

Product Manual

PSE NO Switch

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Changes that contribute to technical improvement are subject to alternations.

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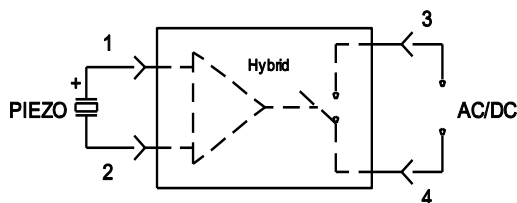
1 PRODUCT DESCRIPTION

- Variety of design options concerning size, colour, shape, illumination, connection or lettering
- especially ideal for use in harsh environments
- high reliability, long lifetime with more than 30 mill. actuations
- no maintenance costs, since no mechanical wear parts
- easy to clean due to a tightly closed surface (IP 69K)

1.1 Functional Description: NO Switch

The piezo switch is based on the functional principle of the piezoelectric crystal. The action of force on the piezo disk causes a voltage to be induced due to a charge transfer. The voltage generated is converted by the electronic connection into a polarity-neutral, electronic switch contact. During the voltage drop, the electronic switch contact is closed for the specified pulse duration. After this, the electronic switch contact opens again, even if the force is still present. The period that the electronic switch contact remains closed depends on the actuating speed and force as well as on the duration of actuation.

Diagram of an NO switch:



The piezo disk is connected to the terminals 1 and 2. The electric circuit to be switched is connected at the terminals 3 and 4. This can be either direct voltage (DC) or alternating voltage (AC). If a pulse is applied to the piezo disk, terminal 1 becomes positive in relation to terminal 2 due to the voltage generated. The integrated switching element controls the electric circuit to be switched.

In the neutral position of the piezo switching element, the terminals 3 and 4 are non-conductive, and initial contact resistance is greater than 10 MOhm. When the piezo disk is actuated, the initial contact resistance is reduced to less than 20 Ohm.

When actuating the piezo disk, the resistance between terminals 3 and 4 is therefore changed from high resistance → low resistance → high resistance.

This corresponds in principle to the function of a conventional **NO pushbutton switch**.

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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1.2 Functional Description: Illumination

Ring Illumination

Single or bi-colored ring illumination is possible for the PSE switches.
When equipped with two colors, it is possible to either switch between the colors or to achieve a combination color, depending on the type of activation.

For example: Diodes of group 1 = red and diodes of group 2 = green

| | | |
|--|---|------------------------------|
| Only group 1 is activated | → | Ring has red illumination |
| Only group 2 is activated | → | Ring has green illumination |
| Both groups are activated at the same time | → | Ring has orange illumination |

| | | |
|-------------|---|----------------------------|
| Red cable | = | Supply voltage: red LEDs |
| Green cable | = | Supply voltage: green LEDs |
| Black cable | = | Minus for all LEDs |
| White cable | = | Switch contact |

[Terminal layout](#) see page 14 section 2.4 Switching Symbols Illumination

Special type 5 VDC upon request

Point Illumination

When illuminating the PSE switch, either a single-color LED (2 pins) is used or a bi-colored LED (3 pins). If a single-color LED is used, cable No. 2 is not needed (see section 2.4 Switching Symbols: Illumination – Point Illumination).

Switching between colors can be achieved by appropriate activation.

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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2 TECHNICAL DATA AND DIMENSIONAL DRAWINGS

2.1 Technical Data

| Electrical Data | | |
|---|----------|---------------|
| Switching Voltage max. | (VAC/DC) | 42/60 |
| Switching Current max. | (mA) | 100 |
| Rated Breaking Capacity | (W) | 1 |
| Lifetime (at Rated Breaking Capacity) | (Mio.) | 20 |
| Switch resistance off (OFF=not actuated) | (MΩ) | >10 |
| Switch resistance on (Ta=25°C) (ON=actuated) | (Ω) | <20 |
| Capacity | (nF) | 5 |
| NO Pulse Time (depending on the actuating force, time and speed) | (ms) | 20-1000 |
| Contact Configuration | | polarity-free |
| Switch Function | | NO switch |

| Mechanical Data | | |
|--|------|------------------|
| Actuating Force (at ambient temperature) | (N) | ≤3 ¹⁾ |
| Actuating Travel | (mm) | 0.002 |
| Torque | (Nm) | 2.5 |
| IK Protection Class | (IK) | 02 |

| Climatic Data | | |
|--|------|---------------------------|
| Operating Temperature | (°C) | -40 to +85 |
| Storage Temperature | (°C) | -40 to +85 |
| IP Degree of Protection Front Side hose water (1m water column) (IEC/DIN/EN 60529) | (IP) | 67 |
| IP Degree of Protection Front Side submerged (DIN 40050-9:1993 High-pressure cleaning test) | (IP) | 69K |
| Degree of Protection DIN EN 60069-2-30 Db (Moist heat (air test with 55°C / 93% humidity)) | | front side / rear side |

¹⁾ At temperatures lower than -10°C, the actuating force increases 2- to 4-fold.

