Key Interlock Switch

Door-Flap Switch

Door-Hinge Switch

1.0 Introduction

1.1 LS-Titan Safety Interlock Switches

Learn Online

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273),
in Canada call 1-800-268-3578.
For Application Assistance in the U.S. and Canada
call 1-800-426-9184.

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Technical Reference

LS-Titan

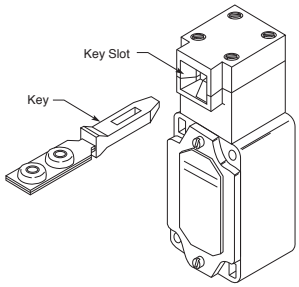
Safety Interlock Switches

Often the need arises for a device to provide a signal indicating that a door has been closed or that a machine guard is in place before a machine can be turned on or a sequence of operations can begin.

While a standard limit switch would probably be able to do this function, the possibility exists that the unit could be false tripped or false actuated either accidently or deliberately, thereby posing a danger to the person operating the machine.

In response to this problem, many switch manufacturers offer what is known as a key interlock switch. These switches look and operate similar to standard limit switches except for the operating heads. Instead of a rotary or plunger operating head, there is a key slot.

Interlock Switch



Actuation of the interlock switch occurs only when the corresponding key is inserted into the key slot. The key is usually mounted on a door or machine guard in such a way that when the door or guard is closed, the key fits into the slot actuating the switch. The special design of the key makes the safety interlock switch extremely difficult to defeat. When inserted into the slot, the key performs three separate mechanical functions.

In addition to being difficult to override, the safety interlock is also designed to fail to a safe mode. If, by chance, the contacts were to become welded together, removal of the key will physically tear the contacts apart, resulting in a safe condition.

LS-Titan key interlock switches by Eaton's electrical sector are available in both NEMA and DIN style housings. NEMA style key interlock switches feature durable metal housings, which remove power to the machine when the guard is opened.

DIN style key interlock switches feature a reduced size and economical plastic housings. They remove power to the machine when the guard is opened.

LS-Titan Safety Interlock Switches

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LS-Titan Safety Interlock Switches

Product Description

Eaton's LS-Titan™ safety interlock switches have been specifically designed for monitoring the position of protective guards, such as doors, flaps, hoods and grilles. All switches in this family are safety-rated, include positively opening NC contacts, and cannot be defeated using simple tools, such as pliers, screwdrivers and nails.

The LS-Titan safety interlock family is comprised of three types of safety switches: key interlock, door-flap and door-hinge switches.

Key interlock switches are a two-piece design, made up of the switch and key (actuator). The key portion of the switch is affixed to a movable door, cover or other such guard. The switch itself is mounted to a rigid portion of the machine. When the guard is opened, the key is removed from the switch, thereby positively breaking the NC contacts. This interrupts the control circuit, stopping machine operation.

The door-flap and door-hinge switches are one-piece designs, suitable for when a key cannot be mounted in the application. When an attempt is made to open a protected door hinge or flap during operation, these switches disconnect the power supply to the machine or installation. Both switches feature four-way adjustable heads.

All LS-Titan safety interlock switches are approved to protect personnel and processes.

Features

- Broad family of safety interlock switches in industry-standard enclosure sizes: miniature DIN; full-size DIN; and larger, solenoid key interlocks providing the highest degree of personnel and process protection
- Large selection of actuators (keys), including those for sliding doors, swing doors and doors that do not close precisely
- Miniature DIN models have a five-way adjustable head, while full-size DIN models have four-way adjustable heads
- Fully safety-rated as interlocking devices per EN 1088, with safety function by positive opening contacts per IEC/EN 60947-5-1
- Door-flap and door-hinge safety switches provide a unique solution when actuators (keys) cannot be used
- IP65 degree of protection

Standards and Certifications

- UL® listed
- CSA® approved
- CCC

Listed

- Positive opening NC contacts per EN 60947-5-1

Safety Notes

Do not use as a mechanical stop/shipping brace.

Any change to an original Eaton safety position switch is not permitted and automatically leads to the loss of all approvals.

Switch must never be used as a mechanical stop.

