



Reyrolle
Protection
Devices

7SR45 Argus

Self Powered Overcurrent and Earth Fault Relay

Energy Management

SIEMENS

7SR45 Argus

Self Powered Overcurrent and Earth Fault Relay



Description

The 7SR45 Self Powered Overcurrent and Earth Fault Relay is developed using the latest generation of hardware technology and is available in two variants depending on the CT configuration. 7SR45 is a member of Siemens Reyrolle® protection devices Argus product family.

The 7SR45 Self Powered Overcurrent and Earth Fault Relay is housed in a 4U high, size 4 non draw-out case and provides protection, monitoring, instrumentation, and metering with integrated input and output logic and fault reports.

The relay functionality can be configured via a front USB port for local PC connection. By using the Reydisp Evolution software, the user can update the settings and view the fault records (trip log) and the event records (event log).

Function Overview

Protection

50	Instantaneous Overcurrent Protection
50N/G	Instantaneous Derived/Measured Earth Fault Protection
51	Time Delayed Overcurrent Protection
51N/G	Time Delayed Derived/Measured Earth Fault Protection
50LC/SOTF	Switch-On-to-Fault

Features

- Password Protection
- Self Monitoring
- Trip Timers
- Healthy shut-down below operating ranges
- Remote reset of flags with/without CT power
- Events Logging

User Interface

- 16 Character x 2 Line Backlit LCD
- Menu Navigation Keys
- 9 fixed function LEDs

Monitoring Functions

- Primary/Secondary Current Phases and Earth Binary Input/Binary Output Status
- Time and Date
- Fault Records (Trip Log)
- Event Records (Event Log)

Hardware

- 4 CT (1 A or 5 A- via ordering option), 2 Binary Inputs, 2 Binary Outputs, 1 Pulse Output, 9 LEDs

Data Storage and Communication

- Front USB Port
- Fault Records (Trip Log)
- Event Recording (Event Log)
- Time Synchronisation through Reydisp Commands
- Viewing and Changing Settings

Application

7SR45 Self Powered Relay is a simple numerical Overcurrent and earth fault protection relay which is primarily intended for Secondary Distribution electrical networks. The 7SR45 relay is designed to operate without an auxiliary supply .It derives its power from the primarily current transformers.

The relay offers definite-time and inverse-time Overcurrent and earth fault protection functions in accordance to IEC and ANSI standards.

A capacitor discharge pulse output for low-energy trip coil of the circuit breaker is built-in the 7SR45. A changeover binary output is also available for trip via an auxiliary powered shunt trip coil.

The 7SR45 is targeted for the following applications:

- a. Protection Relay for Ring Main Units
- b. Back protection relay for Medium Voltage applications
- c. Protection applications in remote locations where auxiliary supply is not available.
- d. Control and Relay panels Refurbishment of old electromechanical protection relays

Functional Diagrams

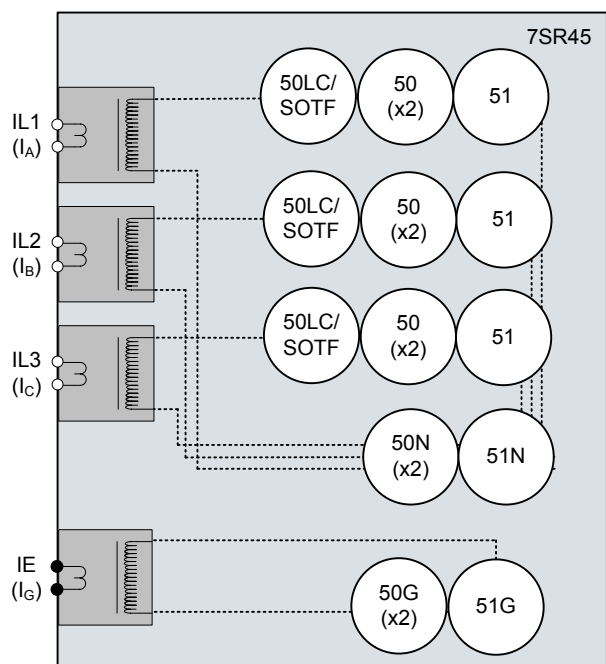


Fig 1. Functional Diagram of 7SR45 Self Powered Overcurrent and Earth Fault Relay

50/51 Phase Fault

50 INST/DTL and 51 IDMTL/DTL elements provide overcurrent protection, each with independent settings for pickup current, time-multiplier (51) and time-delays. User can select IEC or ANSI time current characteristics.

The IDMT curve has a user selectable reset characteristic, either DTL or IEC/ANSI decaying to improve the grading with electromechanical protection.

