ARGUS-M

7SR21 and 7SR22 - Multi-Functional Overcurrent Relay

Description

The REYROLLE Multi-Function platform is a new generation of non-directional and directional overcurrent protection relay. It is built on years of numeric relay protection experience with the ARGUS family of products. Housed in 4U high, size E6 or E8 cases, these relays provide protection, control, monitoring, instrumentation and metering with integrated input and output logic, data logging & fault reports. Communication access to relay functionality is via a front USB port for local PC connection or rear electrical RS485 port for remote connection. Additional rear port options are available.

Standard Functionality ARGUS-M 7SR21 & 7SR22 Overcurrent Relays

37	Undercurrent
46BC	Broken Conductor / Load Unbalance
46NPS	Negative Phase Sequence Overcurrent
49	Thermal Overload
50	Instantaneous Overcurrent
50G/N	Instantaneous Earth Fault
50BF	Circuit Breaker Fail
51	Time Delayed Overcurrent
51G/N	Time Delayed Measured Earth Fault /SEF
64H	High Impedance REF
74TC	Trip Circuit Supervision
81HBL2	2nd Harmonic Block/Inrush Restraint

Cold Load Pickup
8 Settings Groups
Password Protection – 2 levels
User Programmable Logic
Self Monitoring

Additional Functionality ARGUS-M 7SR22 Directional Overcurrent

27/59	Under/Over Voltage
47	Negative Phase Sequence (NPS) voltage
51V	Voltage Dependent Overcurrent
59N	Neutral Voltage Displacement
60CTS	CT Supervision
60VTS	VT Supervision
67/50	Bi-Directional Instantaneous Overcurrent
67/50G/N	Bi-Directional Instantaneous Earth Fault
67/51	Bi-Directional Time Delayed Overcurrent
67/51G/N	Bi-Directional Time Delayed Earth Fault
81	Under/Over Frequency

Optional Functionality ARGUS-M 7SR21 & 7SR22

79	Auto Reclose

Data Communications ARGUS-M 7SR21 & 7SR22

Front USB port
Rear RS485 port

User Interface

20 character x 4 line backlit LCD
Menu navigation keys
3 fixed LEDs
8 or 16 Programmable Tri-colour LEDs (Option)
6 Programmable Function Keys each with Tri-colour LED (Option)

Data Communication Options

2 Rear fibre optic + IRIG-B ports

Protocols

IEC60870-5-103 or Modbus RTU protocols – User selectable

Standard Monitoring Functions ARGUS-M 7SR21 & 7SR22

Primary current phases and earth
Secondary current phases and earth
Positive Phase Sequence (PPS) Current
Negative Phase Sequence (NPS) Current
Zero Phase Sequence (ZPS) Current
Binary Input/Output status
Trip circuit healthy/failure
Time and date
Starters
Fault records
Event records
Frequency
Waveform records
Circuit breaker trip counters
I^2t summation

Additional Monitoring Functions ARGUS-M 7SR22

Direction
Primary line and phase voltages
Secondary voltages
Apparent power and power factor
Real and reactive power
W Hr forward and reverse
VAr Hr forward and reverse
Historical demand record
Positive phase sequence (PPS) Voltage
Negative phase sequence (NPS) Voltage
Zero phase sequence (ZPS) Voltage

