

IMU100

Insulation Monitor

User Manual

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Standards Compliance



DANGER

This symbol indicates the presence of danger that may result in severe injury or death and permanent equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.



CAUTION

This symbol indicates the potential of personal injury or equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.



DANGER

Failure to observe the following instructions may result in severe injury or death and/or equipment damage.

- Installation, operation and maintenance of the meter should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.
- Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the meter.
- Before connecting the meter to the power source, check the label on top of the meter to ensure that it is equipped with the appropriate power supply, and the correct voltage and current input specifications for your application.
- During normal operation of the meter, hazardous voltages are present on its terminal strips and throughout the connected potential transformers (PT) and current transformers (CT). PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuits energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries, ...etc).
- Do not use the meter for primary protection functions where failure of the device can cause fire, injury or death. The meter should only be used for shadow protection if needed.
- Under no circumstances should the meter be connected to a power source if it is damaged.
- To prevent potential fire or shock hazard, do not expose the meter to rain or moisture.
- Setup procedures must be performed only by qualified personnel familiar with the instrument and its associated electrical equipment.
- DO NOT open the instrument under any circumstances.

Limited warranty

- CET offers the customer a minimum of 12-month functional warranty on the meter for faulty parts or workmanship from the date of dispatch from the distributor. This warranty is on a return to factory for repair basis.
- CET does not accept liability for any damage caused by meter malfunctions. CET accepts no responsibility for the suitability of the meter to the application for which it was purchased.
- Failure to install, set up or operate the meter according to the instructions herein will void the warranty.
- Only CET's duly authorized representative may open your meter. The unit should only be opened in a fully anti-static environment. Failure to do so may damage the electronic components and will void the warranty.

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Chapter 1 Introduction

This manual explains how to use the IMU100 Insulation Monitor. Throughout the manual the term “monitor” generally refers to all models.

This chapter provides an overview of the IMU100 and summarizes many of its key features.

1.1 Overview

IT power supply systems are more reliable than other grounded systems. When the first insulation fault occurs in an IT system, it does not result in electric shock to personnel or power interruption. Therefore, IT systems are widely used in industrial settings where power interruption or electric shock presents substantial risks, such as mining operations, glass manufacturing, electric furnaces and test equipment, metallurgical processing, chemical production, and explosive hazardous areas. However, after the first insulation fault occurs in an IT system, an alarm should be issued promptly, and the fault location should be identified to prevent a second fault. Two fault points could form a fault loop, leading to tripping and a power outage.

CET has developed the IMU100 series Industrial Insulation Monitor specifically for IT power supply systems in the aforementioned industrial fields. This innovative product integrates multiple functions, including real-time insulation resistance monitoring, instant alarms upon faults occurrence, SOE Logs, flexible parameter configuration, efficient communication networking capabilities, and fault localization. When the first single-phase ground fault occurs in an IT system, the IMU100 responds promptly by issuing an alarm signal and precisely identifying the specific circuit where the fault is located. This enables maintenance personnel to locate and repair the fault quickly and accurately, ensuring a continuous and reliable power supply.

The IMU100 Insulation Monitor employs premium hardware design coupled with specialized measurement algorithms. It injects a low-frequency AC pulse signal (with frequency varying according to leakage capacitance levels) between the IT power supply system and ground, enabling precise measurement of both the insulation resistance value and leakage capacitance value to ground in the IT power supply system. It continuously monitors the entire insulation resistance of an IT system during operation and triggers an alarm when the value falls below a preset response value.

1.2 Features

- Large, backlit, easy to read LCD display
- Insulation monitoring in accordance with IEC 61557-8
- Automatic adaptation to the system leakage capacitance
- Insulation monitoring for unearthed AC (0-690V) or DC (0~1000V) system
- The monitoring range for Insulation Resistance is between 500 Ω and 10 M Ω
- 2xDI and 2xDO
- 1x100BaseT Ethernet, 1xCAN and 1xRS-485
- Two separate configurable warning and alarm with range from 1k Ω to 10 M Ω
- Disconnection Monitoring
- Self-Diagnostics
- 256 SOE events time-stamped to 1ms resolution
- Easy installation with DIN-Rail mounting, no tools required

Chapter 2 Installation



Caution

Installation of the IMU100 should only be performed by qualified and competent personnel who have the appropriate training and experience with high voltage and current devices. The device must be installed in accordance with all local and national electrical codes.

