

Common Features of Electromechanical Switches

Switching systems

Switching elements lie at the heart of all electromechanical switching devices and must correspond to the respective application. Essentially there are two basic types of switching system that differ in terms of their mechanical design and consequently their scope of application:

- Slow-action contacts
- Snap-action contacts

Slow-action contacts

- On actuation, the normally-closed and normally-open contact functions correspond to the movement of the impact pin
- The approach speed controls the contact opening (closing) time
- Large distance / actuating travel between normally-closed and normally-open contact function
- The switching points are identical in forward and reverse travel

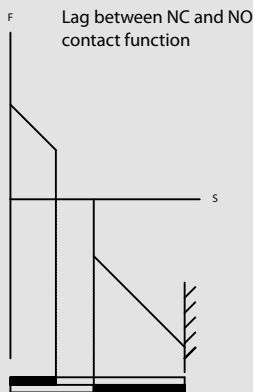


Fig. 1 shows the contact force during the switching cycle of a slow-action contact.

Overlap

- The switching principle of snap-action contacts makes overlapping of the NC / NO contact function possible. The term overlap refers to the area, in which both the normally-closed contact as well as the normally-open contact are closed in connection with a changeover switch with delay.

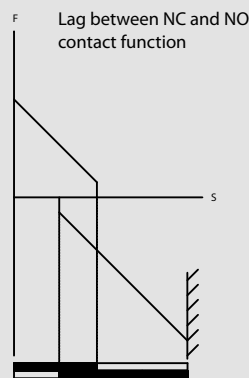


Fig. 2 shows the contact force during the switching cycle of a slow-action contact with overlap.

Snap-action contact

- On actuation, the normally-closed contact function is immediately followed by the normally-open contact function
- In this configuration there is no overlap of the NC/NO contacts. The switch provides a distinct OR-function.
- The changeover accuracy is not dependent on the approach speed
- Consistently effective suppression of DC arc
- Reliable contact-making also for extremely slow approach speeds
- The snap mechanism triggers the full opening width of the contact on reaching the changeover point
- Due to the force reversal in the mechanical system, a different switching point occurs in forward and reverse travel. The lag is referred to as hysteresis.

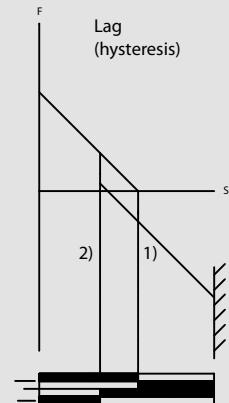


Fig. 3 shows the contact force during the switching cycle of a snap-action contact.

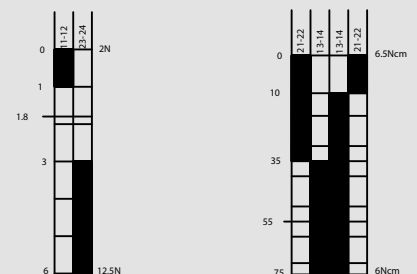
- 1) Changeover point in forward travel
- 2) Changeover point in reverse travel

Switching diagram

The switching diagram describes the function of the switching device in detail.

It combines the mechanical input variables that act on the contact system via the actuator with the electrical output variables. The user can deduct the following information from the switching diagram:

- Mechanical input variables (force, travel, torque, angle)
- Electrical contact-making in forward and reverse travel
- Terminal designation
- Point at which positive opening is achieved
- Type of contact system



Slow-action contact

Snap-action contact

- Contact closed
- Contact open

Contact designation

In accordance with DIN 50013 and DIN 50005 the terminal designations of the contact elements are always made up of two digits.

The contact rows are numbered consecutively with the allocating digit (1st digit) in actuation direction. Contacts of a switching element that belong together have the same allocating digit.

The second digit is the function digit that denotes the type of contact element.

- 1–2 Normally-closed contact
- 3–4 Normally-open contact
- 5–6 Normally-closed contact with delayed opening
- 7–8 Normally-open contact with delayed closing

Protection class

The protection class of an enclosed device denotes the degree of protection. The degree of protection includes the protection of persons against contact with parts under voltage and the protection of equipment against the infiltration of foreign bodies and water. BERNSTEIN standard enclosures mainly correspond to protection classes IP65 and IP67. Higher protection ratings are also available for individual customer solutions. In accordance with DIN EN 60521 (IEC 529), the numerals used in the protection rating denote the following:

1st digit Degree of protection against contact and infiltration of foreign bodies

2nd digit Degree of protection against infiltration of water

Example IP 65:

- 6 =**
 - Complete protection against contact with components under voltage or with internal moving parts
 - Protection against dust infiltration
- 5 =**
 - A water jet directed from all directions at the device must not have damaging effects
 - Protection against hose water

Enclosures

Limit switches are supplied either in a plastic enclosure or a metal enclosure. Which material is to be selected for a specific application depends on the ambient conditions, the location as well as several other factors.

Plastic limit switches provide protective insulation and are resistant to many aggressive chemicals and liquids. The formation of condensation water in moist environments with extreme temperature fluctuations is significantly reduced on plastic enclosures.

In insulation-enclosed switches the switching elements are integrated directly in the plastic enclosure and are therefore not replaceable (complete switching devices).

Metal-enclosed limit switches are able to withstand high mechanical loads, they can also be used wherever hot metal chips and sparks occur and are resistant to many solvents and detergents. The switching elements in metal-enclosed switches are often integrated in the metal enclosure as modular built-in switches. The enclosure has a VDE-compliant connection for the PE conductor.

Safety switches

The scope of application for limit switches has changed over time. Whereas limit switches were previously used for the purpose of detecting end positions, today they are increasingly assuming functions designed to protect persons and products in machine, equipment and plant construction.

The BERNSTEIN range of safety switches offers the right solution for the most diverse applications in many branches of industry. Particularly when it comes to safety, users appreciate the fact that they are able to procure all required safety switches and receive professional advice from one source.

The decisive factors governing the selection of safety equipment include the ambient conditions, installation situation and risk analysis.

A switching device that can be used for safety functions is identified by the standardised symbol conforming to EN 60947-5-1 Addendum K. The switches can, of course, also be used for pure position monitoring purposes.

Safety switches are divided into two categories, Type 1 and Type 2. The difference is in the actuating elements which are completely integrated in the enclosure in Type 1 and separated from the switching element in Type 2.



Type 1



Type 2

Common Features of Electromechanical Switches


Designation

The designation of BERNSTEIN switching devices depends on:

- The enclosure designation of the switching device
- The switching function
- The type of actuator

Type code of position and safety switches

I88	A2Z ¹⁾	AH	M12
Switch group	Switching system ²⁾	Actuator	Special features
<ul style="list-style-type: none">● C2● Ti2● IF● I88● Bi2● ENK● GC● SN2● ENM2● D	<ul style="list-style-type: none">● U1● SU1● A2● SA2● E2● SE2	See Pages 66 – 67	<ul style="list-style-type: none">● M12 connection● Actuator turned 90°, 180°, 270°● Special switching forces● Special temperature ranges● Other special features on request

¹⁾ The letter Z suffix to the designation of the switching function denotes the mechanical positive opening action of the normally-closed contacts. In technical data sheets, the positive opening point is identified by the international symbol .

²⁾ Please refer to the following pages in the catalogue to establish which switching system can be used in the switch groups.