Function Diagrams showing examples of external connections

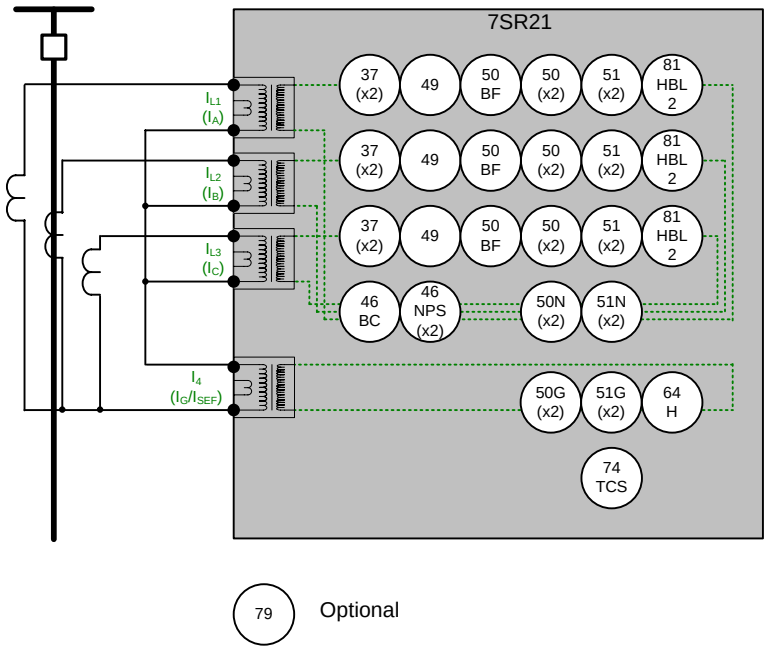


Fig. 1. Overcurrent Relay ARGUS-M 7SR21

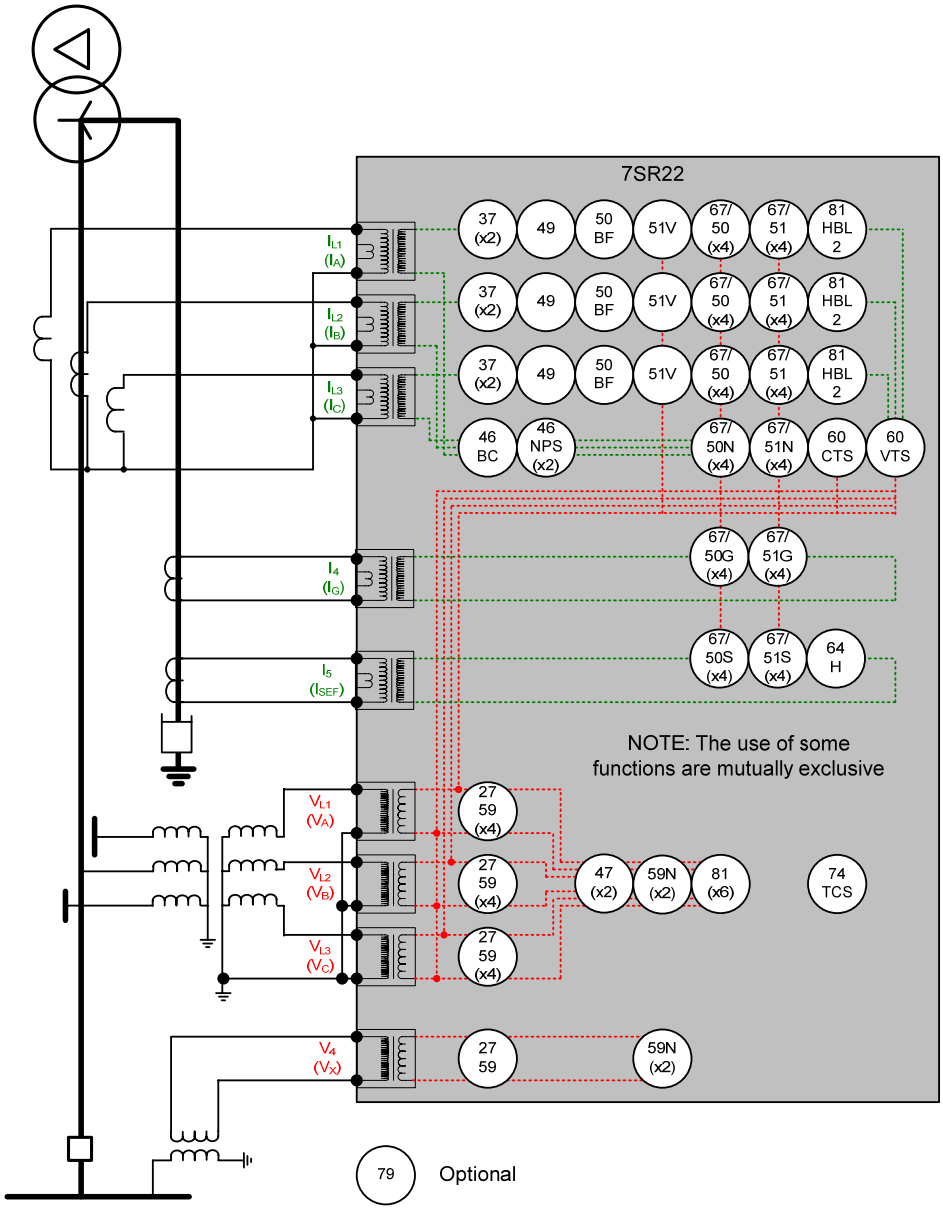


Fig. 2. Directional Overcurrent Relay ARGUS-M 7SR22

Standard Functionality

37 Undercurrent

Each element has settings for pickup level and Definite Time Lag (DTL) delays. Operates if current falls below setting for duration of delay.

46BC Phase Unbalance/Broken Conductor

Element has settings for pickup level and DTL delay. With the circuit breaker closed, if one or two of the line currents fall below setting this could be due to a broken conductor.

46NPS Negative Phase Sequence Overcurrent

Each element has user settings for pickup level and IDMTL or DTL delay, operates if NPS Current exceeds setting and delay. NPS Current elements can be used to detect unbalances on the system or remote earth faults when a delta-star transformer is in circuit.

49 Thermal Overload

The thermal algorithm calculates the thermal states from the measured currents and can be applied to lines, cables and transformers. Alarm outputs are given for thermal overload and thermal capacity.

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 stage has a user programmable reset characteristic, either DTL or shaped current ~ time reset characteristic, to improve grading with electromechanical protection.

50G/51G/50N/51N Earth Fault/Sensitive Earth Fault

Two earth fault measurement modes are available. One mode directly measures the earth current from an independent CT, or the residual connection of the 3 line CTs. This input can be set to be either earth fault or sensitive earth fault (50G/51G). The second mode derives the earth current internally from the 3 phase CTs inputs to give earth fault (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.

50BF Circuit Breaker Fail

The circuit breaker fail function may be triggered from an internal trip signal or from a binary input. Line currents are monitored following a trip signal and an output is issued if any current is still detected after a specified time interval. This can be used to re-trip the CB or to back-trip an upstream CB. A second back-trip time delay is available to enable another stage to be utilized if required.

64H Restricted Earth Fault - scheme

