LS-Titan Miniature DIN Switches



LS-Titan Safety Interlock Switches



46.3 LS-Titan Miniature DIN Switches

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Note: Supplement to Volume 8—Sensing Solutions, CA08100010E, Tabs 46 and 45.

LS-Titan Miniature DIN Switches



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LS-Titan Miniature DIN Switches

Product Description

Eaton's LS-Titan™ limit switch line is a complete offering of safety position switches designed for worldwide application. Economical insulated plastic or rugged metal enclosures and modular, plug-in operating heads and bodies make LS-Titan a flexible switching solution.

A highlight of the LS-Titan switch line is the world's first electronic position switch (LSE models). These switches feature freely programmable operating points that can be set individually at any time. Additional LSE models provide analog outputs proportional to the actuator position.

LS-Titan switches are suitable for use in safety applications designed to protect persons or processes.

Features

- Modular, plug-in system (head and body components)
- Positive opening NC contacts for safety applications
- Wide variety of economical plastic and rugged metal versions available
- Operating heads can be rotated 90 degrees to suit specific direction of operation
- Unique electronic safety position switches (LSE models) provide analog (0–10 Vdc or 4–20 mA) outputs proportional to the actuator position and allow for easy configuration of a custom trip point
- Can be ordered as separate components (head and body) or as completely assembled switches
- Screw and Cage Clamp® (standard on LSE models and optionally available on mechanical models) connections provide larger wiring areas for easier installation
- Approved for worldwide application

Standards and Certifications

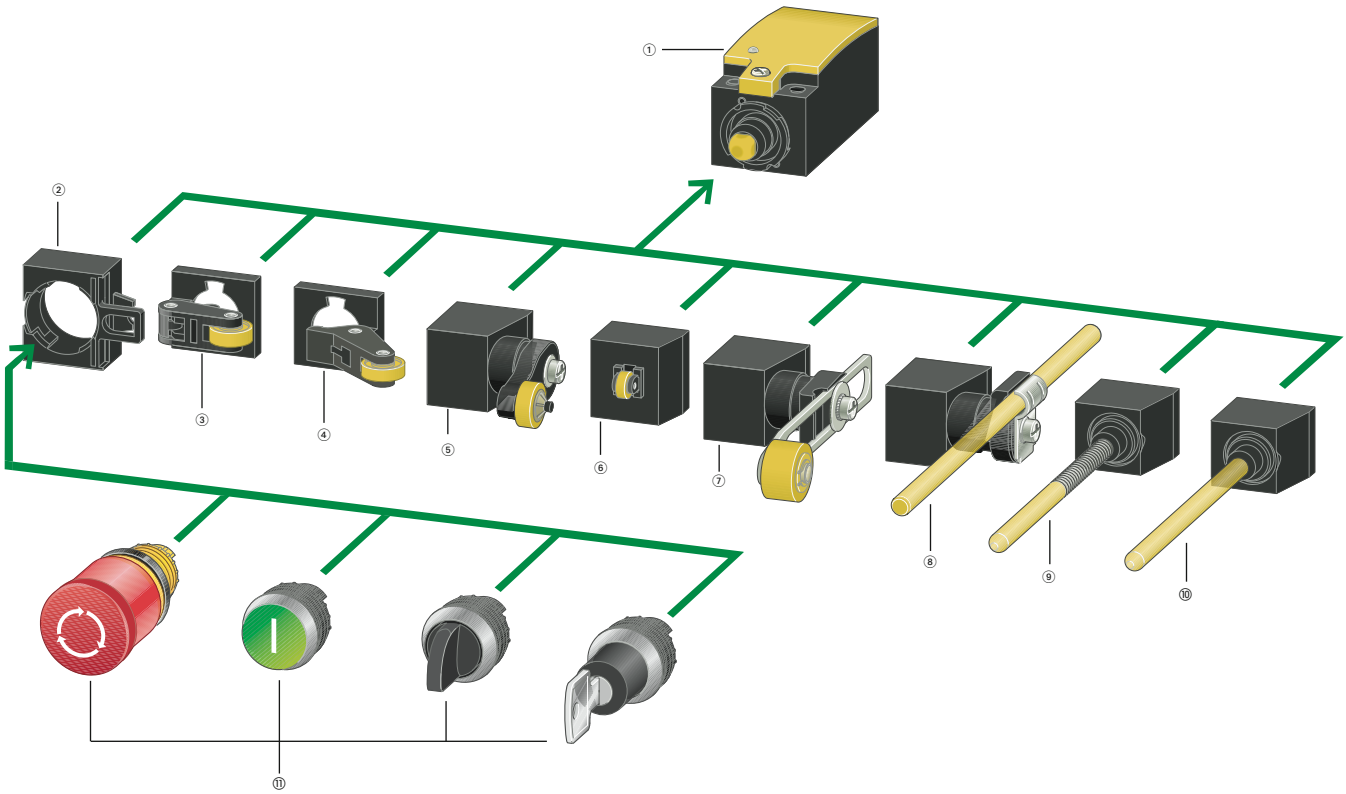
- Safety function by positive opening contacts per IEC/EN 60947-5-1 up to Category 4 per EN 954-1
- TÜV-Rheinland Certified for Functional-Safety (LSE models)
- CSA® certified
- UL® listed
- CE
- CCC

Listed

Note: Cage Clamp is a registered trademark of Wago Kontakttechnik, 32423 Minden, Germany.

