Current and Voltage Controls
3-Phase Asymmetrical Control
Types S 171, SY 175

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- Mains network quality and load monitoring relay
- Monitors phase sequence, phase loss, phase asymmetry and phase angle
- Measures asymmetry on 3-ph. voltage without neutral
- Built-in adjustable timer function
- Knob-adjustable asymmetry sensitivity
- Output: 10 A SPDT relay
- Plug-in type module
- S-housing
- LED-indication for power supply and output ON
- Power supply is the 3-phased measuring voltage

Product Description

3-phase plug-in monitoring relay for phase sequence, phase loss, phase asymmetry and phase angle. Frequently used to control the mains in electrical distribution systems. The S 171 module features built-in time delay.

Ordering Key

S 171 156 220-50

- Housing
- Type
- Output
- Power supply
- Frequency

Product Selection

Plug	Output	Timer	Frequency	Supply: 220 VAC	Supply: 380 VAC	Supply: 400 VAC	Supply: 415 VAC
Circ.	SPDT	Yes	50 Hz	S 171 156 220-50	S 171 156 380-50	S 171 156 400-50	S 171 156 415-50
		Yes	60 Hz	S 171 156 220-60	S 171 156 380-60	S 171 156 400-60	S 171 156 415-60
Circ.	SPDT	No	50 Hz	SY 175 220-50	SY 175 380-50		SY 175 415-50
		No	60 Hz	SY 175 220-60	SY 175 380-60		SY 175 415-60

Input Specifications

Input	
Pin 5	Phase L1
Pin 6	Phase L2
Pin 7	Phase L3
	measures on own supply

Supply Specifications

Power supply AC types		Overvoltage cat. III (IEC 60664) (IEC 60038)
Rated operational voltage through pins 5, 6 & 7	220	3 x 220 VAC ± 15%, 50 or 60 Hz
	380	3 x 380 VAC ± 15%, 50 or 60 Hz
	400	3 x 400 VAC ± 15%, 50 or 60 Hz
	415	3 x 415 VAC ± 15%, 50 or 60 Hz
Voltage interruption		≤ 40 ms
Dielectric voltage		None (supply/elect.)
Rated impulse withstand volt.		4 kV (1.2/50 µs) (line/neutral, line/line), direct connection to electronics
Rated operational power		3 VA

Output Specifications

Output	
Rated insulation voltage	SPDT relay 250 VAC (rms) (cont./elect.)

Contact ratings (AgCdO)		µ (micro gap)
Resistive loads	AC 1	10 A/250 VAC (2500 VA)
	DC 1	1 A/250 VDC (250 W)
	or	10 A/25 VDC (250 W)
Small inductive loads	AC 15	2.5 A/230 VAC
	DC 13	5 A/24 VDC

Mechanical life	≥ 30 x 10^6 operations
Electrical life AC 1	≥ 2.5 x 10^5 operations (at max. load)
Operating frequency	≤ 7200 operations/h
Dielectric strength	
Dielectric voltage	≥ 2 kVAC (rms) (cont./elect.)
Rated impulse withstand volt.	4 kV (1.2/50 µs) (cont./elect.) (IEC 60664)

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General Specifications

Reaction time	$\tau = 0.2$ s, worst case reaction time may be up to 5 x τ Adjustable delay on release built-in (0.2s - 10s) **Note:** Reaction time + set time = actual delay on release time
Accuracy OFF delay	10 s, -1/+3 s on max. < 0,1 s on min.
Time function (S 171)	Delay on release 0.2-10 s. adj.
Indication for Power supply ON Output ON	LED, green LED, red

Environment	(IEC 60947-1)
Degree of protection	IP 20 B (IEC 60529)
Pollution degree	(IEC 60664) 1: S 171 380/400/415 SY 175 380/415 2: S 171 220, SY 175 220
Operating temperature	-20° to +50°C (-4° to +122°F)
Storage temperature	-50° to +85°C (-58° to +185°F)
Weight	200 g
Approvals	**S 171**: UL, CSA, SEV (SEV only 3 x 220 VAC) **SY 175**: UL, CSA

Mode of Operation

The knob-adjustable relays detect phase asymmetries of 2 to 12% of phase-phase amplitude.

The relay operates when all three phases are present at the same time and the phase sequence is correct as well as the measured asymmetry/unbalance is below set point (2 to 12% of phase asymmetry). Phase angle failures are registered as phase asymmetry.

S 171 releases if one or more of the above factors deviate for more than the set time. SY 175 releases immediately.

If the supply voltage drops to approx. 25% of the phase-phase voltage, the relay releases without time delay.

Applications of asymmetry
I: Mains monitoring:
Phase sequence.
Phase loss.
Phase amplitude asymmetry.
II: Load monitoring:
Phase sequence (direction of motor rotation).
Fuse blowing.

Example 1
Mains network monitoring
The relay monitors phase loss, that the power supply has correct phase sequence, that all three phases are present, and that the phase asymmetry is within the preset level.

Setting
The allowed asymmetry for the mains voltage amplitudes is set on the potentiometer.

Example 2
Starting and operating load monitoring
The 3-phased monitoring relays for electrical loads ensure correct starting and operating conditions. The relays measure phase sequence and consequently the correct direction of motor rotation.