The measured earth fault input may be used in a 64H high impedance restricted earth fault scheme. Required external series stabilising resistor and non-linear shunt resistor can be supplied.

74TC Trip Circuit Supervision

The trip circuit(s) can be monitored via binary inputs. Trip circuit failure raises an HMI alarm and output(s).

81HBL2 Second Harmonic Block

Where second harmonic current is detected during transformer energisation the user can select which elements are to be blocked.

Cold Load Pickup

If a circuit breaker is closed onto a 'cold' load, i.e. one that has not been powered for a prolonged period, this can impose a higher than normal load-current demand on the system which could exceed normal settings. These conditions can exist for an extended period and must not be interpreted as a fault. To allow optimum setting levels to be applied for normal operation, the cold load pickup feature will apply alternative settings for a limited period. The feature resets when either the circuit breaker has been closed for a settable period, or if the current has reduced beneath a set level for a user set period.

Programmable Logic

The user can map Binary Inputs and Protection operated outputs to Function Inhibits, Logic Inputs, LEDs and/or Binary Outputs.
The user can also enter up to 16 equations defining scheme logic using standard functions e.g. Timers, AND/OR gates, Inverters and Counters.
Each Protection element output can be used for Alarm & Indication and/or tripping.

Circuit Breaker Maintenance

Two circuit breaker operations counters are provided. The Maintenance Counter records the overall number of operations and the Delta Counter the number of operations since the last reset.
An I^2t summation Counter provides a measure of the contact wear indicating the total energy interrupted by the circuit breaker contacts.
Each counter has a user set target operations count which, when reached, can be mapped to raise Alarms/ Binary Outputs.
These counters assist with maintenance scheduling.

Data Records - accessible via Data Comms ports

Sequence of event records

Up to 5000 events are stored and time tagged to 1ms resolution.

Fault Records

The last 10 fault records are displayed on the HMI, with time and date of trip, measured quantities and type of fault.

