



Reyrolle  
Protection  
Devices

# 7SG16 Ohmega

Distance Protection

Answers for energy

**SIEMENS**

# 7SG16 Ohmega

## Distance Protection



### Description

The 7SG16 Ohmega range of numeric distance relays combines the power and flexibility of microprocessor technology with the proven measuring techniques of previous impedance relays.

7SG16 relays provide mho or quadrilateral elements operating as a full scheme distance protection. All fault loops and all zones are continuously monitored providing superior fault coverage when compared to relays employing starters.

The distance protection is supplemented by integrated signalling schemes allowing the relays to be applied as unit protections.

Complementing the distance protection is a range of protection and control features, which are combined in the various models in the range to suit different applications. Communications facilities using the IEC 60870 standard allow remote update of settings and provide access to the instrumentation, waveform storage and data collection features of the relay.

7SG163n series relays are suitable for distribution networks. 7SG164n series relays are suitable for sub-transmission networks.

### Functional Overview

#### Standard

3 zone Distance protection with mho characteristics and earth fault compensation.

Voltage Transformer supervision detects blown VT fuses by monitoring sequence components of voltage and current.

Switch on to fault (SOTF) protection provides fast tripping if the CB is closed with earthing clamps left in place.

Transient - free Highset overcurrent protection.

Power swing detection can be set to block distance protection tripping.

Fault locator provides the location of the fault in either miles, kilometres or line percentage.

Permissive underreach and Permissive overreach Signalling Schemes are provided in addition to time stepped operation.

Trip circuit supervision

Self monitoring. Hardware and software watchdogs and data integrity checks ensure that the relay operates in the correct manner

#### Optional

4th distance protection zone

Quadrilateral characteristics for earth fault

Single-pole tripping

Blocking, acceleration and loss of load schemes

Stub protection

Directional Earth-Fault (DEF) (High Resistance Earth-Fault)

protection (single or dual) with Permissive Overreach and

Blocking signalling schemes.

Sensitive Earth-Fault protection

Autoreclose (high-speed single-pole or three-pole as appropriate) with Reach extension scheme

Check synchronising

Overvoltage and undervoltage protection

### Monitoring Functions

Analogue values can be displayed in primary or secondary quantities on the LCD screen.

Primary current per phase

Primary earth current

Secondary current per phase

Secondary earth current

Primary phase voltages

Secondary voltages

Apparent power and power factor

Real and reactive power

Direction

Autoreclose status

Check sync line and bus voltages

Check sync differential voltage

Check sync phase difference

Bus and line frequency

Check sync slip frequency

Output contacts

Status inputs

Trip counters

Number of waveform and event records stored

Time and Date

#### LED indication

32 user programmable LEDs are provided, these can be assigned to indicate fault and alarm status.

## Description of Functionality

7SG16 relays use proven phase comparator techniques to provide full scheme distance protection with mho and quadrilateral characteristics. All fault loops are continuously measured, requiring no starter characteristics. This allows developing faults to be correctly cleared.

The reach of each zone is set independently with separate settings for phase and earth fault protection. Time delays may be set separately for phase and earth faults on all zones.

The distance protection can trip the CB directly, or a signalling scheme can be used to verify a trip decision. The section below describes the standard schemes available. On some models the signalling schemes include current reversal detection, circuit breaker echo and weak infeed detection to ensure correct operation of the relay.

### Power swing

System power swings can lead to an apparent drop in impedance, due to heavy load variation or remote system faults, which can lead to the measured impedance entering a protection zone and causing operation. This can be detected using two dedicated impedance characteristics that encompass the protection zones. They are arranged so that one is larger than the other, a fault will cause them to pick up in quick succession while a power swing will cause a longer delay between the outer element picking up and the inner one.

Once a power swing is detected the distance protection can be inhibited.

### Switch on to fault

Inadvertent closing of the circuit breaker with the earth clamps left in place causes a 3 phase short circuit fault. Switch on to fault (SOTF) protection detects this condition and provides instantaneous fault clearance. Two styles of SOTF are provided, AC SOTF is for use where line VTs are fitted, DC SOTF is for use with bus VTs.

### Voltage transformer supervision

Loss of supply from the VTs can cause unwanted operations of the distance protection. To avoid this, the sequence component voltages present on the voltage inputs are monitored. During healthy conditions no residual or NPS voltage is present. If a VT fuse fails, residual and NPS voltage are generated with no increase in the corresponding sequence current. The VT supervision operates and raises an alarm. If required, it can also inhibit operation of the distance protection.