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

Product Identification



Notes

① **Basic device** (see **Pages 4–12**)
According to EN 50047
With screw-on cover
Contacts: 1NO-1NC, 2NO, 2NC
Cage Clamp, screw terminal
As snap-action or standard-action switch
As electronic snap-action switch
(individually adjustable)
As 4–20 mA analog signal encoder
As 0–10 Vdc analog signal encoder

② **Fixing adapter** (see **Page 14**)
Allows mounting of M22 pushbuttons

③ **Roller lever** (see **Pages 4** and **7**)
For one-sided operation with higher operating speed

④ **Angled roller lever**
(see **Pages 4**, **7** and **11**)
For actuation along the unit axis

⑤ **Rotary lever** (see **Pages 4**, **8** and **11**)
For actuation from the side, for pendulum movements

⑥ **Roller plunger** (see **Pages 4**, **7** and **11**)
For actuation from the side with low actuating force

⑦ **Adjustable roller lever**
(see **Pages 5**, **8**, **9** and **11**)
For length adjustment as required

⑧ **Actuating rod** (see **Pages 6**, **10** and **12**)
On conveyor belts for lightweight goods

⑨ **Spring-rod** (see **Pages 6**, **10** and **12**)
For flexible actuation from all sides

j **Actuating rod** (see **Pages 6**, **10** and **12**)
Withdrawable mechanism from front

k Pushbuttons from the M22 family; see M22 catalog (CA04716001E) or www.eaton.com/m22

Operating heads can be rotated by 90 degrees.

Product Selection

LS-Titan Plastic Safety Switches

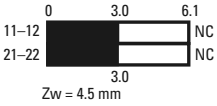
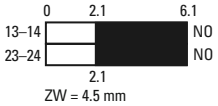
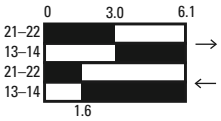
Plastic Safety Switches

Plastic Safety Switch Body



Assembled Switch



Switch Body Catalog Number	**LS-S02**	**LS-S20A**	**LS-S11S**
Output Function	2NC with positive opening contacts	2NO with slow make/break	1NO and 1NC with positive opening contact
Terminal Connection	Screw terminal ①	Screw terminal ①	Screw terminal ①
Contact Sequence			
Contact Travel ■ = contact closed □ = contact open			Snap-action contact 
Operating Head Type ②			
Head Only Catalog Number	**Assembled Switch Catalog Number**		
Top Push Roller Plunger 	**LS-XP**	**LS-S02-P**	**LS-S20A-P**	**LS-S11S-P**
Long Roller Lever 	**LS-XL**	**LS-S02-L**	**LS-S20A-L**	**LS-S11S-L**
Short Roller Lever 	**LS-XLS**	**LS-S02-LS**	**LS-S20A-LS**	**LS-S11S-LS**
Large Roller Lever 	**LS-XLB**	**LS-S02-LB**	**LS-S20A-LB**	**LS-S11S-LB**
Angled Roller 	**LS-XLA**	**LS-S02-LA**	**LS-S20A-LA**	**LS-S11S-LA**
Rotary Lever 	**LS-XRL**	**LS-S02-RL**	**LS-S20A-RL**	**LS-S11S-RL**

Notes

① Cage Clamp versions available. Contact Application Engineering.

② For operating head dimensions, see **Page 21**.

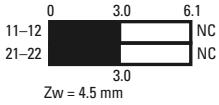
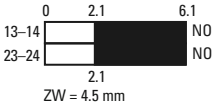
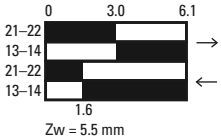
Plastic Safety Switches, continued

Plastic Safety Switch Body



Assembled Switch



Switch Body Catalog Number	LS-S02	LS-S20A	LS-S11S
Output Function	2NC with positive opening contacts	2NO with slow make/break	1NO and 1NC with positive opening contact
Terminal Connection	Screw terminal ①	Screw terminal ①	Screw terminal ①
Contact Sequence			
Contact Travel	■ = contact closed □ = contact open			Snap-action contact 