50G/51G/50N/51N

Two earth fault measurement modes are available. One mode directly measures the earth current from an independent CT (50G/51G) and the second mode derives the residual current internally from the 3 line CTs (50N/51N).

50 INST/DTL and 51 IDMTL/DTL elements provide overcurrent protection, each with independent settings for pickup current, time-multiplier (51) and time-delays. User can select IEC or ANSI time current characteristics. The IDMT stage has a user programmable reset characteristic either DTL or shaped current ~ time reset characteristic to improve grading with electromechanical protection.

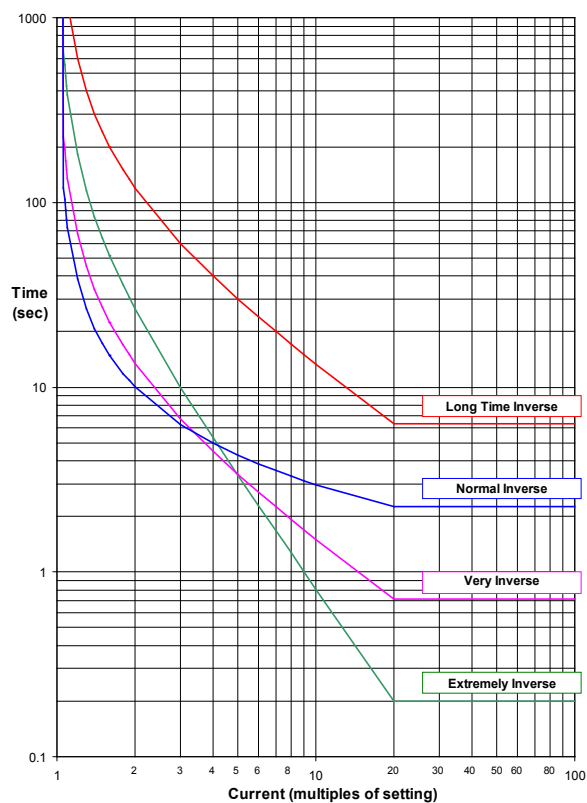


Fig 2. IEC Overcurrent Curves

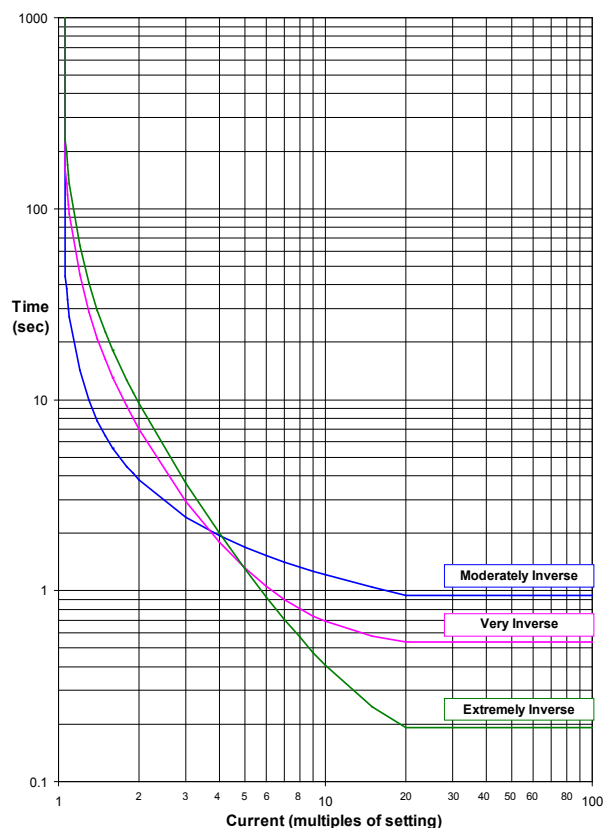


Fig 3. ANSI Overcurrent Curves

Dedicated SOTF functionality provides high speed tripping if a fault is still present on the feeder after the Reclosure of the circuit breaker (Close-on-to-Fault) OR if earthing clamps are left connected after maintenance.

The following graph show the SOTF operating time depending on Fault Currents.