Switching function example

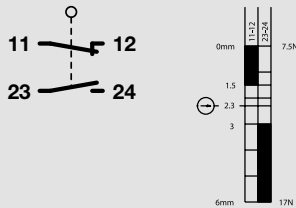
NC = Normally-closed contact

NO = Normally-open contact

V = Overlap

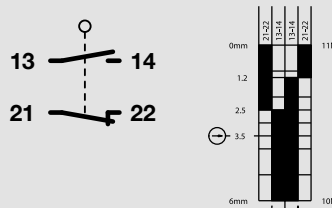
U1Z

Slow-action contact, 1 NC, 1 NO



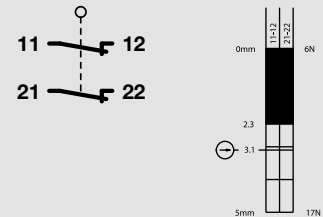
SU1Z

Snap-action contact, 1 NC, 1 NO



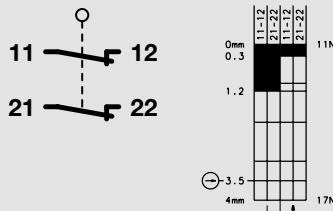
A2Z

Slow-action contact, 2 NC



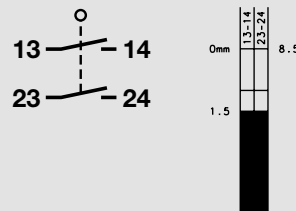
SA2Z

Snap-action contact, 2 NC



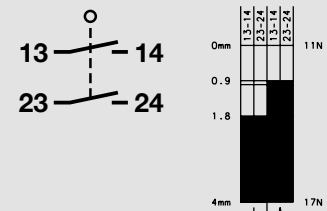
E2

Slow-action contact, 2 NO



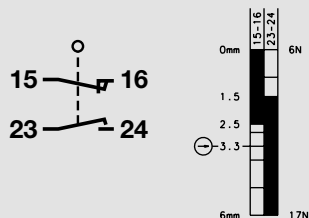
SE2

Snap-action contact, 2 NO



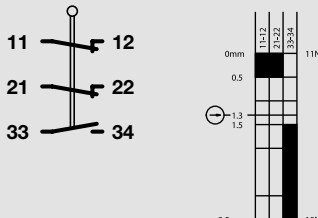
UV1Z

Slow-action contact, with overlapping contacts, 1 NC, 1 NO



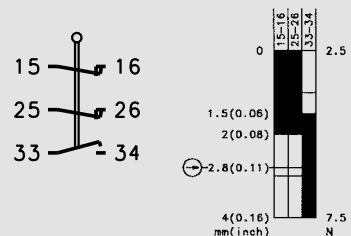
U15Z

Slow-action contact, 2 NC, 1 NO



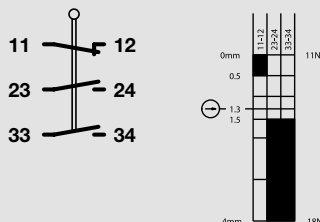
UV15Z

Slow-action contact, with overlapping contacts, 2 NC, 1 NO



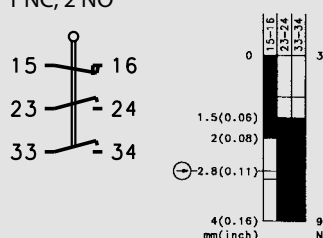
U16Z

Slow-action contact, 1 NC, 2 NO



UV16Z

Slow-action contact, with overlapping contacts, 1 NC, 2 NO



The actuating forces and travel distances are subject to tolerances. These tolerances are listed in Table 1.

In Type 1 and Type 2 position switches, the tolerances are independent of the switching system and switching function.

Function	Tolerance
Switching travel	± 0.25 mm
Switching angle	$\pm 3.5^\circ$
Switching force in N	$\pm 10\%$
Actuating torque in	$\pm 10\%$

Table 1

Common Features of Electromechanical Switches

⊕ = Mechanical positive opening action

The term positive opening action refers to contact separation as the direct result of defined movement of the switch actuator by means of non-sprung parts. All parts involved in contact separation must be form-fit connected. The positive opening distance describes the minimum travel distance from the start of actuation of the operating element up to the point where positive opening action of the opening contacts is completed.

DIN EN 60947-5-1 defines two types of positive opening action contacts with 4 connections and double break.

Type Za

- Positively opening contacts not galvanically isolated

Type Zb

- Positively opening contacts galvanically isolated

Galvanic isolation describes the isolation of electrically conducted parts by insulating material or by air gaps.

In switching devices with several contact elements, galvanically isolated contact elements make it possible to switch voltages with different potential (e.g. normally-closed contact in safety circuit, normally-open contact for indicator).

In accordance with applicable health and safety requirements, protective devices (guards) must be mounted on machines, devices and systems that perform hazardous movements. Safety switches in the form of electromechanical switching devices are predominantly used for this purpose as they offer the following advantages:

- High degree of safety
- Non-susceptibility to interference
- Safety status easily checked on site
- Rational solutions

Form-fit, mechanical drives or coupling elements in the form of levers, rods, gearwheels etc. are necessary to ensure optimum operation of these safety components.

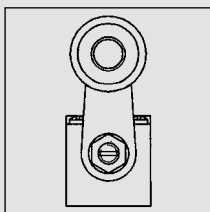
Switching devices that are used for safety functions must be identified with the symbol ⊕ internationally standardised in accordance with DIN EN 60947-5-1. In defining the class of switching devices, this symbol denotes two important properties that must be met for personal protection applications:

- Mechanical positive opening action
- Disruptive breakdown voltage > 2.5 kV

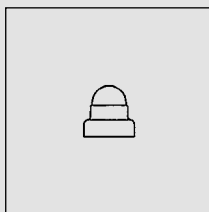
Disruptive breakdown voltage

In accordance with DIN EN 60947-5-1, the open contacts must be able to maintain a minimum surge voltage of 2.5 kV without disruptive breakdown.

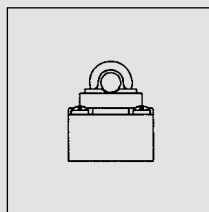
Standard actuator DIN EN 50047



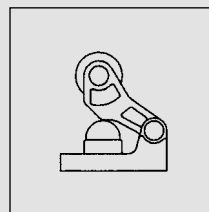
Form A



Form B

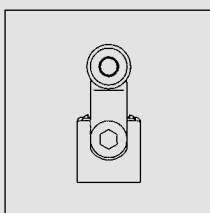


Form C

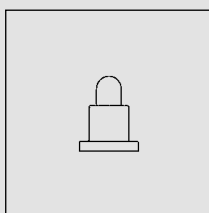


Form E

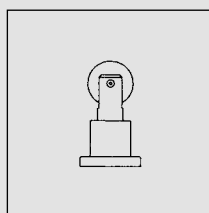
Standard actuator DIN EN 50041



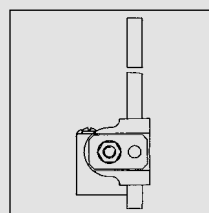
Form A



Form B

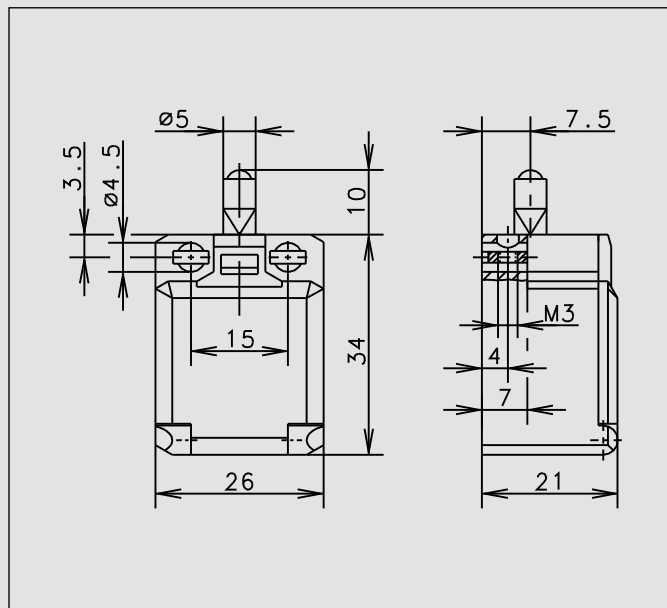


Form C



Form D

C2



Recommended use

Ideal for safety applications and position monitoring in confined spaces.