### Circuit breaker fail (50BF)

The circuit breaker fail function operates by monitoring the current following a trip signal and issues an output if the current does not cease within a specified time interval. This output contact can be used to backtrip an upstream circuit breaker. The circuit breaker fail function has a fast reset feature.

## Optional Functionality

### Phase-fault (highset) overcurrent

A transient free phase-fault definite-time overcurrent element is provided, which operates with a DTL characteristic.

### Directional earth-fault

To achieve effective clearance of high impedance earth-faults a directional earth-fault protection is available. This provides a directional element operating from residual current and voltage, and an overcurrent element operating from the residual current.

A second DEF element can be provided to detect faults in forward and reverse directions.

A variety of signalling schemes are available for use with DEF protection – see section on 'Application' below.

### Sensitive earth-fault

A non-directional sensitive earth fault protection operating from residual current is available. It can be set down to 2% of nominal current to allow clearance of very high impedance earth faults. A definite-time delay is provided to allow the SEF to be graded with the distance protection.

### Overvoltage and undervoltage

Two overvoltage elements and two undervoltage elements are available, with definite-time delays. These monitor line voltages providing alarm and trip levels of operation.

### Autoreclose

An integrated autorecloser is available. This provides delayed or high-speed autoreclose following a zone 1 or scheme-generated trip.

The 7SG163n, with three-pole tripping only, provides a single-shot three-pole autoreclose.

The 7SG164n recloser can provide up to 2 reclosing shots. A variety of sequences may be set up, to allow trips and recloses in different combinations of single- and three-pole.

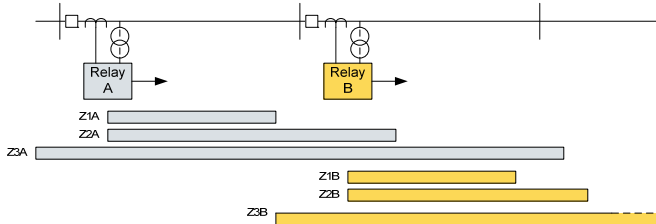
### Check Synchronising

An integrated synchroniser is available, which prevents the circuit breaker being closed if the two power systems are not synchronised with one another.

# Application

## Time Stepped Distance

Time delayed Zones 2,3 & 4. Direct intertripping can be applied.

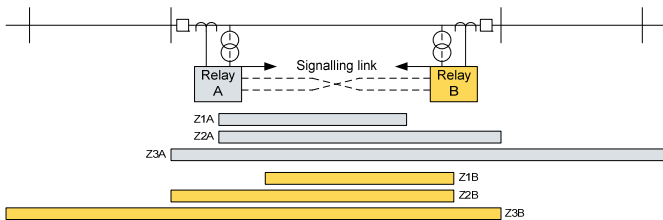


## Permissive Underreach (PUR)

Zone 1 is typically set to give instantaneous coverage up to 80% of the line length and aided tripping using accelerated Zone 3 (7SG163n) or Zone 2 (7SG164n) for the remaining 20%.

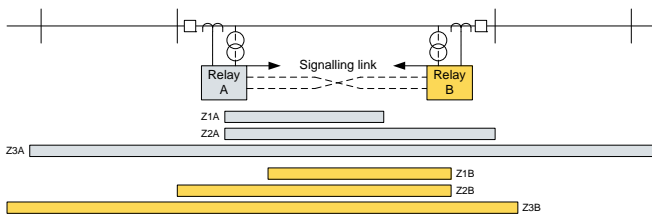
## Zone 2 Accelerated (PA)

Zone 1 is set to give instantaneous coverage typically up to 80% of the line length and aided tripping using accelerated Zone 2 for the remaining 20%.



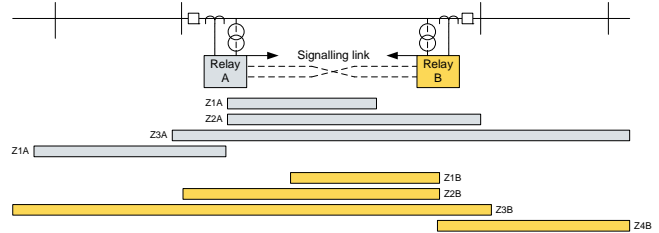
## Blocking Overreach Type 1 (without Z4)

Zone 2 is set to overreach giving instantaneous coverage over 100% of the line length. It is blocked for out of zone faults by the remote Z3.Z2 elements.



