



Reyrolle
Protection
Devices

7SG118 Argus 8

Voltage & Frequency Relay

Answers for energy

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7SG118 Argus 8

Voltage and Frequency Relay



Description

7SG118 Argus 8 voltage and frequency relays are numerical, multi-function devices that are designed to be applied for the protection of transmission, distribution and industrial systems.

The relay provides phase under and over voltage, neutral displacement overvoltage, negative sequence overvoltage and under and over-frequency protection elements.

These relays have extensive protection functions, which are supplemented by advanced metering, data storage and communications. Supervisory and self monitoring features give added confidence to the user as well as reduced maintenance and down time. A menu-based interface gives user-friendly access to relay settings, meters and operational data.

Function Overview

- 2 or 3 voltage inputs
- Under/Over Voltage
- Negative phase sequence over voltage
- Neutral voltage displacement
- Under/Over Frequency
- Under voltage blocking
- Fibre optic or RS485 electrical communications port

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 STARTER, TRIP and PROTECTION HEALTHY 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 1ms resolution. These are available via the communications.

Fault records

The last 10 fault records are available from the 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.

AC voltage waveforms are stored together with the digital states of the status inputs and output relays.

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 and retrieve events and disturbance waveforms from the Relay.

Application

Undervoltage and overvoltage

Four independent elements are supplied, each of which can be set to operate for under or over voltage conditions. Each has separate definite time delay elements. These can be used to protect generators against over-voltages, motors against loss of supply or applied as backup protection in the event of defective system regulating equipment.

Negative sequence overvoltage

Two independent elements are supplied, each of which has a definite time delay element. These can be used to monitor the quality of the supply and protect plant against system unbalance.

Neutral voltage displacement

Two independent elements are supplied, each of which has a definite time delay element. These can be used to detect earth faults in high impedance earthed or isolated systems. For this feature, the residual voltage can be measured directly from an open delta tertiary winding or (for 3-phase variants) calculated internally from the phase voltage inputs.

These elements include a third harmonic filter, which desensitises the elements to any superimposed third harmonic frequencies.

Underfrequency and overfrequency

Four independent elements are supplied, each of which can be set to operate for under or over frequency. Each has separate definite time delay elements. These can be applied wherever frequency protection is required to maintain system stability e.g. in load shedding schemes. The accuracy and security of operation of the numeric algorithms enables the relay to be employed to detect any frequency abnormalities.

Description of Functionality

Relay variants with two voltage inputs have a '2 Systems A/B' connection setting. This allows the voltage of two different systems each to be assigned two of the under/overvoltage elements.

This feature could be used as part of a local generation scheme with islanding capability, where one input is allocated to the local system, and the other to the grid.

Note that in this mode the frequency elements are disabled.

Blocking operation

Each protection element can be blocked from operation by a user-defined status input signal. In addition, the voltage, frequency and NPS elements can be protected against maloperation during system de-energisation using the Voltage Blocking Threshold. Each frequency element may also be blocked by any combination of the voltage elements starting.

Trip circuit supervision

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

Circuit breaker maintenance

A circuit breaker operations counter is provided. An operations count level can be set which, when reached, can be used as an input to a condition-based maintenance regime.

Technical Data

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

Inputs and Outputs

Voltage Inputs

| AC Voltage | Frequency | |
|------------|-----------------|-----------|
| 63.5/110V | 100, 200-series | 50 / 60Hz |
| | 300-series | 50 Hz |

| | |
|----------------------|---------|
| Burden | ≤ 0.2VA |
| 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 | 10mA |
| 110/220V | <5mA |
| Reset/Operate voltage ratio | ≥ 90 % |
| Typical response time | 5 ms |
| 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 |

The 30V and 48V inputs meet the requirements of the ESI48-4 ES1 standard. However, the 110V or 220V inputs will operate with a DC current of less than 10mA. If 110V or 220V inputs compliant with ESI48-4 ES1 are required, a 48 volt status input can be supplied with external dropper resistors as follows:

| 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. The pick-up delays 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.