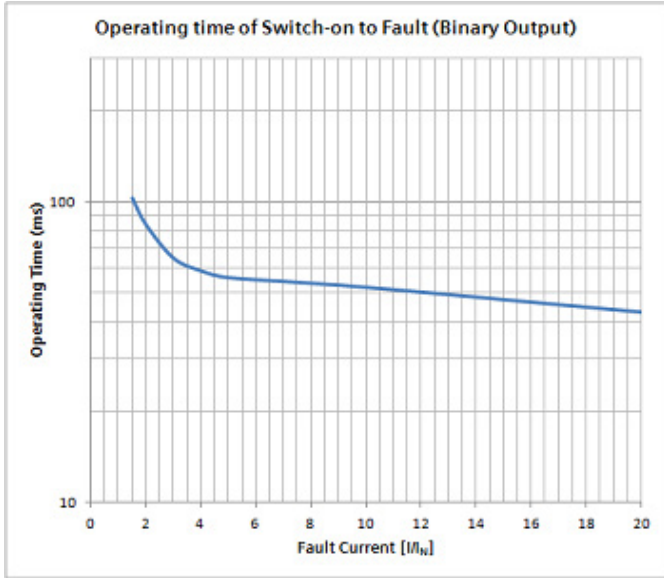


Fig 4. Operating Time for Single Phase Fault with binary output

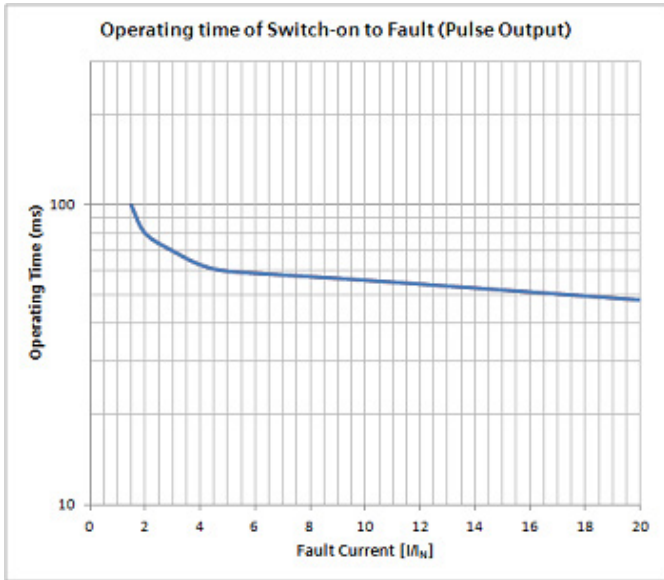


Fig 5. Operating Time for Single Phase Fault with pulse output

NOTE: Multi-phase faults will result in shorter operating time.

Sensitivity of the relay is the minimum phase current required for the relay to energize, detect a fault and issues a trip as per the configuration.

The sensitivity of 7SR45 Self Powered Overcurrent and Earth Fault Relay is $0.20 \times I_n$ nominal current in single phase and $0.13 \times I_n$ nominal current in three phases. The PROTECTION HEALTHY LED and TRIP READY LED turns ON when the relay is TRIP ready at the above mentioned levels.

The following graphs show the sensitivity of the relay and corresponding operating time for different start up currents.