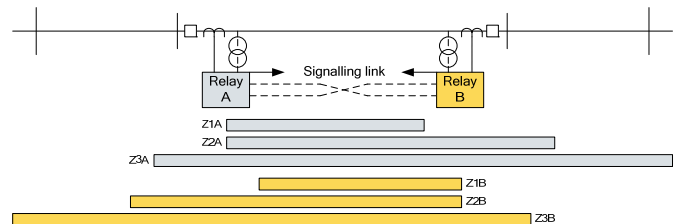
## Blocking Overreach Type 2 (Zone 4)

Zone 2 is set to overreach giving instantaneous coverage over 100% of the line length. It is blocked for out of zone faults by the remote Zone 4 reverse element.



## Permissive Overreach Type 2 (POR2)

Zone 2 is set to overreach giving instantaneous coverage of 100% of the line length with a permissive signal from the remote Zone 2.



## Reach extension (RE)

Instantaneous coverage up to Zone 1 extended setting for the first fault detected with delayed stepped distance for persistent faults. For relays with autoreclose, instantaneous coverage with Zone 1 can be extended for the initial fault. Time stepped distance is applied for persistent faults.



## DEF Permissive Overreach (DPOR)

Overreach DEF to give short time delayed coverage over 100% of the line length for earth faults, with a permissive signal from the remote DEF.

## Current Reversal Logic

This logic is used in conjunction with permissive overreach schemes applied to dual circuit lines. Tripping of the faulted feeder at one end may result in sudden reversal of fault current in the adjacent feeder. This may otherwise cause false tripping of the healthy adjacent feeder due to delayed resetting of the permissive signal.

## Data Storage and Communication

### 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 10 fault waveforms may be stored with associated analogue and digital values.

### Communications

Two fibre-optic communications ports are provided on the rear of the relay. They are optimised for 62.5/125µm glass-fibre, with BFOC/2.5 (ST®) bayonet style connectors.

In addition users may interrogate the relay locally with a laptop PC and the 25-pin female D-type connector RS232 port on the front of the relay.

The relay data comms are compliant with IEC 60870-5-103 communications standard.

## Reydisp Evolution

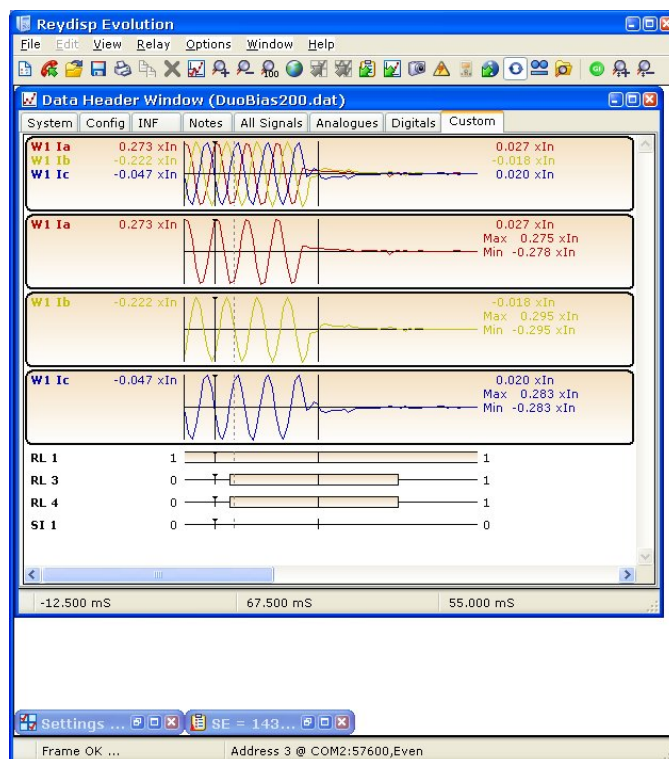


Fig 1. Disturbance Records in Reydisp Evolution

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

Reydisp Evolution utilises IEC 60870-5-103 protocol.

## Technical Data

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

## Inputs and Outputs

### Characteristic energising quantity

Performance data To IEC 60255-3

AC Current/Voltage	Frequency
1A, 2A or 5A ,3-phase	50 / 60Hz
63.5V line-neutral, 3-phase	

### Current Inputs

Thermal Withstand	
12A	continuous
15A	10 minutes
30A	2 minutes
240A	2 Seconds
340A	1 Second
625A peak	1 Cycle

Burden	
5A	$\leq 0.625$ VA
	$\leq 0.1$ VA
1A	$\leq 0.025$ VA

**Note:** Burdens are measured at nominal rating.

### Voltage Inputs: Thermal Withstand

Thermal Withstand	
3.5 x Vn	continuous

Burden	
	$\leq 0.01$ VA

**Note:** Burdens are measured at nominal rating.

### DC Auxiliary Supply

Nominal Voltage	Operating Range V dc
30V	24 to 37.5V
48/110V	37.5 to 137.5
220 V	178.0 to 280.0
110/220V	88 to 275

Operate State	Burden
Quiescent (Typical)	15 W
Maximum	27 W

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

### Binary inputs

Nominal Voltage	Operating Range V dc
30V	18 to 37.5V
48V	37.5 to 60V
110 V	87.5 to 137.5V
220V	175 to 280V

The binary input voltage need not be the same as the main energising voltage.

