iRelay 51-S

Intelligent Protection Relay

www.cet-global.com

iRelay 51-S Intelligent Protection Relay

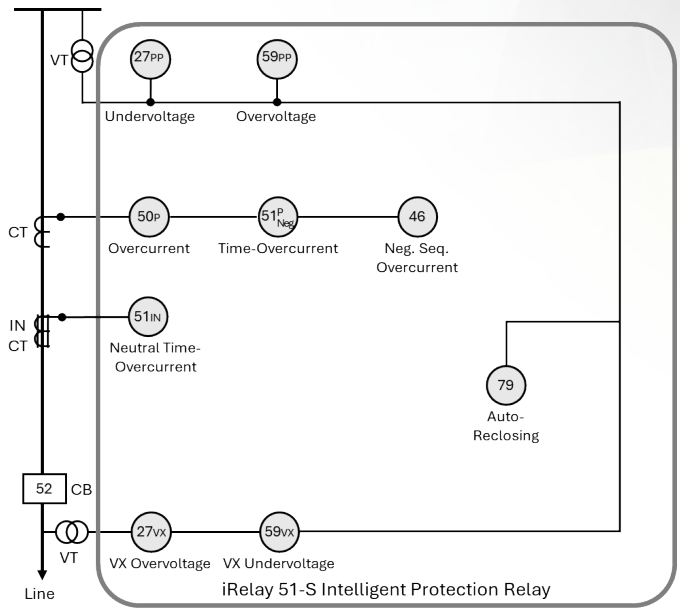
Overview

iRelay 51-S is an advanced intelligent protection relay that integrates protection, control, measurement, supervision and automation functions into a single device. Housed in a compact 174.35x80.35x96.6mm casing, it features a backlit Dot-Matrix, intuitive LCD display for easy navigation, along with additional I/O options. Combining maximum reliability with exceptional functionality and flexibility, the iRelay 51-S is ideal for various applications in LV or MV Energy Distribution, including Feeders, Busbar, Transformers, Capacitor Bank and Motors.

Typical Applications

- 0.4-20kV Ring Main Units, Gas-Insulated Switchgear, Distribution Stations and Switching Stations
- Incoming Line Protection, Distribution Transformer Protection and Feeder Protectiont

Functional Diagram



Basic Features

- Large, backlit LCD for data viewing, relay control, diagnostics and configuration
- LEDs for trip/alarm and breaker status indication and fault type
- 32-bit Dual-Core CPU, non-volatile memory
- Compact installation size
- Supports a 24VDC or 48VDC auxiliary power supply mode
- Waveform Recording, SOE, Motor Start Log
- Supports Modbus RTU

Inputs and Outputs

- 3xProtection Voltage Input: VA, VB, VC
- 4xProtection Current Input: IA, IB, IC and IN
- 1xNeutral Current Input (IN) for standard ground fault protection
- 1xAuxiliary Voltage Input: VX
- 11x24VDC Digital Input: IN1~IN11 (IN10 connected to the circuit breaker's trip position, IN11 connected to the circuit breaker's close position)
- 5xDigital Output, Dry Contact:
  - OUT1: Normally Open (NO) or Normally Closed (NC)
  - OUT2~OUT5: Normally Open (NO)

Metering and Monitoring

- Primary metering for Ua, Ub, Uc, Uab, Ubc, Uca, Aux. Voltage Ux, Ia, Ib,Ic, In, Frequency, Aux. Frequency, Per-phase and Total P, Q, S and PF
- Secondary metering for UA, UB, UC, UAB, UBC, UCA, Aux. Voltage UX, Voltage Sequences U1, U2, 3U0, IA, IB, IC, IN, Current Sequences I1, I2, 3I0, Frequency, Aux. Frequency, P, Q, S, PF Total, Per-phase P and Q, Accumulation of Inverse-time Protection (%): IA/IB/IC, 3I0
- Energy metering for kWh, kvarh Import/Export
- Voltage/Current Transformer circuit supervision
- Trip/Start or Open/Close circuit supervision requiring two Digital Inputs for each circuit breaker pole

Data and Event Recorders

Waveform Recorder

- 8 latest waveform logs of Current, DI/DO Status trigged by Protection Start/Operation/Return or remote control
- 8 cycles for pre-fault (2 cycles x 32 samples/cycle) and post-fault (6 cycles x 16 samples/cycle)
- Stored in non-volatile memory and retrievable through Communication

