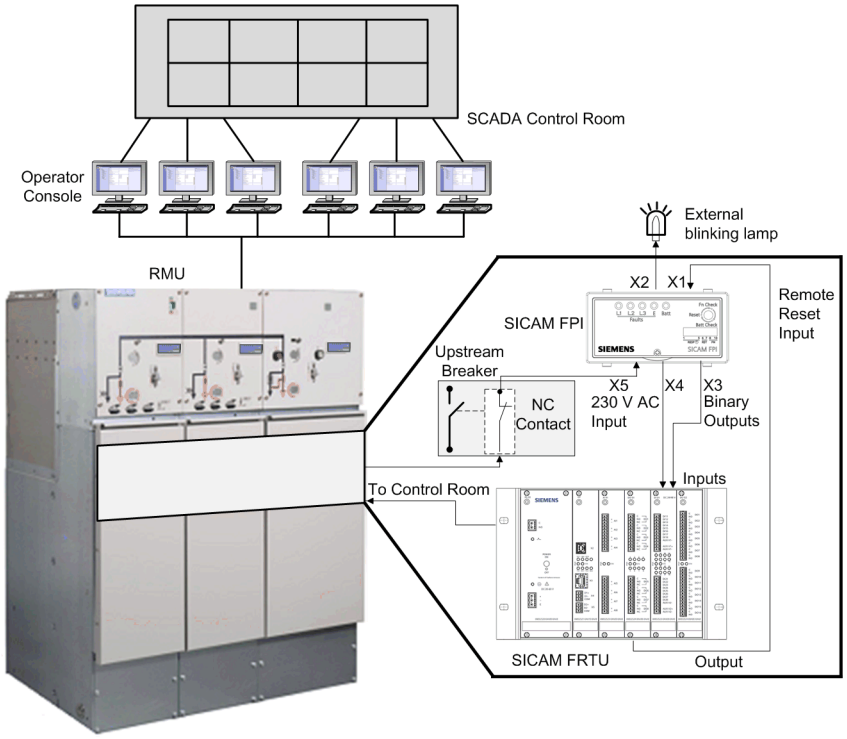
In this mode, the auto-reclosure feature is disabled.

The momentary fault reset feature is activated in the device when both the DIP Switch 1 (DIP 1) and DIP Switch 2 (DIP 2) are in **ON** state. The following are the list of possible conditions and sequence of momentary fault reset:

-
- If there is no phase-fault or ground-fault input to the device and no AC 230 V input from the upstream circuit breaker, the device remains in the monitor mode.
- If one valid momentary fault has occurred, the respective LED performs single blink and the corresponding binary output contact will close. After 2 s, the device check for the AC 230 V input at X5 terminal block. If the AC 230 V signal is not detected, the device resets.
- If one valid momentary fault has occurred, the respective LED performs single blink and the corresponding binary output contact will close. After 2 s, the device check for the AC 230 V input at X5 terminal block. If the AC 230 V signal is detected, the device blinks and indicates the fault continuously. This continuous-fault condition persists as long as the fault is existing and AC 230 V input is available at X5 terminal block.
- If there is a permanent phase-fault or ground-fault and AC 230 V input is not available at X5 terminal block, the device continuously indicates the fault on the respective LED and the binary output remains latched.

NOTE

To operate the momentary fault reset, connect the NC contact of the incoming circuit breaker/bus supply to the AC 230 V input (X5).



[dw_fpimomentfltreset, 2, en_US]

Figure 4-2 SICAM FPI System Diagram

Table 4-1 Momentary Fault Setting

DIP 1	DIP 2	Momentary Fault Setting
1	1	Momentary fault enabled

Sensing of Auto-Reclosure (AR)

Auto-reclosure is a mechanism that automatically closes the circuit breaker after the circuit breaker is opened due to a fault.

The device can sense auto-reclosure activity in the network and accordingly declare the fault type as single fault or permanent fault.