### Binary input performance

Parameter	Value
Minimum DC current for operation (30V and 48V inputs only)	10 mA
Reset/Operate Voltage Ratio	$\geq 90\%$
Typical response time	$< 5$ ms
Typical response time when used to energise an output relay contact	$< 15$ ms
Minimum pulse duration	40 ms

Binary inputs will not respond to the following:  
250V RMS 50/60 Hz applied for two seconds through a 0.1 $\mu$ F capacitor.

500 V RMS 50/60 Hz applied between each terminal and earth.

Discharge of a 10 $\mu$ F capacitor charged to maximum DC auxiliary supply voltage.

### Output Relays

Carry continuously	5A ac or dc
Make and carry (L/R $\leq 40$ ms and V $\leq 300$ V)	20A ac or dc for 0.5s 30A ac or dc for 0.2s
Breaking Capacity ( $\leq 5$ A and $\leq 300$ V): AC Resistive AC Inductive DC Resistive DC Inductive	1250 VA 250 VA at p.f. $\leq 0.4$ 75 W 30 W at L/R $\leq 40$ ms 50 W at L/R $\leq 10$ ms
Minimum number of operations	1000 at maximum load
Minimum recommended load	0.5 Watt limits 10mA or 5V

## Mechanical

### Vibration (Sinusoidal)

IEC 60255-21-1 Class 1

0.5 gn, Vibration response	≤ 5% variation
1.0 gn, Vibration endurance	

### Shock Bump

IEC 60255-21-2 Class 1

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

### Seismic

IEC 60255-21-3 Class 1

1 gn, Seismic response	≤ 5% variation
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### Mechanical Classification

Durability	In excess of 10 <sup>6</sup> operations
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## Electrical Tests

### Insulation

IEC 60255-5 RMS levels for 1 minute

Between all terminals and earth	2.0 kV
Between independent circuits	2.0 kV
Across normally open contacts	1.0 kV

### Transient Overvoltage

IEC 60255-5

Between all terminals and earth or between any two independent circuits without damage or flashover	5 kV 1.2/50 μs 0.5 J
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### High Frequency Disturbance

IEC 60255-22-1 Class III

2.5kV, Longitudinal mode	≤3% variation
1.0kV, Transverse mode	

### Electrostatic Discharge

IEC 60255-22-2 Class III

8kV, Contact discharge	≤5% variation
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### Fast Transient

IEC 60255-22-4 Class IV

4kV, 5/50ns, 2.5 kHz, repetitive	≤3% variation
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### Radio Frequency Interference

IEC 60255-22-3

10 V/m, 80 to 1000 MHz	≤5% variation
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### Conducted RFI

IEC 60255-22-6

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

## Environmental

### Temperature

IEC 60068-2-1/2

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

### Humidity

IEC 60068-2-3

Operational test	56 days at 40 °C and 93% RH
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## Protection Elements

### General Accuracy

Reference Conditions	
General	IEC60255 Parts 6, 6A & 16
Auxiliary	Nominal
Frequency	50Hz
Ambient Temperature	20°C
Impedance setting	6 Ohms
Line angle	75°
$Z_0/Z_1$	2.5

### Accuracy influencing factors

Temperature	
10 °C to +55 °C	≤ 5% variation
Frequency	
47 Hz to 52 Hz	Setting: ≤5% variation
57 Hz to 62 Hz	Operate Time: ≤ 5% variation

### Distance Protection

Impedance Reach	
$Z_N$ setting	0.1 to 250 Ω
$\Phi_N$ Angle	0 to 90° step 5°
Accuracy ( $Z_N = 6\Omega$ , mho characteristic, 3-phase fault)	
$Z_N^1$ ( $\Phi = \Phi_N \pm 3^\circ$ )	$Z_N \pm 5\%$ or 0.1 Ω for $SIR < 30$ $Z_N \pm 10\%$ or 0.1 Ω for $SIR \geq 30$
$Z$ ( $\Phi = \Phi_N \pm 10^\circ$ )	$Z_N^1 \times \cos(\Phi_N - \Phi) \pm 0.05 Z_N \Omega$
$Z$ ( $0^\circ \leq \Phi \leq 90^\circ$ )	$Z_N^1 \times \cos(\Phi_N - \Phi) \pm 0.1 Z_N \Omega$
Accuracy (all $Z_N$ )	class index plus an error not exceeding class index
Transient overreach	class index plus an error not exceeding class index
Operating time (see Technical Manual)	
Operating time	min. 17ms (7SG164n) min. 35ms (7SG163n)
Delay (additional to operating time)	
Setting	0 to 10 s step 10 ms
Accuracy	Setting $\pm 1\%$ or 10

