



Reyrolle
Protection
Devices

7SG11 Argus

Overcurrent Protection Relay

Answers for energy

7SG11 Argus

Overcurrent Protection Relay



Description

The 7SG11 Argus range of overcurrent protection combines the power and flexibility of microprocessor technology with decades of experience in the field of overcurrent protection and auto-reclose. A wide range of protection elements are supplemented by advanced features such as control, metering, data storage and fibre-optic based communications.

Function Overview

- IDMTL phase overcurrent stage
- 3 DTL phase overcurrent stages
- IDMTL earth-fault stage
- 3 DTL earth-fault stages
- 2 instantaneous and DTL SEF/REF stages with harmonic rejection, available as an option
- Trip circuit supervision
- Circuit breaker failure protection
- CT supervision (7SG111 & 7SG112)
- Single pole, three pole and four pole variants
- True RMS measurement
- Status inputs with independent pick-up and drop-off timers and logic inversion reduce scheme engineering
- Flexible supply voltage ranges
- Low AC/DC burden
- Eight independent settings groups
- Self, hand reset contacts
- Extensive fault, sequence of event and disturbance recorder
- Fibre optic interface or RS485 multi-drop electrical bus
- Continuous self-supervision of operation and power supply

Monitoring Functions

Analogue values can be displayed in primary or secondary quantities on the LCD screen. In addition the values can be obtained via the communications port.

- Primary current per phase
- Primary earth current
- Secondary current per phase
- Secondary earth current
- Primary phase voltages*
- Primary phase-phase voltages*
- Secondary voltages*
- Apparent power and power factor*
- Real and reactive power*
- WHr forward and reverse*
- VarHr forward and reverse*
- Rolling and Max demand Ia, Ib, Ic
- Rolling and Max demand W*
- Rolling and Max Var*
- Direction
- Autoreclose status
- Output contacts
- Status inputs
- Trip circuit healthy/failure
- Trip counters
- I² summation
- Number of waveform and event records stored
- Time and Date
- Starters
- Power on counter

* 7SG1125 series models only

Data Storage and Communication

Serial communications conform to IEC60870-5-103 or Modbus RTU protocol. Up to 254 relays may be connected in a ring network and addressed individually. A fibre-optic communications port is provided on the rear of the relay. It is optimised for 62.5/125µm glass fibre using ST® (BFOC/2.5) bayonet connectors. Optionally an RS485 electrical connector can be provided.

Indication

LEDs for TRIP, STARTER and PROTECTION HEALTHY status. 7SG1144 and 7SG1164 relays also have LEDs indicating CB OPEN and CB CLOSED status.
LCD – Alpha-numeric display for settings, instruments and fault data.

Sequence of event records

Up to 500 events are stored and time tagged to 1 ms resolution. These are available via the communications.

Fault records

The last 5 fault records are available from the Argus fascia with time and date of trip, measured quantities and type of fault.

Disturbance recorder

The waveform recorder may be triggered from a protection function or external input and has a configurable pre-fault trigger. Up to 5 fault waveforms may be stored. On all models the AC current waveforms are stored together with the digital states of the status inputs and output relays. 7SG112n models with voltage and power metering additionally store AC voltage waveforms.

Reydisp Evolution

Reydisp Evolution is common to the entire range of Reyrolle numeric products. It provides the means for the user to apply settings, interrogate settings, retrieve events and disturbance waveforms from the Argus.

Application

With reference to Fig 4: Typical Applications for 7SG11 Overcurrent Series Relays

Feeder 1 is a cable circuit; auto-reclosing is not applied, so a 7SG111n relay is used. Transient faults can occur on cables, which are initially self-sealing until the insulation is sufficiently weakened for them to become permanent. In this time much damage can occur. In order to protect against these and to maintain system overcurrent grading, a delayed reset of up to 60 seconds can be set on the IDMTL algorithms.

Feeder 4 is an overhead line so a 7SG1144 with integrated auto-reclosing is used.

The 7SG112n directional protection relay is typically applied wherever there is a potential source of power on both sides of the circuit breaker, i.e. fault current can flow in both directions. If there is a fault on the incoming circuits, or the transformers, the dual setting allows for correct grading to be applied. This directional protection will ensure that only the faulted circuit is tripped, and the healthy circuit remains in service.

On feeders that form a ring where overhead lines are used e.g. feeders 2 and 3, the dual directional 7SG1164 relay can be employed to give integrated auto-reclosing, and correct grading in both directions around the ring.

An inexpensive buszone protection can be formed using the Argus relays in an overcurrent blocking scheme. The starters of the Argus on the outgoing feeders are set to operate status inputs of the Argus on the incomers, which are set to block the

lowset algorithms. If there is a fault on one of the outgoing feeders, e.g. Feeder 1, the starter on the 7SG111n will cause the lowset on the 7SG112n of Incomer 1 to be inhibited. Its IDMTL characteristic will continue to function as a backup. However, for a fault on the busbar the 7SG112n on Incomer 1 will be allowed to operate and will quickly clear the fault.

Description of Functionality

7SG11 overcurrent relays provides comprehensive overcurrent protection with programmable input and output matrix. In addition 8 setting groups enable a flexible approach to protection settings.

Phase Overcurrent

One IDMTL/DTL characteristic and 3 DTL characteristics provide phase overcurrent protection, each with independent current settings and delays. The IDMT stage has a programmable reset with a definite time delay to improve detection of flashing faults.

Earth Fault

One IDMTL/DTL characteristic and 3 DTL characteristics provide phase overcurrent protection, each with independent current settings and delays. The IDMT stage has a programmable reset with a definite time delay to improve detection of flashing faults.

Sensitive earth fault/Restricted Earth Fault

One current setting with two definite time delays are provided for sensitive earth fault protection. This element operates from fundamental frequency only, 50Hz or 60Hz, and ideally a core balance CT should be used to improve accuracy, if low current settings are required.

With the addition of a stabilising resistor and, where applicable, non-linear resistors, the sensitive earth fault input may be used for restricted earth fault protection in a high impedance scheme.

Trip Circuit Supervision

The trip circuit is monitored by a status input. This is linked to an alarm and may be configured to operate an output relay.