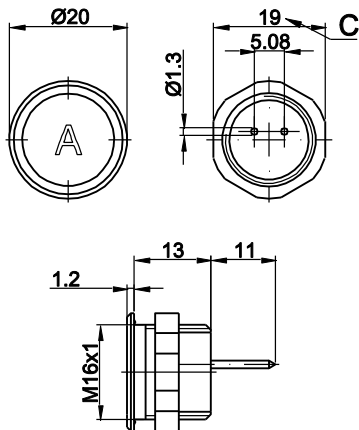
| Material (Individual Part) | Material ²⁾ |
|---|------------------------|
| Housing (depending on type) | Stainless Steel |
| | Anodized aluminum |
| | Polyamide |
| Actuating Area / Insert (with ring illumination) | Stainless steel |
| | Anodized aluminum |
| Illuminated Ring (with ring illumination) | Polyamide |

²⁾ *When using the switch in a saline or chloric environment, special materials must be used. Items available upon request.*

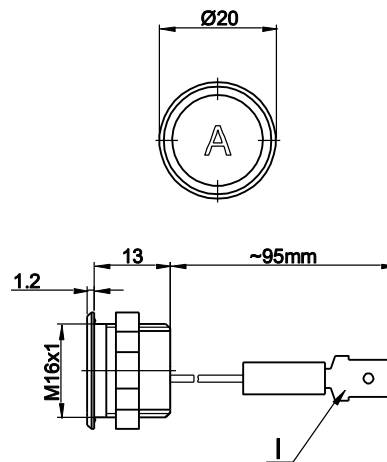
2.2 Component dimensions

2.2.1 M16 Series with Finger Guidance

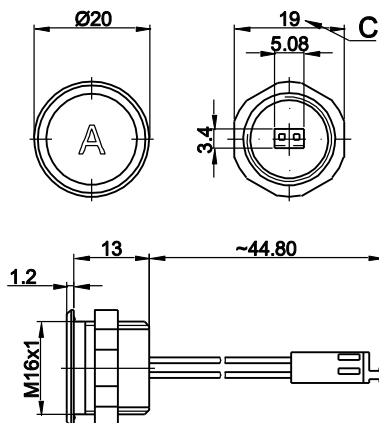
with Pins



with Crimp Terminal male



with AMP ¹⁾



Legend:

- A = Illumination Area
- B = Actuating Area
- C = Width Across Flats
- I = Crimp Terminal male 6.3x0.8

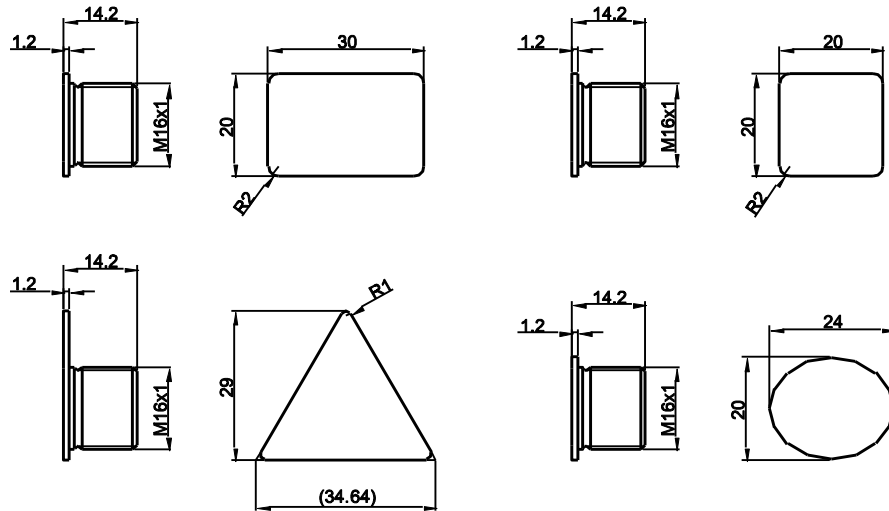
Lettering:

- either with/without lettering
- position of the connections with respect to the position of the lettering is not defined

¹⁾ Version available on request

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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2.2.1.1 Design Possibilities for Housing Geometry: M16

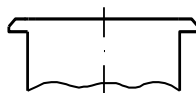


2.2.1.2 Design Possibilities for Actuating Area

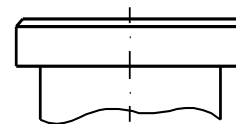
with finger guidance
(standard)



without finger guidance
(upon request)



elevated front design: M19
(standard, others upon request)



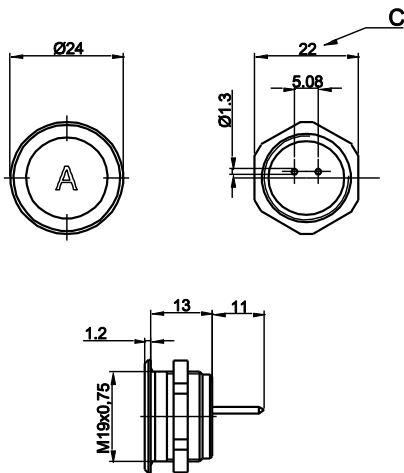
2.2.1.3 Connection variants

- Wire (Standard: 0.14 mm² / 200 mm wire-length)
- Pins (with Connection Terminal 0701.9225)
- Crimp Terminal male 6.3 x 0.8 mm
- AMP