During the operation of the device, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

2.1 Appearance

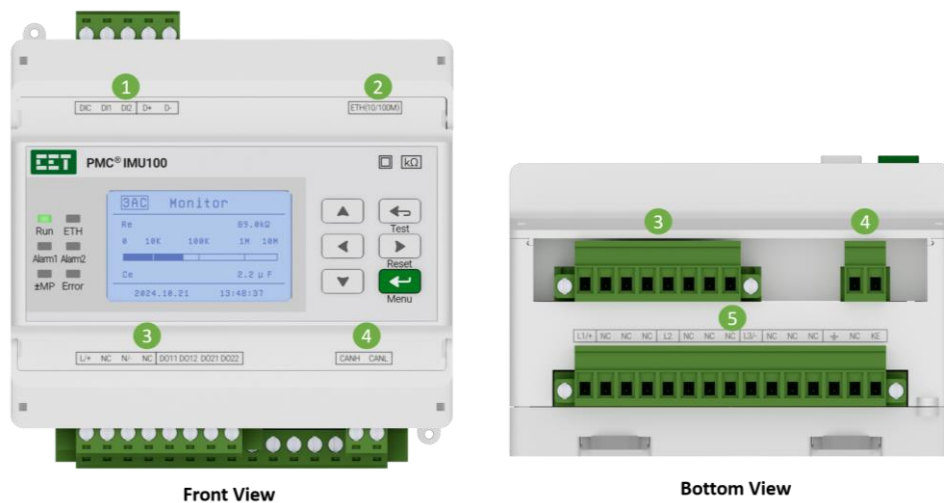


Figure 2-1 Appearance

Area	Label	Description
1	DIC	Digital Input (DI), 24VDC internally wetted.
	DI1	When used for single busbar section coupling control, one of the DI can be used for the bus tie/coupler circuit breaker's normally open (NO) or normally closed (NC) auxiliary contact
	DI2	
	D+	RS-485 Port, for connection to Monitoring System
	D-	
2	ETH	Ethernet Port (RJ45), for connection to Monitoring System and communication with coupled insulation monitors
3	L/+	Device Power Supply
	N/-	
	DO11	2 Digital Outputs for Warning and Alarm
	DO12	
	DO21	
	DO22	
4	CANH	CAN port, for connecting to signal generator IC100 and fault locator ILU100.
	CANL	
5	L1/+	System Terminals for connecting with monitored IT system.
	L2	
	L3/-	
	≡	Ground Terminal.
	KE	

2.2 Installation

The IMU100 should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise sources.

- Before installation, make sure that the DIN Rail is already in place
- Move the installation clips at the back of the IMU100 downward to the “unlock” position
- Align the top of the mounting channel at the back of the IMU100 at an angle against the top of the DIN Rail as shown in the figure below
- Rotate the bottom of the IMU100 towards the back while applying a slight pressure to make sure that the device is completely and securely fixed on to the DIN Rail
- Push the installation clips upward to the “lock” position to secure the IMU100 on to the DIN Rail