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 | 1250 VA |
| AC Inductive | 250 VA at p.f. ≥ 0.4 |
| DC Resistive | 75 W |
| DC Inductive | 30 W at L/R ≤ 40ms 50 W at L/R ≤ 10ms |
| Minimum number of operations | 10 ⁶ at maximum load |
| Minimum recommended load | 0.5 W minimum of 10mA or 5V |

Mechanical

Vibration (Sinusoidal)

IEC 60255-21-1 Class I

| | | | |
|---------------------|-------|----------------|-------|
| Vibration response | 0.5gn | ≤ 5% variation | 0.5gn |
| Vibration endurance | 1.0gn | | 1.0gn |

Shock and Bump

IEC 60255-21-2 Class I

| | | | |
|------------------|------------|----------------|------------|
| Shock response | 5gn, 11ms | ≤ 5% variation | 5gn, 11ms |
| Shock withstand | 15gn, 11ms | | 15gn, 11ms |
| 10 gn, Bump test | 10gn, 16ms | | 10gn, 16ms |

Seismic

IEC 60255-21-3 Class I

| | | |
|------------------|-----|----------------|
| Seismic Response | 1gn | ≤ 5% variation |
|------------------|-----|----------------|

Electrical Tests

Insulation IEC 255-5

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 1.0kV transverse mode | < 3% deviation |
|--------------------------------------------------|----------------|

Electrostatic Discharge

IEC 60255-22-2 class III

| | |
|------------------------|----------------|
| 8kV, Contact discharge | ≤ 5% variation |
|------------------------|----------------|

Fast transient

IEC 255-22-4 class IV

| | |
|----------------------------------|----------------|
| 4kV, 5/50ns, 2.5 kHz, repetitive | ≤ 3% variation |
|----------------------------------|----------------|

Conducted RFI

IEC 60255-22-6 class IV

| | |
|----------------------|----------------|
| 10 V, 0.15 to 80 MHz | ≤ 5% variation |
|----------------------|----------------|

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, 80 to 1000 MHz | ≤ 5% variation |
|------------------------|----------------|

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 |
|------------------|----------------------------|

Performance

General Accuracy

| Reference Conditions | |
|----------------------|--------------|
| General | IEC 60255-3 |
| Auxiliary supply | Nominal |
| Frequency | 50Hz or 60Hz |
| Ambient temperature | 20 °C |

Accuracy Influencing Factors

| Temperature | | |
|------------------|-----------------|-----------------|
| -10 °C to +55 °C | | ≤ 5 % variation |
| Frequency | | |
| 47 Hz to 52 Hz | Level: | ≤ 1 % variation |
| 57 Hz to 62 Hz | Operating time: | ≤ 1 % variation |

Phase Under/Over Voltage protection (27/59)

| | |
|-----------------|-------------------------------------------------------------------------------------------------------------|
| No. of elements | 4 |
| Level | |
| Setting Vs | 5.0 to 200.0 V step 0.5 V |
| Hysteresis | 1 to 90 % step 1 % |
| Accuracy | Operate: setting ± 1% or ± 0.25 V U/V reset: (operate + hysteresis) O/V reset: (operate - hysteresis) |

| Operating Time | | |
|--------------------------------------|------------------|---------|
| Under-Voltage | 1.1x to 0.9x Vs: | ≤ 65 ms |
| Reset | 0 V to 1.1x Vs | ≤ 75 ms |
| | 0 V to 2.0x Vs: | ≤ 65 ms |
| Over-Voltage | 0 V to 1.1x Vs: | ≤ 55 ms |
| | 0 V to 2.0xVs: | ≤ 45ms |
| Reset | 1.1x to 0.9x Vs: | ≤ 50 ms |
| Delay (additional to operating time) | | |
| Setting | 0.00 to 600 sec | |
| Accuracy | ± 1 % or ± 30 ms | |