Circuit Breaker Fail

The circuit breaker fail function operates by monitoring the current following a trip signal and issues an alarm if the current does not cease within a specified time interval. A two-stage time delayed output can be used to operate output contacts to retrip the same circuit breaker, using a second trip coil, or to backtrip an upstream circuit breaker.

CT Supervision

CT wiring is monitored by comparing the current levels of the three line currents against each other. This is linked to an alarm and may be configured to operate an output relay.

Circuit Breaker Maintenance

A circuit breaker operations counters is provided. A summation of I² broken by the circuit breaker provides a measure of the contact erosion. Operations count and I² alarm levels can be set which, when reached, can be used as an input to a condition-based maintenance regime.

Directional Control

7SG112n (Argus 2) and 7SG116n (Argus 6) only. Directional elements are available as an ordering option. The bi-directional elements provide independent settings for each direction of each overcurrent stage. Single phase or two-out-of-three directional decisions are available for the phase-fault elements. On some models the characteristic angle for phase-fault and earth-fault are freely selectable, while on others they are chosen from +30° and +45° for phase-fault, and from 0°, -15°, -45° and -65° for earth-fault. The polarising voltage for phase-fault elements is taken from the quadrature phase-phase voltage - see the typical connection diagrams for details.

Cold Load Pickup

7SG114n (Argus 4) and 7SG116n (Argus 6) only. The relay can apply higher current settings with longer time delays, after the circuit breaker has been open for a programmable time. When the circuit breaker is closed, these higher settings are applied for a programmable time, or until the measured current has fallen to normal levels.

Auto-Reclose

7SG114n (Argus 4) and 7SG116n (Argus 6) only. Integrated auto-reclose is available as an ordering option. The relay incorporates a 5 trip/4 close auto-reclose sequence that can be initiated by an internal or external signal. For each type of protection trip – phase-fault, earth-fault, SEF and external – a separate sequence of instantaneous and delayed trips is available. Programmable dead times and reclaim times with a wide setting range and integrated sequence co-ordination enable virtually all distribution auto-reclose schemes to be realised.

Technical Data

For full technical data refer to the Performance Specification of the Technical Manual.

Inputs and Outputs

Characteristic energising quantity

AC Current/Voltage	Frequency
1A / 5A	50 / 60Hz
63.5/110V	

Current Inputs: Burdens

5A Phase/Earth	< 0.2VA
1A Phase/Earth	< 0.05VA
5A SEF/REF	< 0.4VA
1A SEF/REF	< 0.2VA

Phase/Earth Current Inputs: Thermal Withstand

Continuous	3.0 x In	
10 minutes	3.5 x In	
5 minutes	4.0 x In	
3 minutes	5.0 x In	
2 minutes	6.0 x In	
	1A Input	5A Input
3 Second	57.7A	230A
2 Second	70.7A	282A
1 Second	100A	400A
1 Cycle	177A	618A

SEF/REF Current Inputs: Thermal Withstand

Continuous	2.0 x In	
10 minutes	3.5 x In	
5 minutes	4.0 x In	
3 minutes	5.0 x In	
2 minutes	6.0 x In	
	1A Input	5A Input
3 Second	37.5A	202A
2 Second	46A	247A
1 Second	65A	350A
1 Cycle	120A	618A

Voltage Inputs

Burden	< 0.1VA at 110V
Continuous Withstand	250V

DC Auxiliary supply

Rated DC Voltage	Operating Range V dc
24/30/48V	18 to 60V
110/220V	88 to 280V

Operate State	Burden
Quiescent (Typical)	3 W
Maximum	10 W

Allowable superimposed ac component	≤ 12% of dc voltage
Allowable breaks/dips in supply (collapse to zero from nominal voltage)	≤ 20 ms

DC status input

Nominal voltage	Operating range
30V	18 - 37.5 V D C
48V	37.5 - 60 V D C
110V	87.5 - 137.5 V D C
220V	175 - 280 V D C

Attribute	Value
Min. DC Current for Operation: 30/48V 110/220V	10mA <5mA
Reset/Operate voltage ratio	≥ 90 %
Typical response time	5 ms (10ms for Argus 2 type II)
Typical response time when programmed to energise an output relay contact	< 15 ms
Recommended Minimum pulse duration	40ms with setting of 20ms PU delay for a.c. rejection

For relays to ES148-4 standard and 110/125 or 220/250 volt DC working a 48 volt status input is supplied for use with external dropper resistors:

Nominal Voltage	Resistor Value	Wattage
110V	2k7 ± 5%	2.5 W
220 V	8k2 ± 5%	6.0 W

Each status input has associated timers which can be programmed to give time delayed pick-up and time delayed drop-off. These timers have default settings of 20ms, thus providing rejection and immunity to an AC input signal. Status inputs will not respond to the following:-

250V RMS 50/60Hz applied for two seconds through a 0.1µF capacitor.

Discharge of a 10µF capacitor charged to maximum DC auxiliary supply voltage.

The status inputs with nominal voltage of 30 V to 54 V meet the requirements of ESI 48-4 ESI 1.

Low Burden Status Inputs

Optionally, low burden status inputs are available directly rated for 110/125Vd.c. or 220/250Vd.c. without dropper resistors. These inputs do not meet the ESI 48-4 ESI 1 requirements. Where necessary a single external dropper resistor in parallel can be fitted to meet ESI 48-4 ESI 1 requirements.

Low Burden Status Input performance

Nominal	Operating Range	Typical burden
110, 125	87.5 to 137.5 V DC	1.75 to 3.0 mA
220, 250	175 to 280V DC	1.75 to 3.0 mA

110/125 V minimum pick-up voltage typically 50 – 60 V d.c.
220/250 V minimum pick-up voltage typically 100 – 120 V d.c.