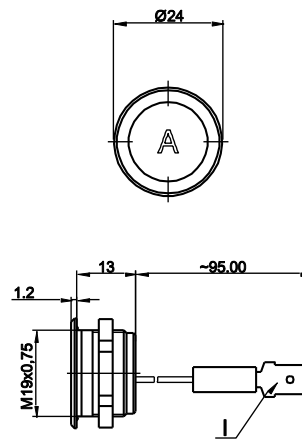
| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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2.2.2 M19 Series

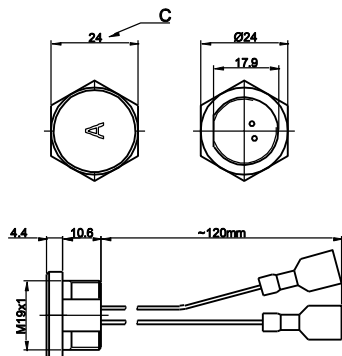
with Pins



with Crimp Terminal male ¹⁾



Cable with Faston, elevated front design



Terminal:
Crimp Terminal female Ultrafast red 6,3x0,8

Legend:

- A = Illumination Area
- B = Actuating Area
- C = Width Across Flats
- I = Crimp Terminal male 6.3x0.8

Lettering:

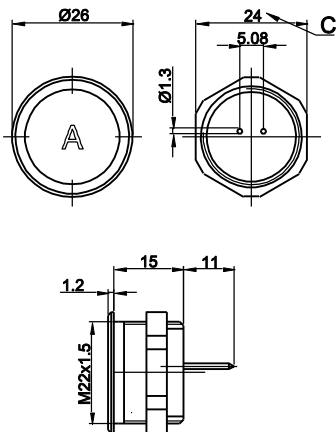
- either with/without lettering
- position of the connections with respect to the position of the lettering is not defined

¹⁾ Version available on request

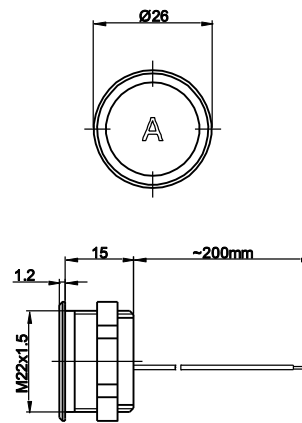
| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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2.2.3 M22 Series

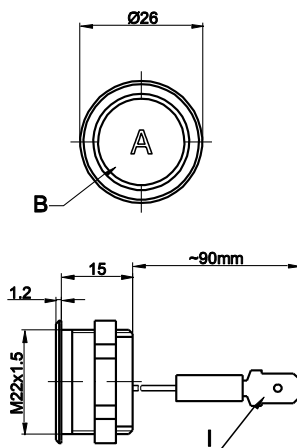
with Pins



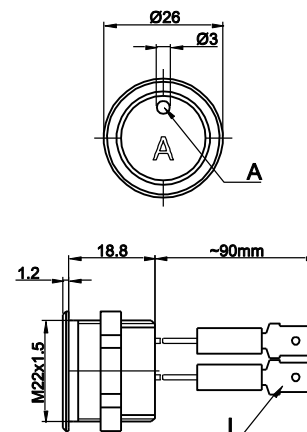
with Wire



with Crimp Terminal male ¹⁾



Point Illumination with Crimp Terminal male



For terminal layout see page 14

Legend:

- A = Illumination Area
- B = Actuating Area
- C = Width Across Flats
- I = Crimp Terminal male 6.3x0.8

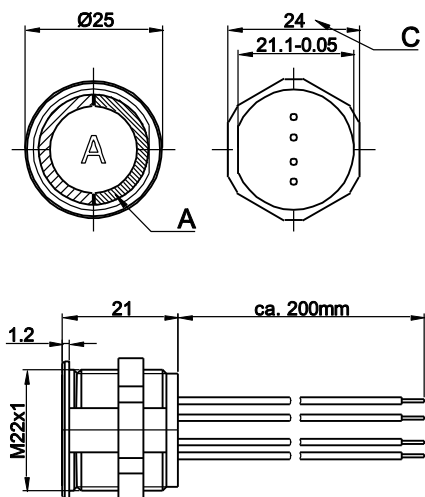
Lettering:

- either with/without lettering
- position of the connections with respect to the position of the lettering is not defined

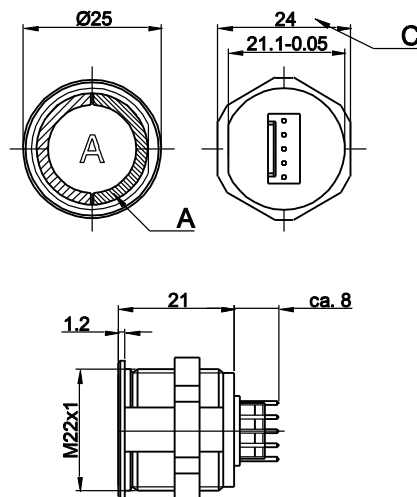
¹⁾ Version available on request

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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Ring Illumination with Wires



Ring Illumination with Plug Connector



Terminal:
Molex 22-23-2051
6373 Serie

For terminal layout see page 15

Legend:

