SIEMENS

CATALOG EDITION 1

7PG23 5B3

Reyrolle

Restricted Earth Fault

Reyrolle 7PG23 5B3 Catalog Restricted Earth Fault Relay

Reyrolle 7PG23 - Catalog Edition 1

7PG23 5B3 Restricted Earth Fault

Description

The 7PG23 relay uses a type B61 attracted armature element energized via a low pass filter circuit and a full wave rectifier. The relay has a minimum setting of 15 V. Other resistors are introduced into the circuit to provide the voltage setting range up to 270 V in increments of 5 V using DIL switches. Included within the relays are the essential non-linear resistors to limit the peak voltage output from saturated CTs. These resistors protect the CT insulation and secondary wiring.

Benefits

The benefits of the 7PG23 5B3 Restricted Earth Fault Relay are:

- Compact design
- User friendly front fascia and easy parameterization
- Reliable performance

Functions

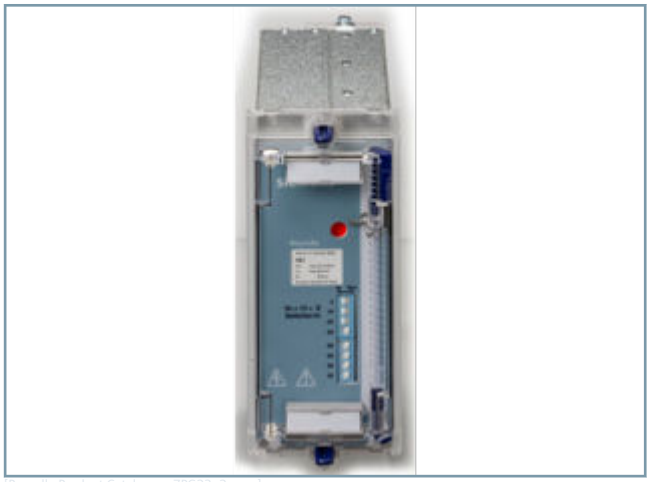
- Low settings can be achieved
- High stability with through faults
- Tuned to rated frequency

Applications

The 7PG23 5B3 relay is ideal for restricted earth fault protection of transformer windings as well as phase and earth fault protection of reactors and the stator windings of large machines.

This relay may also be used for high impedance busbar protection. High impedance schemes have the advantages over low impedance schemes that a more sensitive setting can be obtained without any loss of stability and the primary fault setting calculation is simpler.

Current operated schemes are more susceptible to maloperations from through-faults unless greater care is taken with the selection of the current transformers. For some restricted earth fault applications, the primary fault setting needs to be greater at harmonic frequencies than the setting at the fundamental frequency. The 7PG23 5B3 relay uses a low pass filter circuit to achieve this. No adverse reduction in fault setting can occur with the high frequency currents which may be produced during switching.



[Reyrolle Product Catalogue, 7PG23, 2, _ _]

Figure 1.1/1 Reyrolle 7PG23 5B3 (Updated Model)

CT Requirements

Experience has shown that most protection CTs are suitable for use with the high impedance relays and that where the CTs are specifically designed for this protection their overall size may be smaller than that required for an alternative current balance protection. The basic requirements are:

- All CTs should, if possible, have identical turns ratios
- The knee-point voltage of each CT should be at least 2x Vs. The knee-point voltage is expressed as the voltage applied to the secondary circuit with the primary open circuit which when increased by 10 % causes the magnetizing current to increase by 50 %.
- CTs should be of the low-leakage reactance type. Most modern CTs are of this type and there is no difficulty in meeting this requirement. A low-leakage reactance CT has a jointless ring type core with the secondary winding evenly distributed along the whole length of the magnetic circuit, and the primary conductor passes through the approximate centre of the core.

