CSC-150

Distributed Busbar Protection

IED

Product Guide

BEIJING SIFANG AUTOMATION CO., LTD.

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Note: the company reserves the right to amend the instruction. If equipment does not agree with the instruction at anywhere, please contact our company in time. We will provide you with corresponding service.

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CSC-150 and CSC-211 together constitute a distributed busbar current differential protection suitable for conventional substations. It is a selective, reliable and high speed protection for busbar faults and break failure in medium, high and extra-high voltage substation with various possible busbar configurations, including single bus, single busbar with one-section, double-busbar, double-busbar with one-coupler, double-busbar with one-section and two-coupler, double-busbar with two-section and two-coupler, double-busbar with bypass and breaker-and-a half.

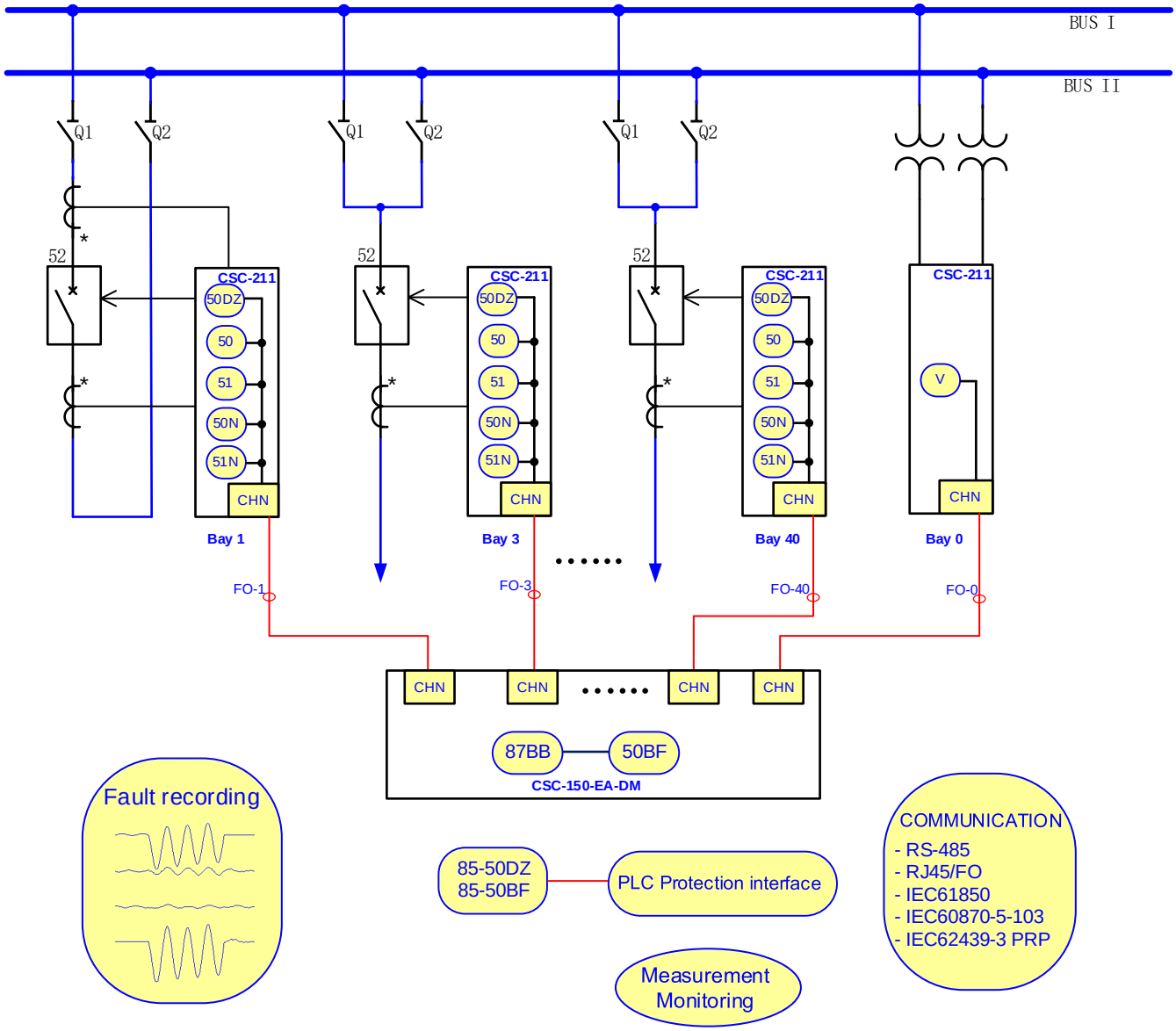
Powerful capability to cover following applications