Disturbance recorder

The waveform recorder stores analogue data for all poles, Binary Inputs, LEDs and Binary Outputs with pre & post trigger data. A record can be triggered from Protection function, Binary input or via data communications.

10 records of 1 second duration are stored and the user can set the ratio of pre-trigger % i.e. pre-fault recording time.
An historical profile record of demand etc. can be stored.

Additional Functionality

27/59 Under/Over Voltage

Each element has settings for pickup level, drop-off level and Definite Time Lag (DTL) delays. Operates if voltage 'exceeds' setting for duration of delay. Can be applied in load shedding schemes.

47 Negative Phase Sequence Overvoltage

Each element has settings for pickup level and Definite Time Lag (DTL) delays. Operates if NPS Voltage exceeds setting for duration of delay.

59N Neutral Overvoltage

Each element has settings for pickup level and Definite Time Lag (DTL) delays. Operates if Neutral voltage exceeds setting for duration of delay.
Neutral overvoltage can be used to detect earth faults in high impedance earthed or isolated systems.

60CTS CT Supervision

The CT Supervision considers the presence of negative phase sequence current, without an equivalent level of negative phase sequence voltage, for a user set time as a CT failure. Element has user operate and delay settings.

60VTS VT Supervision

The VT Supervision uses a combination of negative phase sequence voltage and negative phase sequence current to detect a VT fuse failure. This condition may be alarmed or used to inhibit voltage dependent functions. Element has user operate and delay settings.

67/67N Directional Control

Phase fault, Earth fault and Sensitive Earth fault elements can be directionalised. Each element can be user set to Forward, Reverse, or Non-directional.
Directional Phase fault elements are polarised from quadrature voltage.
Earth fault elements can be user set to be polarised from residual voltage or negative phase sequence voltage.

81 Under/Overfrequency

Each element has settings for pickup level, drop-off level and Definite Time Lag (DTL) delays. Operates if frequency exceeds setting for duration of delay. Typically applied in load shedding schemes.

Optional Functionality

79 Auto-Reclose

Element provides independent Phase fault and Earth Fault/Sensitive Earth fault sequences of up to 5 Trip (3 pole) i.e. 4 Reclose attempts before Lockout. Auto-Reclose sequence can be user set to be initiated from internal protection operation or via Binary Input from an external Protection. Each trip in the sequence can be user set to be either instantaneous (Fast) or delayed. User can set each Reclose (Dead) time and the Reclaim time.

Service Conditions and Performance Data

Temperature

IEC 60068-2-1/2

Type	Level
Operating Range	-10 °C to +55 °C
Storage range	-25 °C to +70 °C

Humidity

IEC 60068-2-3

Type	Level
Operational test	56 days at 40 °C and 95 % relative humidity

Insulation

IEC 60255-5

Type	Level
Between any terminal and earth	2.0 kV AC RMS for 1 min
Between independent circuits	2.0 kV AC RMS for 1 min
Across normally open contacts	1.0 kV AC RMS for 1 min

IP Ratings

Type	Level
Installed with cover	IP 51
Installed with cover removed	IP 30

Auxiliary DC Supply Variation

Quantity	Value
Allowable superimposed ac component	12% of DC voltage
Allowable breaks/dips in supply (collapse to zero)	20ms

High Frequency Disturbance

IEC 60255-22-1 Class III

Type	Level	Variation
Common (longitudinal)	2.5 kV	≤ 5 %
Series (transverse) mode	1.0 kV	≤ 5 %

Electrostatic Discharge

IEC 60255-22-2 Class IV

Type	Level	Variation
Contact discharge	8.0 kV	≤ 5 %

Radiated Immunity

IEC 60255-22-3 Class III

Type	Level	Variation
80 MHz to 1000 MHz	10 V/m	≤ 5 %

Fast Transients

IEC 60255-22-4 Class IV

Type	Level	Variation
5/50 ns 2.5 kHz repetitive	4kV	≤ 5 %

Surge Immunity

IEC 60255-22-5

Type	Level	Variation
Between all terminals and earth, or between any two independent circuits	4.0 kV, 1.2/50 μs or 8/20 μs	≤ 10 %