The auto-reclosure feature is activated in the device based on the position of both the DIP 1 and DIP 2. The following are the list of possible settings of auto-reclosure:

Table 4-2 Factory Configured Auto-Reclosure Timings

DIP 1	DIP 2	Auto-Reclosure Status
0	0	Auto-reclosure disabled
0	1	Auto-reclosure time 2 s
1	0	Auto-reclosure time 3 min

Response Time

The response time is the minimum time that a fault current should persist in the network and to be termed as a valid fault. The response time for a valid fault can be configured manually by using DIP 3 to DIP 5 switch.

For example, set the DIP 3 to **OFF**, DIP 4 to **ON**, and DIP 5 to **OFF** to get the response time as 80 ms.

By default, the factory response-time setting is 40 ms.

The following table shows the response time settings of the device.

Table 4-3 Response-Time Settings

Response Time			
DIP 3	**DIP 4**	**DIP 5**	**Response Time**
OFF	OFF	OFF	40 ms
OFF	OFF	ON	60 ms
OFF	ON	OFF	80 ms
ON	OFF	ON	160 ms
ON	OFF	OFF	200 ms
ON	OFF	ON	300 ms
ON	ON	OFF	500 ms
ON	ON	ON	Future use

Auto-Reset Time

The fault indications reset automatically after the elapse of configured auto-reset time. The auto-reset time can be configured manually by using DIP 6 and DIP 7 switch.

For example, set the DIP 6 and DIP 7 switch to **OFF**, the auto-reset time is set to 1 h.

By default, the factory auto-reset time setting is 1 h.

The following table shows the various settings of auto-reset time.

Table 4-4 Auto-Reset Time

Auto-Reset Time		
DIP 6	**DIP 7**	**Auto-Reset Time**
OFF	OFF	1 h
OFF	ON	2 h
ON	OFF	4 h
ON	ON	8 h

Fault Indication on Binary Output

The phase-fault detection and ground-fault detection can be indicated on the phase binary output and ground binary output respectively. Based on the DIP switch configuration, both the phase-fault and ground-fault can also be indicated on the phase binary output.

For example, if DIP 8 is **OFF**, the L1, L2, L3 phase-fault is indicated on X3 binary output and ground-fault E is indicated on X4 binary output. If DIP 8 is **ON**, L1, L2, L3, and E fault is indicated on X3 binary output only.

By default, the factory setting for fault indication on binary output is L1, L2, L3: X3/E: X4.

The following table shows the various settings of fault indication on binary output.

Table 4-5 Fault Indication on Binary Output

Fault Indication on Binary Output	
DIP 8	
OFF	L1, L2, L3: X3/E: X4
ON	L1, L2, L3, E: X3

Low Battery Status on Binary Output X3

The DIP switch 9 is used to configure the device to indicate the low battery status on the binary output contact (X3). The low battery status is monitored remotely by connecting the X3 terminal of the device to any binary input of RTU located in the RMU. The battery status is monitored by the device when it is powered-on or after functional test or after battery health check or when the device is reset from any fault. If the battery voltage is low, the binary output contact X3 switches from open to close 5 times (open time/cycle: 1 s and close time/cycle: 1 s), thus indicating the low battery status.

For example, if DIP 9 is **OFF**, the low battery indication on binary output is disabled. If DIP 9 is **ON**, the low battery indication on binary output is enabled.

By default, the factory setting for low battery status on binary output is disabled.

The following table shows the various settings of low battery status on binary output X3.

Table 4-6 Low Battery Configuration on Binary Output X3

Low Battery Configuration on Binary Output X3	
DIP 9	
OFF	Disabled
ON	Enabled

Optical Input Test

The optical input test is used to check the health of optical inputs and the plastic fibre-optic cable by using any external light source. For example, any LED torch.

For example, if DIP 10 is **OFF**, the device is set to normal operating mode.

