General Technical Informations

Important note: The terms and definitions laid out here do not lay claim to accuracy, completeness or legal validity. These terms and definitions should help the user to understand our catalogue, and provide some useful hints and advice. In case of any doubt, the user should refer to the relevant VDE regulations, IEC publications and DIN standards.

Standards + specifications: The devices described in this catalogue are manufactured taking into account the provisions of EN60664 / VDE0110, EN50178 / VDE0160, EN60947 / VDE0660, EN 61010 /VDE 0411, EN60255 / VDE0435 and a number of other relevant standards and regulations.

Quality assurance: Our quality management system according DIN EN ISO 9001 is evaluated regularly by an independent body. In addition we have a quality assurance system for the production in accordance with Directive 2014/34/EU (ATEX) and parts of the production are monitored by UL.

AC/DC 24 V: Such a device can be operated from either an AC or DC 24 V supply voltage. It is not equipped with a mains transformer (the supply voltage input goes directly to the rectifier) and there is no insulation between supply voltage and electronic parts.

AC voltage, AC current: technically AC voltage has a sinusoidal form. Preferred frequencies are 50 and 60 Hz. AC voltages and AC currents are measured as RMS value. The peak value is $\sqrt{2}$ times the RMS value.

Altitude: The device is designed for use at a height of up to 2000 m above sea level (MSL).

Ambient temperature, permissible: typically -20 °C to +55 °C measured in a distance of 10 mm to the bottom surface of the housing. Depending on self-heating and the material used also other values can be realized. With some devices the specified accuracy applies only within a narrow temperature range.

ATEX approval: -> Explosion protection
Motor protection devices with ATEX approval protect non-explosion-protected motors and explosion-protected motors with ignition rating according EN 60079 in normal operation an in case of failure.

Accident prevention regulation DGUV Vorschrift 3: All devices featured in the catalogue comply with the accident prevention regulations issued by the Professional Association for precision mechanics and electrical engineering (BG ETEM). This provision clarifies that for "Occasional managing" components such as pushbuttons, tilting levers or knobs,a protection against direct contact has to be made. All dangerous voltage parts are "finger-proof" run and may therefore be not touchable with the test finger acc. EN 60529. The standard equipment of our house meet these conditions, unless the customer has removed no parts.

Climatic conditions, humidity, condensation: Electrical equipment must be suitable for the application. The ambient conditions of the electronic device determine the protection afforded against the environmental influences (e.g. cooling, water splash, oil saturated air) or the equipment has its own protection system (protection provided by enclosures, e.g. IP 65). Ziehl devices are for installation complying with EN50178/VDE 0160. All devices are usually suitable for environmental class 3K3.

CE mark: We declare as manufacturer, that our products comply with the requirements of the appropriate directives. These products carry the CE mark.

Closed current principle: The relay is energized in the OK state (when the actual value is within the permissible range) and releases with the alarm signal. Disadvantage: malfunction may produce a switching signal, e.g. in case of voltage breakdown in the supply voltage. Advantage: A monitoring breakdown will normally be recognized. → Open circuit current.

Current output: Measuring transducers have current outputs with DC 0 - 20 mA or 4 - 20 mA. The loading capacity of current outputs is limited. The permissible maximum load (burden) is determined by the maximum voltage in the device, e.g. 500 Ω at 20 mA and 10 V. Current inputs of multiple devices may be connected to a current output up to the maximum permissible load. → Input resistance.

Creepage destance: shortest distance along the surface of an insulation material between two conducting parts.

DC voltage: A DC voltage is indicated as an average value. Accumulators supply a smooth DC voltage. RMS value and average value are taken to be equal. Rectifiers supply a pulsating DC voltage. If nothing else is stated, a sufficiently smooth DC voltage is expected, produced with the help of capacitors, when using devices with DC supply voltage; the upper and lower peak values of the DC voltage should not exceed the permissible tolerance of the supply voltage.

Duty cycle: ZIEHL devices are usually designed for a 100% duty cycle.

Declaration of Conformity: The devices comply with the regulations and directives 2014/35/EU (electrical equipement designed for use within certain voltage limits) and 2014/30/EU (electromagnetic compatibility - EMC)

1. EN 50178: Electronic equipment for use in power installations
2. EN 61000-6-4: Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
3. EN 61000-6-2:
Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
4. EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
5. EN 60255-27: Measuring relays and protection equipment - Part 27: Product safety requirements
6. EN 60947-8: Low-voltage switchgear and controlgear - Part

Climatic Conditions (normal conditions, minimum ambient conditions)

Typical places	Temperature	Relative Humidity	Barometric Pressure
weather-protected places, e.g. not air-conditioned control rooms and operating areas	+5°C...+40°C outside of cabinet	5%...85% no condensation	760 hPa...1060 hPa
during storage	-20°C...+70°C	5%...95%	760 hPa...1060 hPa
during transport	-20°C...+70°C	5%...95%	700 hPa...1060 hPa

5-8: Control circuit devices and switching elements - Three-position enabling switches.