For the most current information on this product, visit our Web site: www.eaton.com

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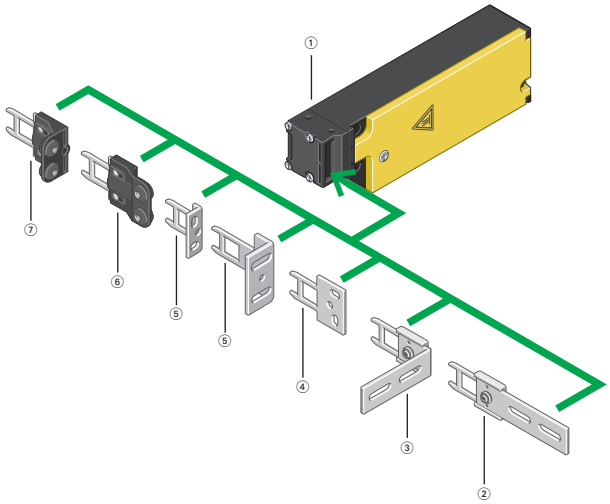
Product Identification

Solenoid Safety Interlock Switches (LS-...ZBZ)



Notes

① **Basic device** (see **Page V8-T1-6**)
Spring or magnet-powered interlock
For increased personnel and process protection
Tamper-proof
Multiple coded actuators
Contacts: 1NO-1NC or 2NC

② **Flat flexible actuator** (see **Page V8-T1-7**)
For doors that do not close precisely

③ **Angled flexible actuator** (see **Page V8-T1-7**)
For doors that do not close precisely

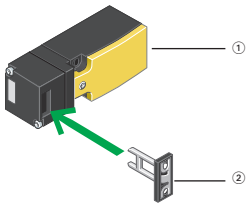
④ **Flat actuator** (see **Page V8-T1-7**)
For sliding doors

⑤ **Angled actuator** (see **Page V8-T1-7**)
For swing doors

⑥ **Flat compensating actuator** (see **Page V8-T1-7**)
For increased tolerance compensation in the direction of door closure

⑦ **Angled compensating actuator** (see **Page V8-T1-7**)
For increased tolerance compensation in the direction of door closure

Miniature DIN Safety Interlock Switch (LS-...ZB)

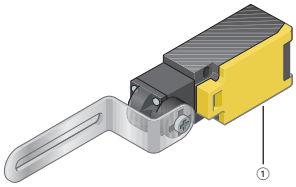


Notes

① **Complete device** (see **Page V8-T1-5**)
For personnel protection
Contacts: 1NC, 1NO-1NO or 2NC
Five directions of operation possible

② **Actuator** (see **Page V8-T1-5**)
Included with switch
Multiple coding protection against tampering

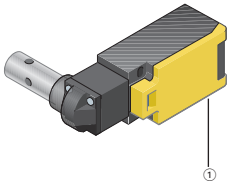
Door Flap Safety Switch (LSR-...TKG)



Note

① **Complete device** (see **Page V8-T1-5**)
For personnel protection
Contacts: 1NO-1NC or 2NC
For swing doors with fixed connection to the door/hinge pin

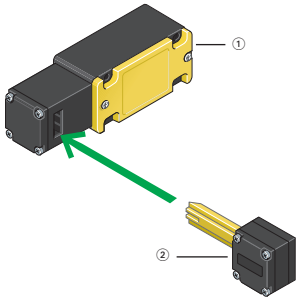
Door Hinge Safety Switch (LSR-...TS)



Note

① **Complete device** (see **Page V8-T1-5**)
For personnel protection
Contacts: 1NO-1NC or 2NC
For swing doors with fixed connection to the door/hinge pin

Full-Size DIN Safety Interlock Switch (LS4-...ZB)



Notes

① **Complete device** (see **Page V8-T1-6**)
Narrow enclosure version
For personnel protection
Contacts: 1NO, 1NO-1NC

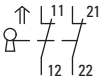
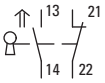
② **Actuator**
Included with switch, not orderable as a separate item
Multiple coding
For horizontal or vertical operation

Product Selection

LS-Titan Miniature DIN Safety Interlock Switches

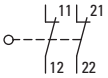
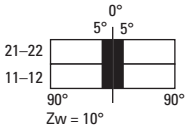
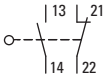
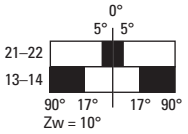
Key Interlock Switch