### Directional earth-fault protection

Characteristic	DTL
Level	
Settings	0.05 to 4.00 x $I_n$
Accuracy	Operate: Setting $\pm 5\%$ Reset: $\geq 95\%$ of operate level
Delay	
Settings	0 to 20s steps 1ms
Accuracy	Setting $\pm 1\%$ or 5ms

### Phase-fault (highset) overcurrent protection

Characteristic	DTL
Level	
Settings	0.1 to 35.0 x $I_n$
Accuracy	Operate: Setting $\pm 5\%$ Reset: $\geq 95\%$ of operate level
Delay	
Settings	0 to 1000ms
Accuracy	Setting $\pm 1\%$ or 10ms



## Case Dimensions

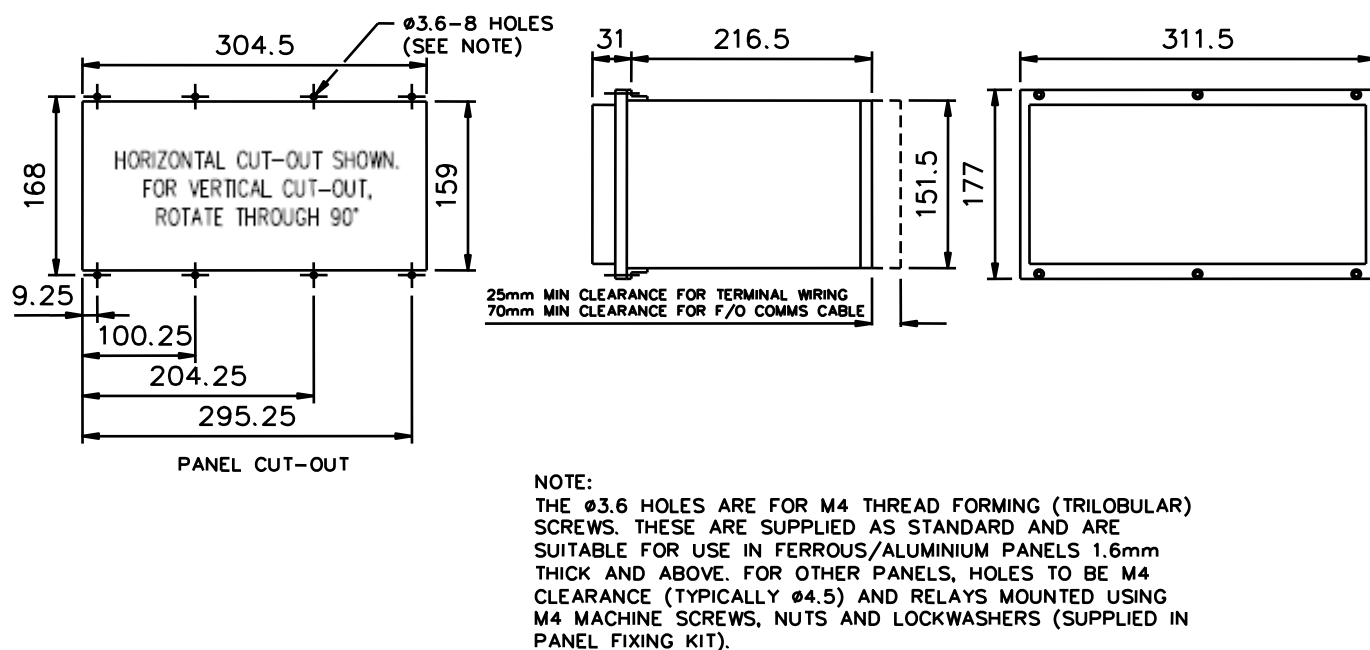


Fig 2. E12 Case Dimensions

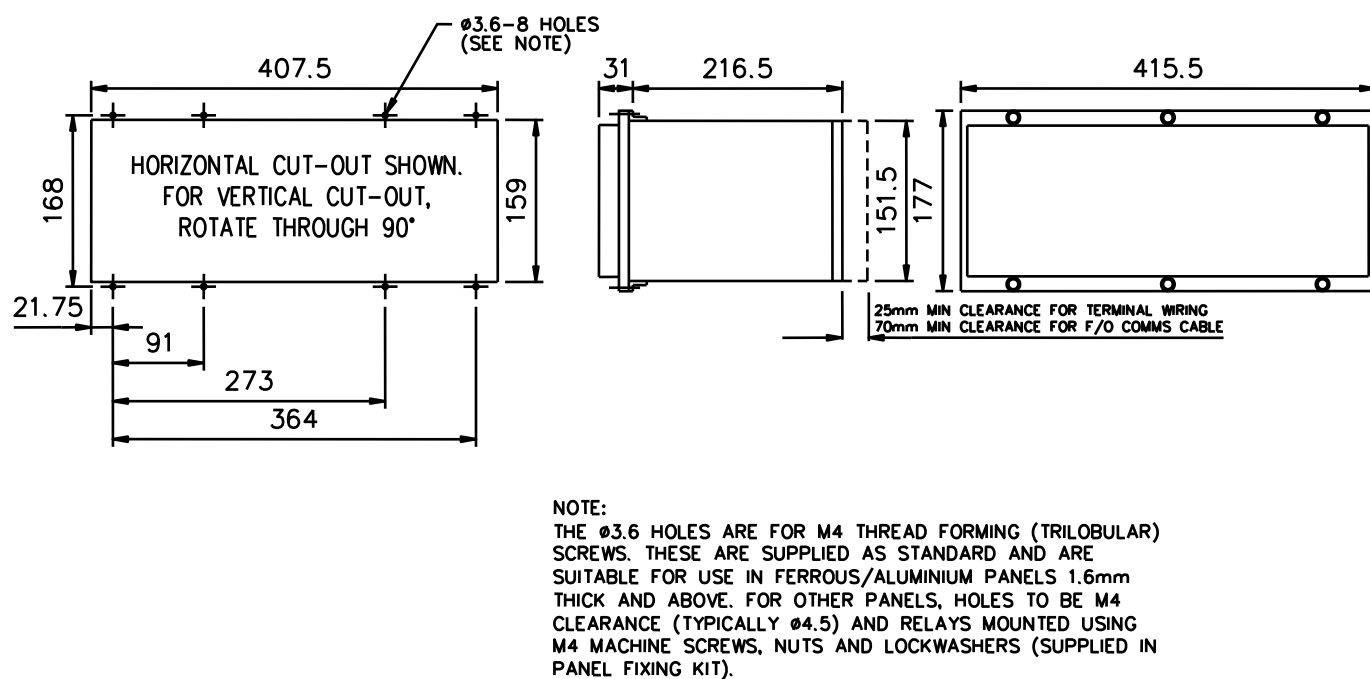


Fig 3. E16 Case Dimensions



Product description	Variants	Order No.
Ohmega (300 series)		7 S G 1 6 □ □ - 0 □ □ □ □ - □ □ □ 0
Distance protection for sub-transmission and distribution networks		↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
Relay type		
<u>OHMEGA 300 series - Standard functionality</u>		3
Numeric distance protection with a range of integrated standard functions.		
All relays can accommodate 1, 2 and 5A inputs and communications using IEC60870-5-103 protocol.		
<u>Distance Protection (21/21N)</u>		
- Phase and earth-fault mho characteristics		
- Loss of load		
- Power swing blocking (68)		
- Switch on to fault		
- Fault locator (21FL)		
<u>Distance signalling schemes</u>		