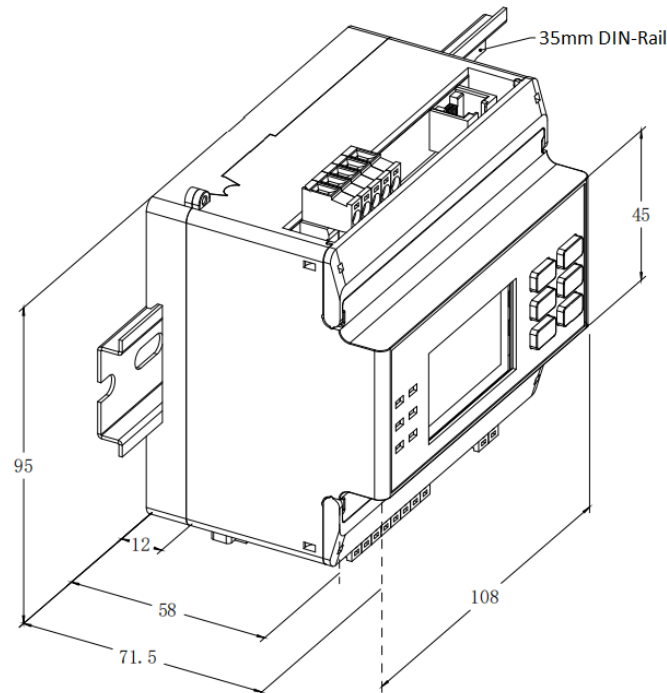


Figure 2-2 Installation



Caution

Only skilled persons are permitted to carry out the work necessary to install, put into service and run a device or system.

Before installing the device and before working on its connections, make sure that the installation has been de-energised. The rules for working on electrical systems must be observed.

- Only operate the device with mounted and locked terminal covers.
- If the terminals L1/+, L2, L3/- of the device are connected to a live IT system, do not disconnect terminals KE and E from the protective conductor PE.
- Connect terminals KE and PE individually to the protective earth conductor PE.