- Easy expansion capability, up to 40 bays
- Comprehensive functionality including phase segregated low-impedance current differential protection, breaker failure protection, overcurrent protection, earth overcurrent protection and dead zone protection, etc.
- Voltage blocking is an option for the current differential protection and breaker failure protection, which will improve reliability of current differential protection and breaker failure protection
- With CT circuit supervision function, once CT circuit failure is detected, the user can choose CT failure alarm or discrimination zone differential protection blocking
- With the disconnector position status monitor and memory function, the device will delay the alarm and operate according to the original normal state

CSC-150 Busbar Protection IED

- LCD can display real-time main wiring diagram, the status of each breaker and disconnector, current and power flow, etc.
- Bay unit CSC-211 works in the distributed busbar protection system, also as feeder backup protection IED
- Robust hardware with excellent EMC performance and IP54 protection under -40℃ to +70℃ operating temperature

Application



Function

Function	ANSI Code	Qty.	Description
Busbar differential protection	87BB	1	Phase current differential protection with low-impedance principle, check zone and discrimination zone, voltage control element, detection of CT saturation
Single/ three-pole breaker failure protection	50BF	40	For each bay; 2 stages, re-tripping and busbar tripping in sequence, and DTT at 2nd stage
Overcurrent protection	50/51	40	For each bay; 2 stages, definite-time characteristic
Earth fault protection	50N/51N	40	For each bay; 2 stages, definite-time characteristic
Dead zone protection	50DZ	40	For each bay, 1 stage; DTT
CT secondary circuit supervision		40	1 stage for alarm, 1 stage for enable/ disable blocking differential protection
VT secondary circuit supervision	97FF	1	
Disturbance recording			Maximum 5s in 1 recording, up to 32 recordings
Programmable logic			
Self diagnostic			
Time synchronization			IRIG-B, IEEE1588, SNTP, PPS, PPM

Note 1: the number in "Qty." column is the maximum quantity of function module that can be offered.

Communication

- Support MMS, GOOSE service of station layer and bay layer application in accordance with IEC61850-8-1
- 3 100Base-TX copper Ethernet ports, or 2 100Base-FX optical Ethernet ports and 1 100Base-TX copper Ethernet port for SAS
- Up to 41 100Base-FX optical Ethernet ports linking with bay units
- 2 RS-485 serial ports, 1 RS-232 print port
- Support all main protocols, include:
  - IEC 61850-8-1
  - DNP 3.0
  - MODBUS
  - IEC 60870-5-103
  - Redundancy protocol IEC 62439-3 PRP
- Support several time synchronizing way, include:
  - IRIG-B modulated electrical/ optical
  - PPS, PPM
  - SNTP
  - IEEE 1588

Tools

AESP tools

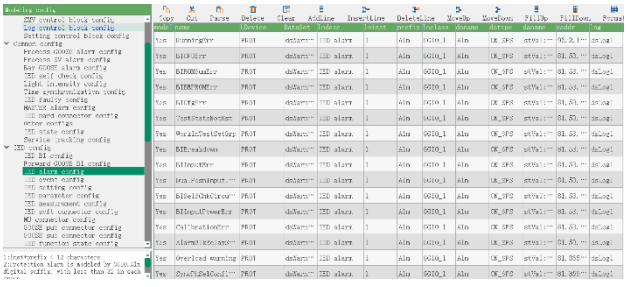
AESP is the user-friendly engineering and commissioning software. The software is applicable to all protection and BCU IEDs of Sifang. It provides integrated configuration and monitoring functions.

Functions

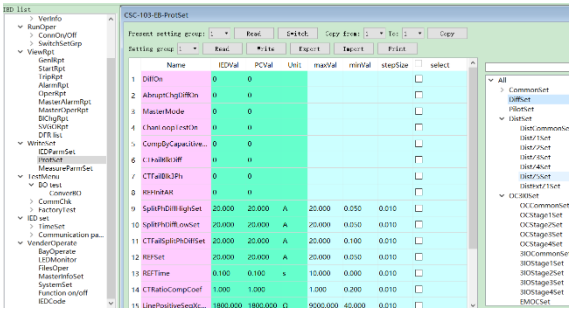
- Setting and parameter
- Single line diagram visualization
- Disturbance extraction and analysis
- Real-time measurement visualization
- Programmable logic editor
- IED 61850 configurator
- IED configuration by IO matrix;
- Online test
- Project archiving, export, and import