Output relays

Carry continuously	5A ac or dc
Make and carry (L/R ≤ 40 ms and V ≤ 300V)	20A ac or dc for 0.5s 30A ac or dc for 0.2s
Breaking Capacity (≤ 5 A and ≤ 300 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 ≤ 40ms 50 W at L/R ≤ 10ms
Minimum number of operations	1000 at maximum load
Minimum recommended load	0.5 Watt minimum of 10mA or 5V

Mechanical

Vibration (Sinusoidal)

IEC 60255-21-1 Class I

Vibration response	0.5gn
Vibration endurance	1.0gn

Shock and Bump

IEC 60255-21-2 Class I

Shock response	5gn, 11ms
Shock withstand	15gn, 11ms
10 gn, Bump test, 16ms	10gn, 16ms

Seismic

IEC 60255-21-3 Class I

Seismic Response	1gn
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Mechanical Classification

Durability	In excess of 10 ⁶ operations
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Electrical Tests

Insulation

IEC 255-5 rms levels for 1 minute

Between all terminals and earth for 1 minute	2.0 kV rms
Between independent circuits for 1 minute	2.0 kV rms
Across normally open contacts for 1 minute	1.0 kV rms

High frequency disturbance

IEC 60255-22-1 class III

2.5kV longitudinal mode	≤ 3% deviation
1.0kV transverse mode	

Electrostatic Discharge

IEC 60255-22-2 class III

8kV, Contact discharge	≤ 5% variation
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Fast transient

IEC 255-22-4 class IV

4kV, 5/50ns, 2.5 kHz, repetitive	≤ 3% variation
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Conducted RFI

IEC 60255-22-6 class IV

10 V, 0.15 to 80 MHz	≤ 5% variation
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Conducted Limits

IEC 60255-25

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

Radiated Limits

IEC 60255-25

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

Radio frequency interference

IEC60 255-22-3

10 V/m, 20 to 1000 MHz	≤ 5% variation
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Environmental

Temperature

IEC 68-2-1/2

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

Humidity

IEC 68-2-3

Operational test	56 days at 40°C and 95% RH
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Performance

General Accuracy

Reference Conditions	
General	IEC 60255-3
Current settings	100% of I _n
Current input	IDMTL: 2 to 30 xls
	DTL: 5 xls
Auxiliary supply	Nominal
Frequency	50 Hz
Ambient temperature	20 °C

General Settings	
Transient overreach of highset/lowset (X/R = 100)	≤ -5 %
Disengaging time (see note)	< 42 ms
Overshoot time	< 40 ms

Note. Output contacts have a programmable minimum dwell time, after which the disengaging time is as above.

Accuracy Influencing Factors

Temperature		
-10 °C to +55 °C		≤ 5 % variation
Frequency		
47 Hz to 52 Hz	Level:	≤ 5 % variation
57 Hz to 62 Hz		
	Operating time:	≤ 5 % variation
Harmonic content: Phase-fault and earth-fault elements only. SEF elements reject all harmonics.		
Frequencies to 550 Hz		≤ 5 % variation

Overcurrent protection

Characteristic	
Setting	IEC Normal Inverse (NI) IEC Very Inverse (VI) IEC Extremely Inverse (EI) IEC Long Time Inverse, (LTI) DTL
No. of elements	1
Level	
Setting Range I _s	0.05, 0.1...2.5 x I _n
Accuracy	Operate: 105% I _s , ±4% or ±1% x I _n Reset ≥ 95% of operate current
Repeatability	± 1%
IDMTL Time Multiplier	
Setting	0.025, 0.05...1.6
Accuracy	± 5% or ± 30 ms
Repeatability	± 1% or ± 5 ms
DTL Delay	
Setting	0.00 to 20.00 sec

Accuracy	± 10ms
Repeatability	± 5 ms
Reset delay	
Setting	0 to 60 sec
Accuracy	± 1% or ± 10ms
Repeatability	± 1% or ± 5 ms

DTL	
No. of elements	3
Level	
Setting Range Is	0.05 to 52.5 x In
Accuracy	Operate: 100% Is, ±5% or, ±10mA Reset ≥ 95% of operate current
Repeatability	± 1%
DTL Delay	
Setting	0.00 to 20.00 sec
Accuracy	± 5ms
Repeatability	± 1% or ± 5 ms

SEF/REF	
No. of elements	2 delays
Level	
Setting Range Is	0.005 to 0.96 x In
Accuracy	Operate: 100% Is, ±5% Reset ≥ 95% of operate current
Repeatability	± 1%
DTL Delay	
Setting	0.00 to 20.00 sec
Accuracy	± 5ms
Repeatability	± 1% or ± 5 ms

Earth fault protection

As overcurrent protection.

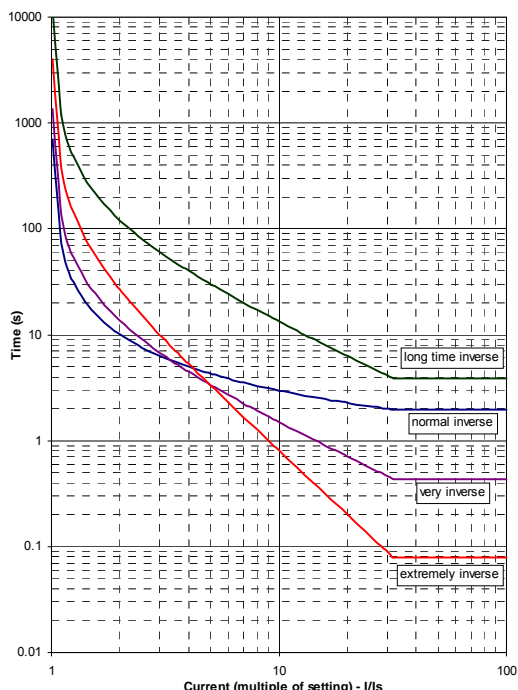


Fig 1. IEC IDMTL Curves

$$t_{operate} = Tm \times \left[\frac{K}{\left[\frac{I}{I_{is}} \right]^\alpha - 1} \right]$$

I = fault current

Is = current setting

Tm = time multiplier

NI: K = 0.14 α = 0.02

VI: K = 13.5 α = 1.0

EI: K = 80.0 α = 2.0

LTI: K = 120.0 α = 1.0

Circuit breaker failure (50BF)

Characteristics	DTL
No. of elements	3
DTL Delay	
Setting	Re-trip 0.00 to 20.00 sec Back-trip 0.00 to 20.00 sec
Accuracy	± 5ms
Repeatability	± 1%

CT Failure (60CTS)

Characteristics	DTL
No. of elements	1
Level	
Setting Range	OFF, 0.05 to 1 x In
DTL Delay	
Setting	0 to 300 sec

Auto-reclose (79)

