

# AZSR170

## 70 AMP POWER RELAY WITH OPTIONAL MONITORING

### FEATURES

- Up to 70 Amp / 600 VAC switching capability
- Optional NC mirror contact acc. EN 60947-4-1 for welding monitoring
- Wide load contact gap of  $\geq 3.0$  mm and optionally  $\geq 3.42$  mm
- High dielectric strength of 5 kV<sub>RMS</sub>
- 10 kV surge withstand voltage
- Compact size with less than 670 mm<sup>2</sup> (1.04 sq.in) of board space required
- TÜV, UL / CUR and CQC approvals



### CONTACTS

<b>Arrangement</b> load contact monitor contact (optional)	SPST-NO (1 Form A) SPST-NC (1 Form B) coupled to NO load contact
<b>Ratings (max.)</b> load contacts switched power switched current continuous current switched voltage contact load category monitor contact switched current recommended min. load	(resistive load)  42000 VA 70 A 70 A 600 VAC CC2  500 mA at 12 VDC 10 mA, 5 VDC, 50 mW (gold plated contact)
<b>Approved ratings</b> load contact	(TÜV, UL/CUR, CQC) 20 A make, 70 A carry, 20 A break at 600 VAC, resistive, 85°C, 50k cycles * [2] 20 A make, 70 A carry, 20 A break at 400 VAC, resistive, 85°C, 50k cycles [1][2][3] 20 A make, 55 A carry, 20 A break at 277 VAC, resistive, 105°C, 50k cycles [1][2][3] 50 A at 277 VAC, resistive, 85°C, 6k cycles [1][2][3] 70 A at 400 VAC, resistive, 85°C, 1k cycles [1][2][3] 70 A at 600 VAC, resistive, 85°C, 500 cycles * [2]
monitor contact	500 mA at 12 VDC, 105°C, 50k cycles  Note: Approvals with * are at TÜV and CQC only.
<b>Contact material</b> load contact	AgNi (silver nickel) [1] AgSnO <sub>2</sub> (silver tin oxide) [2] AgSnO <sub>2</sub> +Ag (silver tin oxide, silver plated) [3]
monitor contact	AgNi+Au (silver nickel, gold plated)
<b>Contact gap</b> standard version option (200) version	(clearance of open load contacts) $\geq 3.0$ mm $\geq 3.42$ mm
<b>Contact resistance</b> load contacts monitor contact	(initial) $\leq 10$ m $\Omega$ (at 6V/20 A, voltage drop method) $< 1$ m $\Omega$ (typ. at 70 A) $\leq 100$ m $\Omega$

### COIL

<b>Nominal coil voltages</b>	6, 9, 12, 24, 48 (DC)
<b>Dropout voltage</b>	$\geq 5\%$ of nominal coil voltage
<b>Holding voltage</b>	$\geq 45\%$ of nominal coil voltage (at 23°C)
<b>Coil power</b> nominal holding power	(at 23°C) 2.5 W 0.4 W
<b>Temperature rise</b>	70 K at nom. coil voltage, 85°C
<b>Insulation system</b>	class F, max. temperature 155°C