Features

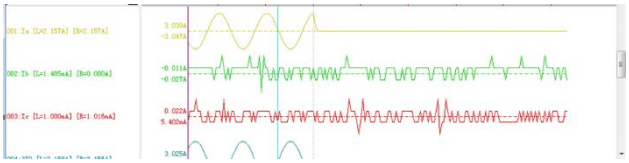
- 1 software for all tasks, 1 software for all IEDs
- Easy management of relays in project
- Flexible graphic programmable logic instead of programming
- Powerful fault record analysis with standard Comtrade file



IED 61850 configurator

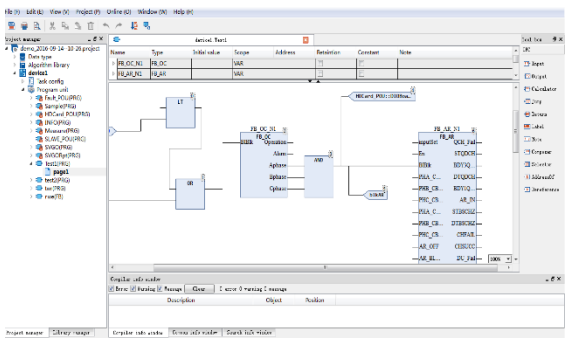


Setting and parameter

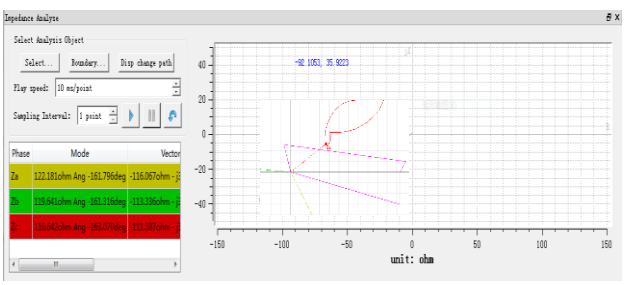


Fault recorder analysis

Fault recorder analysis



Graphic programmable logic

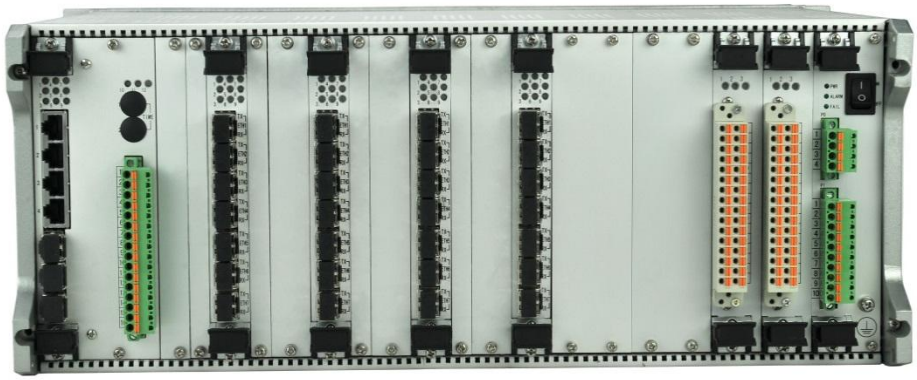


Impedance analysis

Hardware

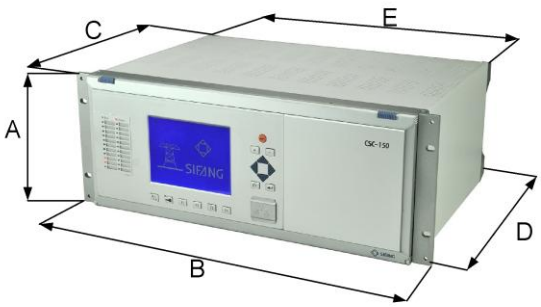
- Up to 6 AC current inputs in the section or coupler bay unit, 3 AC current inputs in other bay units, 1/5 A compatible
- Up to 9 AC voltage inputs in bus-voltage bay unit
- Up to 16 binary inputs, 12 binary outputs in each bay unit
- Up to 28 binary inputs, 16 binary outputs in main unit
- Up to 43 Ethernet optical ports in main unit, 2 ports for SAS, 41 ports for communication with all bay units
- Up to 3 RJ45 Ethernet ports in main unit for SAS
- Up to 2 RS-485 ports and 1 RS-232 print port in main unit
- 1 IRIG-B / Pulse time synchronization port in main unit
- 1 front RJ45 for debugging
- 4.7-inch LCD in main unit, 4.2-inch LCD in each bay unit, 320x240 pixels
- 22 programmable LEDs
- Up to 4 customer defined function keys