Negative Sequence Over Voltage protection (47)

| | |
|-----------------|---------------------------------------------------------------------------------------|
| No. of elements | 2 |
| Level | |
| Setting Vs | 1.0 to 100.0 V step 0.5 V |
| Hysteresis | 1 to 90 % step 1 % |
| Accuracy | Operate: setting ± 1% or ± 0.5 V Reset: ≥ 95% of operate value (for Vs > 3.5 V) |

| Operating Time | | |
|----------------|------------------|---------|
| Operate | 0 V to 1.1xVs | ≤ 85 ms |
| | 0 V to 2.0xVs | ≤ 85 ms |
| Reset | 1.1x to 0.9x Vs: | ≤ 80 ms |
| | 1.1xVs to 0 Vs: | ≤ 70 ms |

| Delay (additional to operating time) | |
|--------------------------------------|------------------|
| Setting | 0.00 to 600 sec |
| Accuracy | ± 1 % or ± 30 ms |

Neutral Over Voltage protection (59N)

| | |
|-----------------|------------------------------------------------------------------------------------------|
| No. of elements | 2 |
| Level | |
| Setting Vs | 1.0 to 100.0 V step 0.5 V |
| Accuracy | Operate: setting ± 1% or ± 0.5 V Reset: ≥ 95% of operate value (for Vs > 7.5 V) |

| Operating Time | | |
|--------------------------------------|------------------|---------|
| Operate | 0 V to 1.1x Vs | ≤ 85 ms |
| | 0 V to 2.0x Vs | ≤ 85 ms |
| Reset | 1.1x to 0.9x Vs | ≤ 80 ms |
| | 1.1xVs to 0 V: | ≤ 70 ms |
| Delay (additional to operating time) | | |
| Setting | 0.00 to 600 sec | |
| Accuracy | ± 1 % or ± 30 ms | |

Under/Over Frequency protection (81U/O)

| | |
|-----------------|--------------------------------------------------------------------------------------------|
| No. of elements | 4 |
| Level | |
| Setting | 47.00 to 62.00 Hz step 0.01 Hz |
| Accuracy | Operate: setting ± 10mHz U/F reset: ≤ operate + 20 mHz O/F reset: ≤ operate - 20 mHz |

| Operating Time | | |
|--------------------------------------|------------------|----------|
| for ROCOF between 0.1 - 10 Hz/s | typically: | < 140 ms |
| | maximum: | 175 ms * |
| Delay (additional to operating time) | | |
| Setting | 0.00 to 600 sec | |
| Accuracy | ± 1 % or ± 30 ms | |

* 7SG118n-nW 300-series meets NGC specification for an underfrequency operating time of 150ms maximum

Voltage Blocking Element

| | |
|---------|-------------------------|
| Level | |
| Setting | 1.0 to 100.0 V step 1 V |

