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Actuator with snap-action switching element

Switching system

Self-cleaning, double-break snap-action switching system with contact opening width 2 x 0.5 mm (switch with small contact opening width as per EN IEC 61058-1).
The switching elements are optionally equipped with the following switching functions:
One to three normally open (NO) or normally closed (NC), or any combination of NO and NC plus connections for T1 3/4 LED or lamp.
The number of switching elements cannot exceed three.
The switching elements provided for the 3-position switch actuators are equipped with max. 2 NC or 2 NO or any combination.
The number of switching elements cannot exceed two.

Material

Lens
Raised mounting Polymethylmethacrylat (PMMA), as per UL 94 HB, flush mounting Polycarbonat (PC), as per UL 94 V0, or Aluminium anodized

Front bezel
Polyetherimid (PEI), as per UL 94 V0, or Aluminium anodized

Front ring
Aluminium anodized

Material of contact
Silver or silver with gold plating

Switching element
Diallylphthalate (DAP), as per UL 94 V0 and Polyamide (PA 66), as per UL 94 V0

Actuator housing
Polyetherimide (PEI), as per UL 94 V0, self-extinguishing

Mechanical characteristics

Terminals

Solder	rigid	flexible	superflexible
1 wire	0.5 … 1.5 mm²	0.5 … 0.75 mm²	0.5 mm²
2 wires	0.75 mm²	0.5 mm²	

Tightening torque
for fixing nut max. 50 Ncm

Actuating torque
Selector-/Keylock switch 2.5 … 10 Ncm

Actuating force
Pushbutton 2.7 … 3.6 N

Actuating travel
Pushbutton 3 mm

Selector-/keylock switch	2 positions	3 positions
Momentary action	approx. 42°	approx. 2 x 42°
Maintained action	approx. 90°	approx. 2 x 90°

Rebound time
The rebound times apply to normal manual activation
Contact making 3 ms
Contact breaking 5 ms

Mechanical lifetime
as per DIN IEC 60512-5-6 and EN IEC 60947-5-1

Pushbutton maintained action	1 million cycles of operation
Pushbutton momentary action	2 million cycles of operation
Keylock switch	50 000 cycles of operation
Selector switch	100 000 cycles of operation

Electrical characteristics

Standards
The devices comply with: EN IEC 61058-1 and EN IEC 60947-5-1

Rated Operational Voltage U_e
250 VAC/DC as per EN IEC 60947-1

Rated Insulation Voltage U_i
320 VAC, as per EN IEC 60947-5-1

Rated Impulse Withstand Voltage U_{imp}
4 kV, as per EN IEC 60947-5-1

Contact resistance
New state with silver contact ≤ 100 mΩ
as per DIN IEC 60512-2-4, measured at 100 mA, 10 V

New state with gold plated contact ≤ 50 mΩ
as per DIN IEC 60512-2-3, measured at 20 mV, 10 mA

Electrical life
≥ 50 000 cycles of operation at 250 VAC, 5 A, cosφ 0.95, as per EN IEC 60947-5-1

Electrostatic discharge (ESD)
Keylock switch 11 kV

Conventional free air thermal current I_{th}
5 A, as per EN IEC 60947-5-1
the maximum current in continuous operation and at ambient temperature must not exceed the quoted maximum values.

Switch rating
Switch rating AC with silver contact or silver contact with gold plating, service category AC-15, as per EN IEC 60947-5-1

Voltage	125 VAC	250 VAC
Current	2.5 A	2 A

Switch rating DC for silver contact or silver contact with gold plating, service category DC-13, as per EN IEC 60947-5-1

Voltage	250 VDC
Current	0.15 A

Recommended minimum operational data

Material of contact	Silver	Silver with gold plating
Voltage	20 VAC/DC	5 VAC/DC
Current	100 mA	10 mA

Actuator with snap-action switching element

Electric strength
2500 VAC, 50 Hz, 1 min., as per DIN IEC 60512-2-11 between all terminals and earth

Overvoltage category
III, as per EN IEC 60947-5-1

Protection class
Class II, as per EN IEC 61058-1

Degree of pollution
3, as per EN IEC 60947-1

Environmental conditions

Storage temperature
-40 °C … +85 °C

Operating temperature
-25 °C … +55 °C

Protection degree
as per EN IEC 60529
Front side IP 65, rear side IP 40

Shock resistance
(semi-sinusoidal)
max. 10 m/s², pulse width 11 ms, 3-axis,
as per EN IEC 60068-2-27