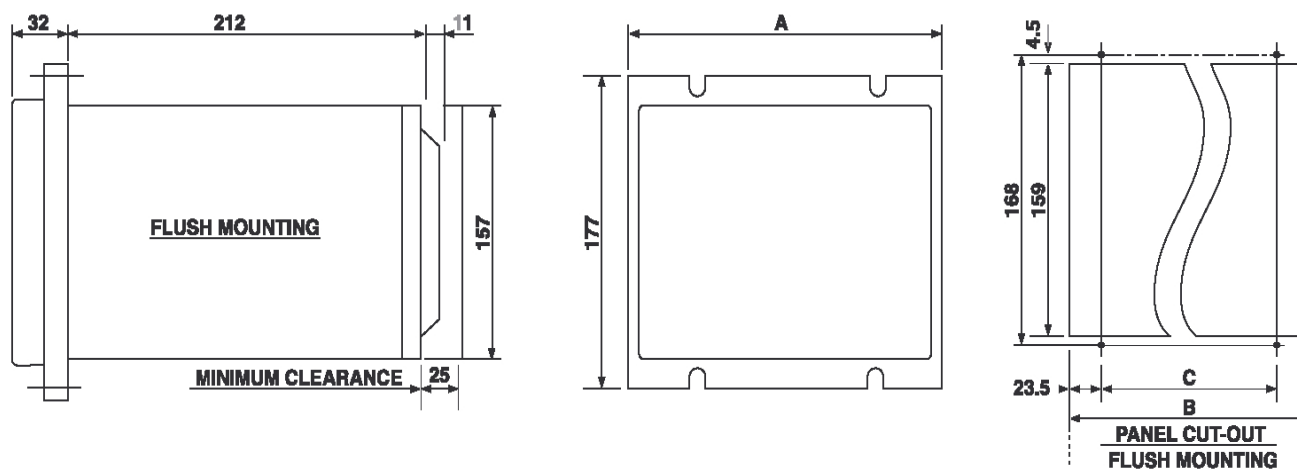
No. of Shots	1 to 4	
Delay		
Settings	Deadtime	0.2 to 14400 sec
	Close Pulse	1.0 to 10.0 sec
	Reclaim	0.2 to 14400 sec
	Lockout	Off, 0.2 to 14400 sec
Accuracy	± 1 % or ± 10 ms	
Repeatability	± 1%	

Instrumentation

Currents		
Reference conditions	I ≥ 0.1 x In	
Accuracy	± 1 % of In	
Voltages		
Reference conditions	V ≥ 0.8 x Vn	
Accuracy	± 1 % of Vn	
Power and Apparent Power		
Reference conditions	V = Vn, I ≥ 0.1 x In, pf ≥ 0.8	
Accuracy	± 3 % of Pn where Pn = Vn x In	
Power Factor		
Reference conditions	V = Vn, I ≥ 0.1 x In, pf ≥ 0.8	
Accuracy	± 0.05	

Case Dimensions

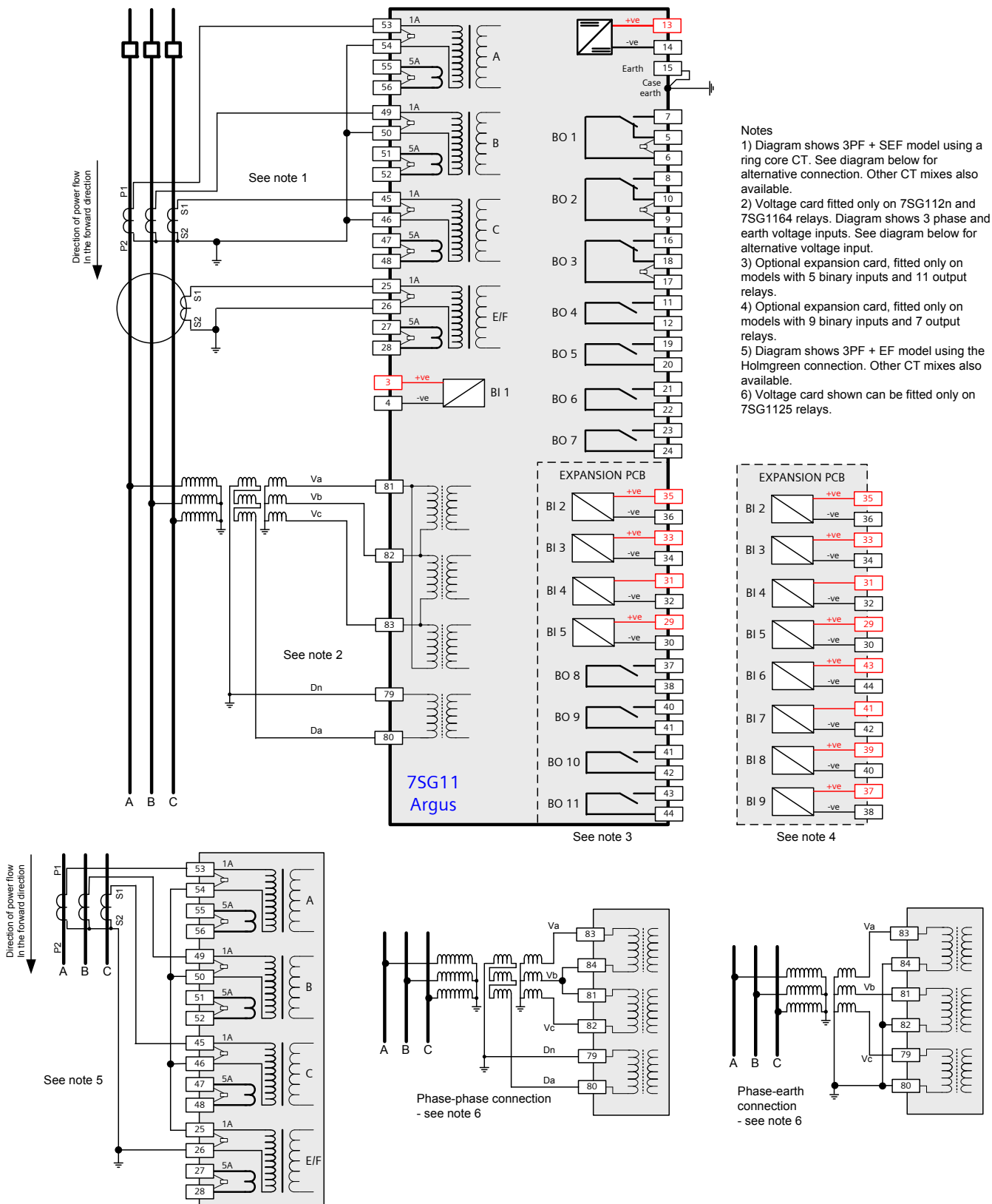
7SG11 series relays are supplied in either in E4, E6 or E8 cases.