Product advantages

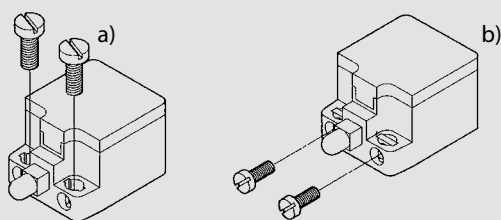
- Miniature switch for safety applications
- Two-channel safety monitoring possible
- With captive snap-on cover
- Small hysteresis in snap action system

Design layout

- Slow-action and snap-action contacts
- Versions: 1 NC / 1NO, 2 NC, 2 NO
- All NC contacts with \ominus in the circuit diagram are positively opening contacts
- Type: Zb (galvanically isolated changeover contact)

Mounting

- Also suitable for front mounting (depending on type)



- a) 2 round holes for M4 screws
- b) 2 Integrated nuts for front mounting for M3 screws (depending on type)

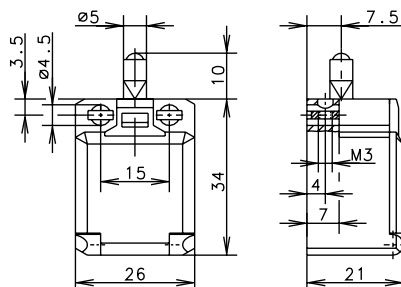
Installation advantages

- Snap-on cover can be released with screwdriver
- Cover opening range 180° (cover can also be detached from hinge)
- Cover protects switching element during installation
- Screw connections with self-lifting clamping plates
- Cover transparent for adjustment and visual inspection
- Easy-action cover lock (close and press)

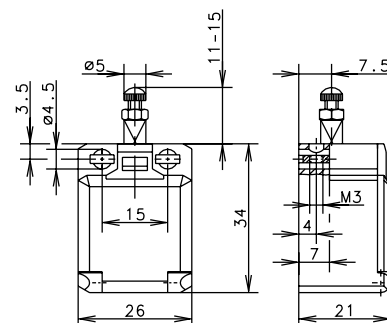
Technical data

Electrical data		
Rated insulation voltage	U_i max.	240 V AC
Conventional thermal current	I_{the}	10 A
Rated operating voltage	U_e max.	240 V
Utilisation category	U_e/I_e	AC-15, U_e/I_e 240 V/3 A
Short-circuit protection		Fuse 6 A gL/gG
Protection class		II, Insulated
Mechanical data		
Enclosure material		Thermoplastic, glass fibre-reinforced (UL 94-V0)
Ambient temperature		-30 °C to +80 °C
Mechanical service life		3 x 10 ⁶ switching cycles
B10d		6 Mio.
Switching frequency		≤ 100/min
Type of connection		Screw connections
Conductor cross sections		Single-wire 0.5 – 1.5 mm ² or Stranded wire with ferrule 0.5 – 1.5 mm ²
Cable entry		Rectangle 8.5 x 3.5 mm
Protection class		IP20 conforming to EN 60529; DIN VDE 0470 T1
Standards		
VDE 0660 T100, DIN EN 60947-1, IEC 60947-1		
VDE 0660 T200, DIN EN 60947-5-1, IEC 60947-5-1		

W



ST



Switching operation

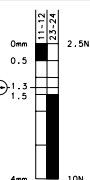
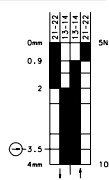
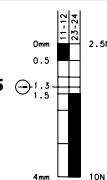
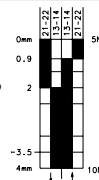
Slow-action

Snap-action

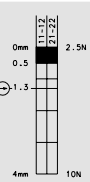
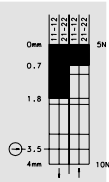
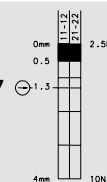
Slow-action

Snap-action

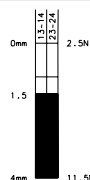
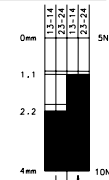
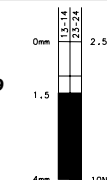
1 NC / 1 NO contact

6008101001
C2-U1Z6008351002
C2-SU1Z6008104025
C2-U1Z ST6008354026
C2-SU1Z ST

2 NC contacts

6008801003
C2-A2Z6008851004
C2-SA2Z6008804027
C2-A2Z ST

2 NO contacts

6008801005
C2-E26008851006
C2-SE26008804029
C2-E2 ST1 NC / 1 NO contact
Overlapping

Approvals



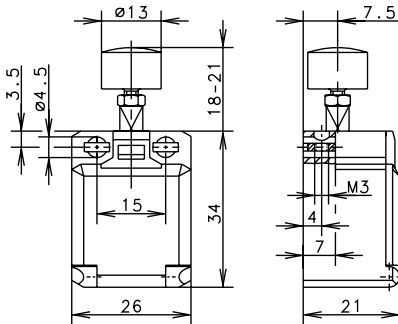
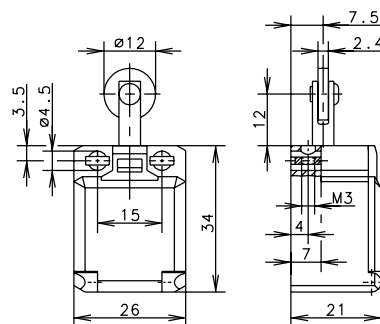
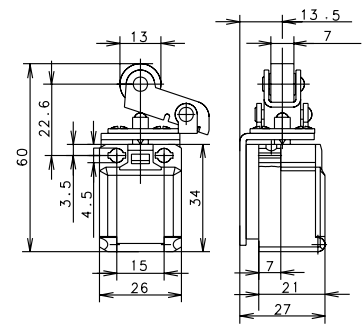
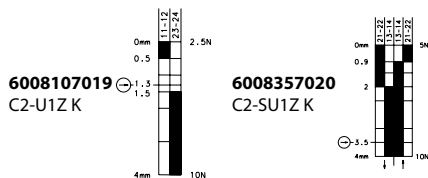
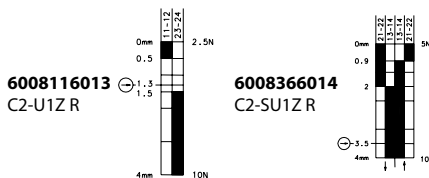
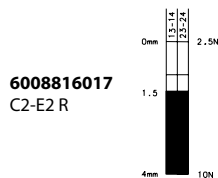
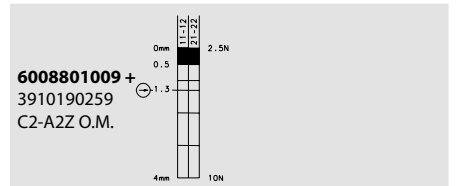
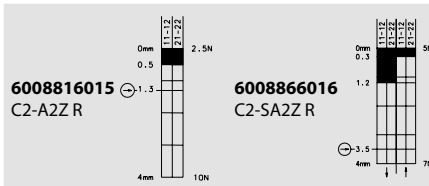
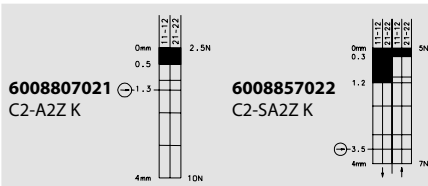
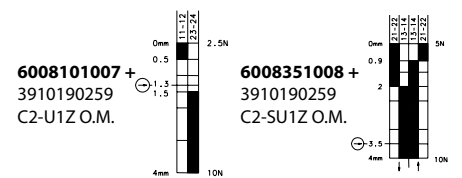
Replacement actuator: –

Replacement actuator: –

Special features / variants
(on request)

Special features / variants

- Actuator length adjustable with adjusting screw

K

R

O.M.