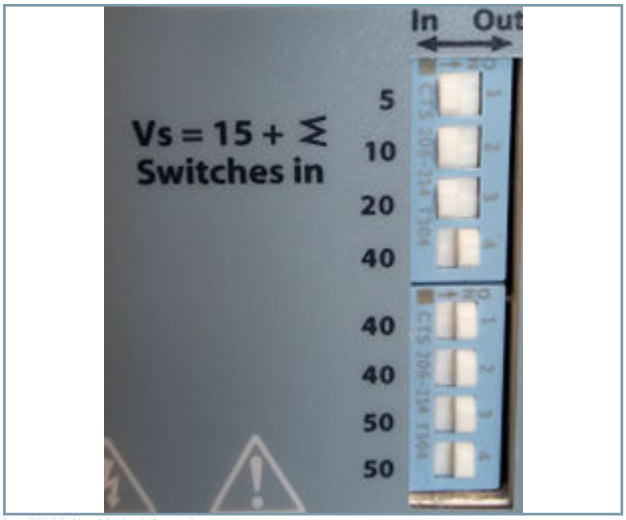
Settings Overview

The 7PG23 5B3 relay has been modified to incorporate updated setting switches and resistor networks. It is important that the user correctly understands the way that the new setting switches work.

The relay has a preset setting of 15 V and other resistors are integrated into the circuit to provide a voltage setting up to 270 V in increments by using DIL switches on the front fascia.

The updated method:

- The relay is set by moving the switches to the Left position marked as the IN position. The corresponding value is added to the setting value. Eight switches are provided to cover the complete setting range. This is shown in *Figure 1.1/2*. Shown is a setting of 50 V: 15 + Σ (5 + 10 + 20)

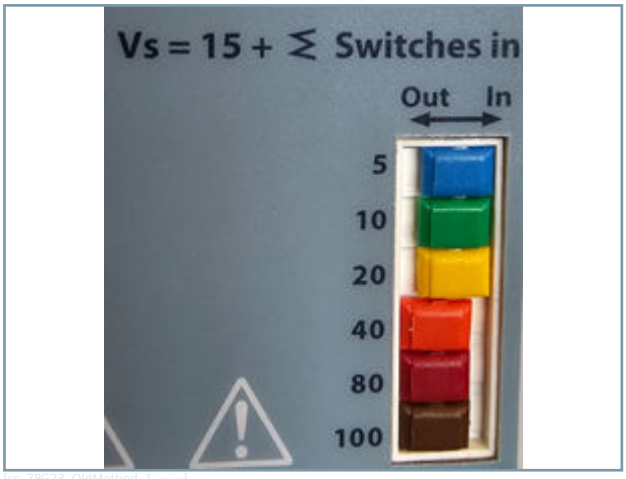


[sc_7PG23_NewMethod, 1, --_--]

Figure 1.1/2 Updated 7PG23 5B3 Relay Setting Method

The previous method shown in *Figure 1.1/3*:

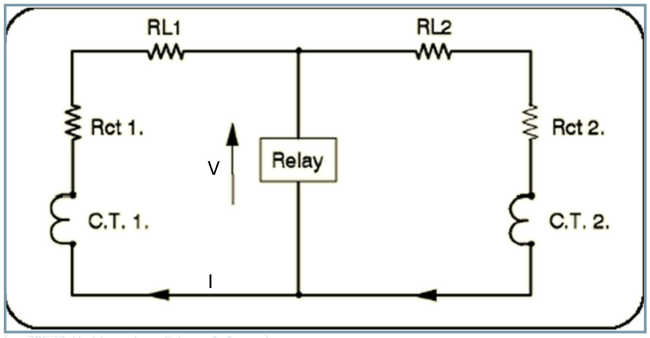
- Previous hardware versions use a colored DIL switch for setting with 6 positions but provides the same setting range. Shown is a setting of 50 V: 15 + Σ (5 + 10 + 20)



[sc_7PG23_OldMethod, 1, --_--]

Figure 1.1/3 Previous 7PG23 5B3 Relay Setting Method

Stability



[sc_7PG23_HighImpedanceScheme1, 1, --_--]

Figure 1.1/4 High Impedance Scheme

For stability the voltage setting of the relay must be made equal to or exceed the highest value of V calculated below:

V = I (Rct + RL)

Where:

- RL = The largest value of pilot-loop resistance between the CTs and the relay
- Rct = The secondary winding resistance of the CT
- I = The CT secondary current corresponding to the maximum steady state through fault current of the protected equipment

Fault Setting

It should, however, be noted that because the operating voltage of the relay circuit is relatively high, the excitation currents of the CTs in parallel with the relay may comprise a large proportion of the fault setting.