Conducted Radio Frequency Interference

IEC 60255-22-6

Type	Level	Variation
0.15 to 80 MHz	10 V	≤ 5 %

Emissions

IEC 60255-25

Radiated Radio Frequency

Type	Limits at 10 m, Quasi-peak
30 to 230 MHz	40 dB(μV/m)
230 to 10000 MHz	47 dB(μV/m)

Conducted Radio Frequency

Type	Limits	
	Quasi-peak	Average
0.15 to 0.5 MHz	79 dB(μV)	66 dB(μV)
0.5 to 30 MHz	73 dB(μV)	60 dB(μV)

Mechanical

Vibration (Sinusoidal)

IEC 60255-21-1 Class I

Type	Level	Variation
Vibration response	0.5 gn	≤ 5 %
Vibration endurance	1.0 gn	≤ 5 %

Shock and Bump

IEC 60255-21-2 Class I

Type	Level	Variation
Shock response	5 gn, 11 ms	≤ 5 %
Shock withstand	15 gn, 11 ms	≤ 5 %
Bump test	10 gn, 16 ms	≤ 5 %

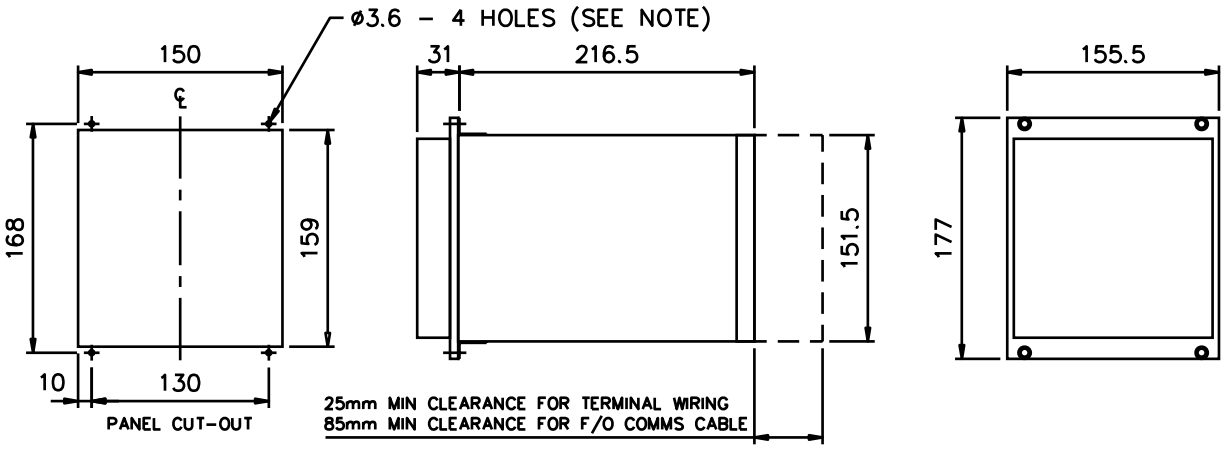