Operating Head Type ②

Head Only Catalog Number	Assembled Switch Catalog Number		
Adjustable Roller Lever (with 18 mm Roller) 	LS-XRLA	LS-S02-RLA	LS-S20A-RLA	LS-S11S-RLA
Adjustable Roller Lever (with 30 mm Roller) 	LS-XRLA30	LS-S02-RLA30	LS-S20A-RLA30	LS-S11S-RLA30
Adjustable Roller Lever (with 40 mm Roller) 	LS-XRLA40	LS-S02-RLA40	LS-S20A-RLA40	LS-S11S-RLA40
Adjustable Roller Lever (with 40 mm Rubber Roller) 	LS-XRLA40R	LS-S02-RLA40R	LS-S20A-RLA40R	LS-S11S-RLA40R

Notes

① Cage Clamp versions available. Contact Application Engineering.

② For operating head dimensions, see **Page 21**.

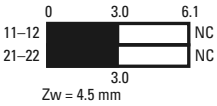
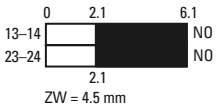
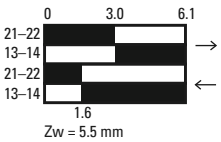
Plastic Safety Switches, continued

Plastic Safety Switch Body



Assembled Switch



Switch Body Catalog Number	LS-S02	LS-S20A	LS-S11S
Output Function	2NC with positive opening contacts	2NO with slow make/break	1NO and 1NC with positive opening contact
Terminal Connection	Screw terminal ①	Screw terminal ①	Screw terminal ①
Contact Sequence			
Contact Travel ■ = contact closed □ = contact open			Snap-action contact 
Operating Head Type ②			
Head Only Catalog Number / **Assembled Switch Catalog Number**			
Plastic Rod Lever 	LS-XRR	LS-S02-RR	LS-S20A-RR	LS-S11S-RR
Metal Rod 	LS-XRRM	LS-S02-RRM	LS-S20A-RRM	LS-S11S-RRM
Spring Rod (Wobble) ③ 	LS-XS	LS-S02-S	LS-S20A-S	LS-S11S-S
Actuating Rod 	LS-XOR	LS-S02-OR	LS-S20A-OR	LS-S11S-OR

Notes

① Cage Clamp versions available. Contact Application Engineering.
② For operating head dimensions, see **Page 21**.
③ Not to be used as a safety position switch. Use only in conjunction with snap-action contact.

LS-Titan Plastic Electronic Safety Position Switches

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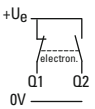
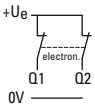
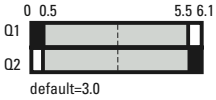
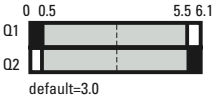
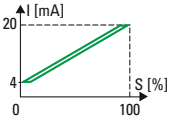
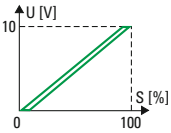
Plastic Electronic Safety Position Switches

Plastic Electronic Safety Position Switch Body



Assembled Switch



Switch Body Catalog Number	LSE-11	LSE-02	LSE-AI	LSE-AU
Output Function	1NO and 1 NC	2NC	Analog 4–20 mA	Analog 0–10V
Terminal Connections	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①
Safety Functions and Approvals	These models may be used in safety-oriented circuits. Visual status LED indication is comparable to positive opening contacts. Certified by TÜV as a "Functional-Safety" device. Suitable for protection of people or processes.		Additional diagnostic output that registers a 0V signal in the event of a fault. Self-test function continuously tests both outputs for overloads, short circuits to 0V and short circuits to $+U_e$. Certified by TÜV to EN 954-1, Category 3 or 4. Suitable for protection of people or processes.	
Contact Sequence			Analog 4–20 mA	Analog 0–10V
Contact Travel ■ = contact closed □ = contact open				

Operating Head Type ②

Head Only Catalog Number	Assembled Switch Catalog Number			
Top Push Roller Plunger 	LS-XP	LSE-11-P	LSE-02-P	LSE-AI-P	LSE-AU-P
Long Roller Lever 	LS-XL	LSE-11-L	LSE-02-L	LSE-AI-L	LSE-AU-L
Short Roller Lever 	LS-XLS	LSE-11-LS	LSE-02-LS	LSE-AI-LS	LSE-AU-LS
Large Roller Lever 	LS-XLB	LSE-11-LB	LSE-02-LB	LSE-AI-LB	LSE-AU-LB
Angled Roller 	LS-XLA	LSE-11-LA	LSE-02-LA	LSE-AI-LA	LSE-AU-LA

Notes

① A compatible Cage Clamp tool is available as an accessory on **Page 14**.

② For operating head dimensions, see **Page 21**.