Emitted interference: If not otherwise specified devices with AC supply voltage (built-in transformer) meet the requirements of the EN 61000-6-3: Emission for residential, commercial and light-industrial environments . If not otherwise specified devices with DC control voltage or AC/DC 24-240 V-all voltage power supplies meet the requirements of EN 61000-6-4: Emission standard for industrial environments.

EN 61558/ VDE 0551: Specification of the technical construction of a transformer with safe separation between mains and electrical low voltage. Performed absolutely short-circuit proof or conditional short-circuit proof with integrated →Fuse.

Explosion proof: Devices carry an explicit warning with regard to applications in potentially explosive atmospheres . They are not equipped with intrinsically safe terminals. Connection to sensors in potentially explosive atmospheres must be effected via suitable zener-barriers (exception MS(R)220Vi). In doing so, it must be observed that line resistance should not be adversely affected. Devices with ATEX approval are to be installed outside potentially explosive atmospheres.

Galvanic isolation (of mains): In many applications a galvanic separation is necessary between the voltage supply and the electronics, and thus e.g. measuring input/sensor. The separation is achieved typically by transformer or DC/DC converters →proof voltage.

Galvanic isolation (between input and output): → Measuring transducer with galvanic isolation

Hysteresis: Hysteresis is the difference between two switching points. For example, the hysteresis is -5°C if a temperature monitor relay switches off at 80°C as the temperature rises and switches back again at 75°C as the temperature falls. A certain minimum hysteresis is necessary to avoid any "flutter effect" in the relay when switching.

Important Notes! Read carefully! Faultless and reliable functioning of devices requires appropriate transport and storage, expert installation and setup, as well as operation in accordance with the regulations. These devices may be operated only by persons who are well acquainted with their installation, setup and operation and who are qualified in accordance with their occupation. They should strictly observe all operating instructions, the directions fixed to the device and the relevant safety regulations for installation and operation of electronic plant. These devices are constructed and tested to DIN VDE specifications, and leave our factory in perfect condition and conforming with safety regulations. To maintain this condition, the safety regulations which are explicitly highlighted under the headline "Attention" in the operating instructions must be strictly observed. Death, bodily harm, or damage to the device itself and to other devices or installations may result from non-observance of the safety regulations. Should the information in the operating instructions be in any way inadequate, please do not hesitate to contact us directly or one of our agents or representatives. Relevant regulations in the user's country must be observed with regard to the application area of the device, over and above the valid industry standards and regulations mentioned in these operating instructions which are valid in Europ

Input impedance: A current input has usually a low input impedance. Especially for the upstream transducer it is important that inputs DC 0/4-20 mA cause loads as little as possible. And high current inputs to keep low power loss on the shunt. Vice versa, a voltage output requires a high load resistance so as to reduce the power losses. → current output → voltage output

Installation hints: All devices are to be installed by appropriately trained skilled labour taking into account all the relevant regulations.

Insulation: In order to protect against dangerous body currents (electric shock), protective arrangements must be taken conforming with EN 61140. Shock-proof protection → Protection system. A frequently used protection measure consists of insulation. →Insulation coordination →creepage distances.

Insulation coordination: due to the application expectable impulse and over-voltages during lifecycle (e.g. lightning strike), subsequent contamination and the insulation features of the materials are used as a basis for the definition of minimum values fo→ creepage distances. The same applies for the → Proof voltage, which is used for testing the insulation features of the products.

Insulation voltage: The rated insulation voltage Ui is specified according EN60664. It provides information of the maximum voltages that can be connected to the equipment.

Insulation voltage, temperature sensor: In the case of temperature sensors a higher insulation voltage will usually lead to a higher heat transmission resistance of the sensor and thus to a higher response time.

Maintenance: Usually not necessary for our devices. Depending upon the application, though, we recommend periodical inspection, especially where otherwise a breakdown would not be noticed.

MAX-contact: The switching condition for a relay will be achieved at signal increase on the set switching point. Switchback after signal falls below particular setting: → Hysteresis. Hysteresis is negativ.

MIN-contact: The switching condition for a relay will be achieved at signal drop on the set switching point. Switchback after signal exceeds a particular point: → Hysteresis. Hysteresis is positive.

MINIKA®: ZIEHL registered trade name.

MINIPAN®: ZIEHL registered trade name.

Modifications: We reserve the right to make technical modifications within the scope of further development of our products.