Seismic

IEC 60255-21-3 Class I

Mechanical Classification

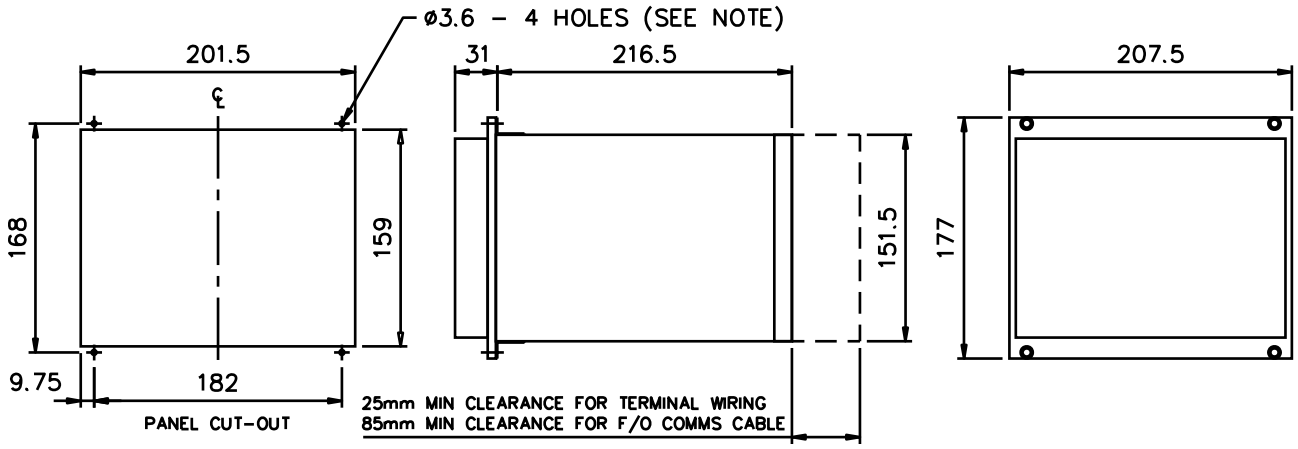
Type	Level
Durability	> 10^6 operations

E6 Case Dimensions



NOTE:
THE ø3.6 HOLES ARE FOR M4 THREAD FORMING (TRILOBULAR) SCREWS. THESE ARE SUPPLIED AS STANDARD AND ARE SUITABLE FOR USE IN FERROUS/ALUMINIUM PANELS 1.6mm THICK AND ABOVE. FOR OTHER PANELS, HOLES TO BE M4 CLEARANCE (TYPICALLY ø4.5) AND RELAYS MOUNTED USING M4 MACHINE SCREWS, NUTS AND LOCKWASHERS (SUPPLIED IN PANEL FIXING KIT).

E8 Case Dimensions



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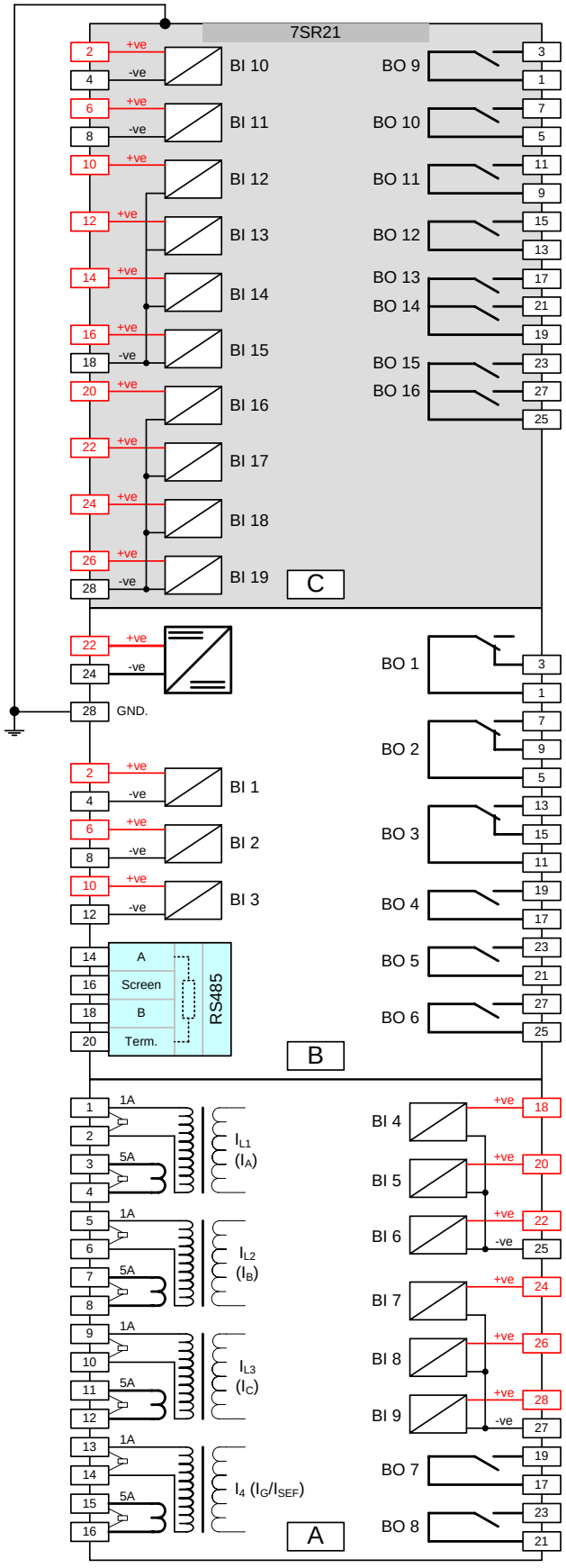
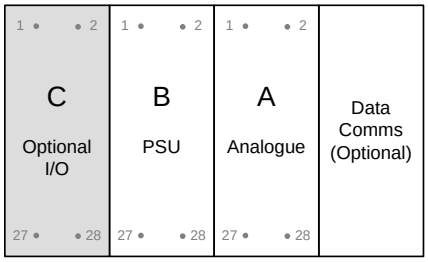
Connection Diagram – ARGUS-M 7SR21 non-directional