Primary fault setting = N (I0 + I1 + I2 + I3...In)

Where:

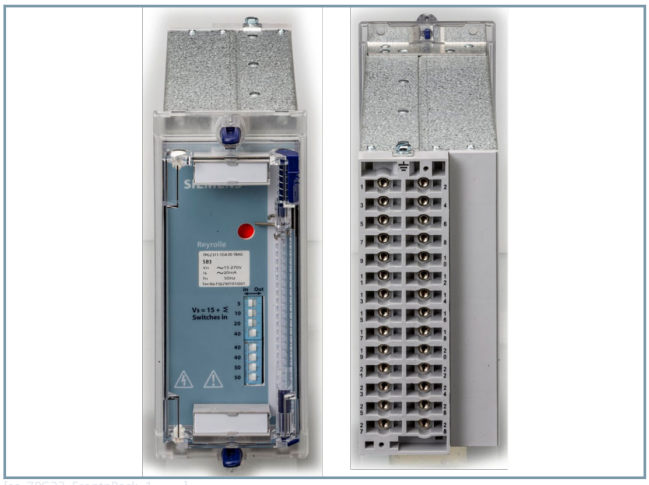
- I0 = Relay operating current
- I1...In = Excitation current of each CT at the relay setting voltage
- N = CT turns ratio

2.1

Hardware Construction

The device is housed in a draw-out case designed for panel mounting.

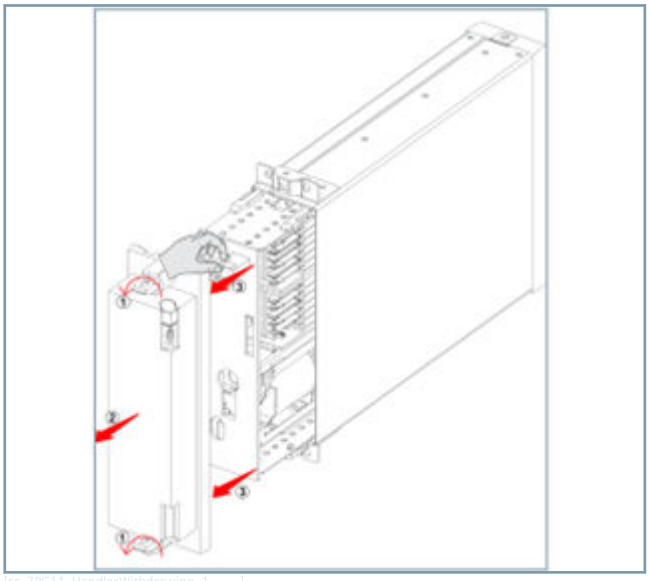
The rear connection comprises of M4 screw terminals suitable for ring type crimps.



[sc_7PG23_FrontnBack, 1, --_--]

Figure 2.1/1 Size E3

The chassis of the device can be withdrawn from the case by pulling the handles on the top and bottom.



[sc_7PG11_HandlesWithdrawing, 1, --_--]

Figure 2.1/2 Withdrawing Device Using Handles

[sc_7PG11_EarthingTerminal, 1, --_--]

Figure 2.1/3 Case Earth Stud

Earthing Terminal

The case earth stud should be solidly earthed to the panel earth before any connections to the device rear terminal. Located at the top rear of the case is a case earth stud as shown in , this must be connected to the main panel earth.

Relay Information

The device fascia displays the MLFB order code, serial number, and device identification reference.

	Electrical Hazard
	Refer to device documentation
	Waste Electrical and Electronic Equipment Directive (WEEE)
CE	European CE marking
EAC	Guideline for the Eurasian Market
UK CA	United Kingdom (UK) conformity-assessed marking

Flag Indicator

The flag indicator changes to red when the device trips. The flag indicator remains visible until it is reset by the mechanical lever operated by hand from the cover of the relay.