2.3 Wiring Connections

2.3.1 Connection to a DC System

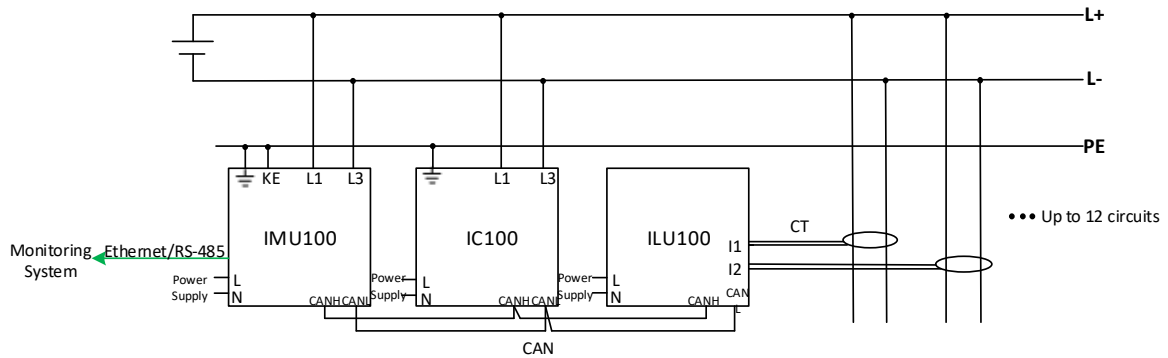


Figure 2-3 Connection to DC System

2.3.2 Connection to an AC System

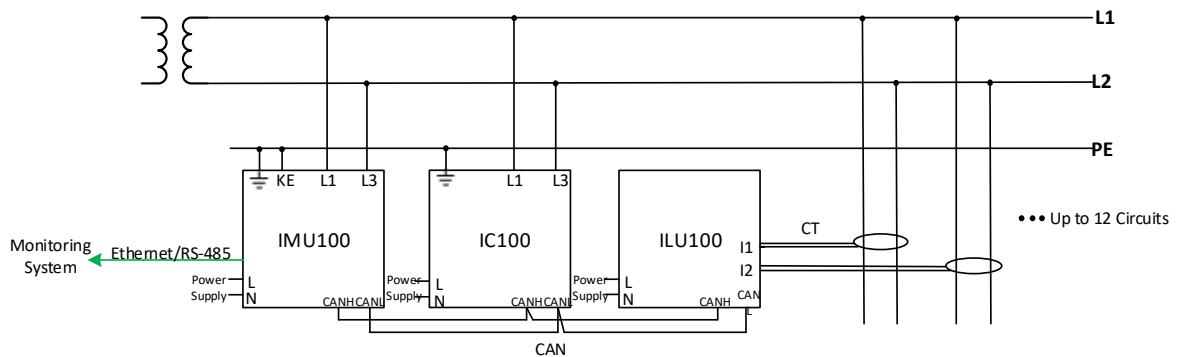


Figure 2-4 Connection to AC System

2.3.3 Connection to a 3(N)AC System

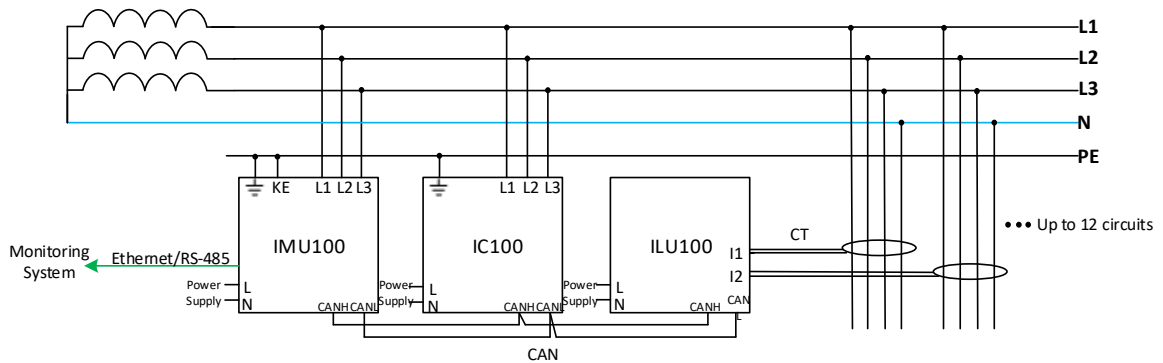


Figure 2-5 Connection to 3(N)AC System

2.3.4 Wiring

Power Supply Wiring

For AC systems: Connect Line (L) to L/+, Neutral (N) to N/-.

For DC systems: Connect Positive (+) to L/+, Negative (-) to N/-.

System Voltage Input Wiring

1. IT System Power Input (L1, L2, L3):

- DC System (Single Phase): Connect L1 to Positive (+), L3 to Negative (-), L2 open.
- AC System (Single Phase): Connect L1 to Line (L), L3 to Neutral (N), L2 open.
- AC System (Three Phase): Connect L1 to Phase A (L1), L2 to Phase B (L2), L3 to Phase C (L3).

2. Grounding Terminals (⏏, KE):

- Must be connected separately using two grounding wires to the PE (Protective Earth) system.

- The device monitors for ground wire breaks.
- Disconnecting either or both $\oplus$ and KE from PE will trigger an alarm.
- Shorting $\oplus$ and KE together before connecting to a single PE wire is not compliant.

▪ **Communication Ports Wiring**

1. Ethernet Port:
 - Use standard Ethernet cable.
 - Connect to network switch, HMI, or coupled IMU100 devices as required.
2. RS-485 Port:
 - Terminals D+ (A) and D- (B).
 - Use shielded twisted pair cable.
 - Maximum 32 devices on one bus, max bus length 1200m. Ensure correct polarity. Install a 120 Ω termination resistor at the far end of the bus.
3. CAN Port:
 - Terminals CANH (High) and CANL (Low).
 - Use shielded twisted pair cable.
 - Maximum 32 devices on one bus, max bus length 500m. Ensure correct polarity. Install a 120 Ω termination resistor at each end of the bus.

Chapter 3 Front Panel



Figure 3-1 Main Display

3.1 Indicators

LED Indicator	Color	Status	Description
Run	Green	Blinking	Device is running normally
ETH	Green	Blinking	Ethernet Comm. Activities
Alarm1	Yellow	On	The insulation resistance of the IT system falls below the set warning or alarm response value.
Alarm2	Yellow	On	
±MP	Red	On	Injecting positive insulation pulse
	Green	On	Injecting negative insulation pulse
Error	Yellow	On	Device self-test error or wiring fault

Table 3-1 Front Panel LED Indicators Description

3.2 Buttons

Buttons	Data Display	Setup Menu
	Pressing this button to move up circularly or move to previous page.	If a numeric parameter is already selected, pressing this button increments a numeric value. If an enumerated parameter is already selected, pressing this button goes back to last enumerated value in the selection list.
	Pressing this button to move left circularly.	If a numeric parameter is already selected, pressing this button shifts the cursor to left. If the Curson is shifted to the end of the left, pressing this button returns to the first right position.
	Pressing this button to move down circularly or move to next page.	If a numeric parameter is already selected, pressing this button decrements a numeric value. If an enumerated parameter is already selected, pressing this button advances to next enumerated value in the selection list.
	Pressing this button to move right circularly.	If a numeric parameter is already selected, pressing this button shifts the cursor to right. If the Curson is shifted to the end of the right, pressing this button returns to the first left position.
	Pressing this button goes back to previous level menu. When inside the first pate, long-pressing this button to execute self-diagnostic.	Pressing this button cancel the entered value or current operation.
	Before a sub-menu or operation is selected, pressing this button enters sub-menu or execute the chosen operation.	After changing the parameter, pressing this button saves the new settings into memory.