	Dimensions		
	A	B	C
E4 Case	103	99.5	52
E6 Case	155	151	103.5
E8 Case	203	203	155.5

Fig 2. Overall dimensions and panel drilling details (All dimensions are in mm)

Connection Diagram



- Notes**
- 1) Diagram shows 3PF + SEF model using a ring core CT. See diagram below for alternative connection. Other CT mixes also available.
 - 2) Voltage card fitted only on 7SG112n and 7SG1164 relays. Diagram shows 3 phase and earth voltage inputs. See diagram below for alternative voltage input.
 - 3) Optional expansion card, fitted only on models with 5 binary inputs and 11 output relays.
 - 4) Optional expansion card, fitted only on models with 9 binary inputs and 7 output relays.
 - 5) Diagram shows 3PF + EF model using the Holmgren connection. Other CT mixes also available.
 - 6) Voltage card shown can be fitted only on 7SG1125 relays.

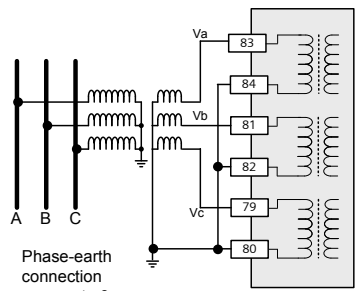
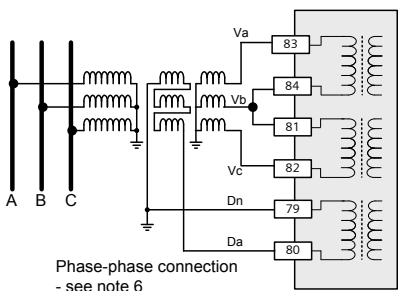
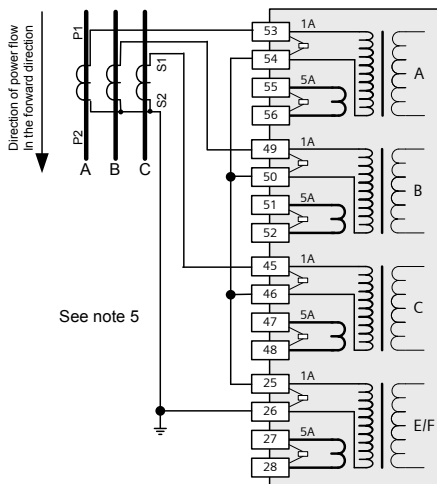