Key Interlock Switch—LS-…ZB ①

Contacts	Contact Sequence	Contact Travel	Connection	Catalog Number (Includes Key)
2NC with positive opening		—	Screw terminal	**LS-S02-ZB**
1NO and 1NC with positive opening		—	Screw terminal	**LS-S11-ZB**
		Snap action contacts	Screw terminal	**LS-S11S-ZB**

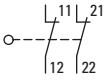
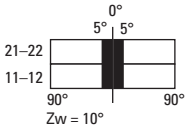
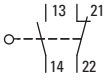
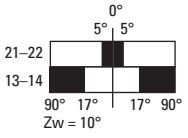
Door-Flap Switch

Door-Flap Switch—LSR-…TKG ①

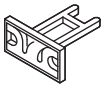
Contacts	Contact Sequence	Contact Travel	Connection	Catalog Number (Includes Key)
2NC with positive opening			Screw terminal	**LSR-S02-1-I-TKG**
1NO and 1NC with positive opening			Screw terminal	**LSR-S11-1-I-TKG**

Door-Hinge Switch

Door-Hinge Switch—LSR-…TS ①

Contacts	Contact Sequence	Contact Travel	Connection	Catalog Number (Includes Key)
2NC with positive opening			Screw terminal	**LSR-S02-1-I-TS**
1NO and 1NC with positive opening			Screw terminal	**LSR-S11-1-I-TS**

Replacement Safety Interlock Key



Replacement Safety Interlock Key ①

Description	Catalog Number
Replacement key for miniature DIN key interlock switches (only models LS-…ZB).	**LS-XB-ZB**

Note

① For dimensions, see **Page V8-T1-10**.

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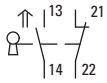
LS-Titan Full-Size DIN Safety Interlock Switches

Key Interlock Switch

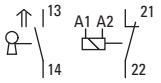
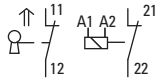
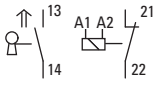
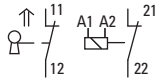
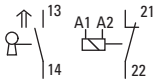
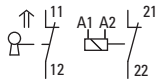
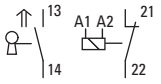
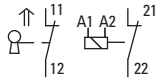
Full-Size DIN—LS4-…ZB ①②

Contacts	Contact Sequence	Contact Travel	Connection	Catalog Number (Includes Key)
1NO and 1NC with positive opening		—	Screw terminal	**LS4-S11-1-I-ZB**

LS-Titan Solenoid Safety Interlock Switches

Switch Body without Key

Switch Body without Key—LS-…ZBZ ①②③

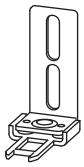
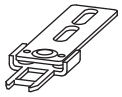
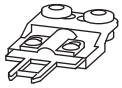
Operation	Operating Voltage	Contacts	Contact Sequence	Catalog Number (Key not Included)
Power to unlock (mechanical bypass present)	24 Vdc	1NO and 1NC with positive opening		**LS-S11-24DFT-ZBZ-X**
		2NC with positive opening		**LS-S02-24DFT-ZBZ-X**
	120 Vac (50/60 Hz)	1NO and 1NC with positive opening		**LS-S11-120AFT-ZBZ-X**
		2NC with positive opening		**LS-S02-120AFT-ZBZ-X**
Power to lock (mechanical bypass present)	24 Vdc	1NO and 1NC with positive opening		**LS-S11-24DMT-ZBZ-X**
		2NC with positive opening		**LS-S02-24DMT-ZBZ-X**
	120 Vac (50/60 Hz)	1NO and 1NC with positive opening		**LS-S11-120AMT-ZBZ-X**
		2NC with positive opening		**LS-S02-120AMT-ZBZ-X**

Notes

① For dimensions, see **Page V8-T1-10**.
② For mounting instructions, see **Page V8-T1-9**.
③ Key ordered separately, see **Page V8-T1-7**.