- Time-stepped distance, permissive underreach, permissive overreach		
- Accelerated underreach		
- Current reversal, CB echo, weak infeed		
<u>Auxiliary functions</u>		
- VT supervision		
- Phase-fault overcurrent (50)		
- Trip circuit supervision (74TC)		
<u>Protection options</u>		
<u>OHMEGA 305 - Relay specific functionality</u>		1
<u>Distance Protection (21/21N)</u>		
- Three mho impedance zones		
<u>OHMEGA 308 - Relay specific functionality</u>		2
<u>Distance Protection (21/21N)</u>		
- Three mho impedance zones		
- Earth-fault quadrilateral characteristics		
<u>Directional (high impedance) earth-fault (67N)</u>		
- IDMTL direct tripping and permissive overreach schemes		
- Current reversal and CB echo		
<u>Auxiliary functions</u>		
- Single shot auto-reclose (79)		
- Check synchronising (25)		
- Sensitive earth-fault (50G)		
- Power swing blocking (68)		
- Two stage DTL undervoltage (27)		
- Two stage DTL overvoltage (59)		
<u>OHMEGA 311 - Relay specific functionality</u>		3
<u>Distance Protection (21/21N)</u>		
- Three mho impedance zones		
<u>Directional (high impedance) earth-fault (67N)</u>		1
- IDMTL direct tripping and permissive overreach schemes		
- Current reversal and CB echo		
<u>Auxiliary functions</u>		
- Single shot auto-reclose with reach extension scheme (79)		
- Check synchronising (25)		
- Broken conductor		
- Circuit breaker fail (50BF)		