SOE Log

- 256 FIFO time-stamped with characteristic value
- I/O Changes, Protection Logs, Power On/Off, Setup Changes, Time Sync., Device Operations and Self-diagnostics, etc.
- Timestamp and characteristic data are recorded

Protection Functions

- Comprehensive protection functions with reliable performance and fast response
- **Current Protection**
  - Inrush Current Blocking (68H2)
  - Instantaneous Overcurrent Protection (50P-1)
  - Definite Time Instantaneous Overcurrent (50P-2)
  - Phase Overcurrent Protection (Stage I, II) (50P-3/4)
  - Overload Protection (50P-5)
  - Inverse Time Overcurrent Protection (51P)
  - Zero Sequence Overcurrent Protection (Stage I, II, III) (50N-1/2/3)
  - Zero Sequence Inverse Time Overcurrent (51IN)
  - Negative Sequence Overcurrent Protection (46)
  - Switch On To Fault Acceleration Protection (SOTF)
- **Voltage Protection**
  - Undervoltage Protection (27PP-1/2, 27VX)
  - Overvoltage Protection (59PP-1/2, 59VX)
  - Zero Sequence Over Voltage (59VL)
- **Others**
  - Auto Reclosing (79)
  - Loss of Potential (LOP)
  - CT Monitoring (CTS)
  - Trip Circuit Supervision (74TC)
  - Digital Input Protection IN1~ IN7
  - Block ATS Output
  - Wiring Diagnosis Function

Communication

- One optically isolated RS-485 ports with Baud Rate from 2.4 to 38.4 kbps
- Modbus RTU protocol

Time Synchronization

- Battery-backed Real-time clock @10ppm (error <1s/day)
- Time Sync. via RTC and Modbus

System Integration

- The iRelay 51-S is supported by CET's PecStar® iEMS
- The iRelay 51-S can be easily integrated into other 3rd party systems via Modbus RTU protocol

Technical Specifications

Voltage Inputs (VA, VB, VC, VN, VX, VXN)	
Nominal (UN)	100VAC (L-L), 380 VAC (L-L)
Range	0.01-1.5UN (L-L)
Burden	≤ 0.5VA/per phase
Overload	1.4xUN continuous, 2xUN for 10s
Current Inputs (IA, IB, IC, IN)	
Nominal (In)	5A or 1A
Burden	≤ 1VA/per phase @ 5A ≤ 0.5VA/per phase @ 1A
Overload	2xIn continuous, 10xIn for 10s, 50xIn for 1s
Frequency	50Hz/60Hz
Power Supply (L/+, N/-)	
Standard	88-264 VAC/DC, 50/60Hz
Optional	48VDC or 24VDC
Burden	≤ 4W
Digital Inputs (IN1-IN11, COM)	
Type	Dry contact, 24VDC internally wetted
Hysteresis	1ms
Digital Outputs (OUT1 to OUT5)	
Rated Voltage	250VAC/24VDC
Turn-on Capacity	5A for continuous, 30A for 0.2s
Active Time	< 10ms
Return Time	< 5ms
Breaking Capacity	50W (L/R = 0.04s)
Terminals Installation Torque	
Current Inputs	0.8 N·m
Others	0.5 N·m
Environmental Conditions	
Operating Temperature	-25°C to 70°C
Storage Temperature	-40°C to 85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	70 kPa to 110 kPa
Altitude	< 3000m
Mechanical Characteristics	
Panel Cutout	151x70 mm
Unit Dimensions	174.35 x 80.35 x 96.6 mm
Front Panel IP Rating	IP40

Operating Range & Accuracy

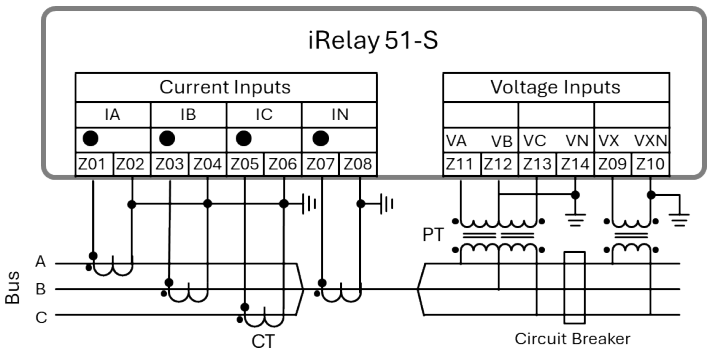
Operating Range	
UN	0.5V~456V (L-L)
Ip (Phase Current)	0.04In-20In
IN	0.04A-20A
Frequency	45Hz-65Hz