LS-Titan Solenoid Safety Interlock Keys

Keys Only—LS-…ZBZ ①②

	Description	Application	Catalog Number
LS-XG-ZBZ 	Flat actuator	For sliding doors	**LS-XG-ZBZ**
LS-X…-ZBZ 	Angled actuator, short	For swing doors starting at 250 mm in width	**LS-XW-ZBZ**
	Angled actuator, long	For swing doors starting at 250 mm in width	**LS-XWA-ZBZ**
LS-XF-ZBZ 	Angled, flexible actuator	For doors that do not close precisely	**LS-XF-ZBZ**
LS-XFG-ZBZ 	Even, flexible coasting actuator	For doors that do not close precisely	**LS-XFG-ZBZ**
LS-XNG-ZBZ 	Flat, compensating actuator	Increased tolerance in closing direction for inaccurately closing doors	**LS-XNG-ZBZ**
LS-XNW-ZBZ 	Angled, compensating actuator	Increased tolerance in closing direction for inaccurately closing doors	**LS-XNW-ZBZ**

Notes

① Switch body ordered separately, see **Page V8-T1-6**.

② For mounting instructions, see **Page V8-T1-9**.

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Technical Data and Specifications

LS-Titan Safety Interlock Switches

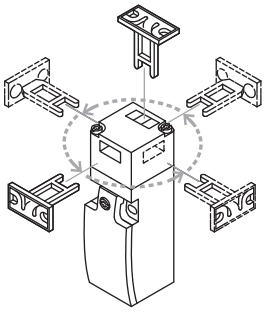
	Units		LS-...ZBZ	LS-...ZB	LS4...ZB
General					
Standards			IEC/EN 60947	IEC/EN 60947	IEC/EN 60947
Climatic proofing			①	①	①
Ambient temperature		°C	–25… +0	–25… +70	–25… +70
Mounting position			As required	As required	As required
Protection type			IP65	IP65	IP65
Terminal capacities					
Solid		mm^2	1 x (0.75–2.5)/2 x (0.75–1.5)	1 x (0.75–2.5)/2 x (0.75–1.5)	1 x (0.75–2.5)/2 x (0.75–1.5)
Flexible with ferrule		mm^2	1 x (0.75–2.5)/2 x (0.75–1.5)	1 x (0.75–2.5)/2 x (0.75–1.5)	1 x (0.75–2.5)/2 x (0.75–1.5)
Contacts/Switching Capacity					
Rated impulse withstand voltage	U_{imp}	Vac	4000	6000	6000
Rated insulation voltage	U_i	V	400	500	500
Overvoltage category/pollution degree			III/3	III/3	III/3
Burden Current					
AC–15					
24V	I_e	A	6	10	10
230V/240V	I_e	A	6	6	6
400V/415V	I_e	A	4	4	4
DC-13					
24V	I_e	A	3	3	3
110V	I_e	A	0.8	0.8	0.8
220V	I_e	A	0.3	0.3	0.3
Supply frequency		Hz	max. 400	max. 400	max. 400
Short-circuit rating to IEC/EN 60947-5-1 Max. fuse		A gG/gL	6	6	6
Repetition accuracy		mm	± 0.02	± 0.02	± 0.02
Mechanical Variables					
Lifespan					
Standard-action contact	Operations	x 10^6	1	10	10
Snap-action contact	Operations	x 10^6	—	—	—
Mechanical shock resistance (half-sinusoidal shock, 20 ms)					
Standard-action contact		g	10	25	5
Snap-action contact		g	—	—	—
Operating frequency	Operations/h		≤ 800	≤ 1800	≤ 1800
Actuation					
Mechanical					
Actuating force at beginning/end of stroke					
ZB/ZBZ (push in/pull out)		N	25/15	10/5	15/20
Mechanical holding force according to GS-ET-19 (04/2004)					
XG, XW		N	1500	N/A	N/A
XFF, XNG, XWA		N	1300	N/A	N/A
XF		N	750	N/A	N/A
XNW		N	500	N/A	N/A
Electromechanical					
For magnet					
Power consumption					
at 120 Vac		VA	8	N/A	N/A
at 230 Vac		VA	11	N/A	N/A
at 24 Vdc		W	8	N/A	N/A
Pickup and dropout values		x U_s	0.85–1.1	N/A	N/A
Magnet duty factor		% ED	100	N/A	N/A

Note

① Damp heat, constant, to IEC 60068-2-78; damp heat, cyclical, to IEC 60068-2-30.