Hand Reset Mechanism

Pull the blue handle upwards to slide the mechanism in an upwards direction with the flag reset wire at the top.

Dimension Drawings

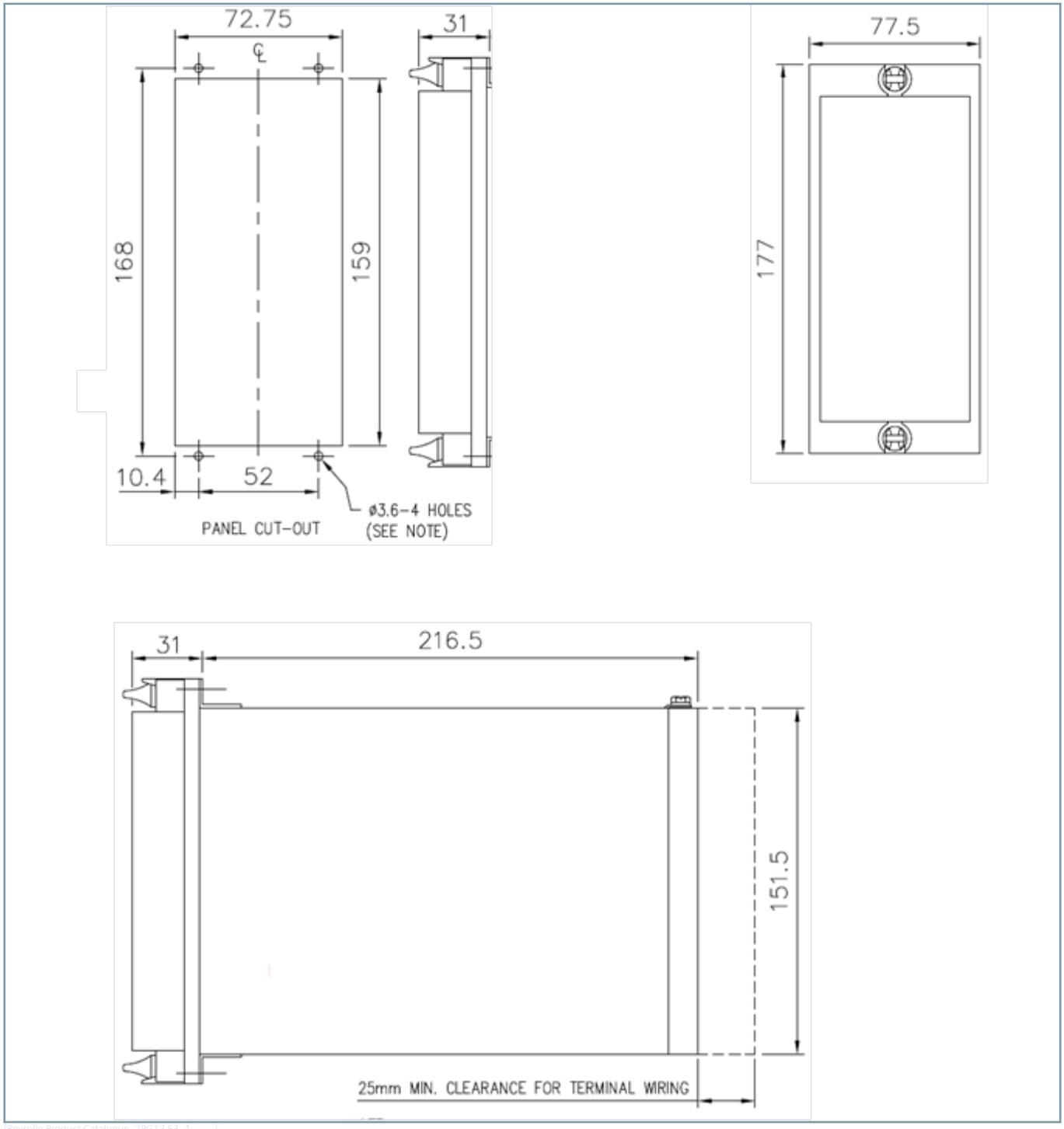
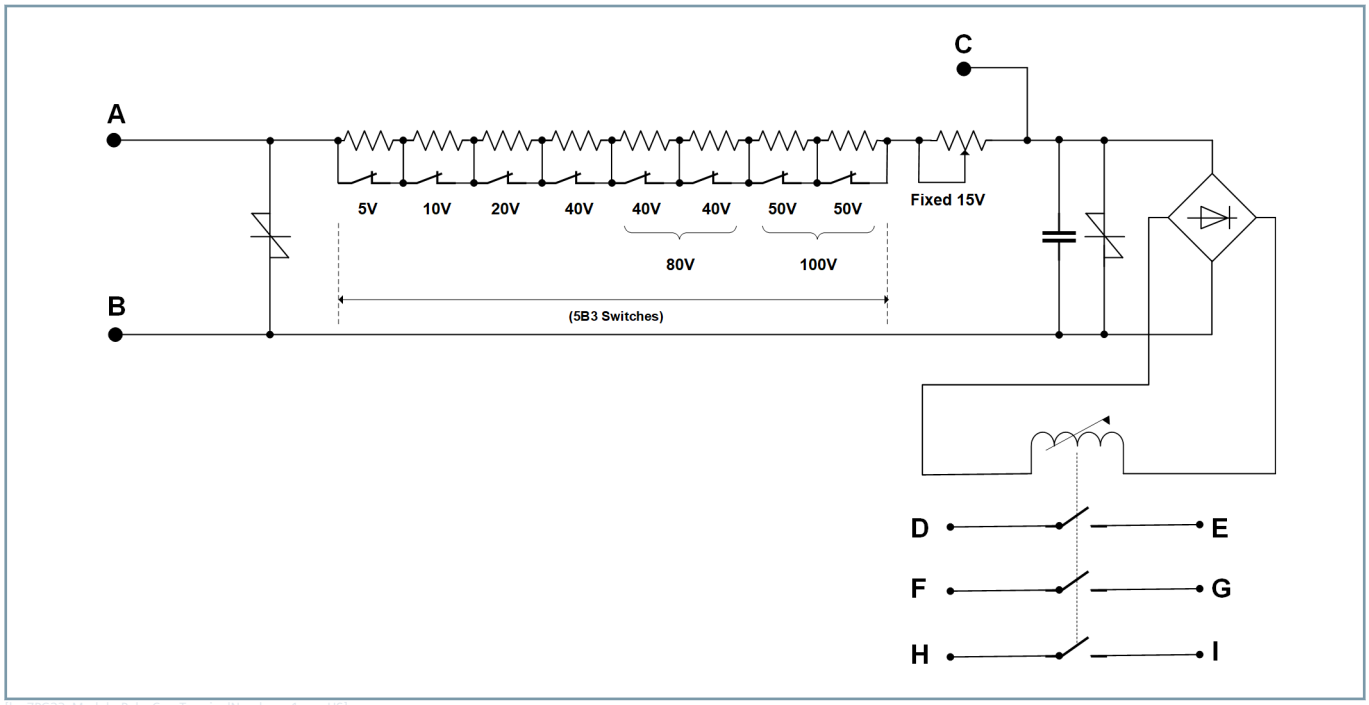