Preotection Setting Accuracy	
Voltage	≤±2.5% or 0.01UN
Current	≤±2.5% or ±0.01In

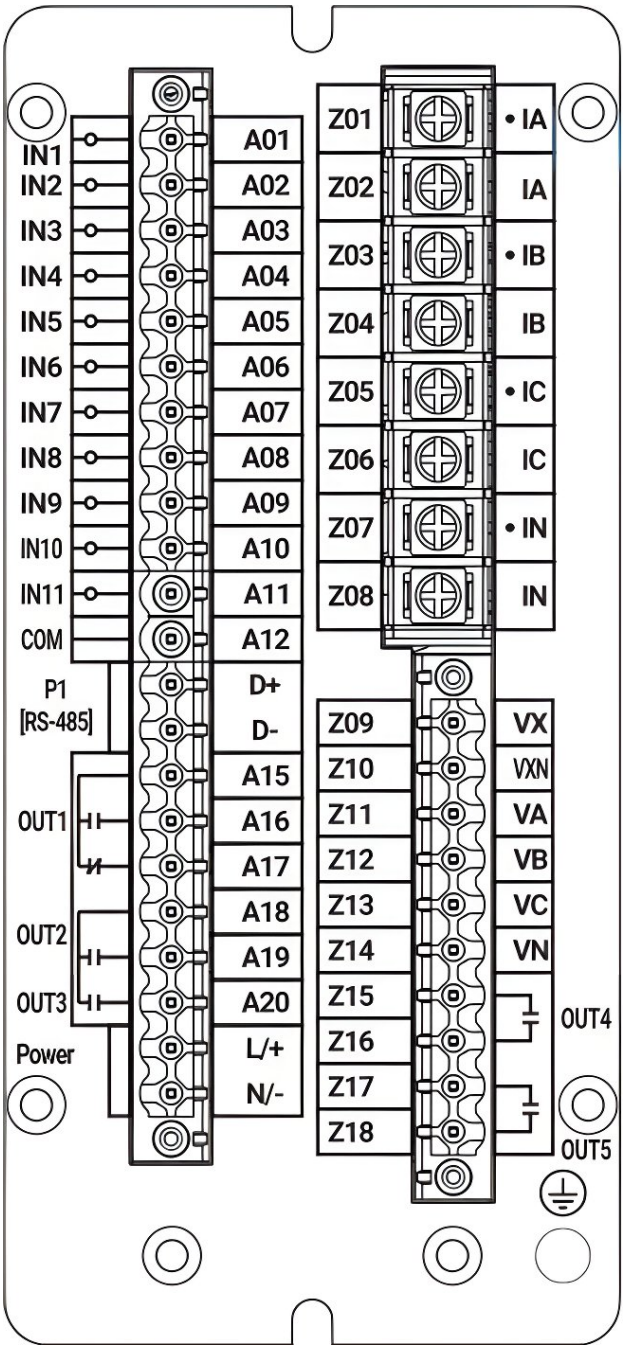
Action Time Accuracy	
Inherent Action	≤40ms (impose 1.2x action setting excitation for over-protection, and 0.8x action setting excitation for under-protection)
Definite-time Action	≤40ms or 1% (impose 1.2x action setting excitation for over-protection, and 0.8x action setting excitation for under-protection)
Inverse-time Action	≤5% (1 - I/(I_{set}*80)) or ±40ms, where I is the imposed exciting current, while I_{set} is the set current value

Measurement Accuracy		
Parameters	Accuracy	Resolution
Voltage	±0.5%	0.01V
Current	±0.5%	0.001A
P, Q	±1.0%	0.001kX
PF	±1.0%	0.001
Frequency	±0.01Hz	0.001Hz
kWh	Class 1	1kWh
kvarh	Class 2	1kvarh