For example, if DIP 10 is **ON**, the device is set to optical input test mode for 5 minutes. The optical input test mode is disabled after 10 min. In this mode, based on the light input provided to the optical inputs (L1, L2, L3, and E), the respective LEDs blink as long as the external light is incident on the plastic fibre-optic cable. The binary outputs X3 and X4 switch from open position to close position. This verifies that the device optical inputs and the connected plastic fibre-optic cable are working properly.

By default, the factory setting for optical input test is disabled.

The following table shows the various settings of optical input test (Sensors plastic fibre-optic cable test).

Table 4-7 Optical Input Test (Sensors Plastic Fibre-Optic Cable Test)

Optical Input Test (Sensors Plastic Fibre-Optic Cable Test)	
DIP 10	
OFF	Disabled
ON	Enabled

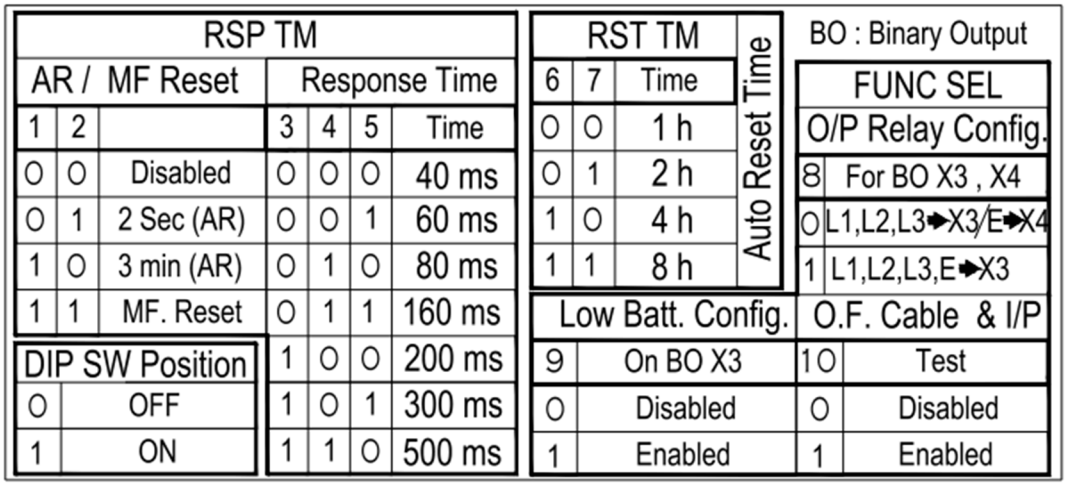
NOTE

After testing, change the DIP 10 switch position to **OFF** position.

DIP Switch Settings

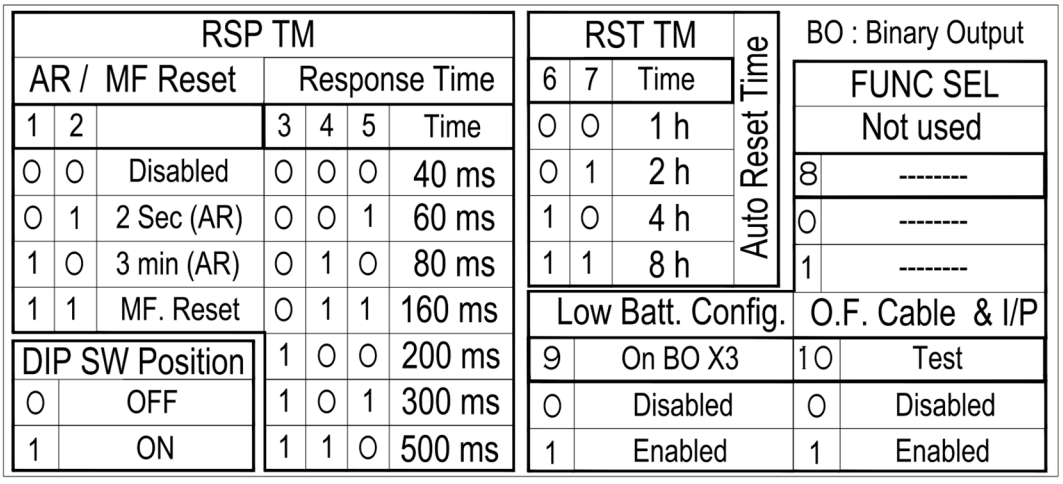
To apply the changes in the DIP switch settings, run the complete function test by pressing the push button for less than 3 s.