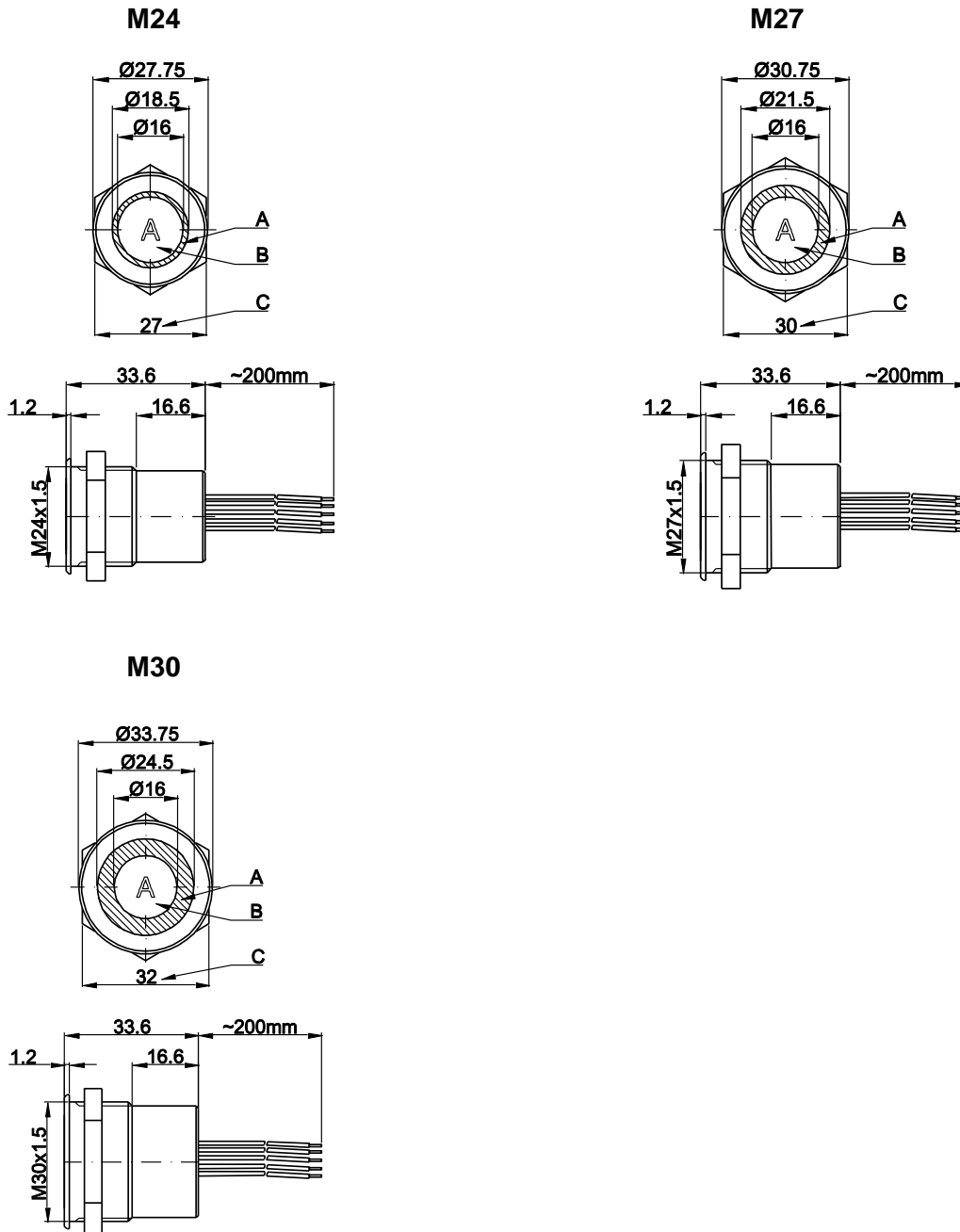
- A = Illumination Area
- B = Actuating Area
- C = Width Across Flats
- I = Crimp Terminal male 6.3x0.8

Lettering:

- either with/without lettering
- position of the connections with respect to the position of the lettering is not defined

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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2.2.4 M24 / M27 / M30 Series with Ring Illumination



For terminal layout see page 14

Legend:

- A = Illumination Area
- B = Actuating Area
- C = Width Across Flats
- I = Crimp Terminal male 6.3x0.8

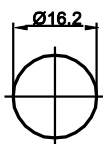
Lettering:

- either with/without lettering
- position of the connections with respect to the position of the lettering is not defined

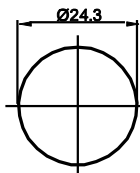
| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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2.3 Hole Dimensions