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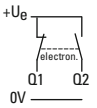
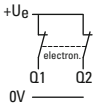
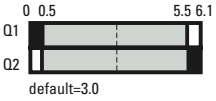
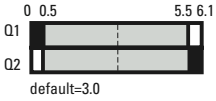
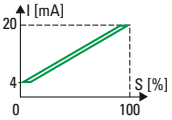
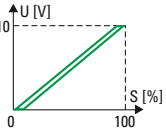
Plastic Electronic Safety Position Switches, continued

Plastic Electronic Safety Position Switch Body



Assembled Switch



Switch Body Catalog Number	LSE-11	LSE-02	LSE-AI	LSE-AU
Output Function	1NO and 1NC	2NC	Analog 4–20 mA	Analog 0–10V
Terminal Connections	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①
Safety Functions and Approvals	These models may be used in safety-oriented circuits. Visual status LED indication is comparable to positive opening contacts. Certified by TÜV as a "Functional-Safety" device. Suitable for protection of people or processes.		Additional diagnostic output that registers a 0V signal in the event of a fault. Self-test function continuously tests both outputs for overloads, short circuits to 0V and short circuits to $+U_e$. Certified by TÜV to EN 954-1, Category 3 or 4. Suitable for protection of people or processes.	
Contact Sequence			Analog 4–20 mA	Analog 0–10V
Contact Travel ■ = contact closed □ = contact open				
Operating Head Type ②				
Head Only Catalog Number	**Assembled Switch Catalog Number**			
Rotary Lever	LS-XRL	LSE-11-RL	LSE-02-RL	LSE-AI-RL	LSE-AU-RL
Adjustable Roller Lever (with 18 mm Roller)	LS-XRLA	LSE-11-RLA	LSE-02-RLA	LSE-AI-RLA	LSE-AU-RLA
Adjustable Roller Lever (With 30 mm Roller)	LS-XRLA30	LSE-11-RLA30	LSE-02-RLA30	LSE-AI-RLA30	LSE-AU-RLA30







Notes

① A compatible Cage Clamp tool is available as an accessory on **Page 14**.

② For operating head dimensions, see **Page 21**.

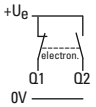
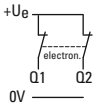
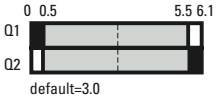
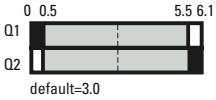
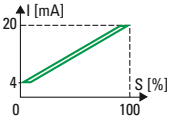
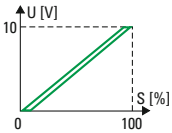
Plastic Electronic Safety Position Switches, continued

Plastic Electronic Safety Position Switch Body



Assembled Switch



Switch Body Catalog Number	LSE-11	LSE-02	LSE-AI	LSE-AU
Output Function	1NO and 1NC	2NC	Analog 4–20 mA	Analog 0–10V
Terminal Connections	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①
Safety Functions and Approvals	These models may be used in safety-oriented circuits. Visual status LED indication is comparable to positive opening contacts. Certified by TÜV as a "Functional-Safety" device. Suitable for protection of people or processes.		Additional diagnostic output that registers a 0V signal in the event of a fault. Self-test function continuously tests both outputs for overloads, short circuits to 0V and short circuits to $+U_e$. Certified by TÜV to EN 954-1, Category 3 or 4. Suitable for protection of people or processes.	
Contact Sequence			Analog 4–20 mA	Analog 0–10V
Contact Travel ■ = contact closed □ = contact open				

Operating Head Type ②

Head Only Catalog Number	Assembled Switch Catalog Number			
Adjustable Roller Lever (With 40 mm Roller)				
LS-XRLA40	**LSE-11-RLA40**	**LSE-02-RLA40**	**LSE-AI-RLA40**	**LSE-AU-RLA40**



Adjustable Roller Lever (With 40 mm Roller)				
LS-XRLA40R	**LSE-11-RLA40R**	**LSE-02-RLA40R**	**LSE-AI-RLA40R**	**LSE-AU-RLA40R**



Plastic Rod Lever				
LS-XRR	**LSE-11-RR**	**LSE-02-RR**	**LSE-AI-RR**	**LSE-AU-RR**



Notes

① A compatible Cage Clamp tool is available as an accessory on **Page 14**.

② For operating head dimensions, see **Page 21**.