The following diagrams show the DIP switch settings label for the different device variants.



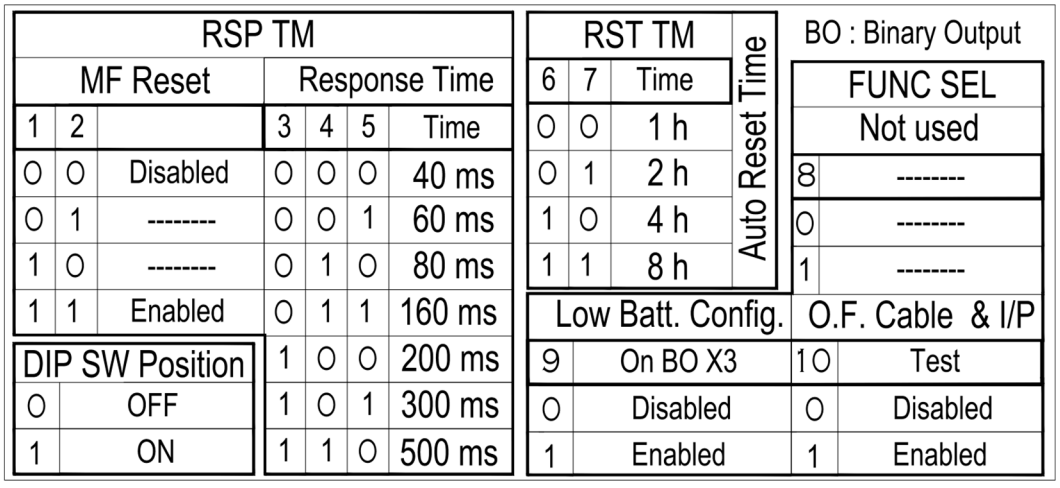
[dw_fpivariant1-280314, 2, --_--]

Figure 4-3 6MD2310-0AX00-0AA0 - 3 Phase, 1 Ground, 2 Binary Outputs with 3 Phase Sensors and 1 Ground Sensor



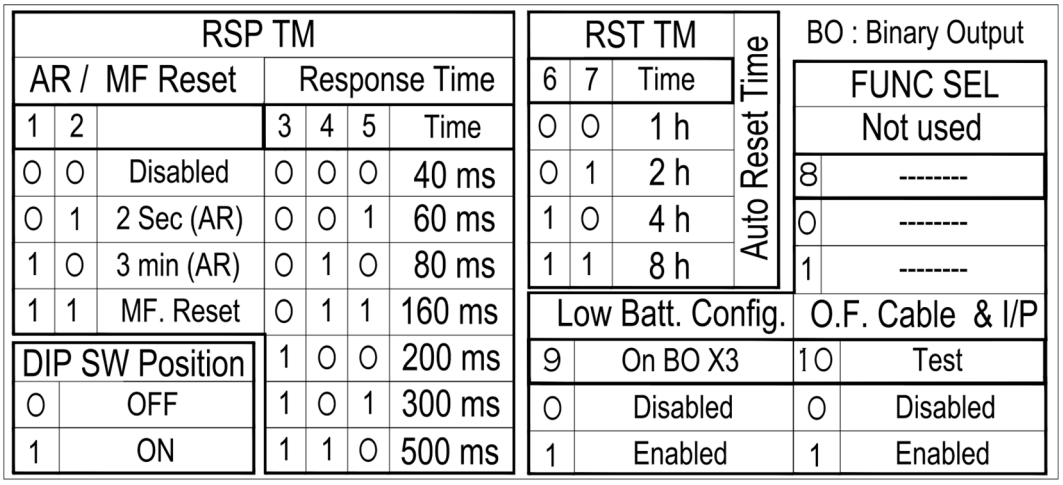
[dw_fpivariant2-280314, 1, --_--]