Slow-action
Snap-action

Slow-action
Snap-action

Slow-action
Snap-action

Replacement actuator: –
Special features / variants

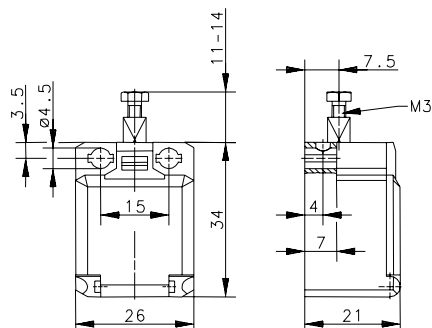
- Button actuator, for manual operation


Replacement actuator: –
Special features / variants

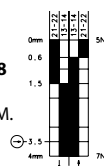
- (on request)
- Also available with roller turned by 90°


Replacement actuator: 3910190259
Special features / variants

(on request)

BISTABLE O.M.**Switching operation****Slow-action****Snap-action****1 NC / 1 NO contact**

6108351008
C2-SU1Z
BISTABLE O.M.

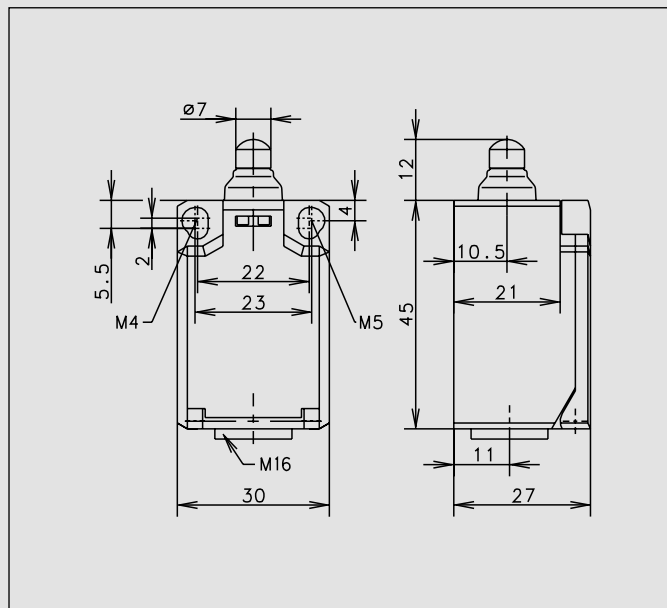
**2 NC contacts****2 NO contacts**

1 NC / 1 NO contact
Overlapping

Approvals**Replacement actuator: –****Special features / variants**

- Bistable characteristics, actuator must be returned to initial position by external actuation (pulling)
- Actuator length adjustable with M3 adjusting screw

Ti2



Recommended use

Ideal for safety applications and position monitoring in confined spaces with high protection class IP 65.

Product advantages

- Compact IP 65 switch for safety applications
- Optimised size while retaining tried-and-tested connection system
- Two-channel safety monitoring possible
- With captive snap-on cover
- 2 mm contact opening width of slow-action system conforming to EN 81-1 for lift construction
- Mall hysteresis in snap action system
- Actuator can be repositioned by 4 x 90°

Options

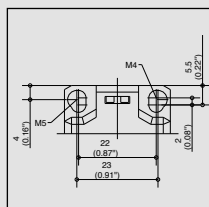
- Available with M12 connector
- AS interface variants available
- Preassembled with customer-specific cables and connectors on request

Design layout

- Slow-action and snap-action contacts
- Versions: 1 NC / 1NO, 2 NC, 2 NO
- All NC contacts with \ominus in the circuit diagram are positively opening contacts
- Type: Zb (galvanically isolated change-over contact)

Mounting

- Mounting dimensions conforming to DIN EN 50047
- 2 slots for adjustment with M4 screws (distance between centres 22 mm)



- Fixed positioning for safety applications with two M5 screws (distance between centres 23 mm)

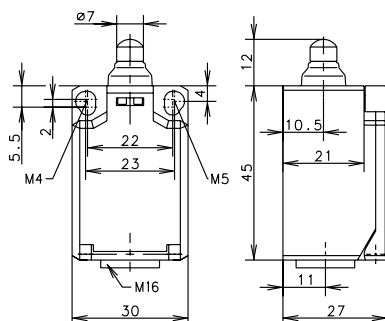
Installation advantages

- Snap-on cover can be released with screwdriver
- Cover protects switching element during installation
- Screw connections with self-lifting clamping plates
- Cover transparent for adjustment and visual inspection
- Easy-action cover lock (close and press)

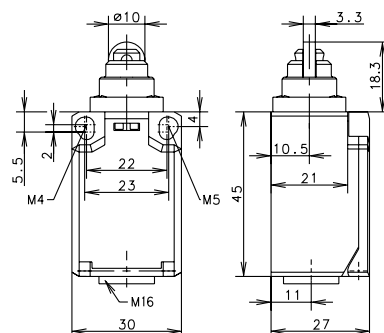
Technical data

Electrical data		
Rated insulation voltage	U _i max.	240 V AC
Conventional thermal current	I _{th}	10 A
Rated operating voltage	U _e max.	240 V
Utilisation category	U _e /I _e	AC-15, U _e /I _e 240 V/3 A; DC-13, U _e /I _e 240 V/0,27 A
Short-circuit protection		Fuse 6 A gL/gG
Protection class		II, Insulated
Mechanical data		
Enclosure material		Thermoplastic, glass fibre-reinforced (UL 94-V0)
Ambient temperature		-30 °C to +80 °C
Mechanical service life		3 x 10 ⁶ switching cycles
B10d		6 Mio.
Switching frequency		≤ 100/min.
Type of connection		Screw connections
Conductor cross sections		Single-wire 0.5 – 1.5 mm ² or Stranded wire with ferrule 0.5 – 1.5 mm ²
Cable entry		1 x M16 x 1,5
Protection class		IP65 conforming to EN 60529; DIN VDE 0470 T1
Standards		
VDE 0660 T100, DIN EN 60947-1, IEC 60947-1VDE 0660 T200, DIN EN 60947-5-1, IEC 60947-5-1		

W (Form B)



RIW (Form C)



Switching operation

Slow-action

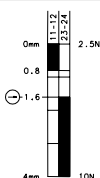
Snap-action

Slow-action

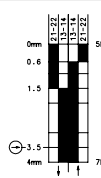
Snap-action

1 NC / 1 NO contact

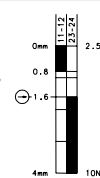
6088103001
TI2-U1Z W



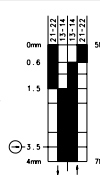
6088153002
TI2-SU1Z W



6088117007
TI2-U1Z RIW

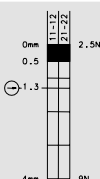


6088167008
TI2-SU1Z RIW

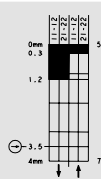


2 NC contacts

6088803003
TI2-A2Z W



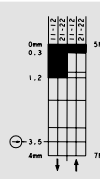
6088853004
TI2-SA2Z W



6088817009
TI2-A2Z RIW

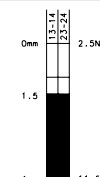


6088867010
TI2-SA2Z RIW

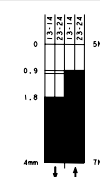


2 NO contacts

6088803005
TI2-E2 W



6088867012
TI2-SE2 RIW



1 NC / 1 NO contact
Overlapping

Approvals



Replacement actuator: –

Replacement actuator: –

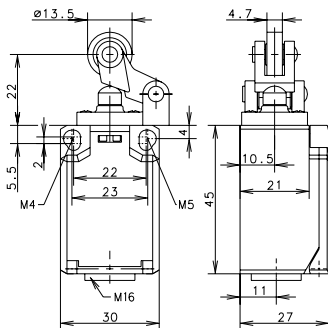
Special features / variants
(on request)