### GENERAL DATA

<b>Life Expectancy</b> mechanical electrical	(minimum operations) 1A: $3 \times 10^5$ ; 1A1B: $1 \times 10^5$ see approved ratings
<b>Timing</b> operate time release time	(at nominal coil voltage) $\leq 20$ ms $\leq 10$ ms (without coil suppression)
<b>Dielectric Strength</b> coil to load contact open load contact load to monitor contact open monitor contact coil to monitor contact	(at sea level for 1 min.) 5000 V <sub>RMS</sub> 2500 V <sub>RMS</sub> 5000 V <sub>RMS</sub> 1000 V <sub>RMS</sub> 1000 V <sub>RMS</sub>
<b>Surge Voltage</b> coil to load contact open load contact load to monitor contact	(1.2/50 $\mu$ s pulses) 10 kV 6 kV 10 kV
<b>Insulation Distances</b> coil to load contact load to monitor contacts coil to monitor contact open load contact standard version option (200) version	(clearance / creepage) $\geq 8.0$ mm / $\geq 8.0$ mm $\geq 6.9$ mm / $\geq 7.3$ mm $\geq 1.3$ mm / $\geq 1.4$ mm $\geq 3.0$ mm / $\geq 5.0$ mm $\geq 3.42$ mm / $\geq 5.0$ mm
<b>Insulation Type</b> rated voltage $\leq 300$ VAC rated voltage $> 300$ VAC	(coil to load contacts) Reinforced insulation, OVC III, PD2 Basic insulation, OVC III, PD2
<b>Insulation Resistance</b>	$\geq 1000$ M $\Omega$ (at 23°C, 500 VDC, 50% RH)
<b>Temperature Range</b> operating	(at nominal coil voltage) -40°C to 85°C (for load current $\leq 70$ A) -40°C to 105°C (for load current $\leq 55$ A)
<b>Vibration Resistance</b>	1.5 mm (0.062") DA at 10–55 Hz
<b>Shock</b>	10 g
<b>Enclosure</b> material protection category material group flammability	PBT RT II, flux proof IIIa UL94 V-0
<b>Terminals</b>	Tinned copper alloy, THT PCB mounting
<b>Soldering</b> preheating soldering	(referring IEC 61760-1 wave soldering) 120°C (248°F) / $\leq 120$ s 260 $\pm 5$ °C (500 $\pm 9$ °F) / $\leq 2 \times 5$ s
<b>Dimensions and Weight</b>	33.1 mm x 20.1 mm x 32.5 mm, 40 grams
<b>Compliance</b>	UL 508, IEC 61810-1, GB/T 21711.1 RoHS, REACH
<b>Agency Approvals</b> TÜV UL/CUR CQC	R 50618310 E365652 CQC 24002421520
<b>Packing (pcs.)</b>	40 per plastic tray 400 per carton box

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## COIL VOLTAGE SPECIFICATIONS

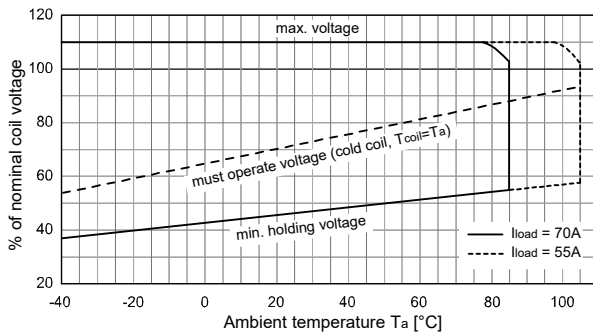
nominal	Voltage [VDC]				Resistance [ $\Omega$ ] $\pm 10\%$	Power (ref.) [W]	
	must operate contact gap 3.0 mm	must operate contact gap 3.42 mm	min. holding	max.		nominal	min. holding
6	4.2	4.8	2.4	6.6	14.4	2.5	0.4
9	6.3	7.2	3.6	9.9	32.4		
<b>12</b>	8.4	9.6	4.8	13.2	57.6		
<b>24</b>	16.8	19.2	9.6	26.4	230.4		
48	33.6	38.4	19.2	52.8	921.6		

Notes:

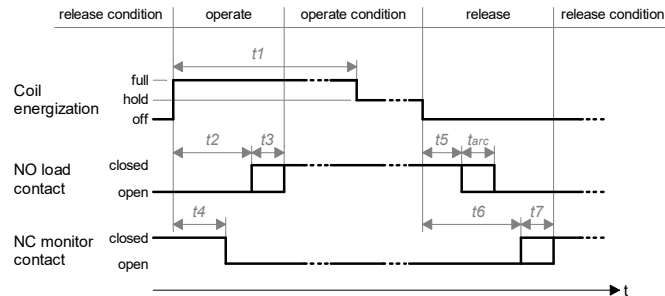
- All values at 23°C, upright position, terminals downward.
- Voltage max. is the voltage the coil can endure for a short period of time.
- To avoid overheating at elevated ambient temperatures, we recommend to operate the coil at 55 - 65% of nominal coil voltage after applying the full nominal coil voltage for  $\geq 200$  ms.
- Preferred coil voltages in bold face numbers.

## COIL OPERATIVE RANGE

Note: Diagram shown for standard 3.0 mm contact gap version. For versions with 3.42 mm contact gap (option 200) the *must operate voltage* is approx. 14% higher.