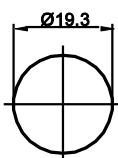
M16



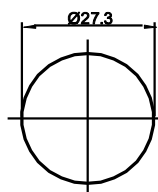
M24



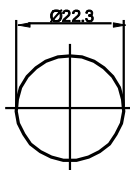
M19



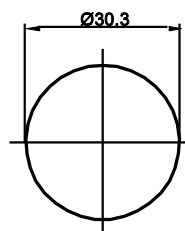
M27



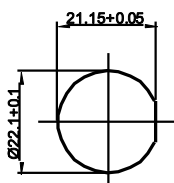
M22



M30



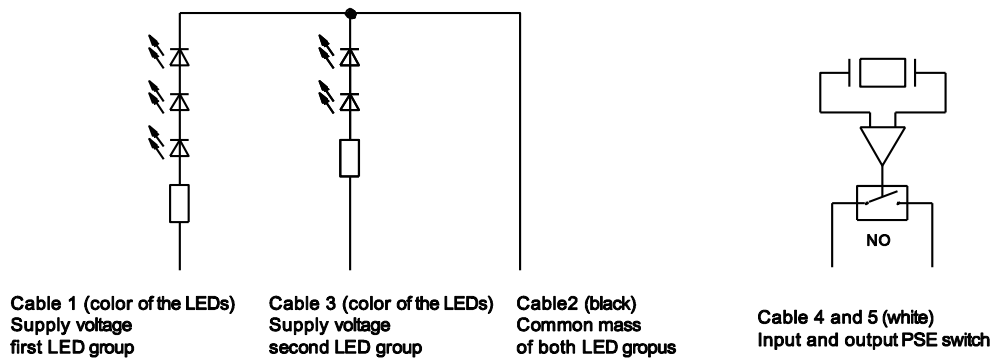
M22 RI



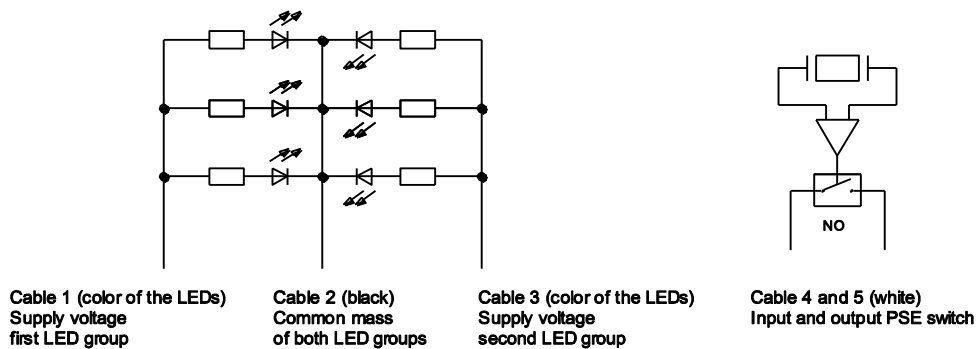
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2.4 Switching Symbols: Illumination

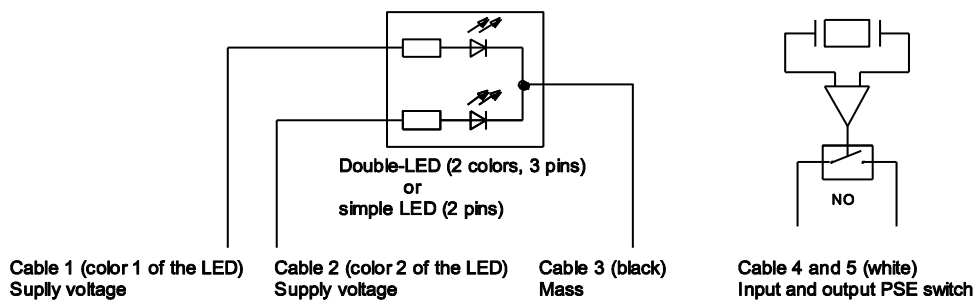
Ring Illumination for the M24, M27, M30, 12/24 VDC Series