- Available with increased switching force

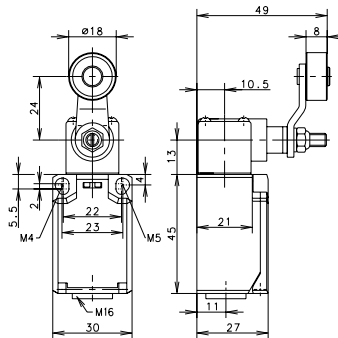
Special features / variants
(on request)

- Available with increased switching force
- Available with different actuating directions
- Cannot be turned by user

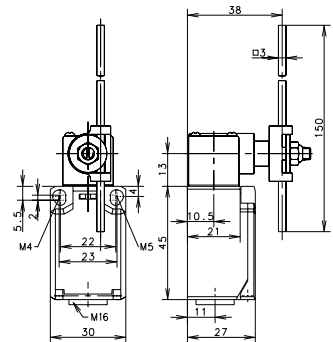
HW (Form E)



AH (Form A)



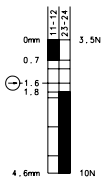
AD



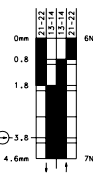
Slow-action

Snap-action

6088121015
TI2-U1Z HW



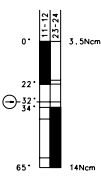
6088171016
TI2-SU1Z HW



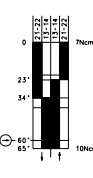
Slow-action

Snap-action

6088135021
TI2-U1Z AH



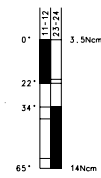
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TI2-SU1Z AH



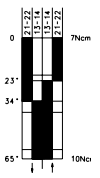
Slow-action

Snap-action

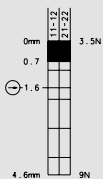
6088137027
TI2-U1 AD



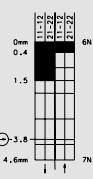
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TI2-SU1 AD



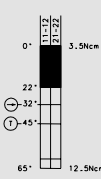
6088821017
TI2-A2Z HW



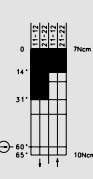
6088871018
TI2-SA2Z HW



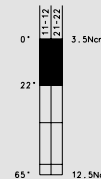
6088835023
TI2-A2Z AH



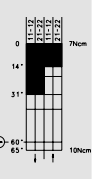
6088885024
TI2-SA2Z AH



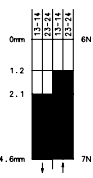
6088837029
TI2-A2 AD



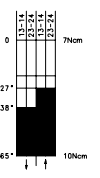
6088887030
TI2-SA2 AD



6088871020
TI2-SE2 HW



6088887032
TI2-SE2 AD



Replacement actuator: 3918190681

Replacement actuator: 3918351166

Replacement actuator: 3918370986

Special features / variants

(on request)

- Available with different actuating directions
- With steel roller
- Various roller diameters

Special features / variants

(on request)

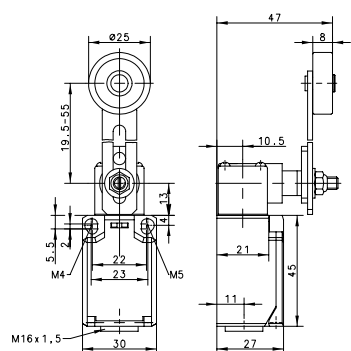
- Available with different actuating directions
- With steel roller
- Various roller diameters
- Cranked or straight lever
- Various lever lengths
- With roller over switch

Special features / variants

(on request)

- Available with different actuating directions
- With various actuator lengths
- Available with increased switching force

AV





Switching operation

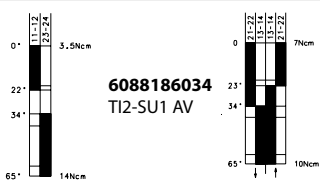
Slow-action **Snap-action**

Snap-action

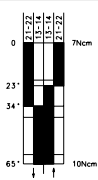
1 NC / 1 NO contact

6088136033  **6088186034** 

TI2-U1 AV TI2-SU1 AV

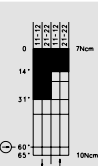


6088186034 23°
TI2-SU1 AV 34°



2 NC contacts

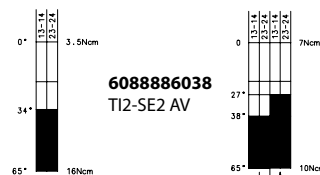
6088886036
TI2-SA2 AV



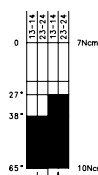
2 NO contacts

6088836037
TI2-E2 AV

6088886038
TI2-SE2 AV



6088886038
TI2-SE2 AV



1 NC / 1 NO contact
Overlapping

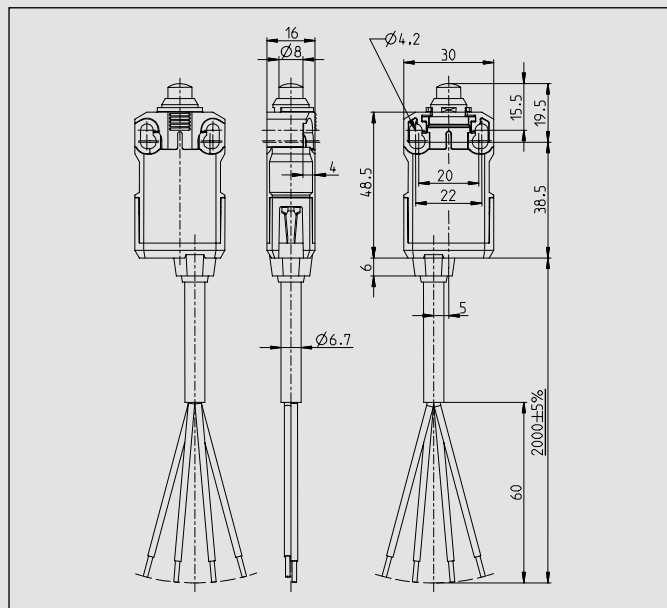
Approvals

Replacement actuator: 3918360984

Special features / variants
(on request)

- Available with different actuating directions
- Various roller diameters
- Various lever lengths
- With roller over switch

IF



Recommended use

Most limit switches soon come up against their limits in applications involving confined spaces and wherever high protection classes are required, not with the IF switch from BERNSTEIN. With its slim design and full IP 67 protection they are simply ideal for position monitoring and end position shutdown in safety applications.

Product advantages

- Slim line design
- With 2 m fixed cable or AMP4 connector
- High quality plastic enclosure
- Metal actuator and mounting clip
- Small hysteresis in snap action system
- Actuator can be repositioned by 4 x 90°
- Compact IP 67 switch for safety applications
- Two-channel safety monitoring possible

Options

- Various cable lengths available on request
- Can be preassembled with customised connectors on request
- Other cable lengths available on request

Design layout

- Slow-action and snap-action contacts
- Versions: 1 NC / 1NO, 2 NC, 2 NO
- All NC contacts with \ominus in the circuit diagram are positively opening contacts
- Type: Zb (galvanically isolated changeover contact)

Mounting

- Two M4 screws for adjustment with slots
- Two M5 screws for safety applications; front mounting depending on type

Installation advantages

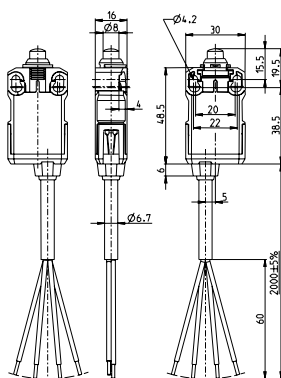
Flexibility is key in practical applications: And it is precisely here that IF switches from BERNSTEIN are a real asset. They have a modular design that makes them extremely flexible in installation and use. Minimum stockkeeping: The approach direction can be quickly and easily changed by installation technician.