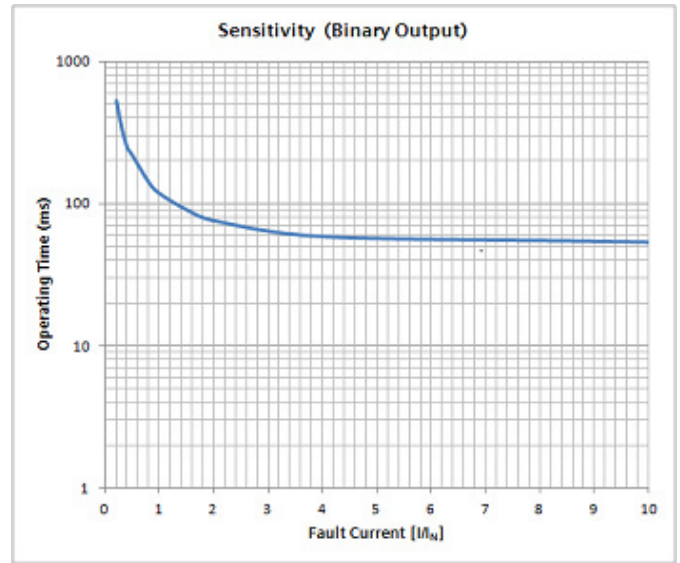


Fig 6. Sensitivity for Single Phase Fault with binary output

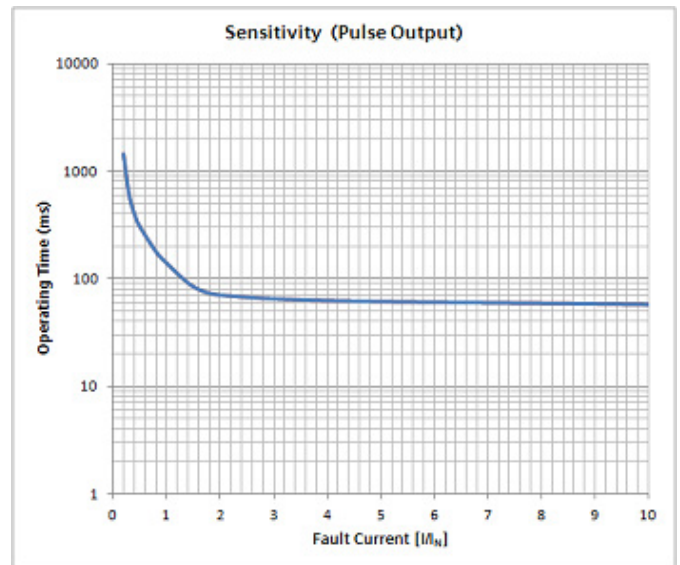


Fig 7. Sensitivity for Single Phase Fault with pulse output

NOTE: Multi-phase current will improve the sensitivity.

Data Acquisition - Via Communication Interface

Sequence of Event Records (Event Log)

Up to 100 events are stored and time tagged to 1 ms resolution. The events are stored on first-in-first-out basis. The events are available through the communication interface.

Fault Records (Trip Log)

The last 10 fault records are displayed on the relay fascia and are also available through the communication interface with time and date of trip, measured quantities and type of fault.

Real Time Clock

The time and date can be set and is maintained while the relay is de-energised by a coin cell battery.

Communications

The relay offers a USB port as standard on the front of all units. All of the relay functions can be set on a PC using Reydisp Evolution software via the USB port. The connection is made with a USB cable and operates with a 'plug and play' connection, so no pre-setting of the relay is required.

Construction

The relay is housed in a non draw-out case 4U high, size 4 case.

The rear connection comprises of user friendly pluggable type terminals for Pulse output, binary inputs and binary outputs.

The CT terminals are suitable for ring type lug connection to provide a secure and reliable termination.



User Interface

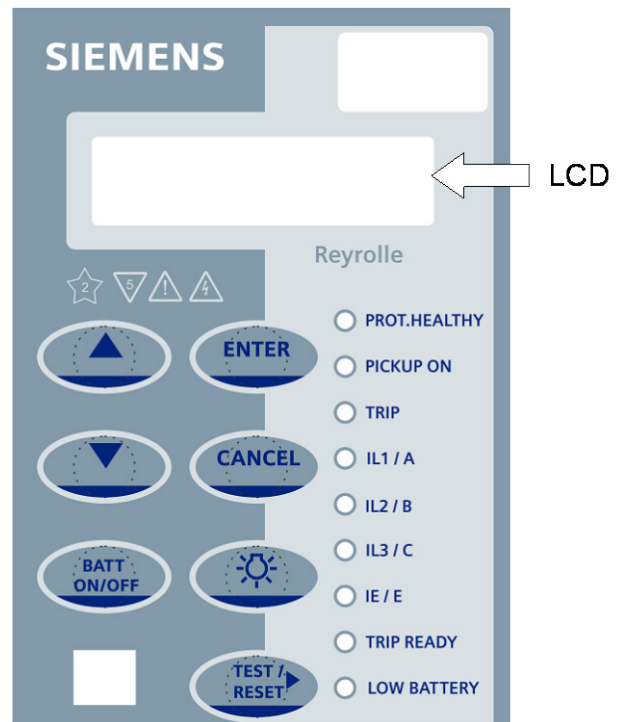


Fig 8. User Interface

The operator interface is designed to provide a user friendly method of viewing menus, entering settings, and retrieving data from the relay. Five buttons are provided for navigation around the menu structure. Additionally, two buttons are provided for battery ON/OFF and Backlight ON/OFF functionality.

LCD

A 2 line by 16 character liquid crystal display with power save operation indicates the relay identifier, settings, instrumentation, and fault data.

LEDs

9 fixed function LEDs are available eliminating the need for expensive panel mounted pilot lights and associated wiring. Each LED shows clear indication of the associated function's state and has a label for identification.

Relay Information

The device is identified by the rating label on the front fascia of the housing. The user can also give the device its own identity by editing the 'Relay Identifier' displayed on the LCD.

Power

7SR45 Self Powered Overcurrent and Earth Fault relay can be powered in the following modes and their priority is as follows:

- CT Power
- USB Power
- Battery Power



Low Voltage Directive:

2006/95/EC Directive of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (**until 19.04.2016**)

2014/35/EU Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits; Official Journal of the EU L96, 29/03/2014, p. 357–374 (**from 20.04.2016**)

EMC Directive:

2004/108/EC Directive of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility (**until 19.04.2016**)

2014/30/EU Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility; Official Journal of the EU L96, 29/03/2014, p. 79–106 (**from 20.04.2016**)

Technical Data

For full technical data, refer to the Technical Specification Section of the User Manual.