## TIMING DIAGRAM



Item	Description	Notes	Timing [ms]		
			min.	typ.	max.
t1	Full energization time	recommended value	200	-	-
t2	NO operate time	at nominal coil voltage (at 23°C) <sup>1)</sup>	-	< 15	20
		at nominal coil voltage (at hot coil) <sup>2)</sup>	-	< 42	55
t3	NO bounce time	at nominal coil voltage	-	< 3	-
t4	NC operate time	at nominal coil voltage (at 23°C) <sup>1)</sup>	-	< 14	20
		at nominal coil voltage (at hot coil) <sup>2)</sup>	-	< 40	55
t5	NO release time	without coil suppression	-	< 2	10
		with suppression: $U_{BR}/U_{nom} = 2$ <sup>3)</sup>	-	< 3	-
t6	NC release time	with suppression: $U_{BR}/U_{nom} = 2$ <sup>3)</sup>	-	< 4	10
t7	NC bounce time		-	< 4	-
tarc	arcing duration	if released under load, dependent on actual load condition			

- Notes: 1) Cold coil at ambient temperature of 23°C  
 2) Hot coil with relay operated at max. temperature.  
 3) Coil suppression breakdown voltage  $U_{BR}$  twice the nominal coil voltage  $U_{nom}$ .  
 E.g. 24V transient voltage suppressor diode in parallel to 12V coil.

## ORDERING DATA

AZSR170-1A□□□-□□□D□□□□

### Options

nil: standard version  
 (200): 3.42 mm contact gap version

**Nominal coil voltage**  
 see coil voltage specifications table

### Monitor contact

nil: without monitor contact  
 1BG: equipped with 1 Form B monitor contact

### Contact material

nil: AgNi (silver nickel)  
 E: AgSnO<sub>2</sub> (silver tin oxide)  
 EP: AgSnO<sub>2</sub>+Ag (silver tin oxide, silver plated)

## Example ordering data

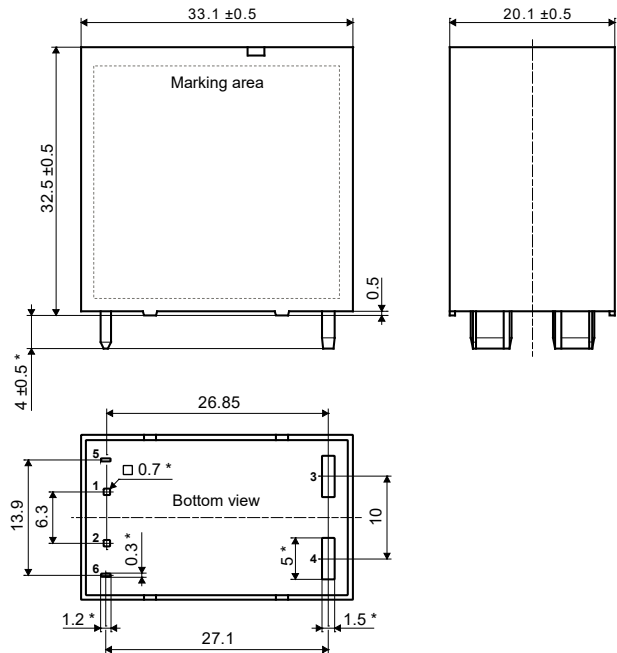
AZSR170-1A-12D AgNi contact material, 12VDC nominal coil voltage

AZSR170-1AE1BG-24D AgSnO<sub>2</sub> contact material, with 1 Form B monitor contact, 24VDC nominal coil voltage.

## MECHANICAL DATA

Dimensions in mm. Tolerance  $\pm 0.3$ mm if not stated otherwise.

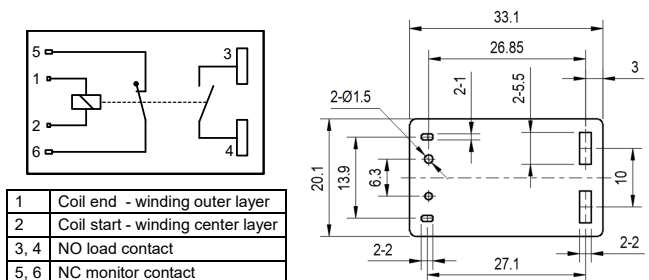
Notes: \* Pin dimensions for reference only and given without tin coating.  
 Pins 5 and 6 are omitted in versions without 1 Form B monitor contact.



CAD data in attachment of this datasheet.

## PCB FOOTPRINT / WIRING DIAGRAM

Layout and footprint recommendation. Dimensions in mm. Viewed towards terminals.  
 Note: Pins 5 and 6 are omitted in



1	Coil end - winding outer layer
2	Coil start - winding center layer
3, 4	NO load contact
5, 6	NC monitor contact

Tolerance  $\pm 0.1$ mm if not stated otherwise

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## NOTES

### General

1. All values in this datasheet are at reference temperature of 23°C (73°F) unless stated otherwise.
2. Evaluate the component's performance and operating conditions under the worst-case conditions of the actual application.
3. The datasheet and the component's specifications are subject to change without notice.