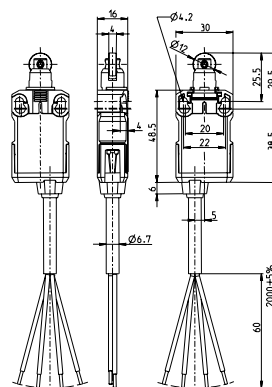
Technical data

Electrical data		
Rated insulation voltage	U _i max.	240 V AC
Conventional thermal current	I _{the}	10 A
Rated operating voltage	U _e max.	240 V
Utilisation category	AC-15, U _e /I _e 240 V/3 A	
Short-circuit protection	Fuse 6 A gL/gG	
Protection class	II, Insulated	
Mechanical data		
Enclosure material	PA6 (glass fibre-reinforced)	
Ambient temperature	-25 °C to +70 °C (Connection cable installed)	
Mechanical service life	3 x 10 ⁶ switching cycles	
B10d	6 Mio.	
Switching frequency	≤ 30/min.	
Type of connection	Cable 4 x 0.75 mm ²	
Protection class	IP67 conforming to EN 60529; DIN VDE 0470 T1	
Standards		
VDE 0660 T100, DIN EN 60947-1, IEC 60947-1		
VDE 0660 T200, DIN EN 60947-5-1, IEC 60947-5-1		

IW



RIW



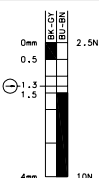
Switching operation

1 NC / 1 NO contact

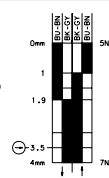
Slow-action

Snap-action

6089102001
IF-U1Z IW



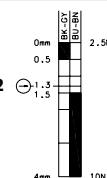
6089152006
IF-SU1Z IW



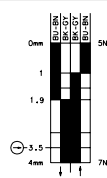
Slow-action

Snap-action

6089117002
IF-U1Z RIW

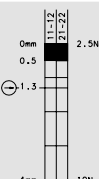


6089167007
IF-SU1Z RIW



2 NC contacts

6089802011
IF-A2Z IW



6089817012
IF-A2Z RIW



2 NO contacts

1 NC / 1 NO contact
Overlapping

Approvals



Replacement actuator: –

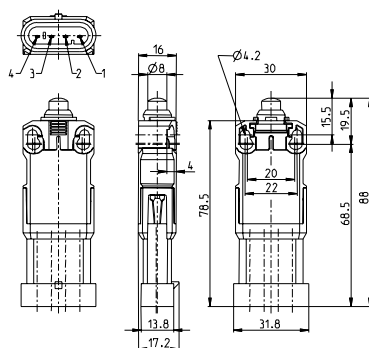
Replacement actuator: –

Special features / variants
(on request)

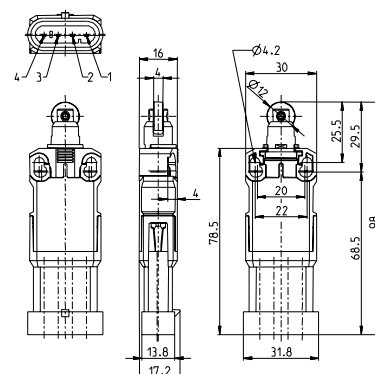
Special features / variants

- Actuator can be turned in steps of 90°

IW AMP4



RIW AMP4



Switching operation

Slow-action

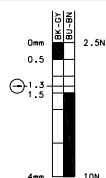
Snap-action

Slow-action

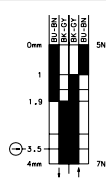
Snap-action

1 NC / 1 NO contact

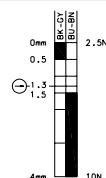
6089102016
IF-U1Z IW
AMP4



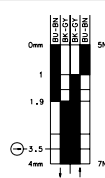
6089152021
IF-SU1Z IW
AMP4



6089117017
IF-U1Z RIW
AMP4

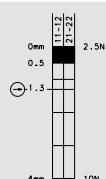


6089167022
IF-SU1Z RIW
AMP4

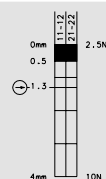


2 NC contacts

6089802026
IF-A2Z IW
AMP4



6089817027
IF-A2Z RIW
AMP4



2 NO contacts

1 NC / 1 NO contact
Overlapping

Approvals



Replacement actuator: –

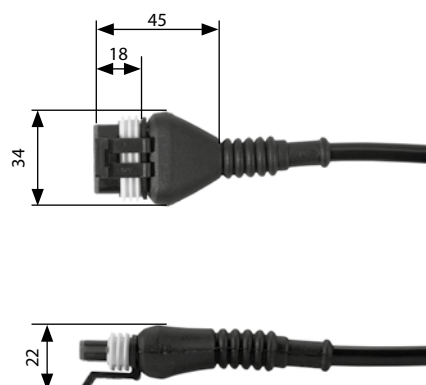
Special features / variants
(on request)

Replacement actuator: –

Special features / variants

- Actuator can be turned in steps of 90

AMP Connection cable



Switching operation

1 NC / 1 NO contact

Cable length 3.5 m:
3251204309
 AN-KAB.IF 3.5M AMP4

Cable length 5 m:
3251204281
 AN-KAB.IF 5M AMP4

2 NC contacts

Cable
 UL-CSA-S03VV2-F4x0.75 black n. UL2517, CSA
 C22.2/210.2 and n. VDE 0281 part 12 n. HAR 21.12 S1

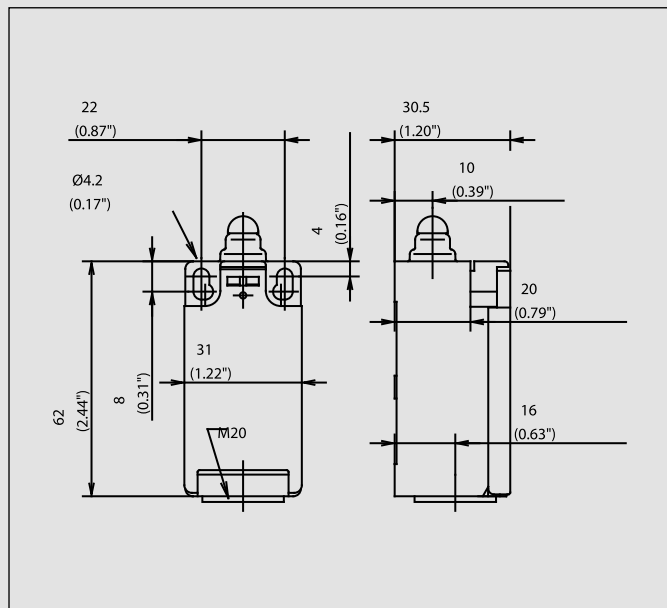
2 NO contacts

Pin assignment
 1-GY, 2-BU, 3-BN, 4-BK

1 NC / 1 NO contact
 Overlapping

Approvals

I88



Recommended use

Thanks to its standard dimensions as well as its wide range of contacts and actuators, this switch can be used on safety facilities and for position monitoring in virtually any industrial application.