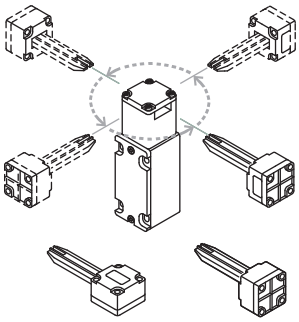
Mounting Instructions

LS-...ZB, TKG, TS



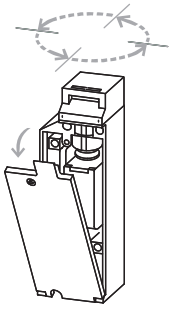
Actuator can be repositioned for horizontal or vertical installation. The operating heads can be rotated manually in 90° steps to suit the specified direction of operation.

LS4-...ZB

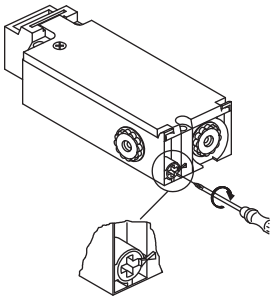


Actuator can be repositioned for horizontal or vertical installation. The operating heads can be rotated manually in 90° steps to suit the specified direction of operation.

LS-...ZBZ



The operating head can be rotated manually in 90° steps to suit the specified level of actuation.



In the event of a loss of voltage, (e.g., during commissioning), the spring-powered LS-...-....FT-ZBZ can be released with a screwdriver. **The auxiliary release mechanism must be sealed**.