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# Ordering Information 7SG163 Ohmega

Product description	Order No.
<b>Ohmega (300 series)</b> (continued from previous page)	7 S G 1 6 <input type="checkbox"/> <input type="checkbox"/> - 0 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 0
<u>Protection options</u> <b>OHMEGA 314 - Relay specific functionality</b> <u>Distance Protection (21/21N)</u> <ul style="list-style-type: none"> <li>- Four mho impedance zones</li> <li>- Earth-fault quadrilateral characteristics</li> </ul> <u>Distance signalling schemes</u> <ul style="list-style-type: none"> <li>- Blocking overreach</li> </ul> <u>Dual directional (high impedance) earth-fault (67N)</u> <ul style="list-style-type: none"> <li>- IDMTL direct tripping and permissive overreach schemes</li> <li>- Blocking scheme</li> <li>- Current reversal, CB echo, weak infeed</li> </ul> <u>Auxiliary functions</u> <ul style="list-style-type: none"> <li>- Single shot auto-reclose with reach extension scheme (79)</li> <li>- Check synchronising (25)</li> <li>- Sensitive earth-fault (50G)</li> <li>- Two stage DTL undervoltage (27)</li> <li>- Two stage DTL overvoltage (59)</li> </ul>	4
<b>OHMEGA 315 - Relay specific functionality</b> <u>Distance Protection (21/21N)</u> <ul style="list-style-type: none"> <li>- Four mho impedance zones</li> <li>- Earth-fault quadrilateral characteristics</li> <li>- Overcurrent guard</li> </ul> <u>Distance signalling schemes</u> <ul style="list-style-type: none"> <li>- Blocking overreach</li> </ul> <u>Dual directional (high impedance) earth-fault (67N)</u> <ul style="list-style-type: none"> <li>- IDMTL direct tripping and permissive overreach schemes</li> <li>- Blocking scheme</li> <li>- Current reversal, CB echo, weak infeed</li> </ul> <u>Auxiliary functions</u> <ul style="list-style-type: none"> <li>- Single shot auto-reclose with reach extension scheme (79)</li> <li>- Check synchronising (25)</li> <li>- Sensitive earth-fault (50G)</li> <li>- Two stage DTL undervoltage (27)</li> <li>- Two stage DTL overvoltage (59)</li> </ul>	5
<u>Auxiliary supply /binary input voltage</u> 30 V DC auxiliary, 30 V DC binary input 30 V DC auxiliary, 48 V DC binary input 48/110 V DC auxiliary, 30 V DC binary input 48/110 V DC auxiliary, 48 V DC binary input <sup>1)</sup> 48/110 V DC auxiliary, 110 V DC low burden binary input 220 V DC auxiliary, 110 V DC low burden binary input 220 V DC auxiliary, 220 V DC low burden binary input 110/220 V DC auxiliary, 110 V DC low burden binary input	A B C D E F G L
<u>I/O range</u> 11 Binary Inputs / 13 Binary Outputs (incl. 3 changeover) 19 Binary Inputs / 21 Binary Outputs (incl. 3 changeover) <sup>2)</sup> 27 Binary Inputs / 29 Binary Outputs (incl. 3 changeover) <sup>2)</sup> 11 Binary Inputs /29 Binary Outputs (incl. 3 changeover) <sup>2)</sup>	B C D F

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# Ordering Information 7SG163 Ohmega

Product description	Variants	Order No.
<b>Ohmega (300 series)</b> (continued from previous page)	<u>Frequency</u> 50Hz 60Hz  <u>Nominal current</u> 1, 2 or 5 A  <u>Voltage inputs</u> 63/110 V AC  <u>Housing size</u> Case size E12 (4U high) Case size E12 (4U wide, vertical) Case size E16 (4U high) Case size E16 (4U wide, vertical)  <u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103	7 S G 1 6 □ □ - 0 □ □ □ - □ □ □ 0 <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">                         ↑ 1 ↑ 2                     </div> <div style="text-align: center;">                         ↑ 1                     </div> <div style="text-align: center;">                         ↑ 1                     </div> <div style="text-align: center;">                         ↑ G ↑ H ↑ J ↑ K ↑ A                     </div> </div>