Product advantages

- Standard switch conforming to DIN EN 50047
- Standard actuator conforming to DIN EN 50047 (see page 16)
- Protection class IP 65 to VDE 0470 T1
- Enclosure and cover PA 6, self-extinguishing (UL-94-V0)
- Actuator can be repositioned by 4 x 90°
- Cable entry M20 x 1.5
- Connection designation conforming to DIN EN 50013

Options

- Available with M12 connector
- AS interface variants available
- Cable entry M16 x 1.5

Design layout

- Slow-action and snap-action contacts
- Versions: 1 NC / 1NO, 2 NC, 2 NO, overlapping contacts
- All NC contacts with \ominus in the circuit diagram are positively opening contacts
- Type: Zb (galvanically isolated changeover contact)
- Latching function on request

Mounting

- Two M4 screws (distance between centres 22 mm), adjustment with slots
- Two M5 screws for safety applications without additional fixing element (Fig. 1)
- Additionally secured by guide plate for lateral approach forces (Fig. 2 and page 69)
- Front mounting (depending on type, Fig. 3)

Installation advantages

- Snap-on cover can be released with screwdriver
- Cover opening range 135° (cover can also be detached from hinge)
- Cover protects switching element during installation
- Screw connections with self-lifting clamping plates
- Easy-action cover lock (close and press)
- Cover additionally secured with screw

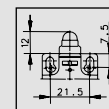


Fig. 1



Fig. 2

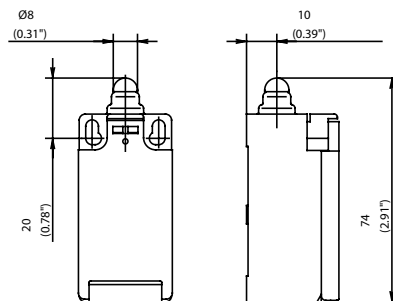
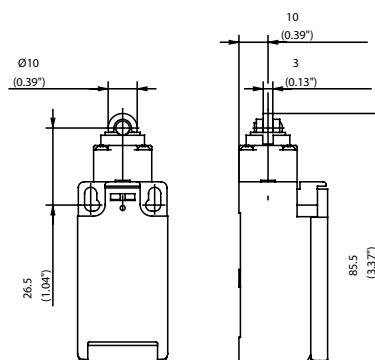


Fig. 3

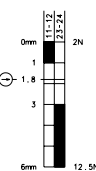
Technical data

Electrical data		
Rated insulation voltage	U _i max.	250 V AC
Conventional thermal current (up to) ^①	I _{the}	10 A
Rated operating voltage	U _e max.	240 V
Utilisation category (up to) ^①	AC-15, U _e /I _e 240 V/3 A	
Short-circuit protection (up to) ^①	Fuse 10 A gL/gG	
Protection class	II, Insulated	
Mechanical data		
Enclosure material	Thermoplastic, glass fibre-reinforced (UL 94-V0)	
Ambient temperature	-30 °C to +80 °C	
Mechanical service life (up to) ^①	10 x 10 ⁶ switching cycles	
B10d (up to) ^①	20 Mio.	
Switching frequency	≤ 100/min.	
Type of connection	Screw connections	
Conductor cross sections	Single-wire 0.5 – 1.5 mm ² or Stranded wire with ferrule 0.5 – 1.5 mm ²	
Cable entry	1 x M20 x 1,5	
Standards		
VDE 0660 T100, DIN EN 60947-1, IEC 60947-1		
VDE 0660 T200, DIN EN 60947-5-1, IEC 60947-5-1		

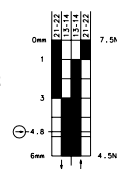
^① Depending on switching system. See Table on Pages 70 – 73.

W (Form B)**RIWK (Form C)****Switching operation****Slow-action****Snap-action****Slow-action****Snap-action****1 NC / 1 NO contact**

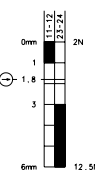
6086103008
I88-U1Z W



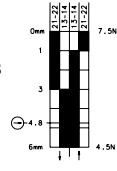
6086153012
I88-SU1Z W



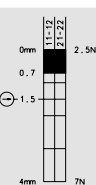
6086117017
I88-U1Z RIWK



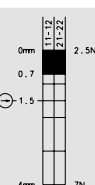
6086167018
I88-SU1Z
RIWK

**2 NC contacts**

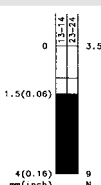
6086803013
I88-A2Z W



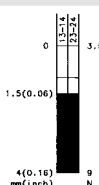
6086817087
I88-A2Z RIWK

**2 NO contacts**

6086803014
I88-E2 W



6086817071
I88-E2 RIWK

**1 NC / 1 NO contact
Overlapping**

6086303011
I88-UV1Z W

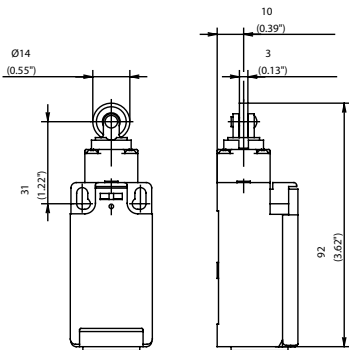
**Approvals****Replacement actuator: –****Replacement actuator: 3918161672****Special features / variants**
(on request)

- Available with black enclosure
- With latching function and following contacts:
2 NC / 1 NO contact
1 NC / 2 NO contact
- Both with and without overlap

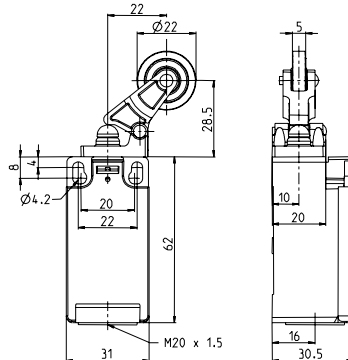
Special features / variants
(on request)

- Available with black enclosure
- With latching function
- With steel roller and following contacts:
2 NC / 1 NO contact
1 NC / 2 NO contact
- Both with overlap

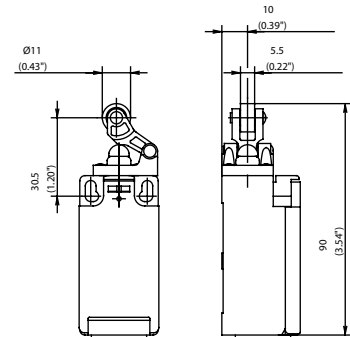
RIWL



KNW RO22

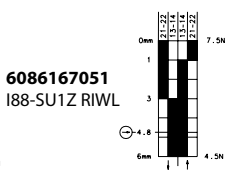
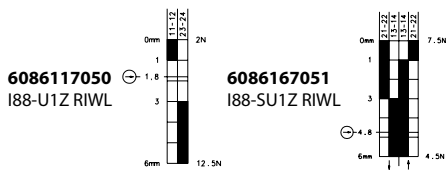


HW RO11 (Form E)



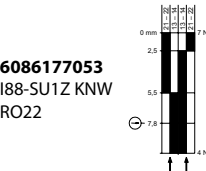
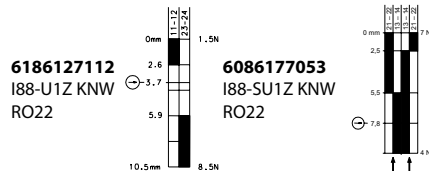
Slow-action