Case Dimensions

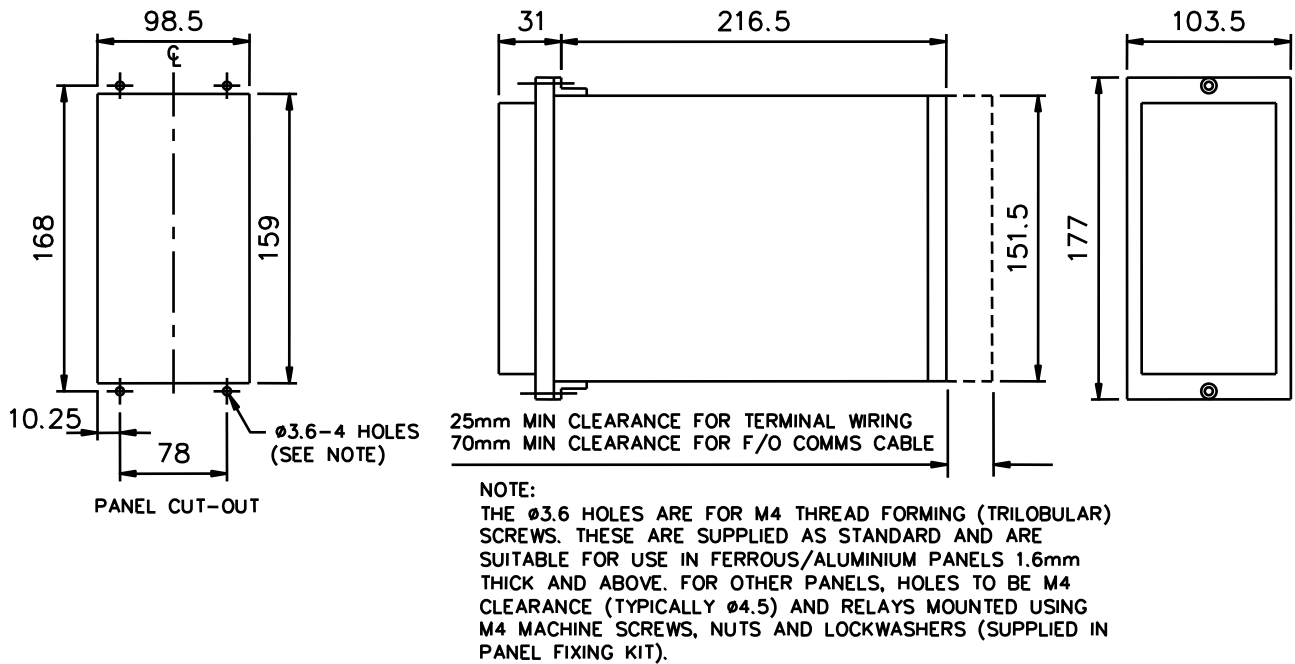


Fig 1. E4 Case Dimensions

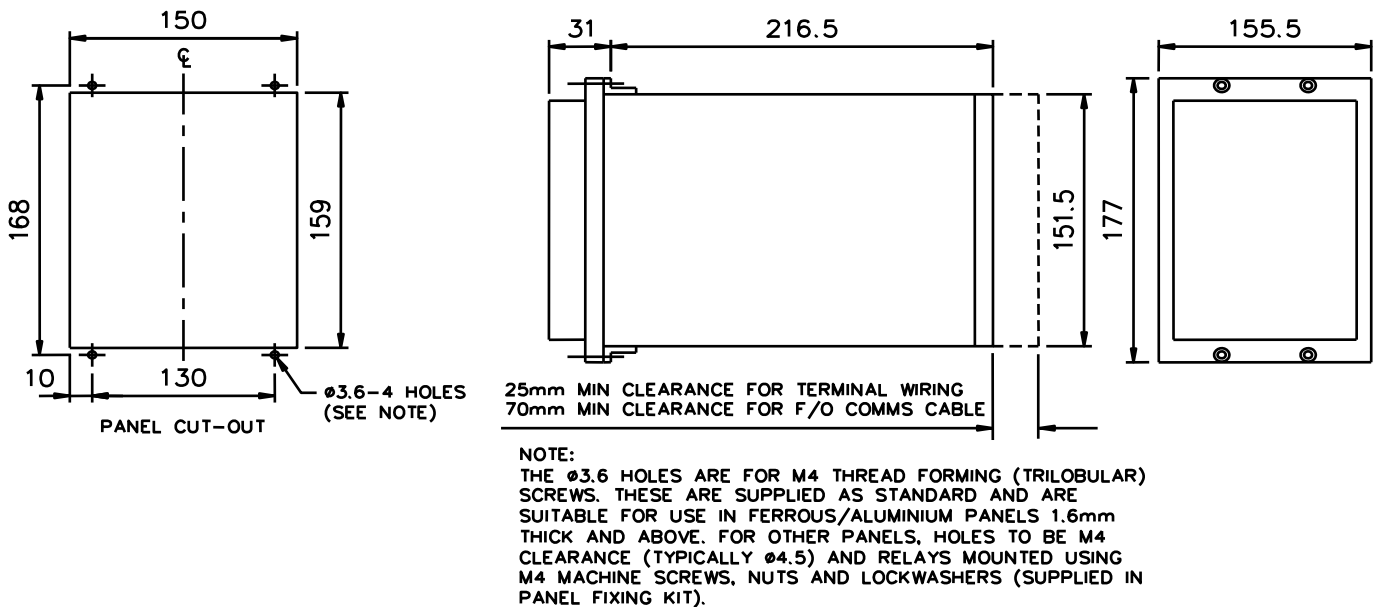
