



Features

- Three-phase low-set overcurrent stage with definite time or inverse definite minimum time (IDMT) characteristic
- Three-phase high-set overcurrent stage with instantaneous or definite time characteristic
- Circuit-breaker failure protection unit (CBFP)
- Disturbance recorder
- Relay settings are modified via a personal computer (free software available)
- The relay settings are stored in a non-volatile memory
- Two normally open power output contacts
- Two change-over type signal output contacts
- Three accurate current inputs
- Galvanically isolated binary input with a wide input voltage range
- Output contact functions freely configurable for the desired operation
- Optical PC connector for two-way data communication
- Continuous self-supervision of hardware and software. At a permanent fault all stages and outputs are blocked
- User-selectable rated frequency 50/60 Hz

Application

The overcurrent relay REJ 513 is a secondary relay that is connected to the current transformers of the object to be protected. The three-phase overcurrent unit continuously measures the phase currents of the protected

object. On detection of a fault, the relay starts, trips the circuit breaker, provides alarms and records fault data in accordance with the application and the relay functions configured.

Design

The relay consists of a high-set and a low-set overcurrent unit and a circuit-breaker failure protection unit. Further, the relay includes a self-supervision system and a disturbance recorder unit.

Overcurrent unit

When the phase currents exceed the set start current of the low-set stage $I_{>}$, the overcurrent unit starts and, after the preset time delay of ~55 ms, it delivers a start signal. After the set operate time, at definite time operation, or the calculated operate time, at inverse time operation, the overcurrent unit operates. In the same way, the high-set stage $I_{>>}$ of the overcurrent unit starts once the set start current is exceeded, and delivers a start signal after the preset ~30 ms start time. When the set operate time elapses, the overcurrent unit operates.

The low-set stage of the overcurrent unit may be given a definite time or an inverse definite minimum time (IDMT) characteristic. When the IDMT characteristic is used, six time/current curve groups are available. Four of the curves comply with the standards BS 142 and IEC 255, and are called “normal inverse“, “very inverse“, “extremely inverse” and “long time inverse”. The two additional inverse time curves are called “RI” and “RD”.

The inverse time function of stage $I_{>}$ can be inhibited by the start of stage $I_{>>}$. Then the operate time is determined by stage $I_{>>}$.

If not needed, the $I_{>>}$ stage can be set out of operation. This situation is indicated by “999” when the set start current value is read via the serial communication.

The set start current value $I_{>>}/I_n$ of stage $I_{>>}$ can be automatically doubled in a start situation, i.e. when the object to be protected is connected to the network. Thus the start current of the overcurrent stage $I_{>>}$ can be set below the connection inrush current level. A start situation is defined as the situation where the phase current rises from a value below $0.12 \times I_{>}$ to a value above $1.5 \times I_{>}$ in less than 60 ms. The start situation ends when the current falls below $1.25 \times I_{>}$.

CBFP unit

The relay incorporates a circuit-breaker failure protection (CBFP) unit. The CBFP unit generates a trip signal via output PO2 after

the set operate time of 0.1...1 s, provided the fault has not been cleared by that time. Normally, the CBFP unit controls the upstream circuit breaker. It can also be used for tripping via redundant trip circuits of the same circuit breaker, if the circuit breaker is provided with two trip coils. The circuit-breaker failure protection unit is activated via a software switch.

Disturbance recorder unit

The relay includes an internal disturbance recorder, which records momentary values, internal logic and external control signals. The disturbance recorder can be set to be triggered by the operation of the protection stages or by an external trigger signal, either on the falling or rising edge.

Self-supervision unit

The relay is provided with a self-supervision system for monitoring internal faults. Once the self-supervision system detects an internal relay fault, the ready indication LED starts blinking. At the same time, the normally operated self-supervision alarm relay drops off and a fault code can be read from the relay. This fault code identifies the fault that has been detected.

Communication capabilities

Relay data, such as events, input data, setting values and recorded information can be read via the optical PC interface. The relay communicates over the SPA bus protocol, data transfer rate 4.8 or 9.6 kbps. For the connection of a PC, an optical connection cable type 1MKC950001-1 is needed.

Auxiliary supply

For its operation the relay requires a secured auxiliary voltage supply. The internal power supply of the relay forms the voltages required by the relay electronics. The power supply is galvanically isolated. A green LED indicator “READY” on the front panel is lit when the power supply module is operating.