Snap-action



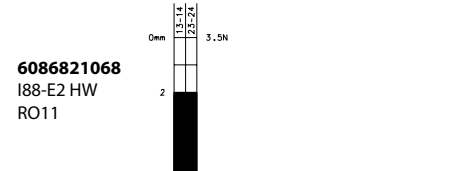
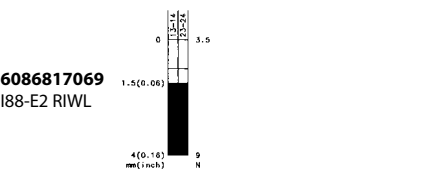
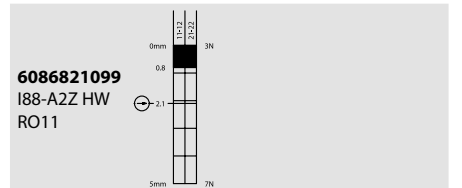
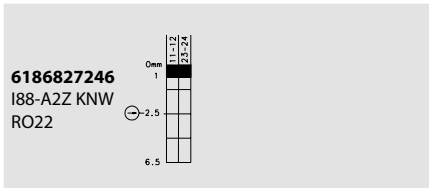
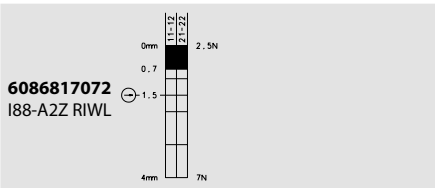
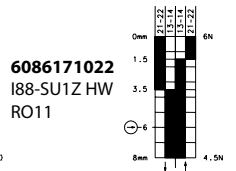
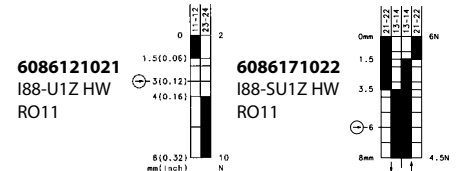
Slow-action

Snap-action



Slow-action

Snap-action



Replacement actuator: 3918161673

Replacement actuator: 3918252223

Replacement actuator: 3918191547

Special features / variants

(on request)

- Available with black enclosure
- With latching function
- Available with different actuating directions
- With steel roller

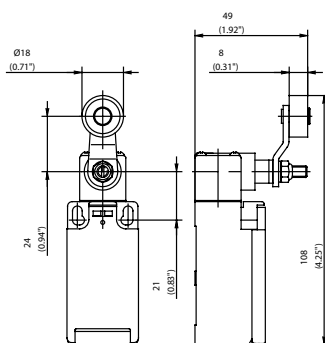
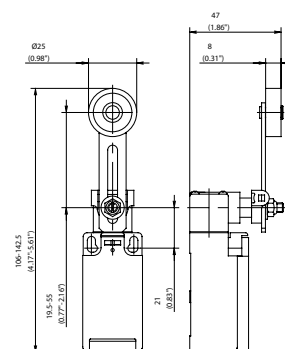
Special features / variants

(on request)

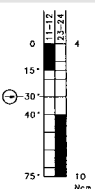
Special features / variants

(on request)

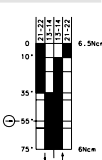
- Available with black enclosure
- With steel roller
- Various roller diameters

AH (Form A)**AV****Switching operation****1 NC / 1 NO contact****Slow-action****Snap-action**

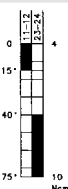
6086135033
I88-U1Z AH



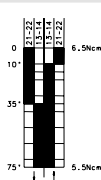
6086185034
I88-SU1Z AH

**Slow-action****Snap-action**

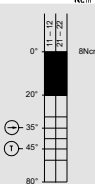
6086136037
I88-U1 AV



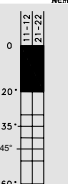
6086186038
I88-SU1 AV

**2 NC contacts**

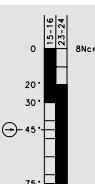
6086835059
I88-A2Z AH



6086836131
I88-A2 AV

**2 NO contacts****1 NC / 1 NO contact
Overlapping**

6186335628
I88-UV1Z AH

**Approvals**

Replacement actuator: 3918351166

Replacement actuator: 3918360984

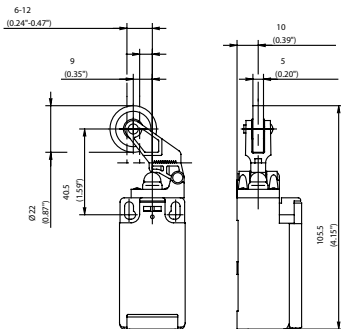
Special features / variants
(on request)

- Available with black enclosure
- Available with different actuating directions
- With steel roller
- Various roller diameters
- Cranked or straight lever
- Various lever lengths

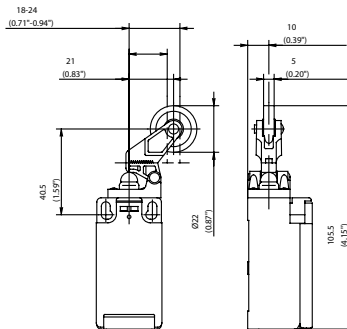
Special features / variants
(on request)

- Available with black enclosure
- Various actuating directions
- Various roller diameters
- Cranked or straight lever
- Various lever lengths
- With roller over switch

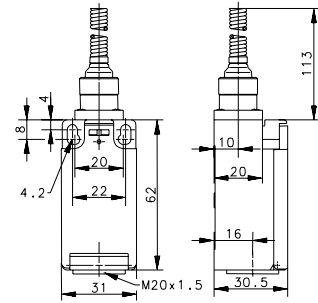
DGHW RO22



DGKW RO22



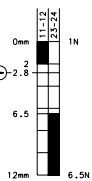
FF



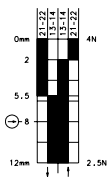
Slow-action

Snap-action

6086121029
I88-U1Z DGHW
RO22



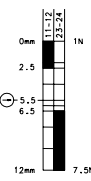
6086171030
I88-SU1Z
DGHW RO22



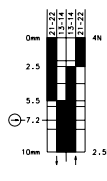
Slow-action

Snap-action

6086127025
I88-U1Z DGKW
RO22



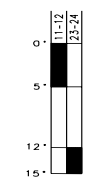
6086177026
I88-SU1Z
DGKW RO22



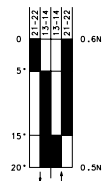
Slow-action

Snap-action

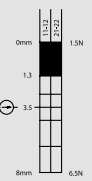
6186140217
I88-U1 FF



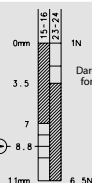
6086190078
I88-SU1 FF



6086821120
I88-A2Z DGHW
RO22



6186321244
I88-UV1Z
DGHW RO22



Replacement actuator: 3918211529

Replacement actuator: 3918271528

Replacement actuator: 3918401031

Special features / variants

(on request)

- Available with black enclosure
- Available with different actuating directions
- Various roller diameters

Special features / variants

(on request)

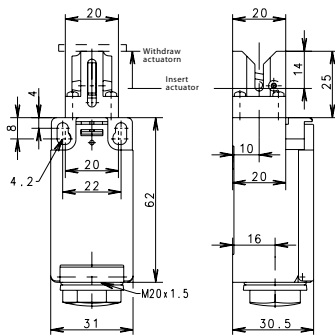
- With latching function
- Various roller diameters and with following contacts:
2 NC / 1 NO contact
1 NC / 2 NO contact
Both with overlap

Special features / variants

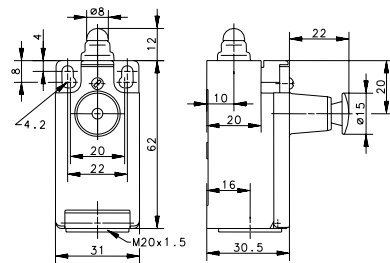
(on request)

- Available with black enclosure
- Various spring lengths
- Different spring versions or spring rod

KS



W RAST



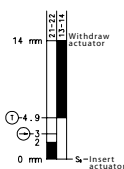
Switching operation

1 NC / 1 NO contact

Slow-action

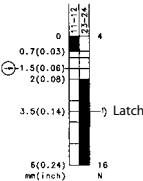
Snap-action

6116819140
I88-U1Z KS



Slow-action

6186103005
I88-U1Z W
RAST



2 NC contacts

2 NO contacts

1 NC / 1 NO contact
Overlapping

Approvals



Replacement actuator: –

Replacement actuator: –

Special features / variants
(on request)

Special features / variants
(on request)