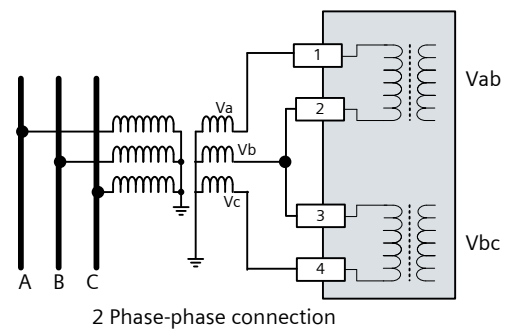
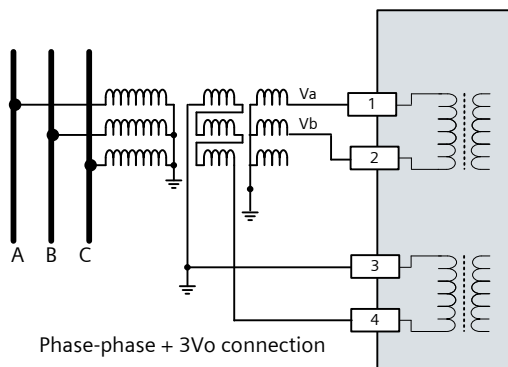
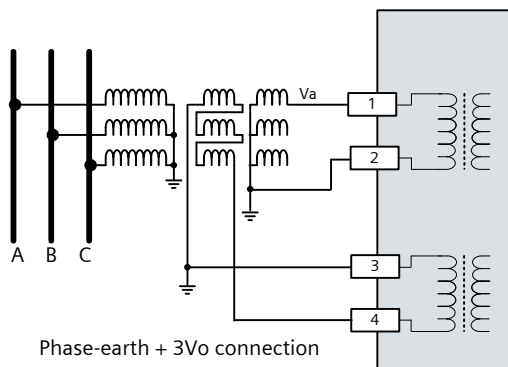
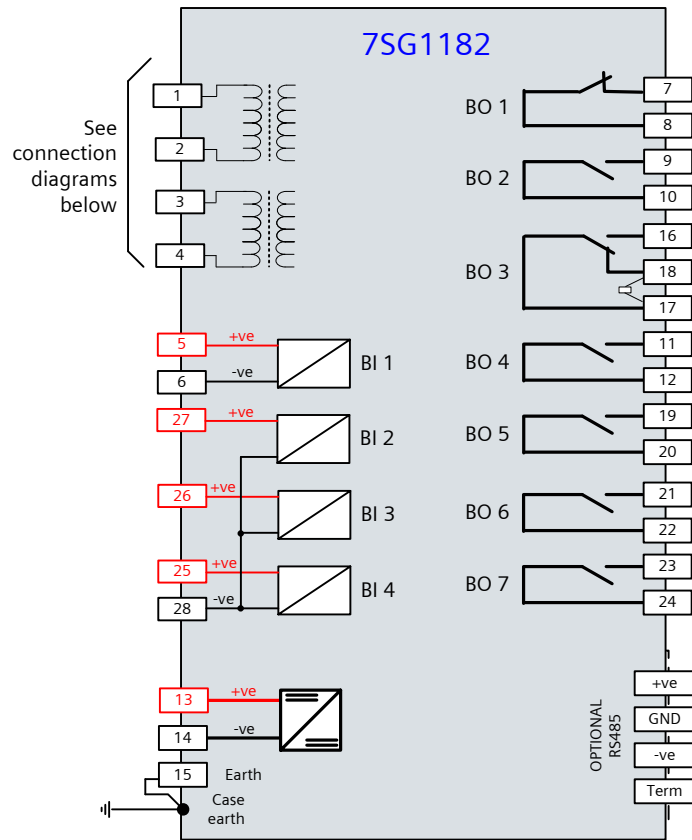