Pollution degree: according to EN 60664-1 the levels of pollution are defined as follows:

Pollution degree 1: no pollution or only dry, non-conductive pollution occurs, which has no influence
Pollution degree 2: only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected
Pollution degree 3: conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected
Pollution degree 4: continuous conductivity occurs due to conductive dust, rain or other wet conditions.

Ambient temperature, permissible: usually -20 or 0 up to 55°C measured at 10mm distance from the middle of the upper housing surface. Different values may be appropriate, dependent on self-heating and the material used. For some devices the stated accuracy is valid only within a reduced temperature range.

Power consumption: Indicated in VA (AC) or W (DC). We are constantly trying to minimize the capacity consumption in our devices by the application of current-saving components.

Power supply: If the voltage range is specified for the supply voltage, e.g. AC 220 - 240 V +10/-15%, the operating range will be from AC 187 V up to AC 264 V. In case of DC supply only smoothed voltages with an upper ripple of max. 5% are admissible.

Proof voltage: voltage for testing the → Insulation of an equipment. The insulation strenght between supply voltage, output contacts, housing and the electrical low voltage circuits (ELV) is tested. As a rule of thumb: withstand voltage = 2 x rated insulation voltage + 1000 V. → Protection provided by enclosure, → Safe separation.

Protection system: ZIEHL devices comply with DGUV part 3 (formerly BGV A3). They are equipped with protection against indirect contact (finger guard, protection against electric shock).

Protection proviced by enclosure (IP-Code): Defined according to EN60529. The first figure thereof states the protection against contact and the penetration of foreign bodies, the second one represents water-proofing, as follows:

1st figure:
0: no protection
1: Protection against large foreign bodies Ø 50 mm
2: Protection against medium-sized foreign bodies Ø 12 mm
3: Protection against small foreign bodies Ø 2.5 mm
4: Protection against granular-structured bodies Ø 1 mm
5: Protection against dust deposit. Complete protection against contact of voltage-carrying parts
6: protection against dust penetration

2nd figure:
0: No protection
1: Protection against vertically falling dripping water
2: Protection against angular (≤15°) falling dripping water
3: Protection against spray water (<60° to vertical)
4: Protection against splash water from all directions
5: Protection against jet water
6: Protection against water penetration while dipping under fixed conditions
7: Protection against water penetration while dipping under fixed conditions
8: Protection against submersion

To achieve the type of required protection in the relevant application, the devices must be installed into housings or cabinets if necessary. In places with expected radiated EMI, the installation should be appropriately shielded.

Rated frequency: ZIEHL devices with AC voltage supply usually operate with 50 and 60 Hz. Deviations are indicated explicitly.

Rated voltage: The component or device is designed for this voltage and the operating and performance features refer to it. → Us, rated operating voltage

Relay, connection designation according to EN 60947-1: Change-over = 11 (15), normally closed contact = 12 (16), normally opened contact = 14 (18) (figures in brackets for time-delayed contacts). NO: 13/14 (17/18), NC: 11/12 (15/16). The first number is the number of the relay, e.g. 32 = normally closed contact of relay K3.

Relay, contact material: The material used for the relay contacts is crucial for the switching capacity. No contact material is optimally suited for all applications. Thus contact materials which are suitable for switching higher voltages and currents will show poor features with regard to the transmission of low signals. ZIEHL devices usually use relays with silver-nickel alloy (AgNi).

Silver-nickel alloy AgNi10
Advantage: high resistance to arc-erosion, low welding tendency, especially suitable for inductive loads, 6 - 400 V and 10 mA up to 100 A. Disadvantage: higher contact resistance than other Ag contacts.

Silver nickel alloy AgNi0,15 (fine grain silver)
Advantages: relatively small contact resistance, low welding tendency, suitable for the switching of medium and high loads.

Relay, contact life cycle: This will be determined by the number of switches under load. Modern relays have mechanical life cycle of more than 1 million switching operations. The electrical life cycle will be determined by the switching capacity of the contacts. See also contact material.

Relay, contact protection: Switching inductive loads it is advised to connect the load with a protection element to eliminate errors. For alternating current with a RC-element or a VDR (voltage-depending resistance) at DC with a RC-element or a free-wheeling diode. The switch-off time then must be observed. Generally the interference effect will be significantly reduced and the life-time of the contacts improved.

Relay contacts: see Table next page

Relay, fuse protection of contacts: In order to avoid welding of the relay contacts, we generally recommend the use of a fuse. For typical application with relays type 2 and make-contact (NO) we recommend a fuse slow-blow 4 A or miniatur circuit breaker 4 A (MCB) characteristic B..

Relay, rated operating current Ie: This is the current which can reliably be switched by the relay contact at an indicated rated operating voltage -> Switching capacity.