Connection Diagram



Rear Terminals



Index	Label	Description
A01-A12	IN1-IN11, COM	Digital Inputs
A15-A20	OUT1-OUT3	Digital Outputs
L/+, N/-	L/+, N/-	Power Supply
Z01-Z08	•IA, IA, •IB, IB, •IC, IC, •IN, IN	Current Inputs
Z09-Z14	VX, VXN, VA, VB, VC, VN	Voltage Inputs
Z15-Z18	OUT4-OUT5	Digital Outputs
D+, D-	D+, D-	RS-485 port
	GND	Chassis Ground Input

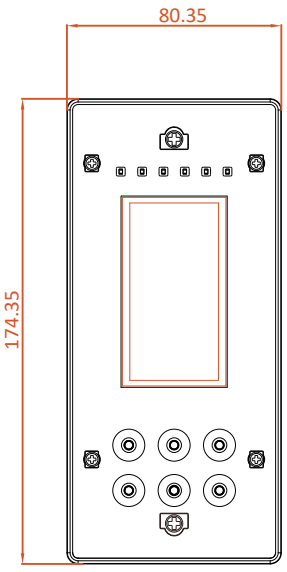
Standards of Compliance

Safety Requirements	
CE LVD 2014/35/EU	EN 61010-1: 2010 + A1: 2019 EN IEC 61010-2-030: 2021 + A11: 2021
Electrical Safety in Low Voltage Distribution Systems up to 1000Vac and 1500 Vdc	IEC 61557-12: 2021 (PMD)
Insulation AC Voltage Insulation Resistance Impulse Voltage	EN 61010-1: 2010 +A1: 2019 2kV @ 1 minute >100MΩ 5kV, 1.2/50μs

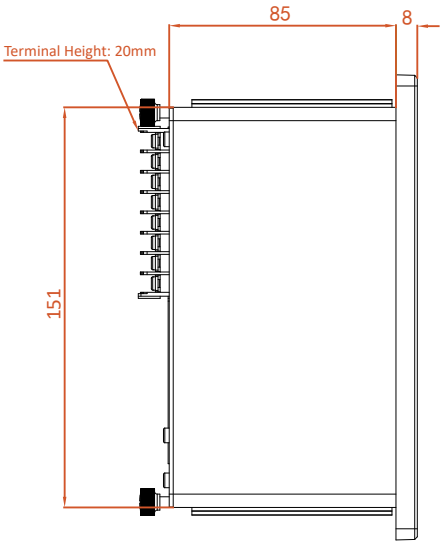
Electromagnetic Compatibility CE EMC Directive 2014/30/EU (EN IEC 61326: 2021 + EN IEC 61326-2-3: 2021)	
Immunity Test	
Electrostatic Discharge	EN 61000-4-2: 2009
Radiated Fields	EN IEC 61000-4-3: 2020
Fast Transients	EN 61000-4-4: 2012
Surges	EN 61000-4-5: 2014 +A1: 2017
Conducted Disturbances	EN 61000-4-6: 2014
Magnetic Fields	EN 61000-4-8: 2010
Impulse Magnetic Fields	EN 61000-4-9: 2016
Voltage Dips and Interruptions	EN IEC 61000-4-11: 2020
Ring Wave	EN 61000-4-12: 2017
Ripple on DC Input Power Port	EN 61000-4-17: 2019
Damped Oscillatory Wave	EN IEC 61000-4-18: 2019
Power Frequency Immunity	IEC 60255-26: 2023
Voltage Ramp Test	IEC 60255-26: 2023
Emission Test	
Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	EN 55011: 2016 + A1: 2017 + A11: 2020 + A2: 2021
Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements	EN 55032: 2015 + A11: 2020 + A1: 2020
Limits for Harmonic Current Emissions for Equipment with Rated Current ≤16 A	EN IEC 61000-3-2: 2019 + A1: 2021
Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current ≤16 A	EN 61000-3-3: 2013 + A1: 2019 + A2: 2021
Emission Standard for Industrial Environments	EN IEC 61000-6-4: 2019

Mechanical Tests	
Vibration Test	IEC 60255-21-1
Shock Test	IEC 60255-21-2
Seismic Test	IEC 60255-21-3

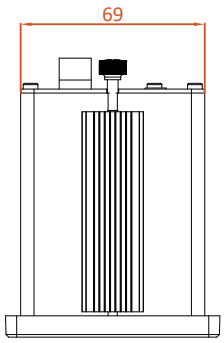
Dimensions (Unit: mm)