Figure 4-4 6MD2310-0BX00-0AA0 - 3 Phase, 1 Binary Output with 3 Phase Sensors



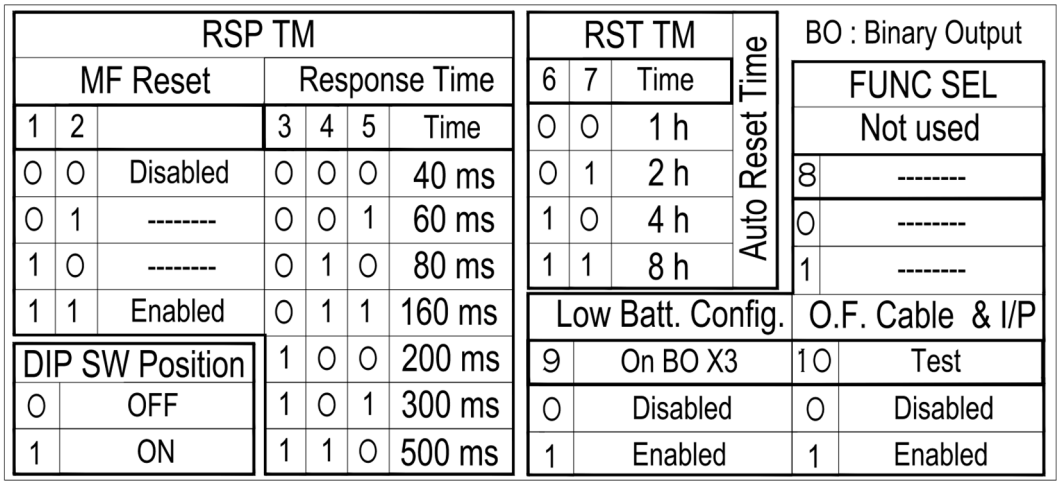
[dw_fpivariant3-280314, 1, --_--]

Figure 4-5 6MD2310-0CX00-0AA0 - 1 Ground, 1 Binary Output with 1 Ground Sensor



[dw_fpivariant4-280314, 1, --_--]

Figure 4-6 6MD2310-0DX00-0AA0 - 3 Phase, 1 Ground, 1 Binary Output with 3 Phase Sensors and 1 Ground Sensor



[dw_fpivariant3-280314, 1, --_--]

Figure 4-7 6MD2310-0EX00-0AA0 - 1 Ground, 2 Binary Outputs with 1 Ground Sensor

X represents the type of sensors ordered as per the MLFB ordering code.

DIP Switch - Default Factory Settings

The following table illustrates the default factory settings of DIP switch.

Table 4-8 Default Factory Settings

DIP Switch Settings	Factory Settings	DIP Switch
AR/MF reset (RSP TM)	Disabled	1 - 2
Response time (RSP TM)	40 ms	3 - 5
Auto-reset time (RST TM)	1 h	6 - 7
Fault indication on binary output (FUNC SEL)	X3, X4	8
Low battery configuration on binary output (FUNC SEL)	Disabled	9
Sensors plastic fibre-optic cable test (FUNC SEL)	Disabled	10

4.1.4 Fault Indication

The device indicates both the phase-fault and ground-fault on LEDs and to the remote monitoring units such as SCADA through the 2 binary outputs.