Fig 2. E6 Case Dimensions

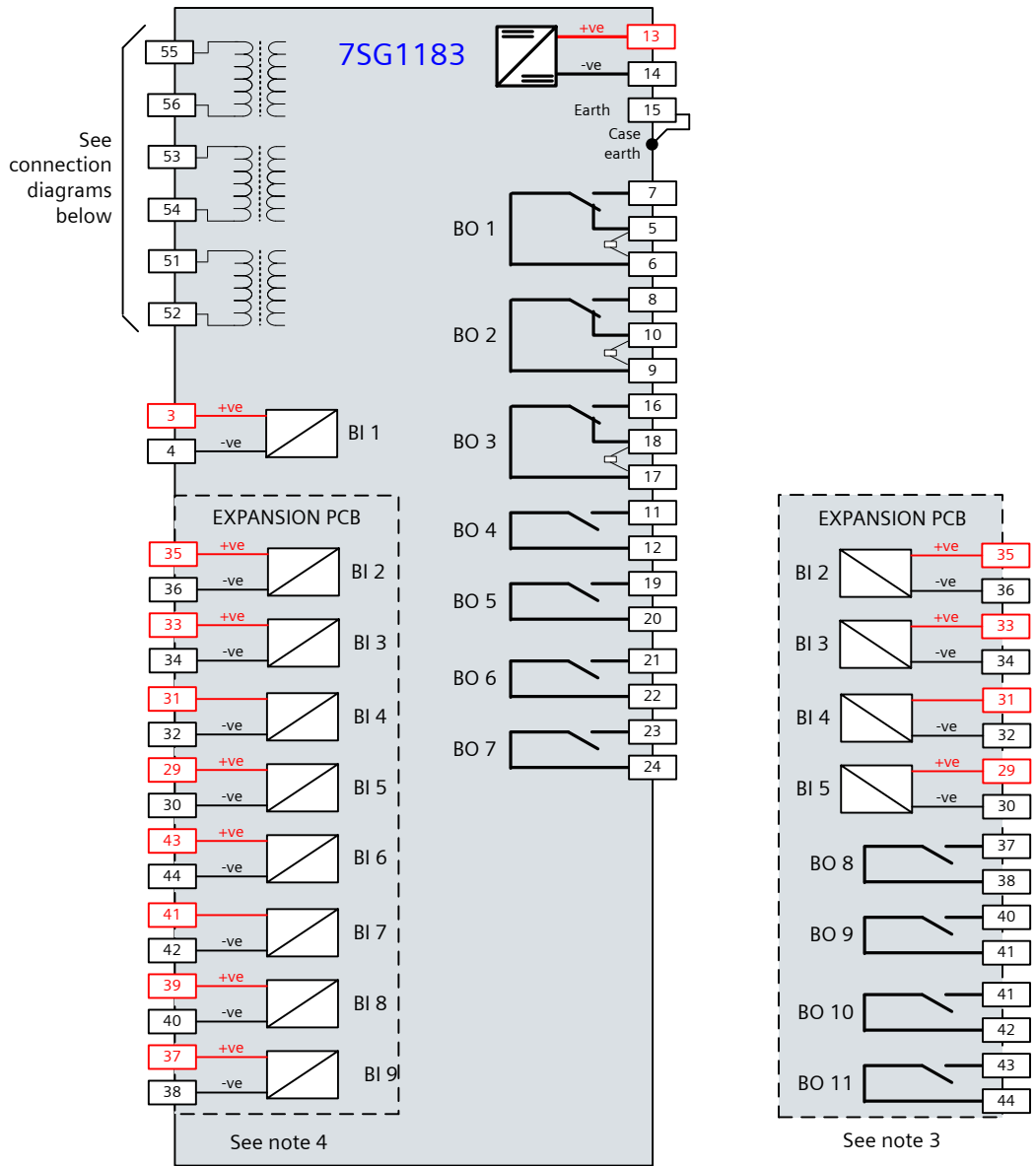
Connection Diagram



Note
For the phase-phase and phase-earth connections, any phasing may be used

Fig 3. Connection Diagram for 7SG1182 Relay

Connection Diagram



Note
For the phase-phase and phase-earth connections, any phasing may be used

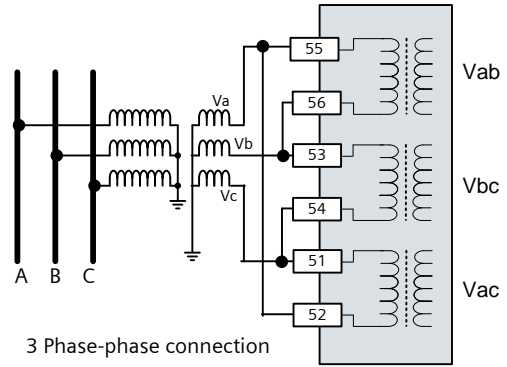
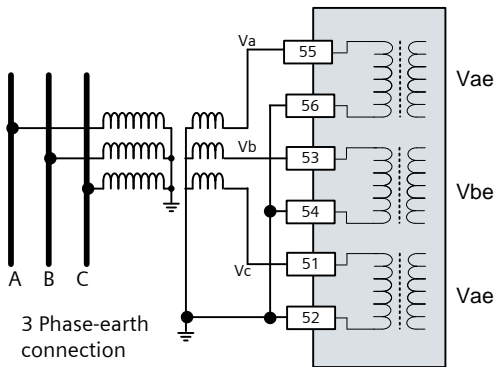


Fig 4. Connection Diagram for 7SG1183 Relay

Ordering Information – 7SG1182

| Product description | Variants | Order No. |
|---------------------|----------|-----------|
|---------------------|----------|-----------|

Voltage/frequency relay

Number of elements

Two 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 input¹⁾
 110/220 V DC auxiliary, 110 V low burden binary input