Diagram showing relay with 9 binary inputs and 8 binary outputs (E6 Case size) and optional 19 binary inputs and 16 binary outputs (E8 case size)

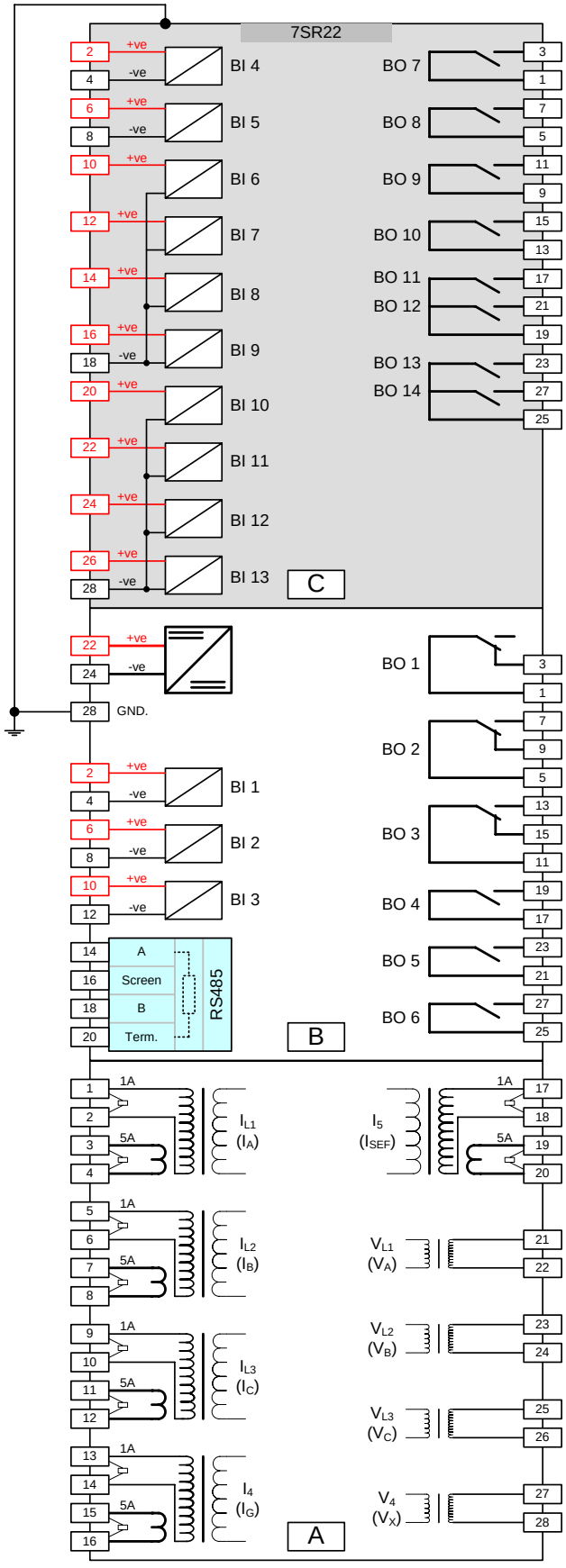


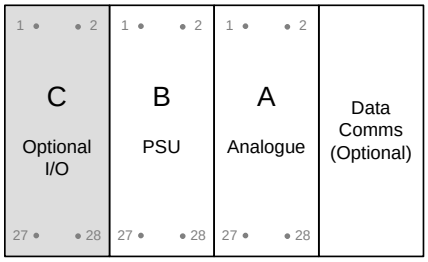


Rear View
Arrangement of terminals and modules

Connection Diagram – ARGUS-M 7SR22 directional

Diagram showing relay with 3 binary inputs and 6 binary outputs (E6 case size) and optional 13 binary inputs and 14 binary outputs (E8 Case size):-