- <sup>1)</sup> High burden 110V & 220V binary inputs are available via external dropper resistors with 48V binary input version
- 110/125 V application, order combination of the following resistor boxes to suit number of binary inputs
- VCE:2512H10064 (9 inputs, 110V)
- VCE:2512H10065 (5 inputs, 110V)
- VCE:2512H10066 (1 inputs, 110V)
- 220/250 V application, order resistor box 2512H10066 in addition
- VCE:2512H10067 (5 inputs, 220V)
- VCE:2512H10068 (1 inputs, 220V)

- <sup>2)</sup> Case size E16

# Ordering Information 7SG164 Ohmega

Product description	Variants	Order No.
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## Ohmega (400 series)

Distance protection for sub-transmission networks

### Relay type

#### OHMEGA 400 series - Standard functionality

Numeric distance protection (Sub-transmission) with a range of integrated standard functions.

All relays can accommodate 1, 2 and 5A inputs and communications using IEC60870-5-103 protocol.

#### Distance Protection (21/21N)

- Four mho impedance zones
- Phase and earth-fault mho characteristics
- Power swing blocking (68)
- Switch on to fault
- Fault locator (21FL)

#### Distance signalling schemes

- Time-stepped distance, permissive underreach, permissive overreach
- Blocking overreach

#### Auxiliary functions

- VT supervision
- Phase-fault overcurrent (50)

### Protection options

#### OHMEGA 402 - Relay specific functionality

Distance Protection (21/21N), three pole tripping

- Stub protection

#### OHMEGA 406 - Relay specific functionality

#### Distance Protection (21/21N)

- Earth-fault quadrilateral characteristics
- Single pole tripping
- Loss of load
- Stub protection

#### Distance signalling schemes

- Current reversal, CB echo, weak infeed

#### Directional (high impedance) earth-fault (67N)

- DTL direct tripping and permissive overreach schemes
- Current reversal and CB echo
- Weak infeed

#### Auxiliary functions

- Two shot 1P/3P auto-reclose with reach extension scheme (79)
- Check synchronising (25)

#### OHMEGA 408 - Relay specific functionality

#### Distance Protection (21/21N)

- Earth-fault quadrilateral characteristics
- Single pole tripping

#### Distance signalling schemes

- Current reversal, CB echo, weak infeed
- Thermal overload

7 S G 1 6 □ □ - 0 □ □ □ □ - □ □ □ 0

4

1

2

3

1

1

(continued on following page)

Product description	Variants	Order No.
<b>Ohmega (400 series)</b> (continued from previous page)	<u>Auxiliary supply /binary input voltage</u> 30 V DC auxiliary, 30 V DC binary input 30 V DC auxiliary, 48 V DC binary input 48/110 V DC auxiliary, 30 V DC binary input 48/110 V DC auxiliary, 48 V DC binary input <sup>1)</sup> 48/110 V DC auxiliary, 110 V DC low burden binary input 220 V DC auxiliary, 110 V DC low burden binary input 220 V DC auxiliary, 220 V DC low burden binary input 110/220 V DC auxiliary, 110 V DC low burden binary input  <u>I/O range</u> 11 Binary Inputs / 13 Binary Outputs (incl. 3 changeover) 19 Binary Inputs / 21 Binary Outputs (incl. 3 changeover) <sup>2)</sup> 27 Binary Inputs / 29 Binary Outputs (incl. 3 changeover) <sup>2)</sup> 11 Binary Inputs /29 Binary Outputs (incl. 3 changeover) <sup>2)</sup>  <u>Frequency</u> 50Hz 60Hz  <u>Nominal current</u> 1, 2 or 5 A  <u>Voltage inputs</u> 63/110 V AC  <u>Housing size</u> Case size E12 (4U high) Case size E12 (4U wide, vertical) Case size E16 (4U high) Case size E16 (4U wide, vertical)  <u>Communication interface</u> Fibre optic (ST-connector) / IEC 60870-5-103	7 S G 1 6 □ □ - 0 □ □ □ - □ □ □ 0 ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ A B C D E F G L  B C D F  1 2  1  1  G H J K  A

1) High burden 110V & 220V binary inputs are available via external dropper resistors with 48V binary input version

110/125 V application, order combination of the following resistor boxes to suit number of binary inputs

VCE:2512H10064 (9 inputs, 110V)

VCE:2512H10065 (5 inputs, 110V)

VCE:2512H10066 (1 inputs, 110V)

220/250 V application, order resistor box 2512H10066 in addition

VCE:2512H10067 (5 inputs, 220V)

VCE:2512H10068 (1 inputs, 220V)

2) Case size E16



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Siemens AG

Energy 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](http://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](mailto:support.energy@siemens.com)

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