Table 3-2 Button Function

3.3 Display and Configuration

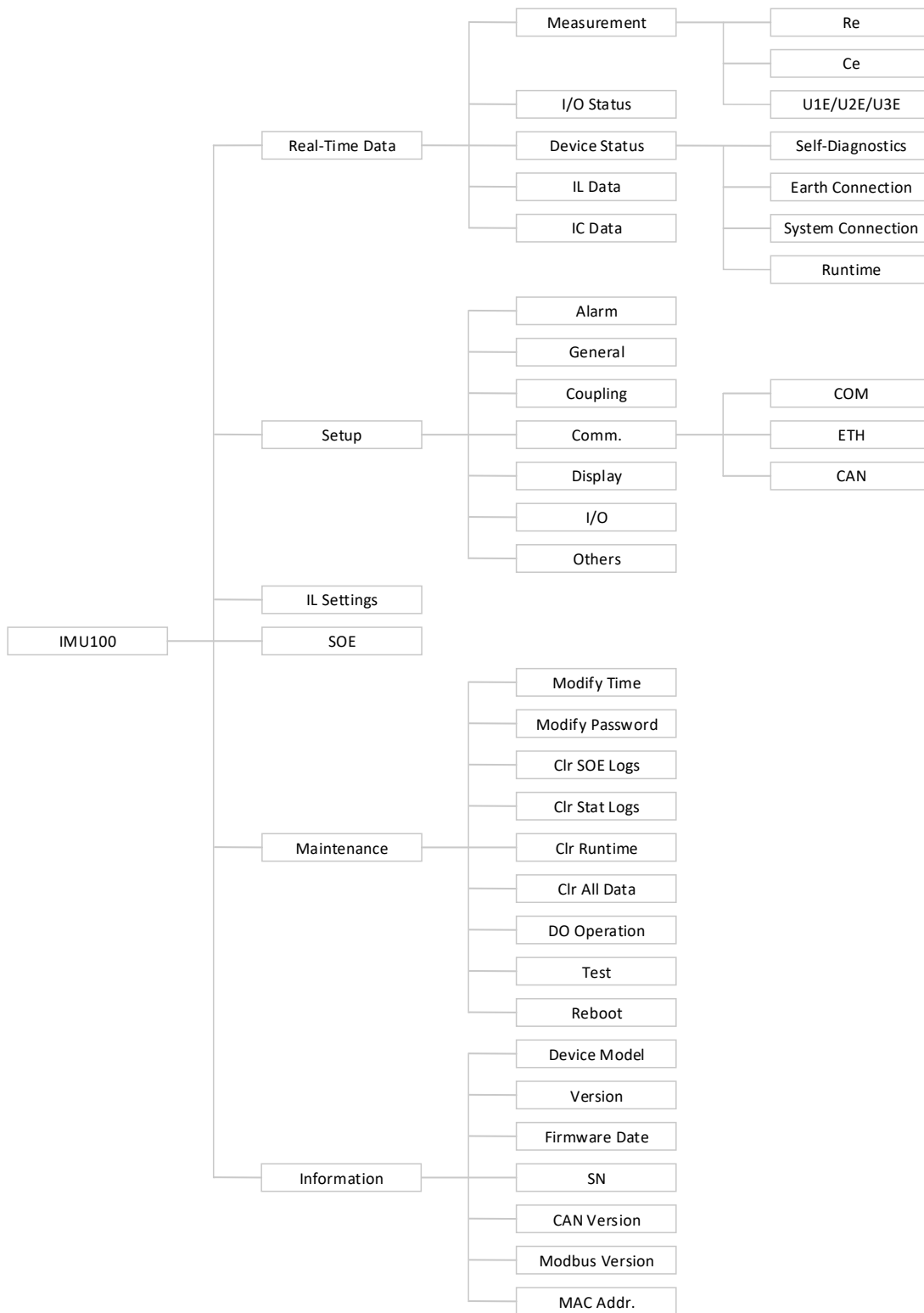


Figure 3-2 Front Panel Display

Chapter 4 Function Description

4.1 Single Busbar Section Coupling Function

The IMU100 supports single busbar section coupling function. The NO or NC auxiliary contact of the bus tie/coupler circuit breaker should be connected to a DI port of the IMU100 (#2). When the IMU100 detects the bus tie breaker is closed (sections coupled), it stops injecting pulses and enters standby mode. Its internal isolation relays open, ensuring complete galvanic isolation between the device and the IT