The most frequent cause of asymmetry and unbalance is fuse blowing. In this case the motor regenerates the interrupted phase. The size of the regenerated phase depends on the actual mechanical load and motor size. In this case it is a combination of phase amplitude and phase angle asymmetry, and normally the regenerated voltage will cause an asymmetry higher than 2-3%.

Setting
Turn the asymmetry potentiometer counterclockwise (from max.) until the relay releases.

Continue turning approx. 1 mark clockwise to ensure correct operation. At approx. 5% or less asymmetry, ensure that possible power supply variations do not result in erroneous releases.

Example:
Usupply nom. = 380 VAC
Setpoint = 6% ~ 23 VAC
Hysteresis = 1% ~ 4 VAC
The relay is ON if all 3 phase-phase voltages are within the range of 357 to 403 VAC. The relay is OFF if one or several phase-phase voltages are higher than 403 VAC plus 1% = 410 VAC or lower than 357 less 1% = 349 VAC.

Wiring Diagrams

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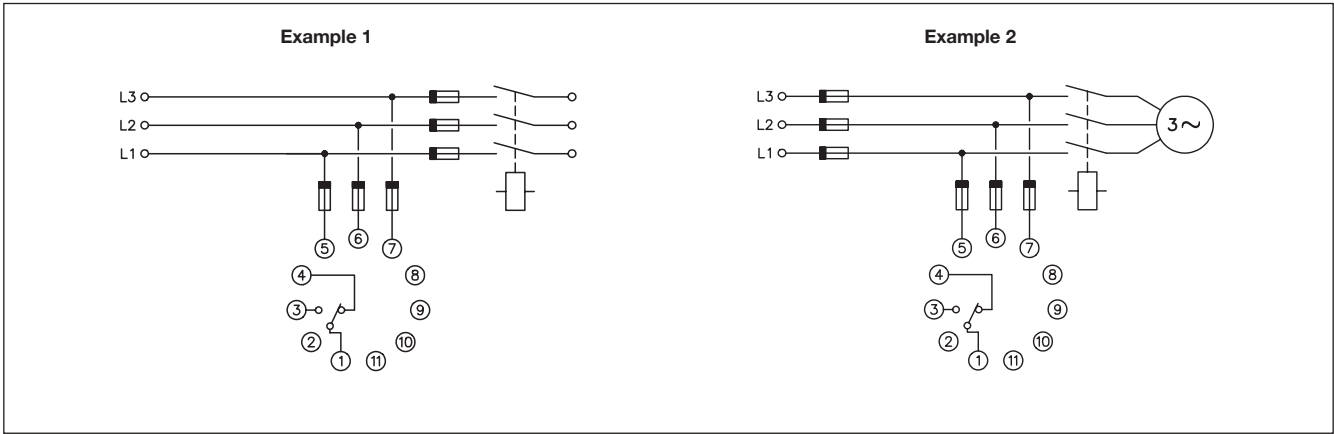
Time/Range Setting

Range setting
Lower potentiometer:
Phase asymmetry sensitivity 2% (± 1,7%) to 12% (+4,5%, -0,5%) of phase-phase amplitude. Adjustable on absolute scale.

Hysteresis:
≤ 2% of nominal voltage.

Time setting
Upper potentiometer
(not SY 175):

Time
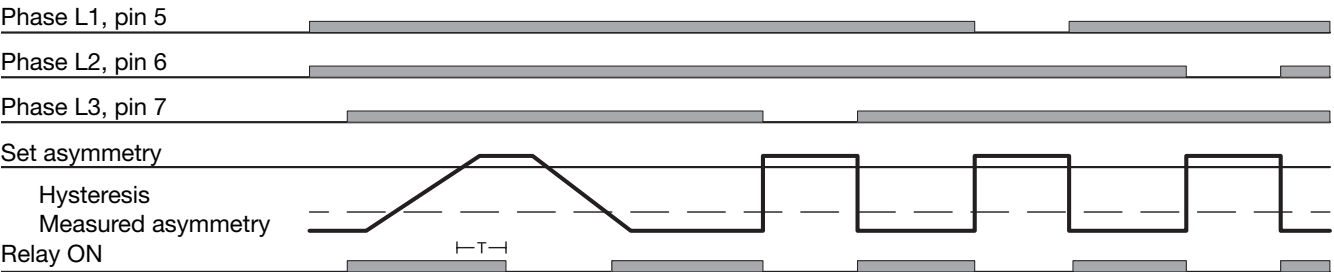Adjustable time delay on release: 0.2 to 10s
Time setting on relative scale.

Accessories

Sockets◊	S 411
Hold down spring◊	HF
Mounting rack	SM 13
Socket covers	BB 4
Front mounting bezel	FRS 2
Potentiometer lock	PL 2

For further information refer to "Accessories".

Operation Diagrams

S 171

Phase L1, pin 5
Phase L2, pin 6
Phase L3, pin 7
Set asymmetry
Hysteresis
Measured asymmetry
Relay ON

SY 175

Phase L1, pin 5
Phase L2, pin 6
Phase L3, pin 7
Set asymmetry
Hysteresis
Measured asymmetry
Relay ON