### Storage, handling, and environmental guidelines

4. Relays are electromechanical components that are sensitive to shock. The relay's adjustment can be affected if the relay is subjected to excessive shock or excessive pressure is applied to the relay case. Relays which have been dropped must no longer be used.
5. Substances containing silicone or phosphorus must be avoided in the vicinity to the relay. Outgassing from these substances can penetrate the relay and adhere on the contacts. Deposits of these substances may act as insulators and adversely affect the contact resistance. Silicone can be found e.g. in gaskets, lubricants or filling materials, phosphorus can be found e.g. as a flame retardant in plastics.
6. Prevent relays from atmospheres containing corrosive gases. Corrosion of internal structures and contacts leads to malfunction and shortens the component's service life.
7. Prevent non-sealed relays from atmospheres subject to dust. Dust particles may enter the case and get stuck between the contacts, causing the contact circuits to fail.
8. Do not use these relays in environments with explosive or flammable gases. Electrical arcing at the contacts could ignite these gases and cause fire.
9. For automated dual wave soldering process we recommend preheating with 120°C (248°F) for max. 120 seconds and a soldering temperature of 260 ±5°C (500 ±9°F) for max. 10 seconds soldering time (max. 5 seconds per wave). For manual soldering we recommend 350°C (662°F) max. temperature for max. 5 seconds. During the soldering process, no force may be exerted on the relay terminals.
10. Non-sealed relays must not be washed, immersion cleaned or conformal coated as substances may enter the case and cause corrosion or seizure of mechanical parts.
11. Avoid high frequency or ultrasonic vibrations on the relays as these can cause contact welding and misalignment or destruction of internal structures.
12. During operation, storage and transport, ambient temperature should be within the specified operating temperature range. Humidity should be in the range of 5% to 85% RH. Icing and condensation must be avoided. Relays stored for an extended period of time may show initially increased contact resistance values due to chemical effects such as oxidation.

### Design guidelines

13. The relay may pull in and operate with less than the specified *must operate* voltage value.
14. The coil's *must operate* and *min. holding* voltages, the coil's *ohmic resistance* and the relay's *operate time* depend on the temperature of the coil. The specified values are given for a coil temperature of 23°C and increase by approx. 0.39% per Kelvin of temperature rise. This circumstance must be considered, especially during operation with high load currents and elevated ambient temperature.
15. At elevated ambient temperatures, after applying the rated nominal coil voltage for ≥ 200 milliseconds, the coil energization must be reduced to a suitable holding level in order to reduce thermal stress and to prevent the coil from overheating.
16. Coil suppression circuits such as diodes, etc. in parallel to the coil will lengthen the release time. We recommend using suppression circuits with a breakdown voltage of approx. 2 times the nominal coil voltage in order to achieve a quick release time.
17. When using PWM coil control, use a fast-switching recirculation diode in parallel with the coil to keep the coil current during pulse pauses. To achieve a quick release time when de-energizing the coil, the recirculation diode must be eliminated from the circuit to get a fast decay of coil current. As PWM frequency we recommend ≥ 15 kHz in order to avoid audible noise from magnetostriction. To reduce negative EMI effects, we recommend to apply the PWM to the coil's inner/center layer terminal and have the outer layer terminal connected to ground or the supply rail.
18. Contact resistance is a function of load current, dwell time and wear level of the contacts. Immediately after closing the contacts, or if tested with low current only, the contact resistance will show a relatively high value. A low level steady state contact resistance is reached at higher current after a certain time in thermal equilibrium.
19. The relay dissipates heat from power losses through its load terminals. Provide sufficient cross section and area of the PCB traces so that they can act as heat spreader.
20. For PCBs with multiple relays, do not place the components directly next to each other. We suggest providing a mounting distance of minimum 10 mm to allow for better cooling.
21. A minimum load of 10 mA / 5 V / 50 mW is recommended for the gold plated NC monitor contact to ensure a reliable and stable electrical connection.
22. As with any contact mechanism, the relay's NC monitor contact bounces when switching. For evaluation of its signal, suitable debouncing measures must be taken to get a reliable signal.

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## DISCLAIMER

This product specification is to be used in conjunction with the application notes which can be downloaded from the regional ZETTLER relay websites. The specification provides an overview of the most significant part features. Any individual applications and operating conditions are not taken into consideration. It is recommended to test the product under application conditions. Responsibility for the application remains with the customer. Proper operation and service life cannot be guaranteed if the part is operated outside the specified limits.

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