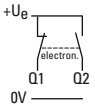
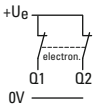
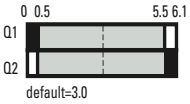
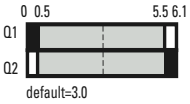
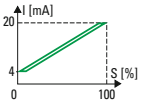
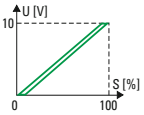
Plastic Electronic Safety Position Switches, continued

Plastic Electronic Safety Position Switch Body



Assembled Switch



Switch Body Catalog Number	LSE-11	LSE-02	LSE-AI	LSE-AU
Output Function	1NO and 1NC	2NC	Analog 4–20 mA	Analog 0–10V
Terminal Connections	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①	Cage Clamp ①
Safety Functions and Approvals	These models may be used in safety-oriented circuits. Visual status LED indication is comparable to positive opening contacts. Certified by TÜV as a "Functional-Safety" device. Suitable for protection of people or processes.		Additional diagnostic output that registers a 0V signal in the event of a fault. Self-test function continuously tests both outputs for overloads, short circuits to 0V and short circuits to $+U_e$. Certified by TÜV to EN 954-1, Category 3 or 4. Suitable for protection of people or processes.	
Contact Sequence			Analog 4–20 mA	Analog 0–10V
Contact Travel ■ = contact closed □ = contact open				
Operating Head Type ②				
Head Only Catalog Number	Assembled Switch Catalog Number			
Metal Rod	LS-XRRM	LSE-11-RRM	LSE-02-RRM	LSE-AI-RRM	LSE-AU-RRM
Spring Rod (Wobble) ③	LS-XS	LSE-11-S	LSE-02-S	LSE-AI-S	LSE-AU-S
Actuating Rod	LS-XOR	LSE-11-OR	LSE-02-OR	LSE-AI-OR	LSE-AU-OR







Notes

① A compatible Cage Clamp tool is available as an accessory on **Page 14**.
② For operating head dimensions, see **Page 21**.
③ Not to be used as a safety position switch. Use only in conjunction with snap-action contact.

LS-Titan Metal Safety Switches

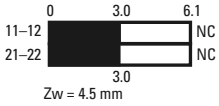
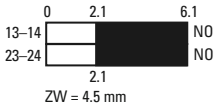
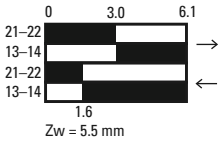
Metal Safety Switches

Metal Safety Switch Body



Assembled Switch



Switch Body Catalog Number	LSM-02	LSM-20A	LSM-11S
Output Function	2NC with positive opening contacts	2NO with slow make/break	1NO and 1NC with positive opening contact
Terminal Connection	Cage Clamp	Cage Clamp	Cage Clamp
Contact Sequence			
Contact Travel ■ = contact closed □ = contact open			Snap-action contact 
Operating Head Type ①			
Head Only Catalog Number	Assembled Switch Catalog Number		
Top Push Roller Plunger	LSM-XP	LSM-02-P	LSM-20A-P	LSM-11S-P
Long Roller Lever	LSM-XL	LSM-02-L	LSM-20A-L	LSM-11S-L
Angled Roller	LSM-XLA	LSM-02-LA	LSM-20A-LA	LSM-11S-LA
Rotary Lever	LSM-XRL	LSM-02-RL	LSM-20A-RL	LSM-11S-RL
Adjustable Roller Lever	LSM-XRLA	LSM-02-RLA	LSM-20A-RLA	LSM-11S-RLA











Note

① For operating head dimensions, see **Page 21**.

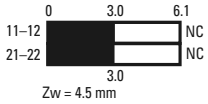
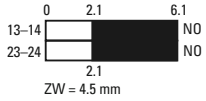
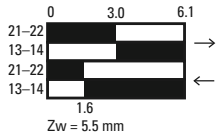
Metal Safety Switches, continued

Metal Safety Switch Body



Assembled Switch



Switch Body Catalog Number	LSM-02	LSM-20A	LSM-11S
Output Function	2NC with positive opening contacts	2NO with slow make/break	1NO and 1NC with positive opening contact
Terminal Connection	Cage Clamp	Cage Clamp	Cage Clamp
Contact Sequence			
Contact Travel ■ = contact closed □ = contact open			Snap-action contact 
Operating Head Type ①			
Head Only Catalog Number	**Assembled Switch Catalog Number**		
Plastic Rod Lever	**LSM-XRR**	**LSM-02-RR**	**LSM-20A-RR**	**LSM-11S-RR**
Metal Rod Lever	**LSM-XRRM**	**LSM-02-RRM**	**LSM-20A-RRM**	**LSM-11S-RRM**
Spring Rod (Wobble)	**LSM-XS**	**LSM-02-S**	**LSM-20A-S**	**LSM-11S-S**







Note

① For operating head dimensions, see **Page 21**.

Understanding LS-Titan Electronic Safety Position Switches

All four LS-Titan LSE switch bodies are safety-rated products. The LSE-11 and LSE-02 switch bodies both have a freely programmable operating point and can be individually adjusted to suit the application, and can be changed as often as required. These devices feature an LED on the body, providing simple indication during programming and operation.