 110/220 V DC auxiliary, 220 V low burden binary input

Type of relay

100 series: Voltage measuring relay providing under & overvoltage, negative sequence overvoltage and neutral voltage displacement 50/60 Hz operation
 200 series: Voltage measuring relay providing under & overvoltage, under & over frequency, negative sequence overvoltage and neutral voltage displacement, 50/60 Hz operation
 300 series: Voltage measuring relay providing under & overvoltage, Under & over frequency with improved operating time, negative sequence overvoltage and neutral voltage displacement, 50 Hz operation only

Nominal voltage inputs

63/110 V AC

I/O range

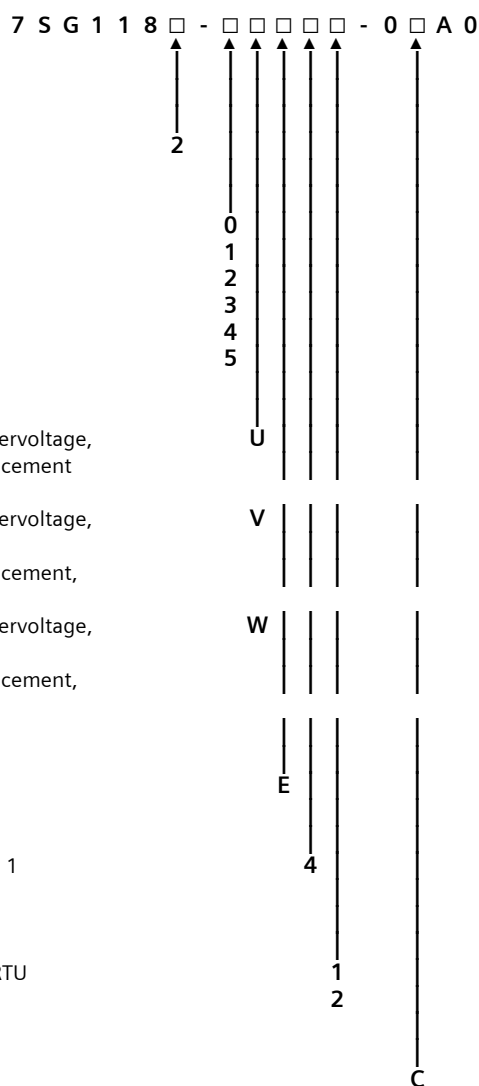
4 Binary Inputs / 7 Binary Outputs (incl. 1 changeover and 1 normally closed)