Front view of the main unit



Rear view of the main unit

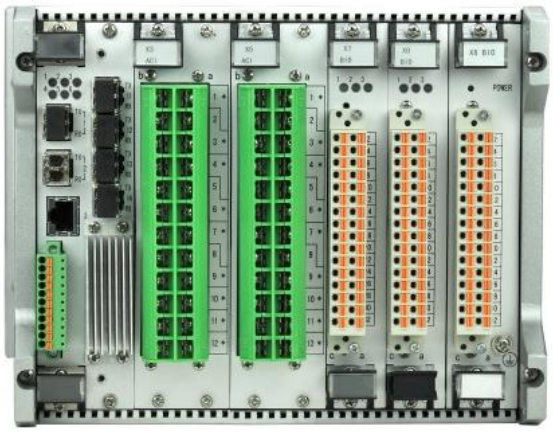
Hardware



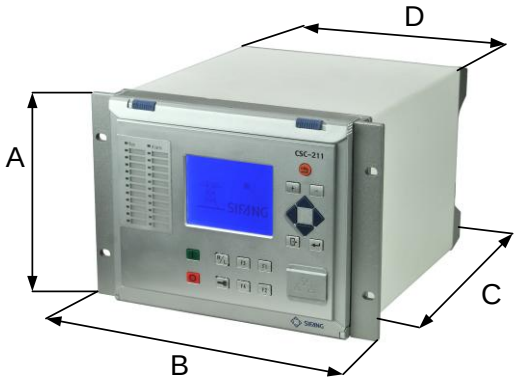
A	177.4
B	482.2
C	322.55
D	343.8
E	446.8
Unit	**mm**

Dimension of the main unit

Front view of the bay unit



Rear view of the bay unit



A	177.5
B	258
C	286
D	226
Unit	**mm**

Dimension of the bay unit

Specification

AC current measurement in bay unit

Item	Data
Rated current I_r IEC60255-1	1/5 A, settable
Measuring range of protection CT	(0.05 ~ 40) I_r
Measuring range for measurement CT	(0.05 ~ 2) I_r
Burden for CT (per phase) IEC60255-27	≤0.05VA at I_r=1A; ≤0.25VA at I_r=5A
Thermal withstand of protection CT (per phase) IEC60255-27	4 I_r continuously; 30 I_r for 10s 100 I_r for 1s

AC voltage measurement in bay unit

Item	Data
Rated voltage $V_{r.ph-ph}$ IEC60255-1	100~120V_{ac}, settable;
Measuring range of VT V_{ph-e}	0.4V ~ 180V
Nominal frequency	50Hz, 60Hz
Burden for VT (per phase) IEC60255-27	≤ 0.05VA, at $V_{r.\ ph-ph}$ = 110V
Thermal withstand of VT (per phase) IEC60255-27	200V, continuously; 400V for 10s.

Binary inputs

Item	Data
Rated voltage $V_{r.aux}$ IEC60255-1	110/125/220/250 V_{dc}, settable; or 24/48V_{dc} settable;
Operating threshold IEC60255-1	≥70% $V_{r.aux}$, guarantee operating ≤55% $V_{r.aux}$, guarantee not to operating
Maximum permissible voltage	286V, at $V_{r.aux}$=110/125/220/250 V_{dc};
IEC60255-1	62V, at $V_{r.aux}$ =24/48 V_{dc};
Burden for binary input IEC60255-1	Typical ≤0.15W, at $V_{r.aux}$=110V_{dc} ≤0.6W, at $V_{r.aux}$=220V_{dc}

Output relay

Item	Data
Maximum contact voltage IEC60255-1	250V_{dc} / 400V_{ac}
Current carrying capacity IEC60255-1	5A continuous, 30A, 200ms on,15s off
Making capacity IEC60255-1	1100W(DC), L/R>40ms 1000VA(AC)
Breaking capacity IEC60255-1	220V(DC), 0.15A, L/R≤40ms; 110V(DC), 0.3A, L/R≤40ms;
Electrical life IEC60255-1	50,000,000 times at 3Hz
Mechanical endurance IEC60255-1	Load, making ≥ 1000 times Load, breaking ≥ 1000 times
Contact resistance IEC60255-1	30mΩ
Contacts insulation test (AC dielectric voltage) IEC60255-1	2kV_{ac}, 1min