Vibration resistance
(sinusoidal)
max. 100 m/s² at 10 Hz … 500 Hz, as per EN IEC 60068-2-6

Climate resistance
Damp heat, cyclic
96 hours, +25 °C/97 %, +55 °C/93 % relative humidity,
as per EN IEC 60068-2-30

Damp heat, state
56 days, +40 °C/93 % relative humidity, as per EN IEC 60068-2-78

Rapid change of temperature
100 cycles, -40 °C … +80 °C, as per EN IEC 60068-2-14

Approvals

Approbations
CB (IEC 61058)
CB (IEC 60947)
CSA
ENEC (EN 61058)
CCA-NTR (EN 60947)
CCC
CENELEC (IEC 60947-5-1)
Germanischer Lloyd
GOST
UL
SEV
NFF

Declaration of conformity
CE

Actuator with slow-make switching element

Switching system

Double-break slow-make system, contact opening width 2 x 1.5 mm, with 2 x 2 contact points per switching element. NC-contact elements in the slow-make elements fulfill requirements of switches with forced opening as per EN IEC 60947-5-12.17. The slow-make elements are optionally obtainable with the following switching functions : 1 NO or 2 NO, 1 NC or 2 NC, 1 NO + 1 NC.

Material

Lens
Raised mounting Polymethylmethacrylat (PMMA), as per UL 94 HB, flush mounting Polycarbonat (PC), as per UL 94 V0, or Aluminium anodized

Front bezel
Polyetherimid (PEI), as per UL 94 V0, or Aluminium anodized

Front ring
Aluminium anodized

Material of contact
Silver or gold (specified for operation for low level switching)

Switching element
Diallylphthalate (DAP), as per UL 94 V0 and Polyamide (PA 66), as per UL 94 V0

Actuator housing
Polyetherimide (PEI), as per UL 94 V0, self-extinguishing

Mechanical characteristics

Terminals

– Solder	rigid	flexible	superflexible
1 wire	0.5 … 1.5 mm²	0.5 … 0.75 mm²	0.5 mm²
2 wires	0.75 mm²	0.5 mm²	
– Screw			
1 wire	0.5 … 1.5 mm²	0.5 … 0.75 mm²	0.5 mm²
2 wires	0.75 mm²	0.5 mm²	0.5 mm²

Tightening torque
for fixing nut max. 50 Ncm

Actuating torque
Selector-/Keylock switch 4 … 16 Ncm

Actuating force
Pushbutton 3.5 … 11 N
Emergency-stop switch max. 65 N

Actuating travel
Pushbutton 3 mm
Emergency-stop switch 10 mm

Selector-/keylock switch	2 positions	3 positions
Momentary action	approx. 42°	approx. 2 x 42°
Maintained action	approx. 90°	approx. 2 x 90°

Rebound time
2 ms, contact making and contact breaking the rebound times apply to normal manual activation

Mechanical lifetime
as per DIN IEC 60512-5-6 and EN IEC 60947-5-1

Pushbutton maintained action	1 million cycles of operation
Pushbutton momentary action	2 million cycles of operation
Emergency-stop switch	6050 cycles of operation
Keylock switch	50 000 cycles of operation
Selector switch	100 000 cycles of operation

Electrical characteristics

Standards
The devices comply with: EN IEC 61058-1 and EN IEC 60947-5-1, EN IEC 60947-5-5 (Emergency-stop)

Electrical life
≥ 50 000 cycles of operation at 250 VAC, 5 A, cosφ 0.95, as per EN IEC 60947-5-1
Switching element of emergency-stop 6050 cycles of operation, as per EN IEC 60947-5-5

Electrostatic discharge (ESD)
Keylock switch 11 kV

Electric strength
4000 VAC, 50 Hz, 1 min., as per DIN IEC 60512-2 between all terminals and earth

Overvoltage category
III, as per EN IEC 60947-5-1

Protection class
Class II, as per EN IEC 61058-1

Degree of pollution
3, as per EN IEC 60947-1

Electrical characteristics for silver contacts

Rated Operational Voltage U_e
250 VAC/DC as per EN IEC 60947-1

Rated Insulation Voltage U_i
320 VAC, as per EN IEC 60947-5-1

Rated Impulse Withstand Voltage U_{imp}
4 kV, as per EN IEC 60947-5-1

Contact resistance
New state ≤ 50 mΩ, as per DIN IEC 60512-2-4, measured at 100 mA, 10 V

Conventional free air thermal current I_{th}
5 A, as per EN IEC 60947-5-1
the maximum current in continuous operation and at ambient temperature must not exceed the quoted maximum values.