Relay, switching capacity according to EN 60 947-5-1: to AC 15 / DC 13, auxiliary current circuits, electromagnetic load

Relay, switching capacity is the load (ohmic), which can switched by a relay contact. Maximum specified values, therefore, shouldn't be exceeded. In case of AC current loads the maximum switching capacity must be reduced because of the phase displacement between current and voltage ($\cos \varphi = 0.7$).

Service life: is mainly limited by the relay (number of operations, contact load) and electrolytic capacitors (which may dry out within a certain period in the case of high ambient temperature). We generally equip our devices with relays and capacitors with a high life expectancy.

Shock resistance: Specifies the acceptable mechanical shock (in a multiple of the acceleration due to gravity "g" with half sine wave form and 11 ms duration) where no malfunctions occur. All instruments featured in the catalogue are resilient with 5 g

Storage temperature, permissible: usually -20 up to +70°C.

Switch-on behaviour: When applying the supply voltage it takes some time until all outputs and displays change into the steady state. Output relay with → closed current principle are designed to signal an error message during this switch-on period.

Test conditions: These are the test conditions of our devices, as far as not mentioned otherwise in the data sheet
Rated insulation voltage Ui acc. EN 60664-1:
AC 250 V pollution degree 3
AC 415 V pollution degree 2
Overvoltage category III
Rated impulse withstand voltage 4000 V

Proof voltage between control supply voltage Us, sensor circuits and relay outputs AC 2500 V
Proof voltage open contact (normal open, no) AC 1000 V
Emitted interference/immunity for industrial environments: EN 61000-6-4; EN 61000-6-2
Vibration resistance: ±0,075 mm 10...57Hz; 1g 57...150Hz
Shock resistance: 5g 11 ms

Relay contacts:		
	Type 3	**Type 2**
Contact material	AgNi 9/10	AgNi 0,15
Rated voltage	AC 250 V 50 Hz	AC 250 V 50 Hz
Switching voltage	max. AC 400 V max. DC 300 V	max. AC 400 V max. DC 300 V
Thermal current AC/DC	3 A	5 A
Minimum current/voltage	12 V 10 mA	12 V 10 mA
Switching power max. AC cos φ = 1 Switching power max. DC (ohmic load) Switching capacity normally opened (no) Rated nominal current	5 A 250 V 0,3 A DC 240 V 5 A DC 30 V Application category - AC-15 Ie = 2 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V DC-13 Ie = 0,8 A Ue = 60 V DC-13 Ie = 0,4 A Ue = 120 V DC-13 Ie = 0,2 A Ue = 240 V	8 A 250 V 0,3 A DC 300 V 8 A DC 30 V Application category AC-15 Ie = 2 A Ue = 400 V AC-15 Ie = 3 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V DC-13 Ie = 0,8 A Ue = 60 V DC-13 Ie = 0,4 A Ue = 120 V DC-13 Ie = 0,2 A Ue = 240 V
Contact life cycle Life cycle electrical 2 x 10^5 switching operations 5 x 10^5 switching operations	 cos φ = 1 3 A - 250 VAC 2 A - 250 VAC	 cos φ = 1 5 A - 250 VAC 3 A - 250 VAC

Application category	Typical conditions
AC-12	Switching of ohmic load and load of semiconductors in inputcircuits of optocoupler
AC-13	Switching of load of semiconductors with de-coupling by a transformer
AC-14	Switching of low electromagnetic load (max. 72 VA)
AC-15	Switching of lelctromagnetic load (> 72 VA)
DC-12	Switching of ohmic load and load of semiconductors in inputcircuits of optocoupler
DC-13	Switching of electromagnetic loads
DC-14	Switching of electromagnetic loads with economy resistance in circuit

Application category	Normal conditions					
	Switch-on			Switch-off		
	I/I_e	U/U_e		I/I_e	U/U_e	
AC-12	1	1	cos φ = 0,9	1	1	cos φ = 0,9
AC-15	10	1	cos φ = 0,3	1	1	cos φ = 0,3
DC-13	1	1	T < 300 ms	1	1	T < 300 ms

Climatic conditions 3K3 acc. EN 60721-3

Us, Control voltage, rated operating voltage: is the rated value of the voltage to be connected for operating the device. Voltage variations are allowed within the stated tolerances

Vibration resistance: Specifies at which amplitude and acceleration in a defined frequency range no malfunctions or damages occur. All our devices featured in the catalog are sufficient resilient and comply with EN 60068-2-6 for device, where no increased demands appear due to their installation location. Vibration Test Fc with 10-57 Hz ± 0.075 mm and 57-150 Hz 1 g

Voltage output: Measuring transducer are available with voltage outputs with DC 0 - 10 V. Other values are available upon request. The Loading capacity of voltage outputs is limited.

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