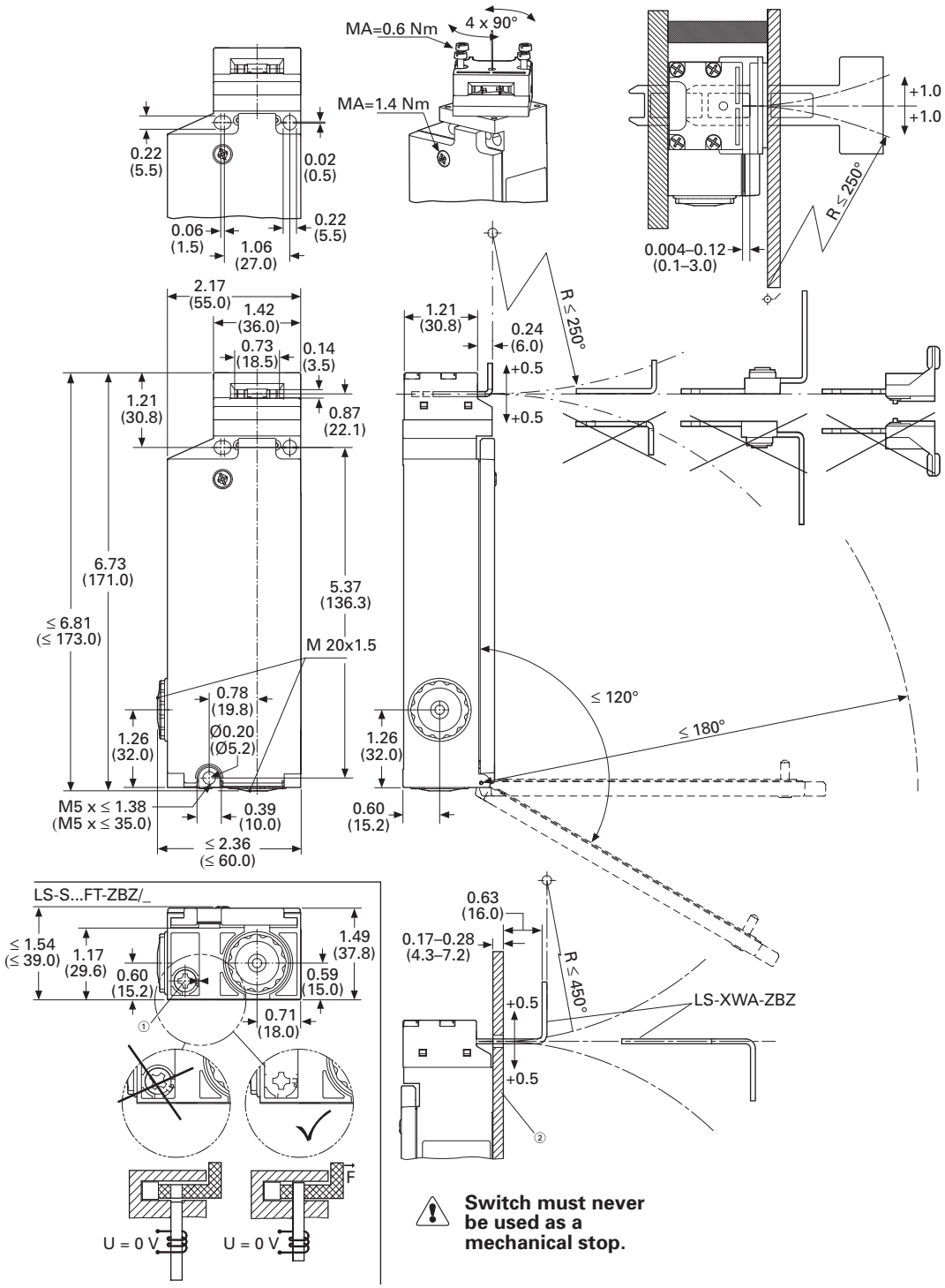
1

Dimensions

Approximate Dimensions in Inches (mm)

Safety Position Switches

LS...-ZB



Notes

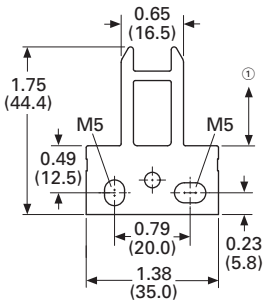
① The auxiliary release mechanism must be sealed for proper operation.

② Can be used as stop with the corresponding material selection and design.

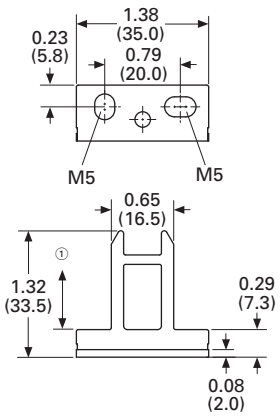
Approximate Dimensions in Inches (mm)