system, maintaining phase-to-phase and phase-to-ground insulation integrity. See Figure 8-1 for a schematic.

- IMU100 #1 is configured as the **Coupling Master**.
- IMU100 #2 is configured as the **Latching Coupling Slave**.
- When the bus tie breaker is closed (sections coupled): Master (#1) is active; Slave (#2) is in standby.

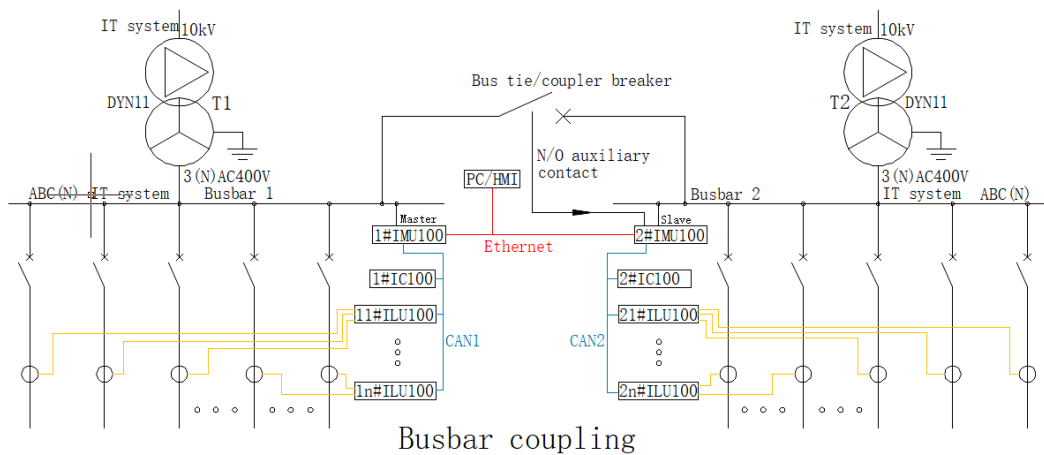


Figure 4-1 Single Busbar Section Coupling Schematic

4.2 Measurements

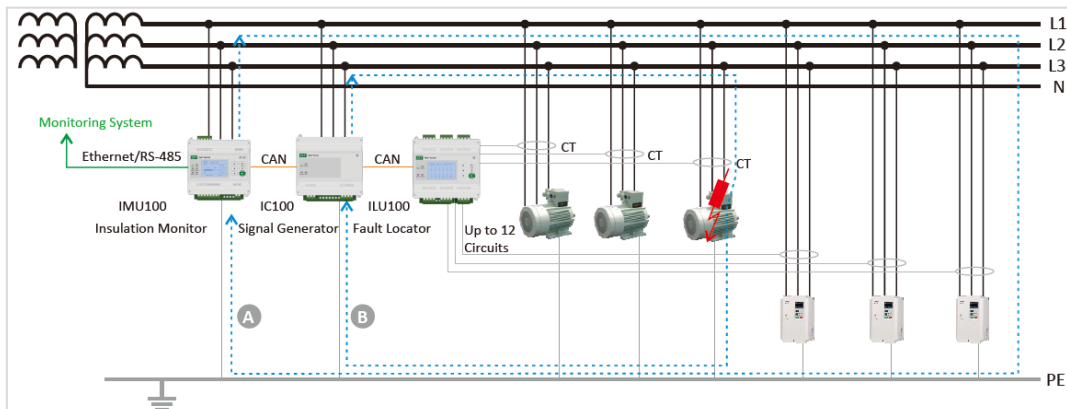
The IMU100 provides Insulation Resistance to ground (Riso) and Leakage Capacitance to ground (Ce) by injecting the low-frequency pulse to the IT system.