Special Types: 5 VDC



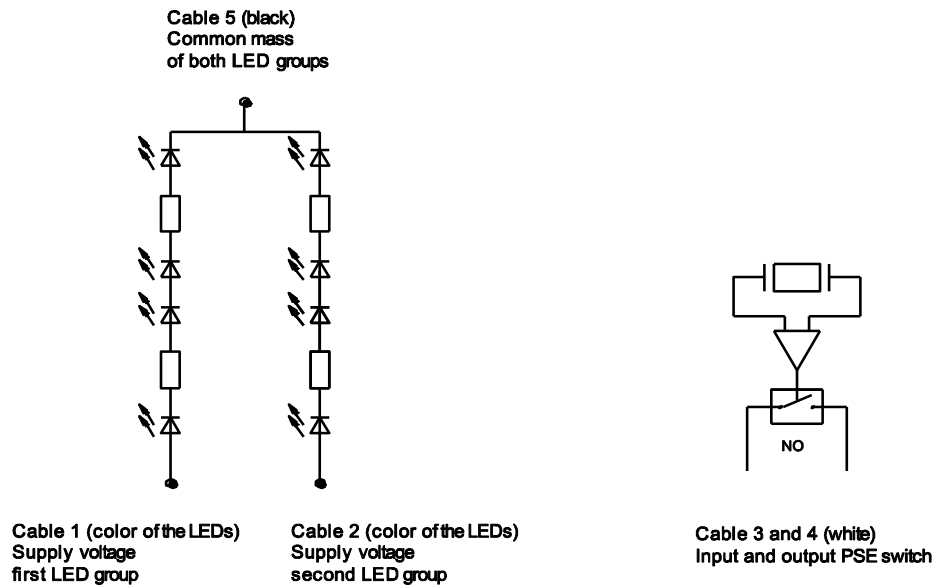
Point Illumination



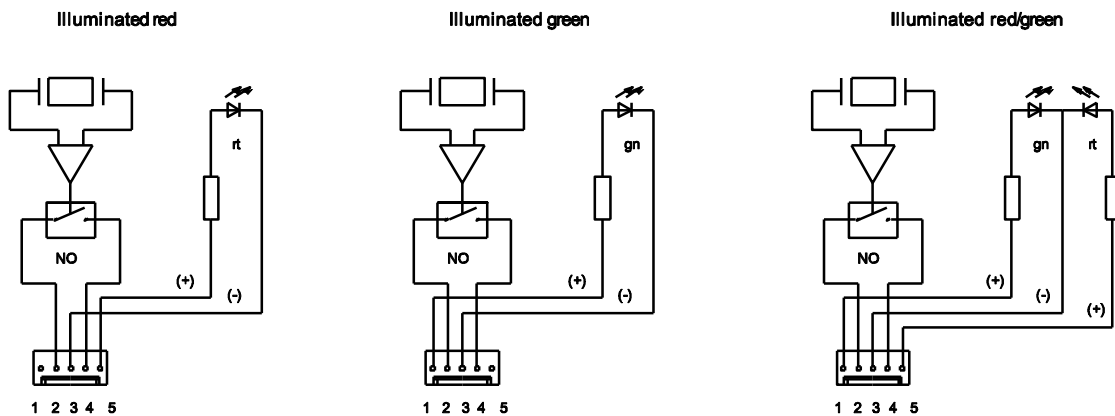
Changes that contribute to technical improvement are subject to alternations.

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Ring Illumination for the M22, 12/24 VDC Series with Wires



Ring Illumination for the M22, 12/24 VDC Series with Quick Connect Terminal



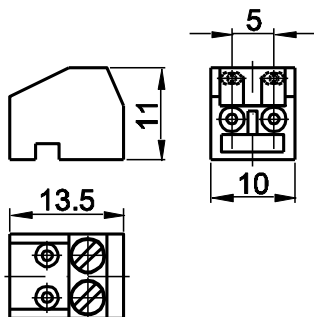
Changes that contribute to technical improvement are subject to alternations.

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2.5 Accessories

Connection Terminal for version with pins

Order number: 0701.9225



| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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3 ORDER NUMBERS

3.1 M16 Series

| Item Number | Function | Connection | Housing Material | Housing Color |
|-------------|----------|---------------------|------------------|------------------|
| 1241.2350 | NO | Pins | Plastic | Red |
| 1241.2351 | NO | Pins | Plastic | White |
| 1241.2352 | NO | Pins | Plastic | Aluminum natural |
| 1241.2353 | NO | Pins | Plastic | Black |
| 1241.2411.1 | NO | Pins | Aluminum | Gold |
| 1241.2411.3 | NO | Pins | Aluminum | Red |
| 1241.2411.4 | NO | Pins | Aluminum | Blue |
| 1241.2411.5 | NO | Pins | Aluminum | Green |
| 1241.2411.7 | NO | Pins | Aluminum | Black |
| 1241.2411.8 | NO | Pins | Aluminum | Aluminum natural |
| 1241.2611 | NO | Pins | Stainless Steel | |
| 1241.3000 | NO | Crimp Terminal male | Aluminum | Red |
| 1241.3001 | NO | Crimp Terminal male | Aluminum | Green |
| 1241.3002 | NO | Crimp Terminal male | Aluminum | Black |
| 1241.3003 | NO | Crimp Terminal male | Aluminum | Aluminum natural |

3.2 M19 Series

| Item Number | Function | Connection | Housing Material | Housing Color |
|-------------|----------|-------------------|------------------|------------------|
| 1241.3123 | NO | Pins | Aluminum | Aluminum natural |
| 1241.5003 | NO | Cable with Faston | Aluminum | Aluminum natural |
| 1241.3388 | NO | Pins | Stainless Steel | |

3.3 M22 Series

3.3.1 M22 non-illuminated

| Item Number | Function | Connection | Housing Material | Housing Color |
|-------------|----------|------------|------------------|------------------|
| 1241.3005 | NO | Pins | Aluminum | Red |
| 1241.3006 | NO | Pins | Aluminum | Green |
| 1241.3007 | NO | Pins | Aluminum | Black |
| 1241.3008 | NO | Pins | Aluminum | Aluminum natural |
| 1241.3075 | NO | Pins | Stainless Steel | |
| 1241.3593 | NO | Wire | Aluminum | Aluminum natural |

*The listed item numbers represent a selection from the range of piezo switches.
Other mounting diameters, materials, colors and connections are available upon request.*

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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3.3.2 M22 with Point Illumination

| Item Number | Function | Connection | Housing Material | Housing Color | Illumination | Voltage |
|-------------|----------|---------------------|------------------|------------------|--------------|---------|
| 1241.3020.M | NO | Crimp Terminal male | Aluminum | Aluminum natural | Red | 24 VDC |
| 1241.3047.M | NO | Crimp Terminal male | Aluminum | Aluminum natural | Yellow | 24 VDC |
| 1241.3089.M | NO | Crimp Terminal male | Aluminum | Aluminum natural | Green | 24 VDC |
| 1241.3244.M | NO | Crimp Terminal male | Aluminum | Aluminum natural | Blue | 24 VDC |
| 1241.3166.M | NO | Crimp Terminal male | Aluminum | Red | Red | 24 VDC |
| 1241.3167.M | NO | Crimp Terminal male | Aluminum | Green | Green | 24 VDC |
| 1241.3222.M | NO | Crimp Terminal male | Aluminum | Gold | Yellow | 24 VDC |
| 1241.3594.M | NO | Wire | Stainless Steel | | Green | 24 VDC |