Actuators

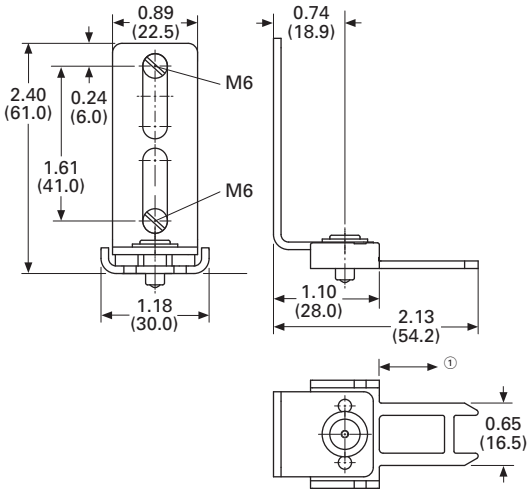
LS-XG-ZBZ



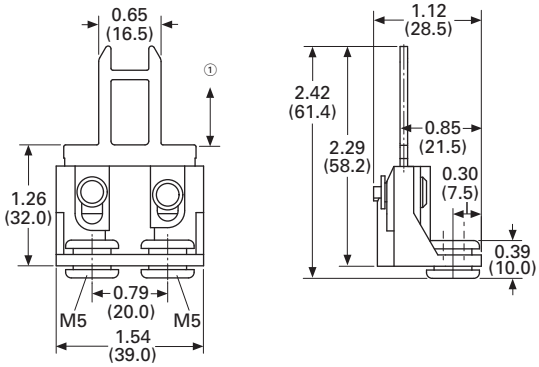
LS-XW-ZBZ



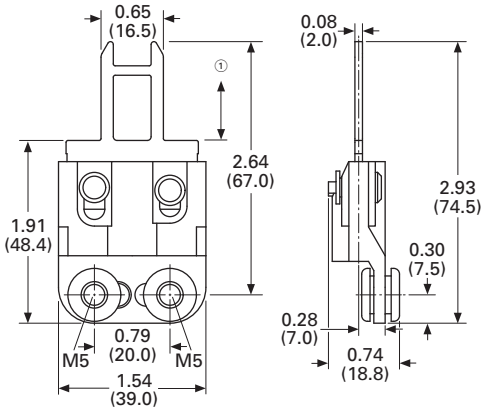
LS-XF-ZBZ



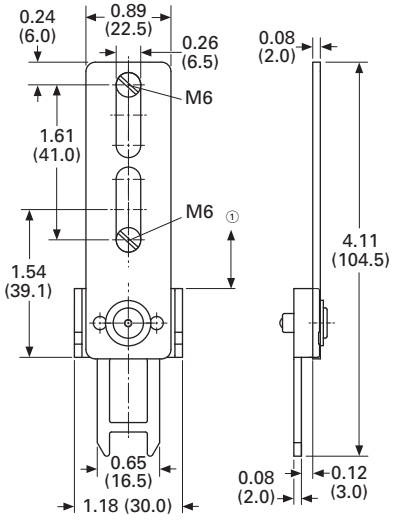
LS-XNW-ZBZ ②



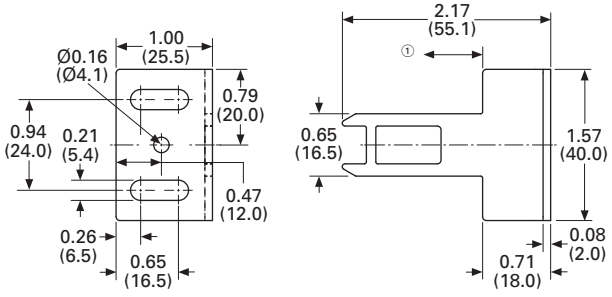
LS-XNG-ZBZ ②



LS-XFG-ZBZ



LS-XWA-ZBZ ③



Notes

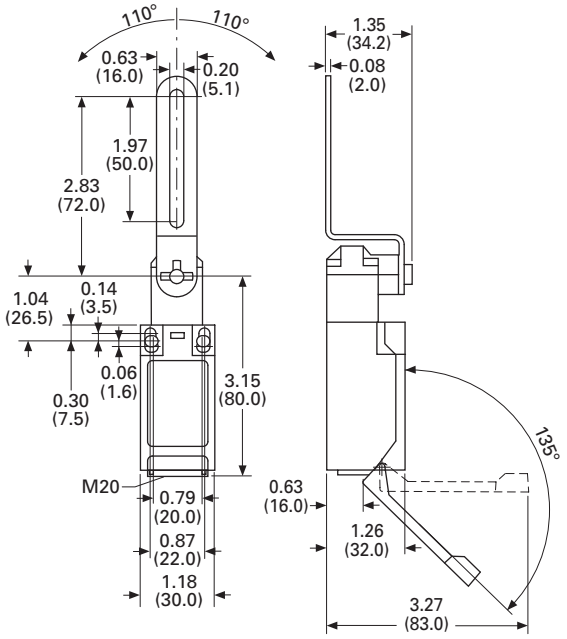
① Distance to device head = 0.1–3.0 mm.
② Fixing only allowed with M5 fixing screw and washer according to DIN EN ISO 7093.
③ Pin with a 4 mm pin after mounting.

1

Approximate Dimensions in Inches (mm)