Rear View
Arrangement of terminals and modules

Ordering Information – ARGUS-M 7SR21 Non-Directional Overcurrent

	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
ORDER-No.:	7	S	R	2	1	0		-	1		A		1	-	0		A	0

Protection Product Family (5)

Overcurrent - Non Directional	1

Case, I/O and Fascia [1] (7)

E6 case, 4 CT, 9 Binary Inputs / 8 Binary Outputs, 8 LEDs	2
E8 case, 4 CT, 19 Binary Inputs / 16 Binary Outputs, 16 LEDs	3
E8 case, 4 CT, 19 Binary Inputs / 16 Binary Outputs, 8 LEDs + 6 keys	4

Measuring input (8)

1/5 A, 50/60Hz	1

Auxiliary voltage (9)

30 to 220V DC, binary input threshold 19V DC	A
30 to 220V DC, binary input threshold 88V DC	B

Communication Interface (11)

Standard version - included in all models, USB front port, RS485 rear port	1
Standard version - plus additional rear F/O ST connectors (x2) and IRIG-B	2

Protocol (12)

IEC 60870-5-103 and Modbus RTU (user selectable setting)	1

Protection Function Packages (14)

Standard version - included in all models		C
37	Undercurrent	
46BC	Broken conductor/load unbalance	
46NPS	Negative phase sequence overcurrent	
49	Thermal overload	
50	Instantaneous phase fault overcurrent	
50BF	Circuit breaker fail	
50G/50N	Instantaneous earth fault	
51	Time delayed phase fault overcurrent	
51G/51N	Time delayed earth fault/SEF	
64H	High impedance REF	
74TC	Trip circuit supervision	
81HBL2	2nd harmonic block/inrush restraint	
	Cold load pickup	
	Programmable logic	
Standard version - plus		D
79	Autoreclose	

[1] 4CT is configured as 3PF + EF/SEF (user selectable setting).

	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
ORDER-No.:	7	S	R	2	2	0		-	2		A		1	-	0		A	0

Protection Product Family (5)

Overcurrent - Directional	2

Case, I/O and Fascia [1] (7)

E6 case, 5 CT, 4 VT, 3 Binary Inputs / 6 Binary Outputs, 8 LEDs	2
E8 case, 5 CT, 4 VT, 13 Binary Inputs / 14 Binary Outputs, 16 LEDs	3
E8 case, 5 CT, 4 VT, 13 Binary Inputs / 14 Binary Outputs, 8 LEDs + 6 keys	4

Measuring input (8)

1/5 A, 63.5/110V, 50/60Hz	2

Auxiliary voltage (9)

30 to 220V DC, binary input threshold 19V DC	A
30 to 220V DC, binary input threshold 88V DC	B

Communication Interface (11)

Standard version - included in all models, USB front port, RS485 rear port	1
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IEC 60870-5-103 and Modbus RTU (user selectable setting)	1

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47	Negative phase sequence voltage	
49	Thermal overload	
50BF	Circuit breaker fail	
51V	Voltage dependent overcurrent	
59N	Neutral voltage displacement	
60CTS	CT supervision	
60VTS	VT supervision	
64H	High impedance REF	
67/50	Directional instantaneous phase fault overcurrent	
67/50G 67/50N	Directional instantaneous earth fault	
67/51	Directional time delayed phase fault overcurrent	
67/51G 67/51N	Directional tIme delayed earth fault/SEF	
74TC	Trip circuit supervision	
81	Under/overfrequency	
81HBL2	2nd harmonic block/inrush restraint	
	Cold load pickup	
	Programmable logic	
Standard version - plus		D
79	Autoreclose	

[1] 5CT is configured as 3PF + EF/SEF + EF/SEF (user selectable setting).

Qualifications

Siemens Protection Devices Limited operates a quality system accredited to ISO9001.
CE Compliant to relevant EU Directives.

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