3.4 M22 / M24 / M27 / M30 with Ring Illumination

3.4.1 M22 With Ring Illumination

| Item Number | Function | Connection | Housing Material | Housing Color | Illumination | Voltage |
|-------------|----------|----------------|------------------|------------------|--------------|---------|
| 1241.3250 | NO | Wire | Aluminum | Aluminum natural | Red | 12 VDC |
| 1241.3251 | NO | Wire | Aluminum | Aluminum natural | Green | 12 VDC |
| 1241.3252 | NO | Wire | Aluminum | Aluminum natural | Red/Green | 12 VDC |
| 1241.3253 | NO | Plug Connector | Aluminum | Aluminum natural | Red | 12 VDC |
| 1241.3254 | NO | Plug Connector | Aluminum | Aluminum natural | Green | 12 VDC |
| 1241.3255 | NO | Plug Connector | Aluminum | Aluminum natural | Red/Green | 12 VDC |
| 1241.3256 | NO | Wire | Aluminum | Aluminum natural | Red | 24 VDC |
| 1241.3257 | NO | Wire | Aluminum | Aluminum natural | Green | 24 VDC |
| 1241.3258 | NO | Wire | Aluminum | Aluminum natural | Red/Green | 24 VDC |
| 1241.3259 | NO | Plug Connector | Aluminum | Aluminum natural | Red | 24 VDC |
| 1241.3260 | NO | Plug Connector | Aluminum | Aluminum natural | Green | 24 VDC |
| 1241.3261 | NO | Plug Connector | Aluminum | Aluminum natural | Red/Green | 24 VDC |
| 1241.3390 | NO | Wire | Aluminum | Aluminum natural | Blue | 12 VDC* |
| 1241.3413 | NO | Wire | Aluminum | Aluminum natural | Blue | 24 VDC |

*Illumination blue 12 VDC: voltage supply 12 VDC +10% / -1%

*The listed item numbers represent a selection from the range of piezo switches.
Other mounting diameters, materials, colors and connections are available upon request.*

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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3.4.2 M24 Series

| Item Number | Function | Connection | Housing Material | Housing Color | Illumination | Voltage |
|------------------|-----------|-------------|------------------|-------------------------|------------------|---------------|
| 1241.3010 | NO | Wire | Aluminum | Aluminum natural | Red/Green | 24 VDC |
| <i>1241.3134</i> | <i>NO</i> | <i>Wire</i> | <i>Aluminum</i> | <i>Aluminum natural</i> | <i>Red/Green</i> | <i>12 VDC</i> |

3.4.3 M27 Series

| Item Number | Function | Connection | Housing Material | Housing Color | Illumination | Voltage |
|------------------|-----------|-------------|------------------|-------------------------|------------------|---------------|
| 1241.3011 | NO | Wire | Aluminum | Aluminum natural | Red/Green | 24 VDC |
| <i>1241.3138</i> | <i>NO</i> | <i>Wire</i> | <i>Aluminum</i> | <i>Aluminum natural</i> | <i>Red/Green</i> | <i>12 VDC</i> |

3.4.4 M30 Series

| Item Number | Function | Connection | Housing Material | Housing Color | Illumination | Voltage |
|------------------|-----------|-------------|------------------|-------------------------|------------------|---------------|
| 1241.3012 | NO | Wire | Aluminum | Aluminum natural | Red/Green | 24 VDC |
| <i>1241.3230</i> | <i>NO</i> | <i>Wire</i> | <i>Aluminum</i> | <i>Aluminum natural</i> | <i>Red/Green</i> | <i>12 VDC</i> |
| 1241.3189 | NO | Wire | Aluminum | Aluminum natural | Blue | 24 VDC |
| 1241.3237 | NO | Wire | Stainless steel | | Blue | 24 VDC |

- *Items in italics are available upon request*
- *Other supply voltages available upon request*

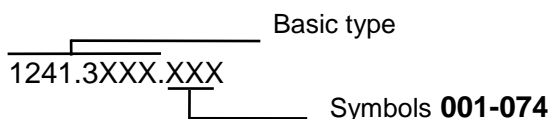
*The listed item numbers represent a selection from the range of piezo switches.
Other mounting diameters, materials, colors and connections are available upon request.*

3.5 Lettering:

The last three figures of the order number relate to the type of lettering.