Switch rating
Switch rating AC with silver contact and screw terminal, service category AC-15, as per EN IEC 60947-5-1

Voltage	125 VAC	250 VAC
Current	3 A	2 A

Actuator with slow-make switching element

Switch rating with silver contact and screw terminal, service category DC-13, as per EN IEC 60947-5-1

Voltage 250 VDC
Current 0.2 A

Recommended minimum operational data
20 VAC/DC, 100 mA

Electrical characteristics for gold contacts

Rated Operational Voltage U_e
50 VAC/DC, as per EN IEC 60947-5-1

Rated Insulation Voltage U_i
U_i = 320 VAC, as per EN IEC 60947-5-1

Rated Impulse Withstand Voltage U_{imp}
0.8 kV, as per EN IEC 60947-1

Contact resistance
New state ≤ 50 mΩ
as per DIN IEC 60512-2-4, measured at 20 mV, 10 mA

Conventional free air thermal current I_{th}
0.3 A, as per EN IEC 60947-5-1
the maximum current in continuous operation and at ambient temperature must not exceed the quoted maximum values.

Switch rating
Switch rating AC with gold contact, service category AC-15, as per EN IEC 60947-5-1

Voltage 50 VAC
Current 0.5 A

Switch rating with gold contact, service category DC-13, as per EN IEC 60947-5-1

Voltage 50 VDC
Current 0.1 A

Recommended minimum operational data
Voltage 10 mVAC/DC
Current 2 mA

Environmental conditions

Storage temperature
-40 °C … +85 °C

Operating temperature
-25 °C … +55 °C

Protection degree
as per EN IEC 60529
Frontside IP 65, rear side IP 40

Shock resistance
(semi-sinusoidal)
max. 100 m/s², pulse width 11 ms, 3-axis,
as per EN IEC 60068-2-27

Vibration resistance
(sinusoidal)
max. 100 m/s² at 10 Hz … 500 Hz, as per EN IEC 60068-2-6

Climate resistance
Damp heat, cyclic
96 hours, +25 °C/97 %, +55 °C/93 % relative humidity,
as per EN IEC 60068-2-30

Damp heat, state
56 days, +40 °C/93 % relative humidity,
as per EN IEC 60068-2-78

Rapid change of temperature
100 cycles, -40 °C … +80 °C, as per EN IEC 60068-2-14

Approvals

Approbations
CB (IEC 61058)
CB (IEC 60947)
CSA
ENEC (EN 61058)
CCA-NTR (EN 60947)
CCC
CENELEC (IEC 60947-5-1)
Germanischer Lloyd
GOST
UL
SEV
NFF

Declaration of conformity
CE

Actuator with flasher element

Material

Lens
Raised mounting Polymetylmethacrylat PMMA, as per UL 94 HB, flush mounting Polycarbonat (PC), as per UL 94 V0

Actuator housing
Polyetherimide (PEI), as per UL 94 V0, self-extinguishing

Flasher element
Polyetherimide (PEI), as per UL 94 V0

Mechanical characteristics

Terminals
Soldering terminal

Tightening torque
for fixing nut max. 50 Ncm

Electrical characteristics

Illumination

Filament lamp	14 VAC/DC	28 VAC/DC
Power consumption	80 mA	44 mA
Single-LED	12 VAC/DC	28 VAC/DC
Power consumption	15 mA	18 mA

Flashing frequency
1 Hz ±0.25 Hz

Pulse duty factor
approx. 50 %

Operating voltage
12 … 28 VAC/DC ±10 %

Environmental conditions

Operating temperature
0 °C … +45 °C

Protection degree
as per EN IEC 60529
Front side IP 65, rear side IP 40

Lens plastic with symbols

Chemical and mechanical tests

1. Wipe resistance according to EN 61058-1 section 8.9
   (Petrol/gasoline, distilled water, diluted alcohol)
2. Graffiti-Killer Test
3. Railway cleaning agents (Walo)
4. Damp/dry heat durability
5. UV test according to EN 60068-2-5 / 56 days
6. Mechanical life time 2 Mio. Operations (abrasive test)

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