- Measurement Pulse Voltage U_m : $\pm 40V$
- Internal DC Resistance R_i : $\geq 126k\Omega$
- Measurement Pulse Current I_m : $\leq 317.46\mu A$

4.3 Communications

The IMU100 comes standard with one Ethernet Port, one RS-485 port and one CAN port for integration into power monitoring networks:

- The Ethernet port and RS-485 port are used for integrating the IMU100 to a monitoring system.
- The CAN port is used for communications between the signal generator IC100 and the insulation fault locator ILU100.



4.4 SOE Log

The IMU100's SOE Log can store up to 256 events such as Power-on, Power-off, Warnings, Alarms, Setup changes and Self-Diagnostics in its non-volatile memory. If there are more than 256 events, the newest event will replace the oldest event on a First-In-First-Out basis.

- Power-on
- Power-off
- Warning Active
- Warning Inactive
- Alarm Active
- Alarm Inactive
- Setup changes via Front Panel
- Self-Diagnostics
- Ground Wiring Error
- System Wiring Error

4.5 Time Synchronization

The Monitoring System is configured to provide regular time synchronization by broadcasting time-sync packets over the Ethernet or RS-485 of the IMU100. Further, the IMU100 is equipped with a battery-backed real-time clock. If the supply power is lost or removed, the internal back-up battery keeps the real-time clock running until power is restored.

Chapter 5 Technical Specification

IT System		
Nominal Voltage U_n		0~690V 3AC/AC, 0~1000V DC
(AC) Nominal Frequency f_n		50Hz/60Hz
Power Supply		
Standard		95~250V AC/DC, 47~440Hz
Burden		<7W
Inputs and Outputs		
Digital Input (DI)		2 channels, 24VDC internally powered
Digital Output (DO)		DO1, DO2: 8A @ 250VAC or 24VDC, Normally Open (NO) contact
Communications		
Port		1xRS-485 + 1xEthernet + 1xCAN
Protocols		Modbus-RTU, Modbus-TCP, CAN 2.0
Insulation Monitoring		
Insulation Resistance	Range	500Ω ~ 10MΩ
	Accuracy	500Ω ~ 10kΩ: ±1kΩ; 10kΩ ~ 10MΩ: ±10%
Leakage Capacitance	Range (Ce)	AC/3AC: 0~300uF; DC: 0~200uF
	Accuracy (Ce)	±10 μF or ±10%
Voltage	Range	0~690V 3AC/AC, 0~1000V DC
	Accuracy	± 5V or ±5 %
Response Time (Ce=1μF)		< 10 s
Warning/Alarm Range		1kΩ~10MΩ
Measuring Circuit		
Measuring Voltage U_m		±40V
Measuring Current I_m		≤317.46μA
Internal DC Resistance R_i		≥126kΩ
Permissible Extraneous DC voltage U_{fg}		≤480V
Environmental Conditions		
Operating Temp.		-25°C~+70°C
Storage Temp.		-40°C ~+85°C
Humidity		5%~95%
Atmospheric Pressure		70 kPa~110 kPa
Impulse Voltage/Pollution Degree		9.6/III
EMC/EMI		Compliant with IEC 61326-2-4

Chapter 6 Standards Compliance

IEC 61557-8: 2007 Electrical safety in low-voltage distribution systems up to 1000 Va.c. and 1500 Vd.c.- Equipment for testing, measuring or monitoring of protective measures - Part 8: Insulation monitoring devices for IT systems

IEC 61557-9: 2009 Electrical safety in low-voltage distribution systems up to 1000 Va.c. and 1500 Vd.c.- Equipment for testing, measuring or monitoring of protective measures - Part 9: Equipment for insulation fault location in IT systems

IEC 61326-2-4: 2020 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-4: Particular requirements - Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8: 2014 and equipment for insulation fault location according to IEC 61557-9: 2023.

Chapter 7 Contact Us

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