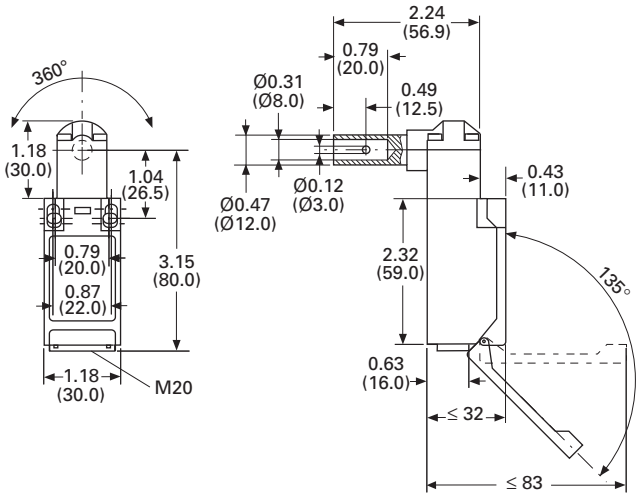
Safety Door Flap Switch

LSR-.../TKG



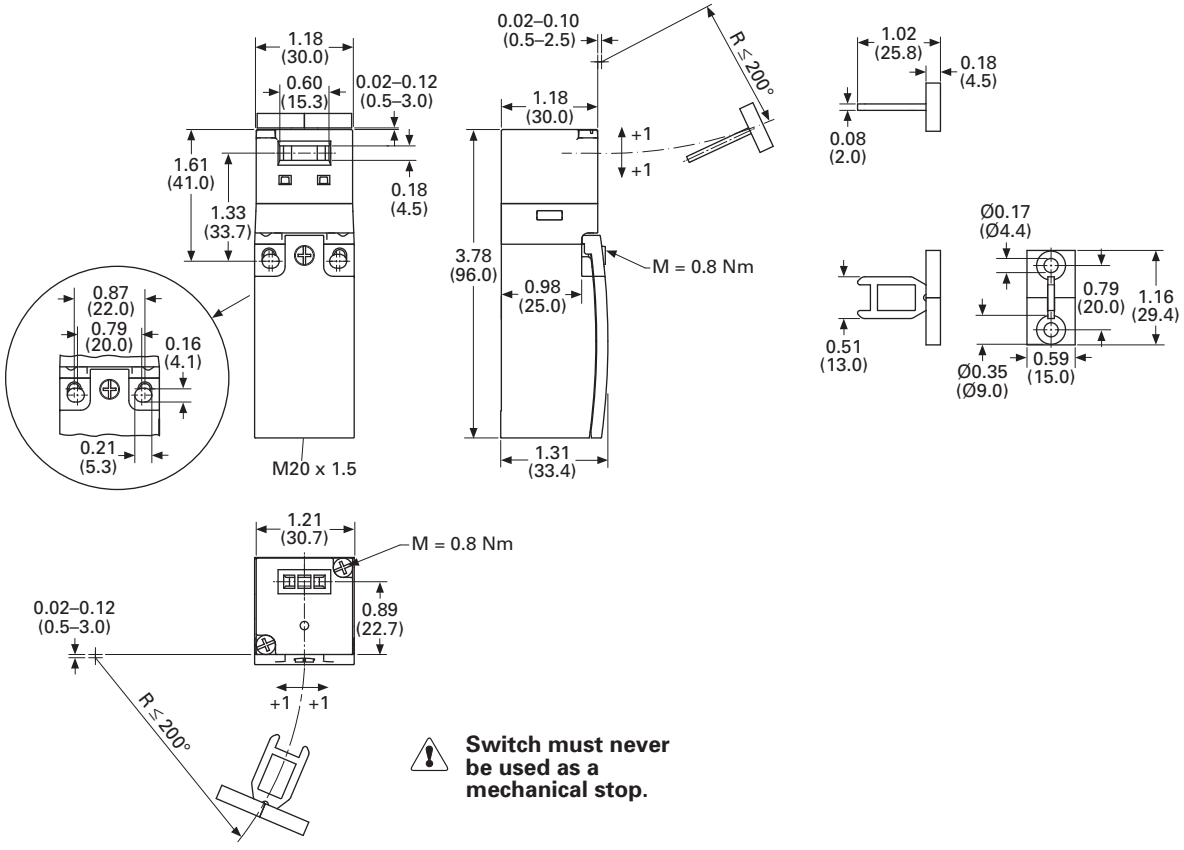
Safety Hinge Switch

LSR-.../TS



Safety Position Switches

LS...-ZB

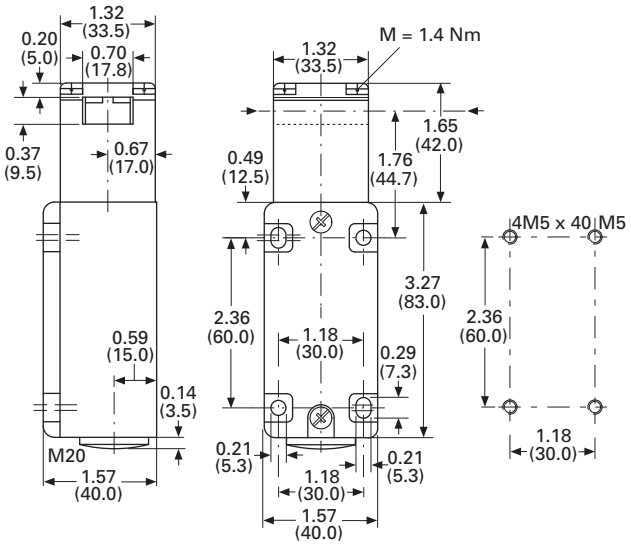


Switch must never be used as a mechanical stop.

Approximate Dimensions in Inches (mm)

Safety Position Switches

LS4...ZB



Actuator—Included with Switch Above