Auxiliary power

Item	Data
Rated voltage $V_{r.aux}$ IEC60255-1	110V to 250$V_{dc/ac}$ 24/48V_{dc}
Input voltage range IEC60255-1	(0.8~1.2) $V_{r.aux}$
Burden for power supply unit IEC60255-1	Main unit: ≤40W, at quiescent ≤70W, at maximum load
AC ripple voltage IEC 60255-26 IEC 61000-4-17	≤15% of the nominal auxiliary voltage

Specification

Ethernet communication

Item	Data
Max. ports number	3
Electrical Ethernet port type	RJ45
Maximum transmission distance of Ethernet cable	100M
Optical Ethernet port type	LC
Fiber optic cable type	Multi-mode
Optic wavelength	1310 nm
Maximum transmission distance of optical cable	2km
Transmission rate for IEC61850 or DNP3.0	100Mbit/s
Maximum transmission distance of optical fiber between main unit and bay units	2kM 62.5/125μm MMF
Optic received sensitivity	-30 dBm

Serial communication

Item	Data
Number	2
Port type	RS-485
Maximum transmission distance	1.0km
Voltage withstand test	500V AC voltage to earth
Transmission rate for IEC60870-5-103 or Modbus	Default setting 9600 bps; Minimum: 1200bps; maximum: 19200bps

Time synchronization

Item	Data
Synchronization mode	SNTP IRIG-B time sync Minute or second Pulse IEEE 1588
IRIG-B signal format	IRIG-B000
IRIG-B Port type	Twisted-pair connection or multi-mode optical fiber
IRIG-B signal voltage level	Differential signal input/ modulated

Product safety test

Item	Data
Over voltage IEC60255-27	Class III
Interference degree IEC60255-27	Degree 2
Insulation type IEC60255-27	Basic insulation
Degree of protection (IP) IEC60255-27 IEC60529	Main unit: Front: IP54 Top, bottom, left, right, rear: IP30; Bay unit: Front: IP54 Top, bottom, left, right: IP52 Rear: IP30
Power frequency insulation voltage withstand test IEC60255-5 EN60255-5 ANSI/IEEE C37.90 GB/T15145-2017 DL/T478-2013	2kV, 50Hz, at rated voltage > 63V, Tested between : Auxiliary power supply port; Current and voltage transformer ports; Input and output ports; Enclosure earth port; 500V, 50Hz, at rated voltage ≤63V, Tested on: Communication ports; Time port; Enclosure earth port;
Impulse voltage IEC60255-27 EN60255-5 ANSI/IEEE C37.90 GB/T15145-2017 DL/T478-2013	5kV(1.2/50μs, 0.5J), at rated voltage>60V, 1kV, at rated voltage≤60V, Tested between : Auxiliary power supply port; Current and voltage

Specification

	transformer ports; Input and output ports; Communication ports; Time port; Enclosure earth port;
Insulation resistance IEC60255-5 IEC60255-27 EN60255-5 ANSI/IEEE C37.90 GB/T15145-2017 DL/T478-2013	≥550MΩ, 500V_{dc}
Protective bonding resistance IEC60255-27	≤0.02Ω
Fire withstand/ flammability IEC60255-27	Class V1

EMC test

Item	Data
Pulse immunity test (1MHz) IEC60255-26 IEC61000-4-18 ANSI/IEEE C37.90	Class III 2.5 kV, CM 1.0 kV, DM
Electrostatic discharge immunity test IEC60255-26 IEC61000-4-2	Class IV; ±8kV contact discharge; ±15kV air gap discharge;
Radiated interference radio-frequency electromagnetic field immunity test IEC60255-26 IEC61000-4-3	Class IV; 10 V/m, Frequency sweep: 80 MHz ~1 GHz; 1.4 GHz ~2.7 GHz
Electrical fast transient/burst immunity test IEC60255-26 IEC61000-4-18 ANSI/IEEE C37.90	Class IV; 4kV peak voltage; Tested on: Auxiliary power supply port; Current and voltage transformer ports; Input and output ports; 2kV peak voltage; Tested on: Communication ports;
Surge (impact) immunity test IEC60255-26 IEC61000-4-5	Class IV 4.0kV, CM 2.0kV, DM
Test for immunity to conducted disturbances, induced by radio-frequency fields IEC60255-26 IEC61000-4-6	Class A 150Ω, 80% AM (1 kHz) Frequency sweep: 150kHz–80MHz Spot frequencies: 27MHz and 68MHz;
Power frequency immunity test IEC 60255-26 IEC 61000-4-16	Class A 300V, CM; 150V, DM;
Power frequency magnetic field immunity test IEC 60255-26 IEC 61000-4-8	Class V 100 A/m Continuous; 1000 A/m 3s;
Pulse immunity test (100KHz) IEC61000-4-18	Class III 4 kV Tested on: Auxiliary power supply port; Current and voltage transformer ports; Input and output ports; 2 kV Tested on: Communication ports
Damped oscillation magnetic field immunity test IEC61000-4-10	Class V 100A/m
Pulse magnetic field immunity test IEC61000-4-9	Class V 1000A/m