4.1.5 Device Reset

The device can be reset from the fault indication mode by using any one of the following reset methods:

- **Manual Reset** - Press the push button for resetting the device manually.
- **Remote Reset** - Short the remote reset input terminals for a minimum of 1 s to perform the remote reset of the device.
- **230 V AC Reset** - Apply AC 230 V signal to the AC 230 V reset input terminals for 2 s.
- **Auto Reset** - The fault indications are reset automatically after expiry of the auto-reset time set on the device.

4.1.6 Push Button

The following functions are possible by using the push button:

- **Manual Reset** - In fault indication mode, press the push button for resetting the device manually. The manual reset stops the L1, L2, L3, and E LED blinking and switches the binary output from close to open position.
- **Function Check** - Press the push button for more than 1 s (and less than 3 s) and release it. The L1, L2, L3, E, and yellow LED blinks in sequence for 5 s and it indicates that the device is functioning properly.
- **Battery Check** - Press the push button for more than 3 s and release it. The device verifies the status of battery and indicates the battery health state on yellow LED.

4.1.7 Battery Health Condition

The health of the battery can be checked by pressing the push button for more than 3 s and less than 10 s and then releasing it. The battery health state is indicated on yellow LED. When the battery is healthy, the LED glows continuously for 2 s and stops. When the battery is not healthy, the LED blinks for 5 s (1 blink/s).

4.1.8 Blinking Lamp Output

The blinking lamp output is used to indicate phase faults and ground faults in outdoor areas. The blinking lamp is connected to the X2 terminal block of the device and indicates the fault. The blinking lamp output can be connected to a suitable LED blinking lamp of maximum 2.5 mA consumption. For more information, refer to *Figure 4-2*.

4.1.9 Binary Outputs

The device consists of 2 binary outputs (phase and ground). In normal operation, the binary outputs are in open condition. When any fault is detected, the respective binary output changes from open position to close position and remains in the position until the device is reset.

In the 6MD2310-0EX00-0AA0 variant (X represents the type of sensors), 1 NO and 1 NC contact binary outputs are available. When the ground-fault is detected, both the binary outputs change their position from open to close and from close to open and remain in that position until the device is reset.

5 Troubleshooting

5.1 Troubleshooting

This section provides the common problems of SICAM FPI and the recommended solution to resolve the problem.

Observations	Action
The device is not responding	• Remove the housing screw and ensure that the paper strip inserted between the battery and battery-clip during shipment is removed.
Device failed to work as per the DIP switch configuration settings	• Perform the complete function test by pressing the push button for less than 3 s, to apply the DIP switch settings.
Fault current above the threshold value is not detected by the device	• Check the current sensor threshold limit setting on the phase and ground sensor (The fault cannot be detected until the current has exceeded the threshold limit set). • Check the plastic fibre-optic cable connection between the current sensor and the device. • Always ensure that both the ends of plastic fibre-optic cable touch the internal part of current sensor and device. • Perform the function test by pressing the push button for less than 3 s. • Perform the sensors plastic fibre-optic cable test function to ensure the cable healthiness by using the DIP switch.
Device resets immediately after detecting the fault	• Check if the remote reset is activated or the AC 230 V reset input is applied continuously. • Check if momentary fault reset is activated using DIP switches DIP1 and DIP2.
LED indicates the fault condition in device, but the binary outputs do not operate	• Check the battery health by performing battery check. Press the push button for more than 3 s. If battery is not healthy, replace it with a new battery.
The device does not detect any fault even after the current is supplied in phase and ground sensor	• Check the current threshold limits set in the sensors. (The fault cannot be detected until the current has exceeded the threshold limit set on the phase and current sensor).
Fault is detected and the indication is stopped after the fault condition is cleared	• Check the DIP 10 switch setting. Check if the device is in optical input test mode. Revert the device to normal operating mode and execute the functional test.
The ground sensor detects the ground-fault E and LED glows, but the binary output X4, does not operate	• Check if the DIP 8 switch in the device has been set to indicate both the faults on a single binary output X3.
Device is not responding to the optical light input	• Ensure that the sticker pasted on the optical input (rear side) is removed.

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