001-074 Standard Lettering
101- Customized Lettering

Example for ordering with lettering



Order Indices for Lettering

| | | | | |
|---------------|---------------|---------------|---------------------|--------------------|
| 001= A | 016= P | 031= 4 | 046= \updownarrow | 061= EIN |
| 002= B | 017= Q | 032= 5 | 047= \rightarrow | 062= AUS |
| 003= C | 018= R | 033= 6 | 048= \leftarrow | 063= AUF |
| 004= D | 019= S | 034= 7 | 049= \downarrow | 064= AB |
| 005= E | 020= T | 035= 8 | 050= \uparrow | 065= ON |
| 006= F | 021= U | 036= 9 | 051= % | 066= OFF |
| 007= G | 022= V | 037= + | 052= $\sqrt{\quad}$ | 067= UP |
| 008= H | 023= W | 038= - | 053= CTRL | 068= DOWN |
| 009= I | 024= X | 039= . | 054= RETURN | 069= HIGH |
| 010= J | 025= Y | 040= x | 055= SHIFT | 070= LOW |
| 011= K | 026= Z | 041= ÷ | 056= LOCK | 071= ON/OFF |
| 012= L | 027= 0 | 042= * | 057= STOP | 072= START |
| 013= M | 028= 1 | 043= = | 058= ENTER | 073= RESET |
| 014= N | 029= 2 | 044= # | 059= BACK | 074= ⏻ |
| 015= O | 030= 3 | 045= ↔ | 060= LINE | |

Changes that contribute to technical improvement are subject to alternations.

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Font Size

PSE M16 / M19 / M24 / M30

| | |
|--------------------------------------|--|
| Individual characters: | Height: 5 mm; font: Helvetica normal DIN1451-1E |
| Lettering, max. 3 characters: | Height: 3 mm; font: Helvetica normal DIN1451-1E |
| Symbols (Indices 037-052): | Height of capital letters: 5 mm; font: True Type, Symbol |

PSE M22

| | |
|--------------------------------------|--|
| Individual characters: | Height: 5 mm; font: Helvetica normal DIN1451-1E |
| Lettering, max. 3 characters: | Height: 5 mm; font: Helvetica normal DIN1451-1E |
| Lettering, max. 6 characters: | Height: 2.5 mm; font: Helvetica condensed DIN1451-1E |
| Symbols (Indices 037-052): | Height of capital letters: 5 mm; font: True Type, Symbol |

Laser Lettering

| <u>Material</u> | <u>Colour</u> | |
|---------------------------|---------------|---|
| Stainless Steel: | Black | Filled letters |
| Aluminum natural: | Grey | Filled letters (only after customer approval) |
| Anodized Aluminum: | White | Filled letters |

| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
|---|---------------|---------|-----------------|-------------|------------|---------------|-------|
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4 PACKAGING

PSE Switches

| | | |
|---|-------------------------|---------------------------------|
| M16 | | 10 pieces per carton with inlay |
| M19 | | 10 pieces per carton with inlay |
| M22 | | 10 pieces per carton with inlay |
| M24 / M27 / M30 with Ring Illumination | Air-cushion bag 1 piece | 10 pieces per carton |

Nuts with sealing rings are packaged separately and are enclosed in the carton.



| | | | | | | | |
|---|---------------|---------|-----------------|-------------|------------|---------------|-------|
| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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5 QUALIFICATION TESTS

5.1 IP Protection Class

| | | |
|---|------------------------|--------|
| IP Protection Class IEC/DIN/EN 60529 | front side | IP 67 |
| IP Protection Class DIN 40050-9:1993 (High-pressure steam jet cleaning test) | front side | IP 69K |
| DIN EN 60068-2-30 Db (moist heat (air test with 55°C / 93% humidity)) | front side / back side | |

5.2 IK Protection Class

Tested centrally

| | |
|----------------------------------|-------|
| IK Protection Class DIN EN 50102 | IK 02 |
|----------------------------------|-------|

5.3 Salt-Spray Test

Salt-spray test according to DIN 50021- SS
24h, 48h and 96h test duration

After 8h, the start of corrosion may be discerned; after 96h, this corrosion has spread across large areas of the switch.

This surface corrosion may be removed under running water.

5.4 Hygienic Switches for Food Processing Equipment

The PSE switches meet the requirements for food processing equipment:

DGUV test certificate FW 11 040

As housing material, stainless steel is recommended for use in food processing equipment.
At the final equipment, the installation position for switches with anodized aluminum housing may not be located above the food area.

| | | | | | | | |
|---|---------------|---------|-----------------|-------------|------------|---------------|-------|
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6 APPROVALS

| Test | Norm |
|------------------|--|
| Thermal Shock | MIL-STD 202F Method 107G |
| High Temperature | MIL-STD 810E Method 501.3 |
| Low Temperature | MIL-STD 810E Method 502.3 |
| Humidity | MIL-STD 810E Method 507.3 |
| Vibration | MIL-STD 202F Method 204D |
| Mechanical Shock | MIL-STD 202F Method 213B |
| RFI | MIL-STD 416D Method RS103 |
| ESD | EN 61000-4-2 (+/-6 kV Kontakt, +/-16 kV Luft) |
| Burst | EN 61000-4-4 (+/- 1kV einzeln, +/- 2kV parallel) |
| Surge | EN 61000-4-5 (+/- 1kV unsym. , +/- 0,5kV sym.) |

7 COMPLIANCE

All articles are ROHS-compliant and in compliance to the EMV - Directive (2004/108/EWG).



| Changes that contribute to technical improvement are subject to alternations. | | | | | | | |
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- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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