Technical Data Overview

Product Family (Self Powered)	Non Directional Self Powered Overcurrent and Earth Fault Relay
Case and LEDs	Non draw-out Polycarbonate case (Size 4 standard, Non draw-out design), 9 LEDs
Measuring Inputs (Current)	1 A or 5 A (ordering option), 50 Hz/60 Hz
Communication	Front Communication Port (works with Reydisp Evolution)
Protection Functions	50, 50G/N, 51, 51G/N, 50LC/SOTF
Binary Input and Binary Output	2 BI and 2 BO
Pulse output	24 V, 0.1 Ws pulse output
Overvoltage	Category III
Pollution Degree	2

Sensitivity

Minimum current for relay operation	0.20xIn of nominal current in single phase 0.13xIn of nominal current in three phases
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Mechanical Specifications

Design	Panel mounting, Non draw-out Polycarbonate moulded case
Enclosure	IP 52 (front panel) IP 40 (enclosure sides) IP 20 (rear side) Depth is 203 mm
Weight	1.8 kgs (appx)

Terminal Blocks

Current Inputs	8 position (Terminal X5), M4 Screw-type Barrier Terminal block suitable for 2.5 mm ² / 4 mm ² cable
Binary Input	4 position (Terminal X1), M3 screw-type plug-in terminals suitable for 2.5 mm ² cable
Binary Output	6 position (Terminal X2), M3 screw-type plug-in terminals suitable for 2.5 mm ² cable
Pulse Output	2 position (Terminal X3), M3 screw-type plug-in terminals suitable for 2.5 mm ² cable
Front Port	USB, Type B

Inputs and Outputs

Current Inputs

Quantity	3 x Phase and 1 x Earth
Rated Current In	1 A or 5 A (ordering option)
Measuring Range	0.2xIn to 20xIn
Instrumentation	> 0.13xIn to 2xIn ± 5 % (Typical) > 2xIn to 20xIn ± 3%
Frequency	50 Hz (Range: 45 Hz to 55 Hz) 60 Hz (Range: 54 Hz to 66 Hz)
Thermal Withstand: Continuous 1 second	2xIn 50 A (1 A) 150 A (5 A)
Burden @ In	≤ 3.0 VA per phase and ≤ 0.2 VA earth for 1 A ≤ 3.5 VA per phase and ≤ 0.2 VA earth for 5 A

Binary Inputs

Number	2	
	19 V DC	19 V - 110 V DC
Maximum DC current for operation 19 V - 110 V DC	3.0 mA	
Pick Up Delay	User selectable 0 to 600 s (up to 10 mins)	
Drop Off Delay	User selectable 0 to 600 s (up to 10 mins)	

Binary Outputs

Number	2 (1 NO contact and 1 C/O contact)
Operating Voltage	Voltage Free
Operating Mode	Latched
Operating Time from energizing Binary Input	< 20 ms
Making Capacity: Carry continuously Make and carry (L/R ≤ 40 ms and V ≤ 300 V AC)	5 A AC or DC 20 A AC or DC for 0.5 s 30 A AC or DC for 0.2 s
Breaking Capacity (≤ 5 A and ≤ 250 V): AC Resistive AC Inductive DC Resistive DC Inductive	1250 VA 250 VA at p.f. ≤ 0.4 75 W 30 W at L/R ≤ 40 ms 50 W at L/R ≤ 10 ms

Front Communication Port

Quantity	1
Electrical connection	USB, Type B

Data Storage

Fault Record (Trip Log)	10 records
Events (Event Log)	100 events (1 ms resolution)

Mechanical Tests

Test	Standard
Vibration	IEC60255-21-1, Class 1 (Endurance 1G, Response 0.5G)
Shock and Bump	IEC 60255-21-2, Class I Shock response, Shock withstand, Bump
Degree of Protection	IEC 60529, IP52 front, IP20 back
Seismic	IEC 60255-21-3, Class I
Contact	IEC 60255-1 (Ref: Std IEC 61810-1)
Electrical Endurance Test	IEC 60255-1 (Ref: Std IEC 61810-1)