Front

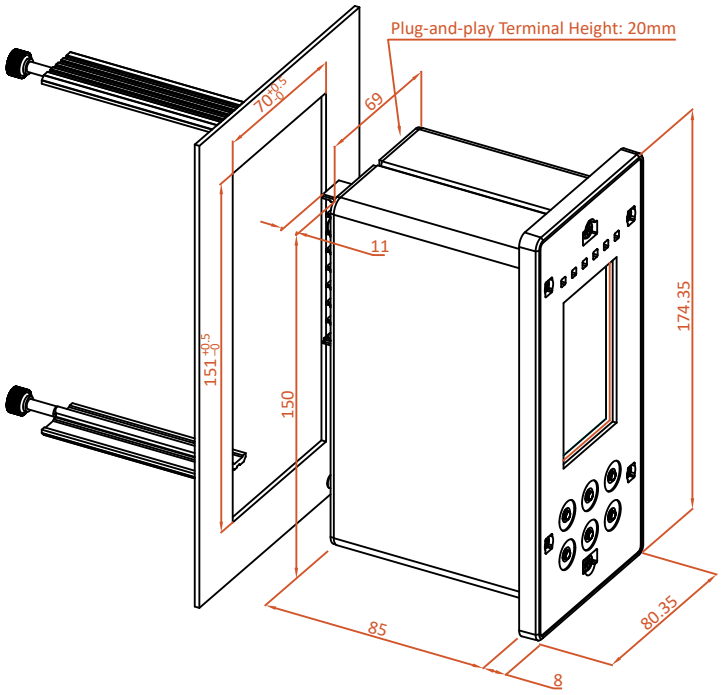


Side

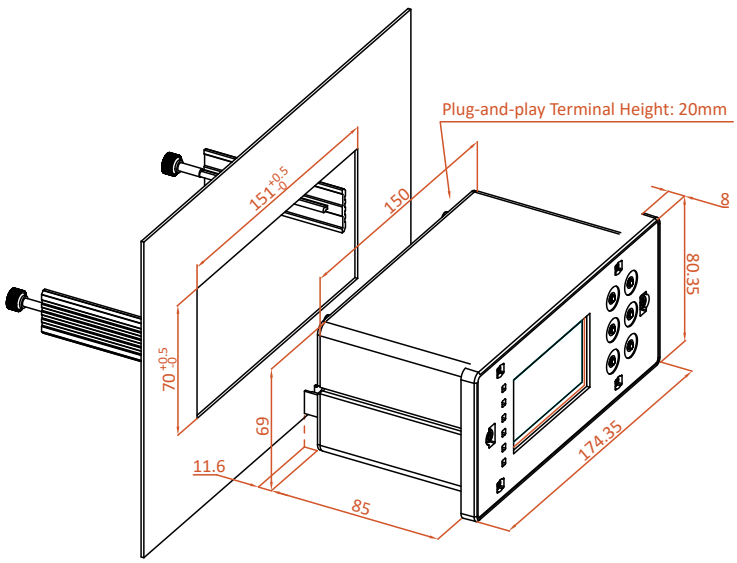


Bottom

Installation (Unit: mm)



iRelay 51 (Vertical)



iRelay 51 (Horizontal)

Ordering Information

Product Code	Description
iRelay 51 Intelligent Protection Relay	
Basic Function	• Rated VLL Nominal Input: 100V/380VAC, 570VAC Max. • Protection Categories: Feeder, Incoming, Transformer • Hardware Spec: 32-bit CPU with 12-bit A/D, Metal Enclosure, 11xDI, 5xDO, 1xRS-485 • Protocols: Modbus RTU • Features: Small footprint, Easy installation, Waveform Recording, SOE
Function Selection	S — Feeder / Incoming / Transformer Protection
Mounting Type	S — Vertical mounting H — Horizontal mounting
Language	E — English
Ip (Phase Current)	5 — 5A 1 — 1A
IN (Neutral Current)	1 — 5A/1A Compatible
Power Supply	4 — 48/24V DC 2 — 88-264V AC/DC
System Frequency	5 — 50Hz 6 — 60Hz
DI/DO	A — 11DI+5DO, DI Internal Excitation (24 VDC)
Communication Ports	A — 1xRS-485
iRelay 51 - S S E 5 1 2 5 A A	iRelay 51-SSE5125AA (Standard Model)

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Your Local Representative

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