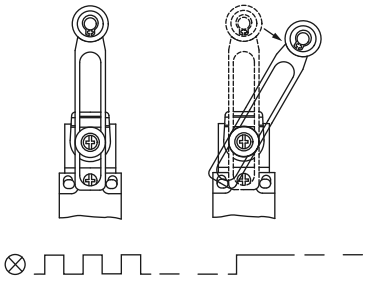
The LSE-AI (4–20 mA) and LSE-AU (0–10V) analog position switches take position data and convert to an analog current or voltage value that can then be continuously fed into an automation system. These two switches also feature a diagnostic output for additional data processing.

This ensures that a safe operating state can be monitored and evaluated at any time. A self-test function is also present on these models. Outputs Q1 and Q2 are continuously tested for overloads, short circuits to 0V and short circuits to $+U_e$.

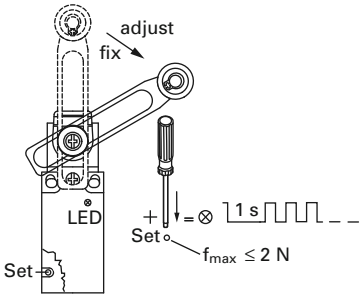
Like the electromechanical position switches, LS-Titan electronic position switches meet Category 3 or 4 of the EN 954-1 standard for machine safety when configured as a redundant system. All devices are thus suitable for safety applications that are used for the protection of persons or processes.

Operating Point Adjustment

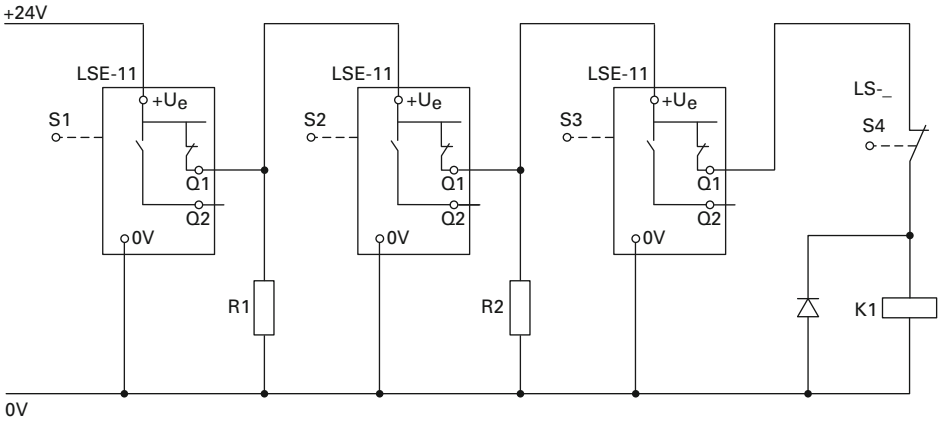
LSE-11



LSE-02



Example of LS-Titan LSE Models in a Safety-Oriented Circuit



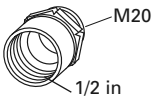
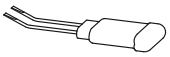
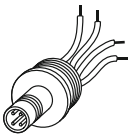
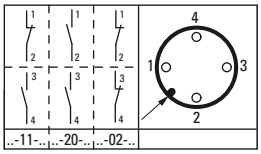
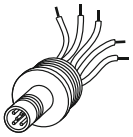
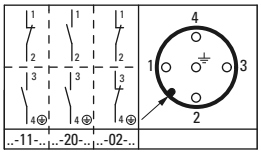
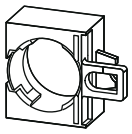
Notes

LSE-11 and LSE-02—individual operating point adjustment.

LSE-11 and LSE-02 can be used in safety circuits.
S1 is connected to 24 Vdc
S2, S3 each switch with a delay of 0.7s
R1, R2, e.g., series element M22-XLED60 (2820 ohms/0.5W)

Accessories

LS-Titan Safety Switches

	For Use With	Description	Notes	Catalog Number
V1-2-M20 	Any	M20 screw terminal in 1/2 in. For use with American pipe thread, metal.	The screw connection must be earthed. Not total insulation.	**V1-2-M20-NA**
	Any	M20 screw terminal in 1/2 in. For use with American pipe thread, molded material.	—	**V1-2-M20**
EMS20 	Any	M20 diaphragm bolt. With internal push-through membrane. Will fit cable with an external diameter of up to 13 mm. Rated IP65 with cable inserted.	—	**EMS20**
LS-XTW 	Any	Cage Clamp tool.	—	**LS-XTW**
M12A 	LS-Titan plastic bodies (LS-_)	Plug connector, 12 mm, 4-pin male connector M12x1 (M12x1). Rated IP65. Molded material. Color coded to IEC/EN 60947-5-2.		**MS12A**
M12A5 	LS-Titan metal bodies (LSM-_)	Plug connector, 12 mm, 5-pin male connector (M12x1). Rated IP65. Molded material. Color coded to IEC/EN 60947-5-2.		**MS12A5**
M22-LS 	Any	Allows mounting of M22 pushbuttons. (See the M22 catalog, CA04716001E, for a full selection of pushbuttons.)	—	**M22-LS**