Electrical Tests

Test	Standard
Insulation Resistance	IEC 60255-27# Insulation resistance >100 M Ohms at 500 V DC Test Duration: > 5 s
Impulse Voltage Withstand	IEC 60255-27# 5 kV, 1.2/50 μ s, 0.5 J 5 +ve, -ve pulses
Hi Voltage (Dielectric) Voltage	IEC 60255-27# 2 kV AC RMS for 1 min (Between any terminal and earth, independent circuits) 1 kV AC RMS for 1 min (across normally open contacts)
High Frequency Disturbance	IEC 60255-26 2.5 kV (CM), 1.0 kV (DM) 1 MHz
Electrostatic Discharge	IEC 60255-26 8 kV air discharge 6 kV contact discharge
Electrical Fast Transient or Burst	IEC 60255-26, Zone B 2 kV, 5 kHz
Surge Immunity	IEC 60255-26, Zone A 4 kV (CM), 2 kV (DM) 1.2/50 μ s
Radiated Immunity	IEC 60255-26 80 MHz to 1.0 GHz and 1.4 GHz to 2.7 GHz Both frequency at 10 V/m
Conducted Radio Frequency Interference	IEC 60255-26 150 kHz to 80 MHz
Power Frequency Magnetic Field	IEC 60255-26 30 A/m applied 1 min, 300 A/m applied for 3 s
Radiated Emissions	IEC 60255-26 CISPR 11, Class A
Thermal Withstand Continuous 1 s	IEC 60255-27 2 x I _n 50 A (1 A) 150 A (5 A)
Burden	IEC 60255-1 \leq 3.0 VA per phase and \leq 0.2 VA earth for 1 A \leq 3.5 VA per phase and \leq 0.2 VA earth for 5 A
Functional	IEC 60255-3
Maximum Allowable Temperature	IEC 60255-6 Max. temperature limit +100 °C

NOTE: All aspect of IEC 60255-5 have been covered under IEC 60255-27

Climatic Environmental Tests

Ambient Operating Temperature	IEC 60068-2-1, IEC 60068-2-2
Cold test Operational test Non-operational storage test	IEC 60068-2-1, -10°C, 96 h -25°C, 16 h
Dry heat test Operational Non-Operational, Storage	IEC 60068-2-2 +60°C, 96 h +70°C, 16 h
Damp heat test, Steady State	IEC 60068-2-78 4 days at 95% RH, +40°C
Damp heat test, cyclic	IEC 60068-2-30 +25...55°C, R.H. > 93% 6 cycles
Altitude above sea level	Maximum upto 2000 m

Product Safety Test

Clearances and Creepage Distances	IEC/EN 60255-27: Edition 2: 2013-10 \geq 4 mm
IP Rating	IEC/EN 60255-27: Edition 2: 2013-10 IP52 (Front side) IP20 (Rear side)
Impulse Voltage	IEC/EN 60255-27: Edition 2: 2013-10 5 kV, 5 +ve, -ve pulses
AC Dielectric Voltage	IEC/EN 60255-27: Edition 2: 2013-10 2 kV AC, 50 Hz, 1 min
Insulation Resistance	IEC/EN 60255-27: Edition 2: 2013-10 500 V DC, > 5 s, > 100 M ohm
Protective Bonding Resistance	IEC/EN 60255-27: Edition 2: 2013-10 < 12 V AC/DC, 1 min, < 0.1 Ohm
Protective Bonding Continuity	IEC/EN 60255-27: Edition 2: 2013-10
Flammability of Insulating Materials, Components and Fire enclosures	IEC/EN 60255-27: Edition 2: 2013-10
Single Fault Condition	IEC/EN 60255-27: Edition 2: 2013-10

Performance

50 Instantaneous & DTL OC&EF

Operation	Non directional
Elements	Phase, Derived Earth, Measured Earth
Setting Range Is (50/50N/50G)	1,2,...20xIn
Time Delay	0,0.01,...600 s
Operate Level Iop	100% Is, ±5%
Reset level	≥ 94 % Iop
Basic Operate time (with load current): 50, 50G 50N	2xIs 25 ms, ±15 ms, 5xIs 20 ms, ±15 ms
Operate time delay	Tbasic+Td, ± 1% or ± 30 ms
Inhibited by	Binary Input

51 Time Delayed OC&EF

Operation	Non directional
Elements	Phase, Derived Earth, Measured Earth
Setting Range Is (51)	0.2, 0.21... 2.0xIn
Setting Range Is (51G,51N)	0.1,0.11... 0.8xIn
Time Multiplier	0.01,0.02.....10
Time Delay (DTL)	0,0.01...15 s
Operate Level	110% Is, ±5% or ±2%x In
Reset level	≥ 90 % Iop
Operate time (with load current) IEC	$t_{op} = \frac{K}{\left[\frac{I}{I_s}\right]^\alpha - 1} \times Tm$
ANSI	$t_{op} = \left[\frac{A}{\left[\frac{I}{I_s}\right]^\alpha - 1} + B \right] \times Tm$ ± 5% or ± 50 ms
Minimum operate time	0 s - 20 s
Follower Delay	0 s - 20 s
Reset	IEC/ANSI decaying, 0 s - 60 s
Inhibited by	Binary Input