Fig 3. Connection Diagram for 7SG11 Overcurrent Relay

Typical Applications

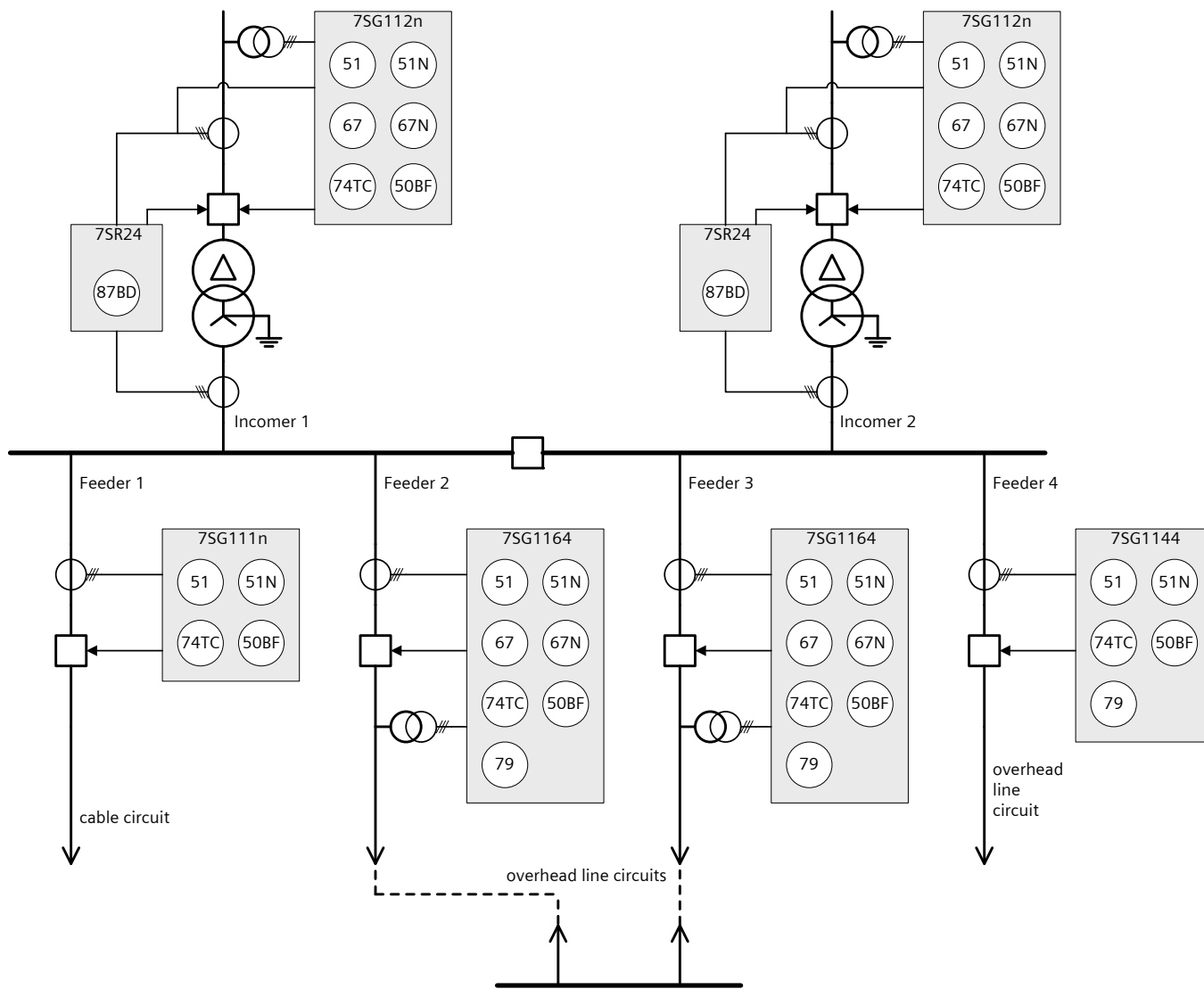


Fig 4. Typical Applications for 7SG11 Overcurrent Series Relays

Ordering Information – 7SG1111 Argus

Product description	Variants	Order No.
<p>Nondirectional O/C relay</p> <p>Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.</p>	<p><u>Number of elements</u> Single pole relay</p> <p><u>Auxiliary supply /binary input voltage</u> 24/30/48 V DC auxiliary, 30 V binary input 110/220 V DC auxiliary, 30 V binary input 24/30/48 V DC auxiliary, 48 V binary input 110/220 V DC auxiliary, 48 V binary input ¹⁾ 110/220 V DC auxiliary, 110 V low burden binary input 110/220 V DC auxiliary, 220 V low burden binary input</p> <p><u>Type of elements</u> Single pole phase-fault or single pole earth-fault Single pole sensitive/restricted earth-fault (SEF/REF)</p> <p><u>Nominal current</u> 1/ 5 A</p> <p><u>I/O range</u> 1 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)</p> <p><u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU RS485 interface / IEC 60870-5-103 or Modbus RTU</p> <p><u>Housing size</u> Case size E4 (4U high)</p>	<p>7 S G 1 1 1 □ - □ □ □ □ - 0 □ A 0</p>

1) High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition
for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition
Refer to website for application note about ESI48-4 compliance.

Ordering Information – 7SG1113 Argus

Product description	Variants	Order No.
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Nondirectional O/C relay

Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.

Number of elements

Three pole relay

Auxiliary supply /binary input voltage

24/30/48 V DC auxiliary, 30 V binary input
 110/220 V DC auxiliary, 30 V binary input
 24/30/48 V DC auxiliary, 48 V binary input
 110/220 V DC auxiliary, 48 V binary input ¹⁾
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

Type of elements

3 pole phase-fault or
 2 pole phase-fault and earth-fault
 2 pole phase-fault and sensitive/restricted earth-fault (SEF/REF)

Nominal current

1/ 5 A

I/O range

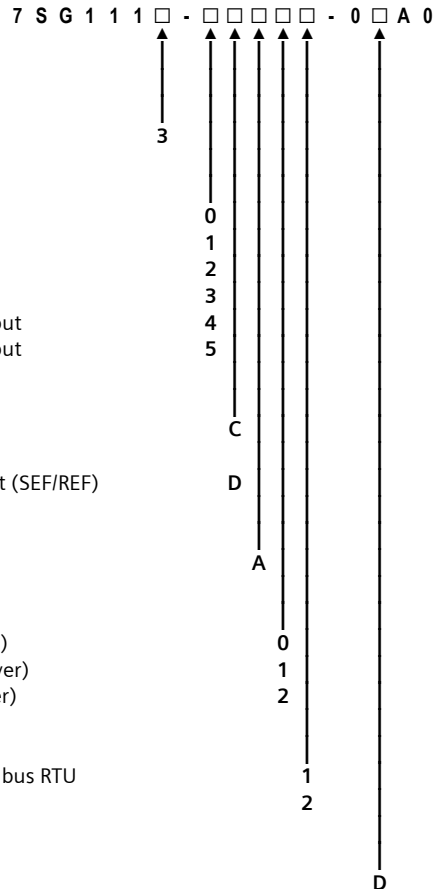
1 Binary Input / 7 Binary Outputs (incl. 3 changeover)
 5 Binary Inputs / 11 Binary Outputs (incl. 3 changeover)
 9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)

Communication interface

Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU
 RS485 interface / IEC 60870-5-103 or Modbus RTU

Housing size

Case size E6 (4U high)



¹⁾ High burden 110V & 220V binary inputs compliant with ES148-4 ESI 1 available via external dropper resistors with 48V binary input version
 for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition
 for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition
 for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition
 for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition
 for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition
 for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition
 Refer to website for application note about ES148-4 compliance.

Ordering Information – 7SG1114 Argus

Product description	Variants	Order No.
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Nondirectional O/C relay

Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.

Number of elements

Four pole relay

Auxiliary supply /binary input voltage

24/30/48 V DC auxiliary, 30 V binary input
 110/220 V DC auxiliary, 30 V binary input
 24/30/48 V DC auxiliary, 48 V binary input
 110/220 V DC auxiliary, 48 V binary input ¹⁾
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

Type of elements

3 pole phase-fault and earth-fault
 3 pole phase-fault and sensitive/restricted earth-fault (SEF/REF) or
 2 pole phase-fault and earth fault and sensitive/restricted earth-fault (SEF/REF)

Nominal current

1/ 5 A

I/O range

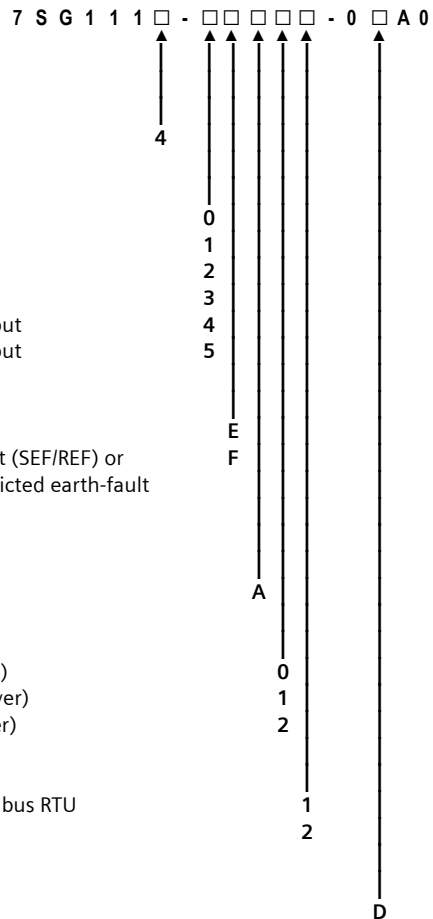
1 Binary Input / 7 Binary Outputs (incl. 3 changeover)
 5 Binary Inputs / 11 Binary Outputs (incl. 3 changeover)
 9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)

Communication interface

Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU
 RS485 interface / IEC 60870-5-103 or Modbus RTU

Housing size

Case size E6 (4U high)



¹⁾ High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
 for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition
 for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition
 for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition
 for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition
 for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition
 for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition
 Refer to website for application note about ESI48-4 compliance

Ordering Information – 7SG1115 Argus

Product description	Variants	Order No.
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Nondirectional O/C relay

Over current and earth fault protection for radial feeders, capacitor banks and industrial and commercial plant.