Figure 3.1/1 E3 Case

Connection Diagrams



[Io_7PG23_ModularRelayCaseTerminalNumbers, 1, en_US]

Figure 3.1/2 7PG23 5B3 Connection Diagram

5B3 (size 3 case)	A	B	C	D	E	F	G	H	I
Terminal Numbers	28	27	22	1	3	2	4	5	7

Table 3.1/1 Modular Relay Case Terminal Numbers

Technical Data

Indication of Conformity

This product complies with the directive of the Council of the European Communities on the harmonization of the laws of the Member States relating to electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU) as well as restriction on usage of hazardous substances in electrical and electronic equipment (RoHS Directive 2011/65/EU).

This conformity has been proved by tests conducted by Siemens AG in accordance of the Council Directive in accordance with the product standard IEC/EN 60255-27 for the low-voltage directive.

RoHS directive 2011/65/EU is met using the standard EN 50581. The device has been designed and produced for industrial use.

General Technical Data

Parameter	Value
Frequency f_n	50 or 60 Hz
Current I_s	Fixed at 20 mA
Voltage V_s	15 V to 270 V in 5 V steps
Thermal withstand	Continuous 1.25 x V_s
Accuracy	V_s ± 5 %
Burden	V_s x 20 mA
Operating time	45 ms maximum at 3 x V_s

Indication:	Hand reset flag
Contact arrangement:	3 normally open self reset
Contact rating:	Contacts are capable of making and carrying 6.6 kVA for 0.2 seconds with a maximum of 30 A. Contacts are intended for use in circuits where a circuit breaker auxiliary switch breaks the trip coil current.

Environmental

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

Table 3.2/1 Temperature (IEC 60255-6)

Parameter	Value
Damp heat test, cyclic	56 days at 95 % RH and +40 °C

Table 3.2/2 Humidity (IEC 60068-2-3)

The relay complies with the requirements of BS142, section 2.2, category S2 over the frequency range 10 to 800 Hz impact. The relay will withstand panel impact shocks of 20 g. Operational/mechanical life in excess of 10,000 operations.

Table 3.2/3 Vibration (IEC 60255-21-2)

Insulation IEC 60255-5

5 kV 1.2/50 µs 0.5 j between all terminals and case earth and between adjacent terminals. 2 kV rms 50 HZ for 1 minute between all case terminals connected together and the case earth and between independent circuits. 1 kV rms 50 HZ for 1 minute across normally open contacts.

Table 3.2/4 Dialectric Withstand

Ordering Information - 7PG23 Restricted Earth Fault (5B3)

Product Description	Order No.																
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
5B3	7	P	G	2	3	□	□	-	□	□	□	□	□	-	□	□	A	0
						|	|		|	|	|	|	|		|	|		
Single element high impedance relay, ideal for REF applications.						|	|		|	|	|	|	|		|	|		
Relay Type						|	|		|	|	|	|	|		|	|		
5B3 - High impedance, 50 Hz						1	|		|	|	|	|	|		|	|		
5B3 - High impedance, 60 Hz						2	|		|	|	|	|	|		|	|		
							|		|	|	|	|	|		|	|		
Type of Flag							|		|	|	|	|	|		|	|		
Hand reset flag							1		|	|	|	|	|		|	|		
									|	|	|	|	|		|	|		
Contact Operation									|	|	|	|	|		|	|		
Self reset contacts									1	|	|	|	|		|	|		
										|	|	|	|		|	|		
Contact Arrangement – NO										|	|	|	|		|	|		
3 NO										D	|	|	|		|	|		
											|	|	|		|	|		
Contact Arrangement NC											|	|	|		|	|		
0 NC											A	|	|		|	|		
												|	|		|	|		
Number of Contacts[1]												|	|		|	|		
Three												3	|		|	|		
													|		|	|		
Contact Type													|		|	|		
NO (Standard) / NC (Standard)													0		|	|		
															|	|		
Setting Range[1]															|	|		
AC 15 V to AC 270 V															1	|		
																|		
Housing Size																|		
Case size E3 (4U high)																B		

3.3

1 Relay is pre-set to AC 15 V, customer adjustable settings up to AC 270 V in increments of 5 V provided by heavy duty DIL switches.

Indication of Conformity

This product is CE-compliant to relevant EU directives.

Disclaimer of Liability

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.

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OpenSSL

This product includes software developed by the OpenSSL Project for use in OpenSSL Toolkit (*http://www.openssl.org/*).

This product includes software written by Tim Hudson (*tjh@cryptsoft.com*).

This product includes cryptographic software written by Eric Young (*eay@cryptsoft.com*).

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Smart Infrastructure
Electrification & Automation
Mozartstrasse 31c 91052
Erlangen, Germany

For more information, please contact
Phone: +49 9131 1743072
Email: support.ea.si@siemens.com
Web: siemens.com/reyrolle

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3617 Parkway Lane
Peachtree Corners, GA 30092
United States

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