50LC / SOTF Switch-On-To-Fault

Operate level	100% Is, ±5%
Setting range	1,2,...20xIn

Case Dimensions

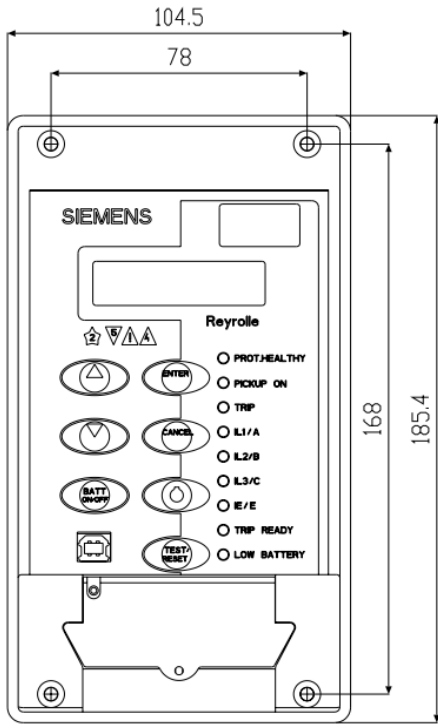


Fig 9. Front View

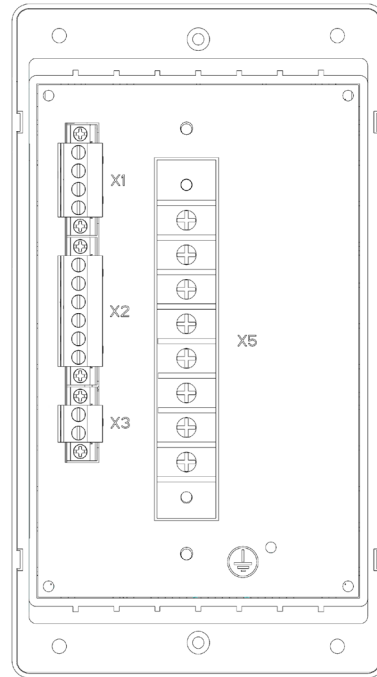


Fig 10. Rear View

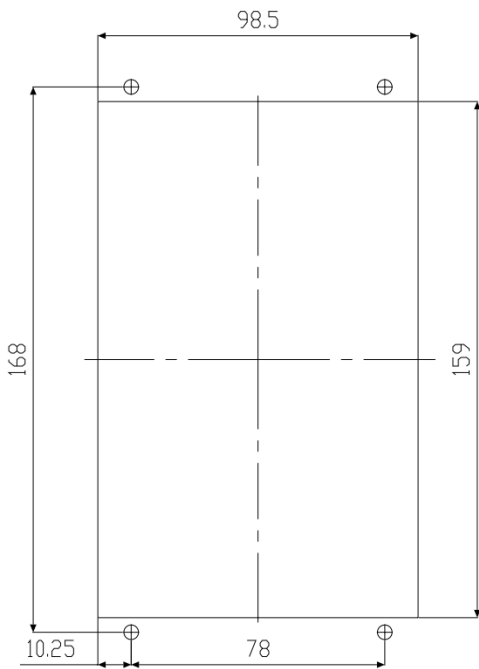


Fig 11. Panel cut-out view

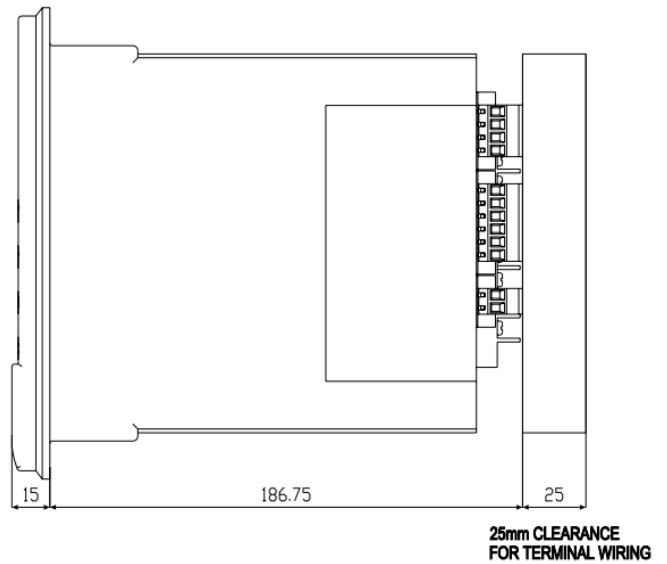


Fig 12. Side View

7SR45 Terminal/Wiring Diagram

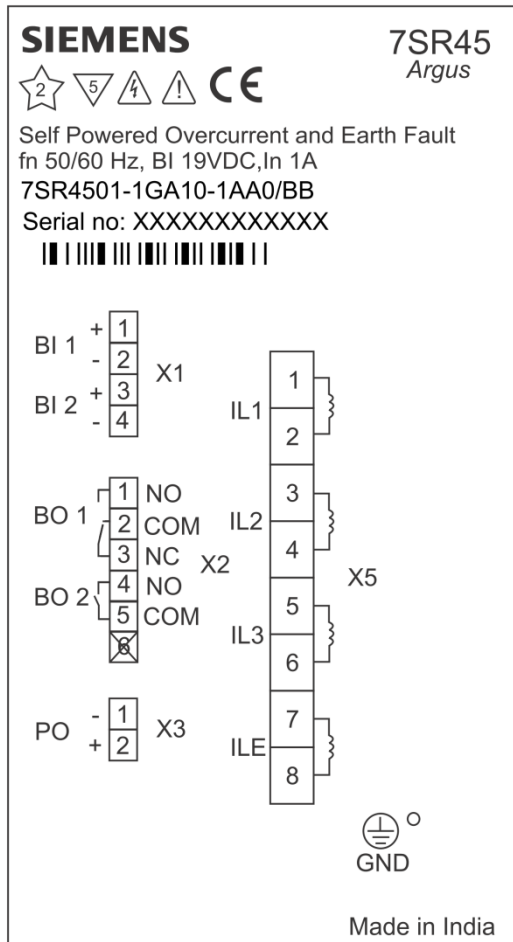


Fig 13. Terminal/Wiring Diagram View

Ordering Information – 7SR45 Argus

Product description Variants

Order No.

7SR45 Argus

Non directional O/C Relay

Relay Type

Size 4 Moulded Case (Non-Drawout Design), 4 CT¹⁾,
2 BI/2 BO, Impulse Output, 9 LEDs

Measuring Input

1 A, 50/60 Hz
5 A, 50/60Hz

Auxiliary Voltage

Self Powered (CT Powered Only)

Spare

Communication Options

Front Communication port : USB

Protocol