Number of elements

Four pole relay (fixed I/O)

Auxiliary supply /binary input voltage

24/30/48 V DC auxiliary, 30 V binary input
 110/220 V DC auxiliary, 30 V binary input
 24/30/48 V DC auxiliary, 48 V binary input
 110/220 V DC auxiliary, 48 V binary input ¹⁾
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

Type of elements

3 pole phase-fault and earth-fault

Nominal current

1A
 5A

I/O range

3 Binary Input / 5 Binary Outputs (incl. 2 changeover)

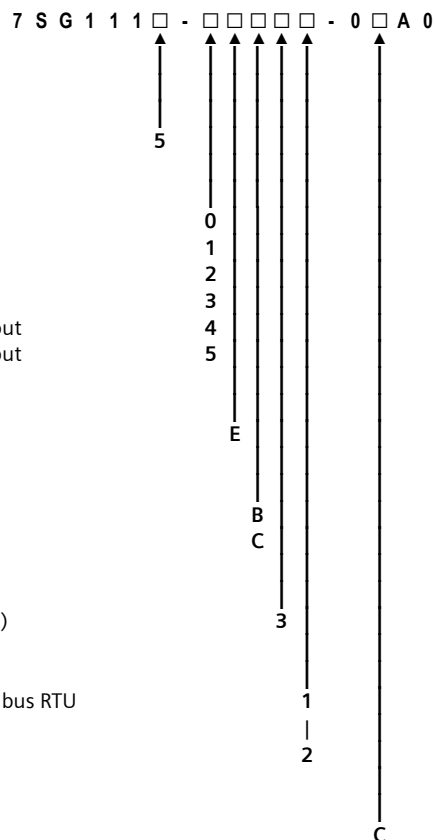
Communication interface

Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU

RS485 interface / IEC 60870-5-103 or Modbus RTU

Housing size

Case size E4 (4U high)



¹⁾ High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
 for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition
 for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition
 Refer to website for application note about ESI48-4 compliance

Ordering Information – 7SG1121 Argus

Product description	Variants	Order No.
<p>Directional O/C relay</p> <p>Ideal for directional overcurrent and earth fault protection of solid ring systems utilising the fully independent bi-directional feature.</p>	<p><u>Number of elements</u> Single pole relay</p> <p><u>Auxiliary supply/binary input voltage</u> 24/30/48 V DC auxiliary, 30 V binary input 110/220 V DC auxiliary, 30 V binary input 24/30/48 V DC auxiliary, 48 V binary input 110/220 V DC auxiliary, 48 V binary input 1) 110/220 V DC auxiliary, 110 V low burden binary input 110/220 V DC auxiliary, 220 V low burden binary input</p> <p><u>Type of elements</u> Single pole earth-fault directional Single pole earth-fault directional Single pole sensitive/restricted directional earth-fault (SEF/REF) Single pole sensitive/restricted directional earth-fault (SEF/REF)</p> <p><u>Nominal current</u> 1/ 5 A</p> <p><u>I/O range</u> 1 Binary Input / 7 Binary Outputs (incl. 3 changeover)</p> <p><u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU RS485 interface / IEC 60870-5-103 or Modbus RTU</p> <p><u>Directional measurement characteristic angle (CA)</u> 0°, -15°, -45°, -65° for earth faults 0°, -15°, -45°, -90° for earth faults</p> <p><u>Housing size</u> Case size E4 (4U high)</p>	<p>7 S G 1 1 2 □ - □ □ □ □ □ - □ □ A 0</p>

1) High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
for 1 binary input and 110 V application, order resistor box VCE:2512H10066 in addition
for 1 binary input and 220 V application, order resistor box VCE:2512H10068 in addition
Refer to website for application note about ESI48-4 compliance

Ordering Information – 7SG1125 Argus

Product description	Variants	Order No.
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Directional O/C relay

Ideal for directional overcurrent and earth fault protection of solid ring systems utilising the fully independent bi-directional feature, includes additional voltage protection and energy metering.

Number of elements

Four pole relay (numeric VT)

Auxiliary supply/binary input voltage

24/30/48 V DC auxiliary, 30 V binary input
 110/220 V DC auxiliary, 30 V binary input
 24/30/48 V DC auxiliary, 48 V binary input
 110/220 V DC auxiliary, 48 V binary input 1)
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

Type of elements

3 pole phase-fault directional and earth-fault directional
 3 pole phase-fault directional and sensitive/restricted earth fault (SEF/REF) or
 2 pole phase-fault directional and earth fault directional and sensitive/restricted earth-fault (SEF/REF)

Nominal current

1/5 A and 63/110 V AC

I/O range

5 Binary Inputs / 11 Binary Outputs (incl. 3 changeover)
 9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)

Communication interface

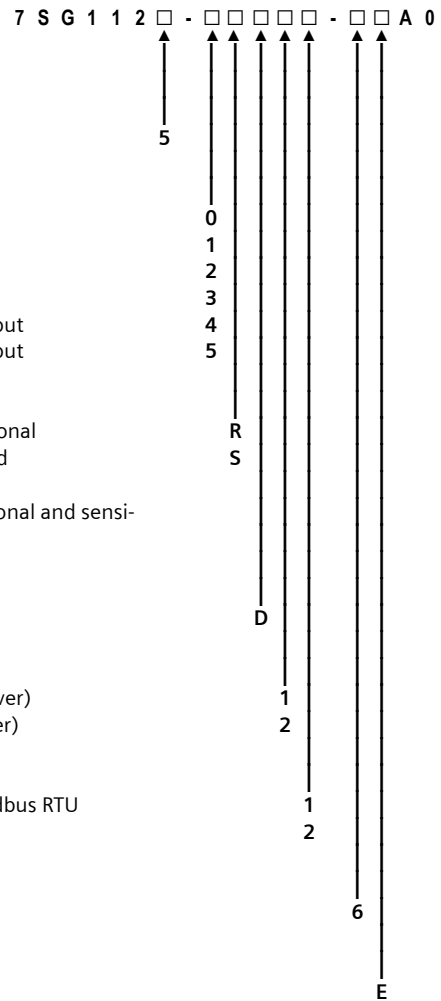
Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU
 RS485 interface / IEC 60870-5-103 or Modbus RTU