Rated voltage ranges:

- AC range 80...265 V ac, rated 110/120/220/240 V
- DC range 38...265V dc, rated 48/60/110/125/220 V

The primary side of the power supply is protected with a fuse located on the printed circuit board of the relay. The fuse size is 2.5 A (slow).

Technical data

Table 1: Energizing inputs

Rated current I_n		1 A	5 A
Thermal withstand capability	continuously	4 A	20 A
	for 1 s	100 A	500 A
Dynamic current withstand, half-wave value		250 A	1250 A
Input impedance		<100 mΩ	<20 mΩ
Rated frequency f_n		50 Hz or 60 Hz ±5 Hz	

Table 2: Measuring ranges

Currents measured on phases L1, L2 and L3 as multiples of the rated currents of the energizing inputs	0...50 x I_n
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Table 3: Output contact ratings for power outputs (PO1 and PO2)

Terminals	X2.1/3-4, X2.1/5-6
Rated voltage	250 V dc/ac
Continuous carry	5 A
Make and carry for 0.5 s	30 A
Make and carry for 3.0 s	15 A
Breaking capacity for dc, when the trip circuit time constant $L/R \leq 40$ ms, at 48/110/220 V dc	5 A / 3 A / 1 A
Contact material	AgCdO ₂

Table 4: Output contact ratings for signal outputs and self-supervision output (SO1, SO2 and IRF)

Terminals	X2.1/7-8-9, X2.1/10-11-12, X2.1/13-14-15
Rated voltage	250 V dc/ac
Continuous carry	5 A
Make and carry for 0.5 s	10 A
Make and carry for 3.0 s	8 A
Breaking capacity for dc, when the trip circuit time constant $L/R \leq 40$ ms, at 48/110/220 V dc	1 A / 0.25 A / 0.15 A
Contact material	AgCdO ₂

Table 5: External binary input

External control rated voltage level	$U_n = 24/48/60/110/220$ V dc
Operative range	18...265 V dc
Typical control current of input circuit	2...25 mA

Table 6: Auxiliary voltage

Rated voltage	$U_n = 110/120/220/240$ V ac $U_n = 48/60/110/125/220$ V dc
Operative range	80...265 V ac 38...265 V dc
Power consumption	4...10 W

Table 7: Data transmission

Transmission mode	Optical PC interface
Protocol	SPA bus

Table 7: Data transmission

Selectable data transfer rates	4.8 or 9.6 kbps
Optical connection cable	1MKC 950001-1

Table 8: Dielectric tests

Insulation test according to IEC 60255-5	2 kV, 50 Hz, 1 min
Impulse test according to IEC 60255-5	5 kV, 1.2/50 μ s, 0.5 J
Insulation resistance test according to IEC 60255-5	> 100 M Ω , 500 V dc

Table 9: Electromagnetic compatibility tests

The EMC immunity test level fulfills the requirements specified in the generic standard EN 50082-2		
1 MHz burst disturbance test, class III (IEC 60255-22-1)	common mode	2.5 kV
	differential mode	1.0 kV
Electrostatic discharge test, class III (IEC 61000-4-2)	for contact discharge	6 kV
	for air discharge	8 kV
Radio frequency interference test	conducted, common mode (IEC 61000-4-6)	10 V (rms), f = 150 kHz...80 MHz
	radiated, amplitude-modulated (IEC 61000-4-3)	10 V/m (rms), f = 80...1000 MHz
	radiated, pulse-modulated (ENV 50204)	10 V/m, f = 900 MHz
	radiated, test with a portable transmitter (IEC 60255-22-3, method C)	f = 77.2 MHz, P = 6 W; f = 172.25 MHz, P = 5 W
Fast transient disturbance test (IEC 60255-22-4 and IEC 61000-4-4)	ac/dc ports	4 kV
	binary contacts	2 kV
Surge immunity test (IEC 61000-4-5)	power supply, ac/dc ports	4 kV, common mode 2 kV, differential mode
	I/O ports	2 kV, common mode 1 kV, differential mode
Electromagnetic emission tests (EN 55011 and EN 50081-2)	conducted RF emission (mains terminal)	EN 55011, class A
	radiated RF emission	EN 55011, class A
CE approval	Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC	

Table 10: Mechanical tests

Vibration test (IEC 60255-21-1)	class I
Shock/bump test (IEC 60255-21-2)	class I

Table 11: Environmental conditions

Climatic environmental tests	Dry cold test	according to IEC 60068-2-1
	Dry heat test	according to IEC 60068-2-2
	Damp heat test	according to IEC 60068-2-30
Degree of protection by enclosure of the device case according to IEC 529, when the relay is panel-mounted		IP54
Weight of the relay		~3.1 kg