Technical Data and Specifications

LS-Titan Miniature DIN Switches—IP66, IP67 Complete Units

	Units		LS, LSM	LSE-11/LSE-02	LSE-AI ①	LSE-AU ①
General						
Standards			IEC/EN 60947	IEC/EN 60947 EN 61000-4	IEC/EN 60947 EN 61000-4	IEC/EN 60947 EN 61000-4
Climatic proofing			Damp heat, constant, to IEC 60068-2-78; damp heat, cyclical, to IEC 60068-2-30	Damp heat, constant, to IEC 60068-2-78; damp heat, cyclical, to IEC 60068-2-30	Damp heat, constant, to IEC 60068-2-78; damp heat, cyclical, to IEC 60068-2-30	Damp heat, constant, to IEC 60068-2-78; damp heat, cyclical, to IEC 60068-2-30
Ambient temperature		°F (°C)	–13° to 158°F (–25° to 70°C)	–13° to 158°F (–25° to 70°C)	–13° to 158°F (–25° to 70°C)	–13° to 158°F (–25° to 70°C)
Mounting position			As required	As required	As required	As required
Protection type			IP66, IP67	IP66, IP67	IP66, IP67	IP66, IP67
Terminal capacity of screw terminal and Cage Clamp						
Solid		mm^2	1 x (0.5–2.5)	1 x (0.5–2.5)	1 x (0.5–2.5)	1 x (0.5–2.5)
Flexible with ferrules to DIN 46228		mm^2	1 x (0.5–1.5)	1 x (0.5–1.5)	1 x (0.5–1.5)	1 x (0.5–1.5)
Power Supply						
Rated voltage	U_e	Vdc	N/A	12–30	24 (–15%/+20%)	24 (–15%/+20%)
Burden current						
12V	I_e	mA	N/A	15	N/A	N/A
24V	I_e	mA	N/A	18	28–45	24
30V	I	mA	N/A	19	N/A	N/A
Contacts/Switching Capacity						
Rated impulse withstand voltage	U_{imp}	Vac	4000	N/A	N/A	N/A
Rated insulation voltage	U_i	V	400	N/A	N/A	N/A
Overvoltage category/ pollution degree			III/3	III/3	N/A	N/A
Rated Operational Current						
AC-15						
24V	I_e	A	6	N/A	N/A	N/A
230V/240V	I_e	A	6	N/A	N/A	N/A
400V/415V	I_e	A	4	N/A	N/A	N/A
DC-13						
24V	I_e	A	3	0.2	N/A	N/A
110V	I_e	A	0.8	N/A	N/A	N/A
220V	I_e	A	0.3	N/A	N/A	N/A

Note

① The following applies for LSE-11 and LSE-02: ensure that the power supply operates correctly when setting the operating point.

LS-Titan Miniature DIN Switches—IP66, IP67 Complete Units. continued

		Units	LS, LSM	LSE-11/LSE-02	LSE-AI ①	LSE-AU ①
Burden Current						
Analog output Q1						
Output voltage (max. 10 mA)		Vdc	N/A	N/A		0–10
Output current		mA	N/A	N/A	4–20	
Fault scenario		V	N/A	N/A	0	0
Resolution		Steps	N/A	N/A	100	100
Step tolerance		Steps	N/A	N/A	1	1
Shunt resistor, resistive load		ohms	N/A	N/A	<400	>1000
Digital diagnostics output Q2 (switching to + pole PNP)						
Response threshold		V	N/A	N/A	Approx. U_e	Approx. U_e
		mA	N/A	N/A	<200	<200
Control circuit reliability						
At 24 Vdc/5 mA	H_F	Fault probability	$<10^{-7}$, <1 fault in 10^7 operations	N/A	N/A	N/A
At 5 Vdc/1 mA	H_F	Fault probability	$<10^{-6}$, <1 failure at 5 x 10^6 operations	N/A	N/A	N/A
Supply frequency		Hz	Max. 400	N/A	N/A	N/A
Short-circuit rating to IEC/EN 60947-5-1						
Maximum fuse		A gG/gL	6	N/A	N/A	N/A
Repetition accuracy		mm	±0.02	±0.02	±0.02	±0.02

Note

① The following applies for LSE-11 and LSE-02: ensure that the power supply operates correctly when setting the operating point.