Directional measurement characteristic angle (CA)

-90° to +90° in steps of 1°

Housing size

Case size E8 (4U high)



1) High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
 for 5 binary inputs and 110 V application, order resistor box VCE:2512H10065 in addition
 for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition
 for 5 binary inputs and 220 V application, order resistor box VCE:2512H10067 in addition
 for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition
 Refer to website for application note about ESI48-4 compliance

Ordering Information – 7SG1144 Argus

Product description	Variants	Order No.
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Nondirectional O/C Relay with auto-reclose

Integrated overcurrent and earth fault relay with multishot autoreclose facilities.

Number of elements

Four pole relay

Auxiliary supply /binary input voltage

24/30/48 V DC auxiliary, 30 V binary input
 110/220 V DC auxiliary, 30 V binary input
 24/30/48 V DC auxiliary, 48 V binary input
 110/220 V DC auxiliary, 48 V binary input 1)
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

Type of elements

3 pole phase-fault and earth-fault
 3 pole phase-fault and sensitive/restricted earth-fault (SEF/REF) or 2 pole phase-fault and earth fault and sensitive/restricted earth-fault (SEF/REF)

Nominal current

1/ 5 A

I/O range

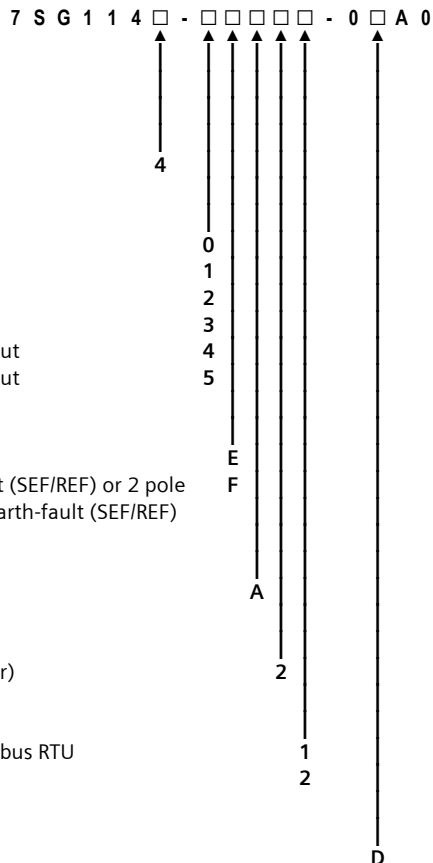
9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)

Communication interface

Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU
 RS485 interface / IEC 60870-5-103 or Modbus RTU

Housing size

Case size E6 (4U high)



1) High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition Refer to website for application note about ESI48-4 compliance

Ordering Information – 7SG1164 Argus

Product description	Variants	Order No.
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Directional O/C relay with auto-reclose

Bi-directional version of ARGUS 4.

Number of elements

Four pole relay

Auxiliary supply /binary input voltage

- 24/30/48 V DC auxiliary, 30 V binary input
- 110/220 V DC auxiliary, 30 V binary input
- 24/30/48 V DC auxiliary, 48 V binary input
- 110/220 V DC auxiliary, 48 V binary input 1)
- 110/220 V DC auxiliary, 110 V low burden binary input
- 110/220 V DC auxiliary, 220 V low burden binary input

Type of elements

- 3 pole phase-fault directional and sensitive/restricted earth-fault (SEF/REF)
- 3 pole phase-fault directional and earth-fault directional or 3 pole phase-fault directional and earth-fault
- 3 pole phase-fault directional and earth-fault directional or 3 pole phase-fault directional and earth-fault
- 3 pole phase-fault and earth-fault directional
- 3 pole phase-fault and earth-fault directional

Nominal current

1/ 5 A

I/O range

9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)

Communication interface

Fibre optic (ST-connector) / IEC 60870-5-103 or Modbus RTU
RS485 interface / IEC 60870-5-103 or Modbus RTU

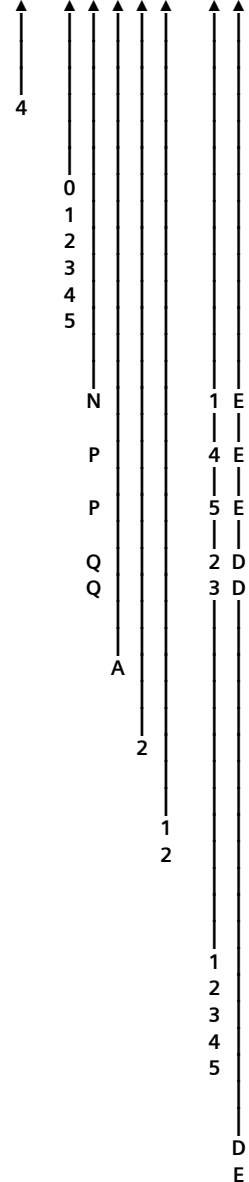
Directional measurement characteristic angle (CA)

- +30°, +45° for phase faults
- 0°, -15°, -45°, -65° for earth faults
- 0°, -15°, -45°, -90° for earth faults
- +30°, +45° for phase faults and 0°, -15°, -45°, -65° for earth faults
- +30°, +45° for phase faults and 0°, -15°, -45°, -90° for earth faults

Housing size

Case size E6 (4U high)
Case size E8 (4U high)

7 S G 1 1 6 □ - □ □ □ □ - □ □ A 0



1) High burden 110V & 220V binary inputs compliant with ESI48-4 ESI 1 available via external dropper resistors with 48V binary input version
for 9 binary inputs and 110 V application, order resistor box VCE:2512H10064 in addition
for 9 binary inputs and 220 V application, order two resistor boxes VCE:2512H10067 in addition
Refer to website for application note about ESI48-4 compliance

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