No Protocol (No rear port communication)

Front Fascia

Standard Version

Protection Function Packages - Standard version

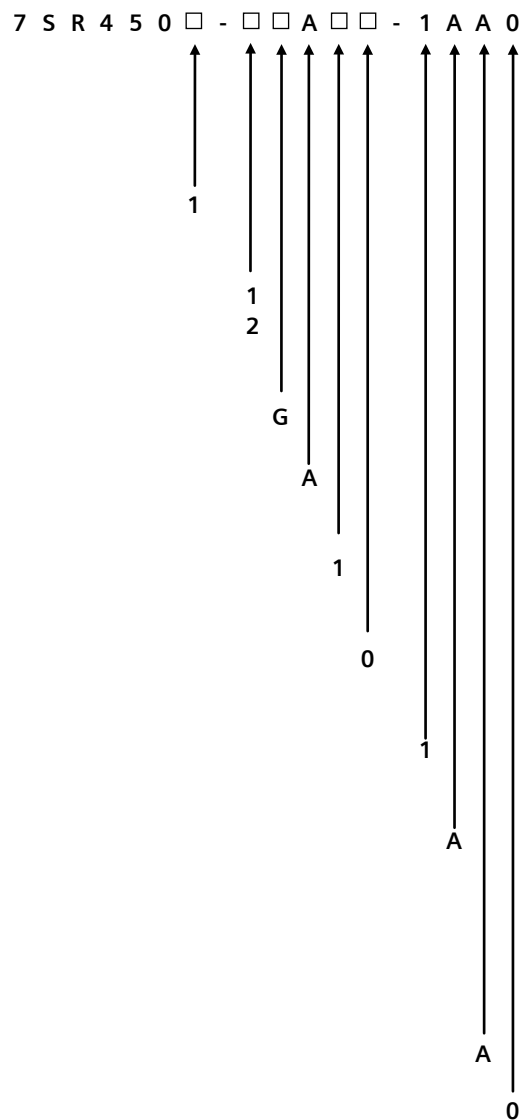
50 Instantaneous phase fault overcurrent
50G/50N Instantaneous earth fault
51 Time delayed phase fault overcurrent
51G/51N Time delayed earth fault
50LC/SOTF Switch-On-To-Fault

Additional functionality

No additional functionality

Spare

Spare



¹⁾ 4 CT is configured as 3PF + EF

Use the following ordering information to order 7SR45 self powered overcurrent and earth fault relay battery spares.

Variants	Description
7XG1900-1AA00-1000	Main Battery CR123A
7XG1900-2AA00-1000	RTC Battery CR1632
7XG1900-3AA00-1000	Main Battery CR123A + RTC Battery CR1632

Siemens Protection Devices Limited
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January 2016

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