

## 60 AMP MINIATURE POWER RELAY

### FEATURES

- Single pole / normally open miniature power relay
- 60 Amp switching capability
- High dielectric strength of 4.5 kV<sub>RMS</sub>
- 10 kV surge withstand voltage
- Compact size with less than 484 mm<sup>2</sup> (0.75 sq.in) of board space required
- Flux proof RTII and wash tight RTIII versions available
- TÜV, UL / CUR and CQC approvals



### CONTACTS

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Arrangement                              | SPST-NO (1 Form A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Ratings (max.)                           | (resistive load)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| switched power                           | 28800 VA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| switched current                         | 60 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| switched voltage                         | 480 VAC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Approved ratings<br>UL/CUR/TÜV/CQC       | 60 A at 277 VAC, resistive, 60°C, 1k cycles <sup>1)</sup><br>50 A at 480 VAC, resistive, 85°C, 6k cycles <sup>1)</sup><br>40 A at 480 VAC, resistive, 85°C, 30k cycles <sup>2)</sup><br>20A make, 60A carry, 20A break at 480 VAC, 85°C, resistive, 50k cycles <sup>3)</sup><br>10A make, 40A carry, 10A break at 460 VAC, 85°C, resistive, 100k cycles <sup>3)</sup><br><br>Cycle timing:<br><sup>1)</sup> On 0.1 s / Off 10 s<br><sup>2)</sup> On 3 s / Off 3 s<br><sup>3)</sup> On 1 s (make 0.1 s, carry 0.8 s, break 0.1 s) / Off 9 s<br><br>Note: Approvals only with the vent hole open for RT III (wash tight) types. |
| Contact material                         | AgSnO <sub>2</sub> (silver tin oxide)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Contact gap                              | ≥ 0.8 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Contact resistance<br>initial<br>typical | ≤ 100 mΩ (at 1A)<br>< 3 mΩ (contact factory for details)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### GENERAL DATA

|                                                                                |                                                                                                        |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Life Expectancy<br>mechanical<br>electrical                                    | (minimum operations)<br>1 x 10 <sup>6</sup><br>see approved ratings                                    |
| Operate Time                                                                   | ≤ 20 ms (at nominal coil voltage)                                                                      |
| Release Time                                                                   | ≤ 10 ms (nom. coil voltage, w/o suppression)                                                           |
| Dielectric Strength<br>coil to load contacts<br>open load contacts             | (at sea level for 1 min.)<br>4500 V <sub>RMS</sub><br>1700 V <sub>RMS</sub>                            |
| Surge Voltage<br>coil to load contacts<br>open load contacts                   | (1.2/50 µs pulses)<br>10 kV<br>2.5 kV                                                                  |
| Insulation Distances<br>coil to load contacts<br>open load contacts            | (clearance / creepage)<br>≥ 6.4 mm / ≥ 7.6 mm<br>≥ 0.8 mm / ≥ 7.5 mm                                   |
| Insulation Resistance                                                          | 1000 MΩ (min.) at 23°C, 500 VDC, 50% RH                                                                |
| Temperature Range<br>operating                                                 | (at nominal coil voltage)<br>-40°C (-40°F) to 85°C (185°F)                                             |
| Vibration Resistance                                                           | 1.5 mm (0.062") DA at 10–55 Hz                                                                         |
| Shock                                                                          | 20 g                                                                                                   |
| Enclosure<br>material<br>protection category<br>material group<br>flammability | PBT<br>RT II, flux proof / RT III, wash tight<br>IIIa<br>UL94 V-0                                      |
| Terminals                                                                      | Tinned copper alloy, THT PCB mounting                                                                  |
| Soldering<br>preheating<br>soldering                                           | (referring IEC 61760-1 wave soldering)<br>120°C (248°F) / ≤ 120 s<br>260 ± 5°C (500 ± 9°F) / ≤ 2 x 5 s |
| Cleaning                                                                       | (RT III - wash tight versions only)<br>80°C (176°F)<br>30 seconds                                      |
| Dimensions and Weight                                                          | 30.4 mm x 15.9 mm x 25.15 mm, 25 grams                                                                 |
| Compliance                                                                     | UL 508, IEC 61810-1, GB/T 21711.1-2008, RoHS, REACH                                                    |
| Agency Approvals<br>TÜV<br>UL/CUR<br>CQC                                       | B 088793 0019<br>E365652<br>CQC22002335876                                                             |
| Packing (pcs.)                                                                 | 50 per plastic tray<br>500 per carton box                                                              |

### COIL

|                                        |                                         |
|----------------------------------------|-----------------------------------------|
| Nominal coil voltages                  | 5, 9, 12, 18, 24, 48 (DC)               |
| Dropout voltage                        | > 5% of nominal coil voltage            |
| Holding voltage                        | > 35% of nominal coil voltage (at 23°C) |
| Coil power<br>nominal<br>holding power | (at 23°C)<br>900 mW<br>110 mW           |
| Temperature rise                       | 70 K at nom. coil voltage, 85°C         |
| Insulation system                      | class F, max. temperature 155°C         |