Block diagram

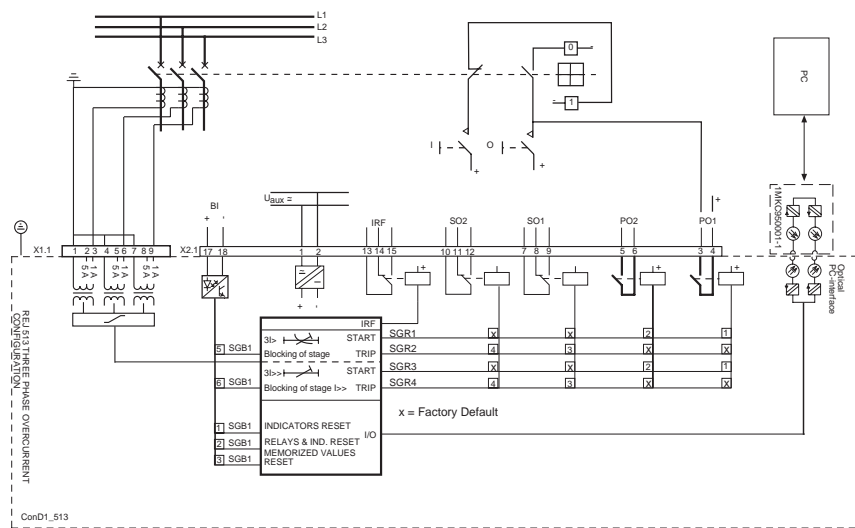


Fig. 1 Connection diagram of the overcurrent relay REJ 513

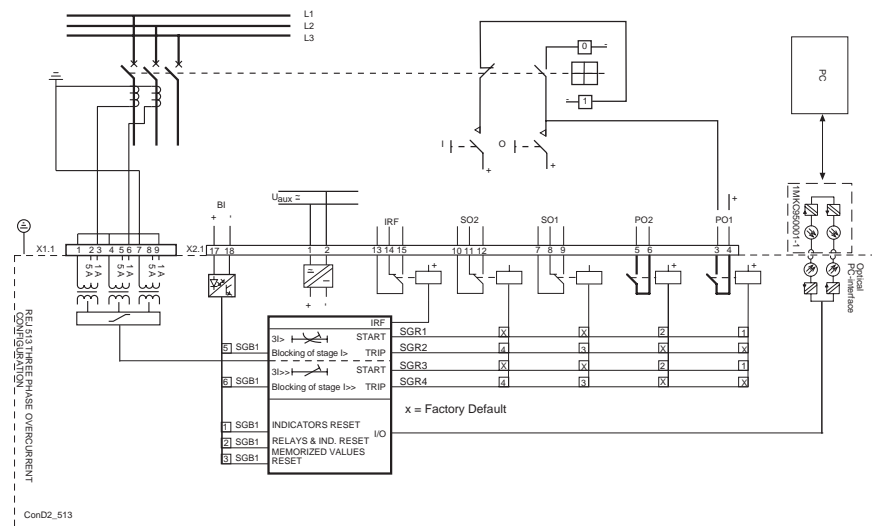
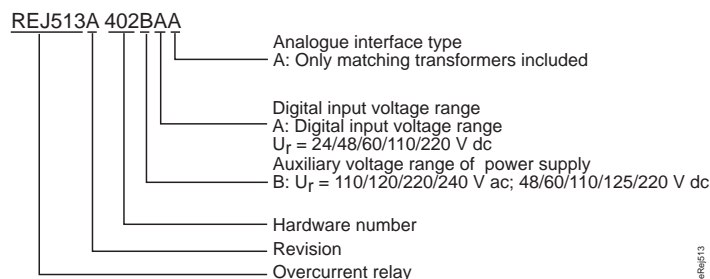


Fig. 2 Connection diagram of the overcurrent relay REJ 513

Ordering

The order number identifies the hardware as described below.

This number is labelled on the marking strip on the front panel.



When ordering, please specify:

Ordering information	Ordering example
1. Type designation and quantity	REJ 513, 5 pieces
2. Order number	REJ513A 402-BAA
3. Optical connection cable	1 piece (1MKC 950001-1)
4. Relay setting and simulation tool	1 piece (REJ software)

Order numbers

Optical connection cable	1MKC 950001-1
Relay setting and simulation tool	REJ software

References

Additional information

User's Guide	1MRS 750613-MUM
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