Specification

Conducted emission IEC60255-1, CISPR 22	Class A; 0.15MHz to 30MHz;
Radiated emission IEC 60255-1, CISPR 22	Class A; 30MHz to 1GHz;

Mechanical test

Item	Data
Vibration response test IEC 60255-21-1 EN 60255-21-1	Class 1
Vibration endurance test IEC 60255-21-1 EN 60255-21-1	Class 1
Shock response test IEC 60255-21-2 EN 60255-21-2	Class 1
Shock withstand test IEC 60255-21-2 EN 60255-21-2	Class 1
Bump test IEC 60255-21-2	Class 1

Seismic test IEC 60255-21-3	Class 1

Environmental test

Item	Data
Temperature test	-40°C~+70°C, relay energized
Storage test	-40°C~+70°C, relay non-energized
Humidity test	95% r.h. no condensation
Pollution degree	2
Altitude	＜3000m

CE Certification

Item	Data
EMC	EN 60255-26 (Directive 2014/30/EU)
LVD	EN 60255-27 (Directive 2014/35/EU)

Specification

87BB, Busbar differential protection

Item	Data
Differential current threshold	0.2 I_r to 20.00 I_r ≤ ±2.5% setting or ±0.02 I_r
Restraint factor, k	0.3 - 0.99
Operating time	≤ 20ms at 200% setting
Reset time	≤ 50ms
Undervoltage blocking setting	0.0~ 100V
Zero sequence voltage blocking setting	0.0~ 100V
Negative sequence voltage blocking setting	0.0~ 100V

50, 51, Overcurrent protection

Item	Data
Definite time characteristic	
Current	0.1 I_r to 20.00 I_r ≤ ±2.5% setting or ±0.02 I_r
Time delay	0.00s to 10.00s, step 0.01s ≤ ±1% setting or ≤ +40ms, at 200% setting

50N, 51N, Earth fault protection

Item	Data
Current inputs	Calculated with three phase currents
Definite time characteristic	
Current	0.1 I_r to 20.00 I_r ≤ ±2.5% setting or ±0.02 I_r
Time delay	0.00s to 10.00s, step 0.01s ≤ ±1% setting or ≤ +40ms, at 200% setting

50BF, Breaker failure protection

Item	Data
Phase current negative sequence current zero sequence current	0.1 I_r to 20.00 I_r ≤ ±2.5% setting or ±0.02 I_r
Time delay of stage 1 Time delay of stage 2	0.00s to 10.00 s, step 0.01s ≤ ±1% setting or ≤ +40 ms, at 200% setting
Reset ratio	0.95
Reset time	≤ 20ms
Undervoltage blocking setting	0.0~ 100V
Zero sequence voltage blocking setting	0.0~ 100V
Negative sequence voltage blocking setting	0.0~ 100V

50DZ, Dead zone protection

Item	Data
Current	0.1 I_r to 20.00 I_r ≤ ±2.5% setting or ±0.02 I_r
Time	0.02s to 10.00s, step 0.01s ≤ ±1% setting or ≤ +40 ms, at 200% setting
Reset ratio	0.95

97FF, VT secondary circuit supervision

Item	Data
Phase to earth voltage	5.0V to 20.0V, step 0.01V ≤ ±3% setting or ± 1 V
Phase to phase voltage	10.0V to 30.0V, step 0.01V ≤ ±3% setting or ± 1 V
Recovering phase to phase voltage	40.0V to 120.0V, step 0.01V ≤ ±3% setting or ± 1V