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

²⁾ An additional unit is required for use with capacitor cones, order 7XG2100-1AA00-0AA0

Ordering Information – 7SG1183

| Product description | Variants | Order No. |
|---------------------|----------|-----------|
|---------------------|----------|-----------|

Voltage/frequency relay

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 relay

100 series: Voltage measuring relay providing under & overvoltage, negative sequence overvoltage and neutral voltage displacement 50/60 Hz operation
 200 series: Voltage measuring relay providing under & overvoltage, under & over frequency, negative sequence overvoltage and neutral voltage displacement, 50/60 Hz operation
 300 series: Voltage measuring relay providing under & overvoltage, Under & over frequency with improved operating time, negative sequence overvoltage and neutral voltage displacement, 50 Hz operation only

Nominal voltage inputs

63/110 V AC

I/O range

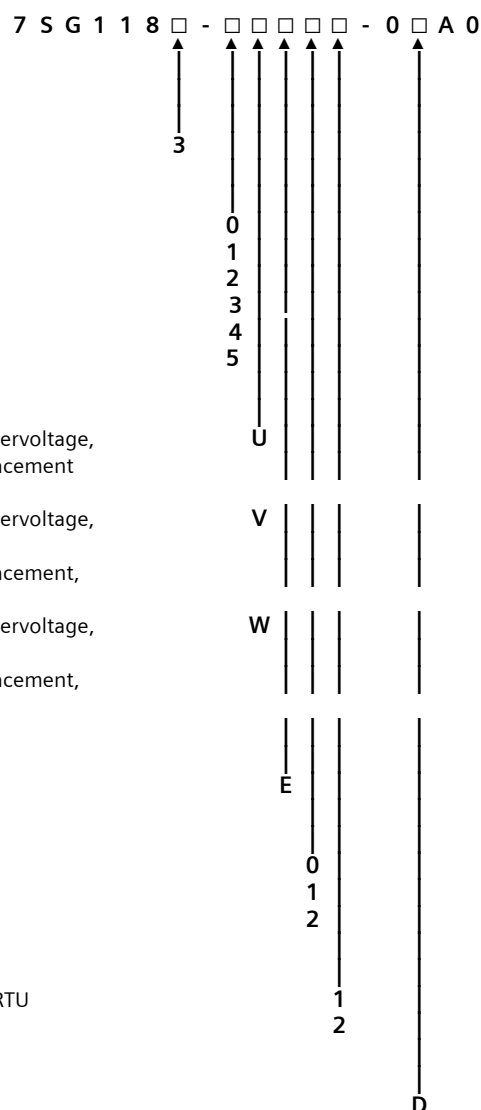
1 Binary Input / 7 Binary Outputs (incl. 3 changeover)
 5 Binary Inputs / 11 Binary Outputs (incl. 3 changeover)
 9 Binary Inputs / 7 Binary Outputs (incl. 3 changeover)

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

2) An additional unit is required for use with capacitor cones, order 7XG2100-1AA00-0AA0

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Siemens AG
Infrastructure & Cities Sector
Freyeslebenstrasse 1
91058 Erlangen, Germany

Siemens Protection Devices Limited
P.O. Box 8
North Farm Road
Hebburn
Tyne & Wear
NE31 1TZ
United Kingdom
Phone: +44 (0)191 401 7901
Fax: +44 (0)191 401 5575
www.siemens.com/energy

For more information, please contact our
Customer Support Center.
Phone: +49 180/524 70 00
Fax: +49 180/524 24 71 (Charges depending on provider)
E-mail: support.energy@siemens.com

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