# AZ160

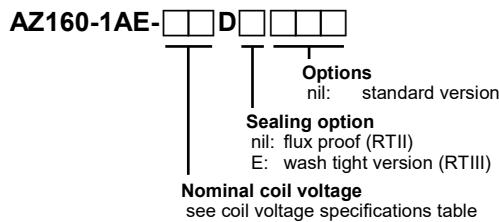
## COIL VOLTAGE SPECIFICATIONS

| Voltage<br>[VDC] |                 |                 |      | Resistance<br>[Ω] ±10% | Power (ref.)<br>[mW] |                 |
|------------------|-----------------|-----------------|------|------------------------|----------------------|-----------------|
| nominal          | must<br>operate | min.<br>holding | max. |                        | nominal              | min.<br>holding |
| 5                | 3.75            | 1.75            | 6.0  | 27.8                   |                      |                 |
| 9                | 6.75            | 3.15            | 10.8 | 90.0                   |                      |                 |
| <b>12</b>        | <b>9.0</b>      | 4.2             | 14.4 | 160.0                  | 900                  | 110             |
| 18               | 13.5            | 6.3             | 21.6 | 360.0                  |                      |                 |
| <b>24</b>        | <b>18.0</b>     | 8.4             | 28.8 | 640.0                  |                      |                 |
| 48               | 36.0            | 16.8            | 57.6 | 2560.0                 |                      |                 |

Notes:

1. All values at 23°C, upright position, terminals downward.
2. Voltage max. is the voltage the coil can endure for a short period of time.
3. To avoid overheating at elevated ambient temperatures, we recommend to operate the coil at 50 - 75% of nominal coil voltage after applying the full nominal coil voltage for ≥200 ms.
4. Preferred coil voltages in bold face numbers.

## ORDERING DATA

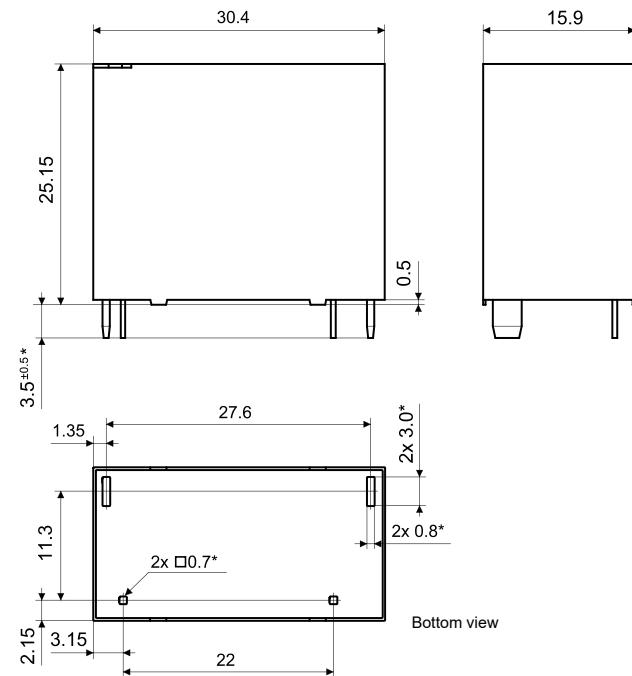


### Example ordering data

AZ160-1AE-12D      12 VDC nominal coil voltage, flux proof version  
 AZ160-1AE-24DE      24 VDC nominal coil voltage, wash tight version

## MECHANICAL DATA

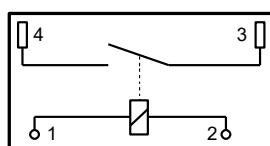
Dimensions in mm. Tolerance ±0.3mm if not stated otherwise.  
 Note: \* Pin dimensions for reference only and given without tin coating.



CAD data in attachment of this datasheet.

## WIRING DIAGRAM

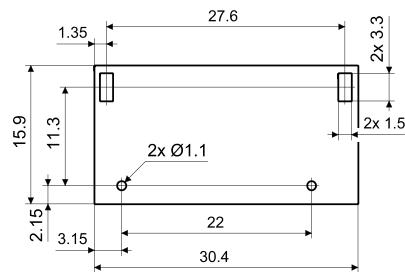
Viewed towards terminals.



|   |                                         |
|---|-----------------------------------------|
| 1 | Coil start - winding inner/center layer |
| 2 | Coil end - winding outer layer          |
| 3 | NO load contact - movable               |
| 4 | NO load contact - stationary            |

## PCB FOOTPRINT

Layout and footprint recommendation. Dimensions in mm. Viewed towards terminals.



## 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 and relays with opened vent hole 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. With sealed versions of this relay type, to achieve the specified performance and service life the vent hole must be cut open after washing or conformal coating. Care must be taken to ensure no particles get into the relay as a result of the cutting process.
12. Avoid high frequency or ultrasonic vibrations on the relays as these can cause contact welding and misalignment or destruction of internal structures.
13. 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

14. The relay may pull in and operate with less than the specified *must operate* voltage value.
15. 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.
16. At elevated ambient temperatures, after applying the rated nominal coil voltage for ≥ 200 milliseconds, the coil energization should be reduced to a suitable holding level in order to reduce thermal stress and prevent the coil from overheating.
17. Coil suppression circuits such as rectifier diodes, etc. in parallel to the coil will lengthen the release time. We recommend using suppression circuits like TVS diodes, or Zener diodes in series with a rectifier diode, with a breakdown voltage of approx. 2 times the nominal coil voltage in order to achieve a quick release time.
18. 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 EMI effects, we recommend to apply the PWM to the coil's inner layer terminal (1) and have the outer layer terminal (2) connected to ground or the supply rail.
19. 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.
20. 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.
21. 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.

# AZ160

## 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.

## ZETTLER GROUP

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