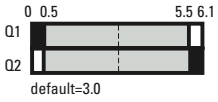
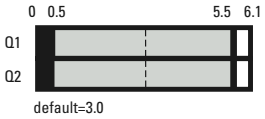
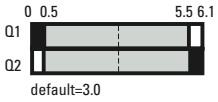
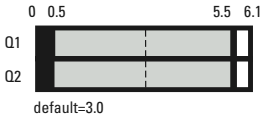
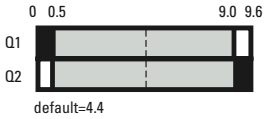
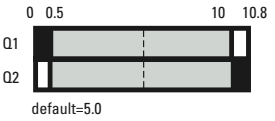
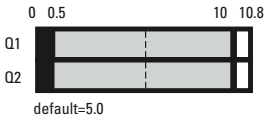
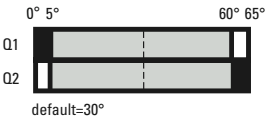
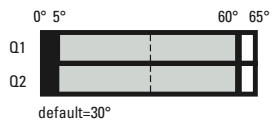
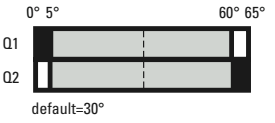
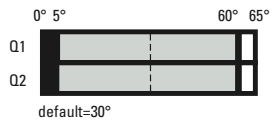
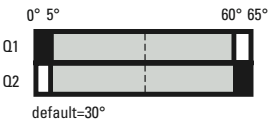
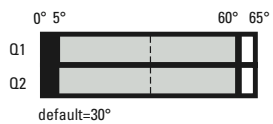
LS-Titan Miniature DIN Switches—IP66, IP67 Complete Units

	Units		LS, LSM	LSE-11/LSE-02	LSE-AI/LSE-AU	LSE-AI/LSE-AU
Mechanical Variables						
Lifespan						
Standard-action contact	Operations	X 10^6	8	N/A	N/A	N/A
Snap-action contact	Operations	X 10^6	8	3 (electronic)	N/A	N/A
Contact temperature of roller head		°C	≤100	≤100	≤100	≤100
Mechanical shock resistance (half-sinusoidal shock, 20 ms)						
Standard-action contact		g	25	N/A	N/A	N/A
Snap-action contact		9	N/A	N/A	N/A	N/A
Basic unit		g	N/A	30	30	30
Operating frequency	Operations/h		≤6000	≤3000	≤3000	≤3000
Switching point			N/A	0.5–5.5 mm freely adjustable	N/A	N/A
Hysteresis		mm	N/A	0.4	0.4	0.4
Contact sequence (contact closed open Zw = positive opening clearance)		mm	N/A	0.04	0.06	0.06
Actuation						
Mechanical						
Actuating force at beginning/ end of stroke						
Basic units		N	1.0/8.0	3.5/8.0	3.5/8.0	3.5/8.0
LS(M)-XP		N	1.0/8.0	1.0/8.0	1.0/8.0	1.0/8.0
LS(M)-XL		N	1.0/8.0	1.0/8.0	1.0/8.0	1.0/8.0
LS(M)-XLA		N	1.0/8.0	1.0/8.0	1.0/8.0	1.0/8.0
Actuating torque of rotary drives		Nm	0.2	0.2	0.2	0.2
Maximum operating speed with DIN cam						
Basic units for angle of actuation	α = 0°/30°	m/s	1/0.5	1/0.5	1/0.5	1/0.5
LS(M)-XRL for angle of actuation	α = 0°	m/s	1.5	1.5	1.5	1.5
LS(M)-XRLA for angle of actuation	α = 30°, L = 125 mm	m/s	1.5	1.5	1.5	1.5
LS(M)-XRR for angle of actuation	L = 130 mm	m/s	1.5	1.5	1.5	1.5
LS(M)-XL for angle of actuation	α = 30°/45°	m/s	1	1	1	1
LS(M)-XLA for angle of actuation	α = 30°/45°	m/s	1	1	1	1
LS(M)-XP for angle of actuation	α = 0°/30°	m/s	1/1	1/1	1/1	1/1
Electromagnetic Compatibility (EMC)						
Electrostatic discharge (IEC/EN 61000-4-2, Level 3 ESD)						
Air discharge		kV		8	8	8
Contact discharge		kV		4	4	4
Electromagnetic fields (IEC/EN 61000-403, RFI)		V/m		10	10	10
Burst pulses (IEC/EN 61000-4-4, Level 3)						
Supply cables		kV		2	2	2
Signal lines		kV		2	2	2
High-energy pulses (surge) (IEC/EN 61000-4-5)		kV		0.5	0.5	0.5
Immunity to line-conducted interference to (IEC/EN 610000-4-6)		V		10	10	10

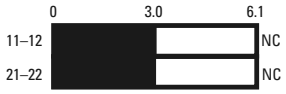
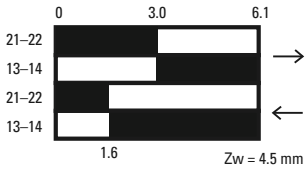
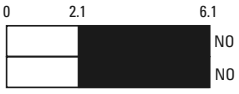
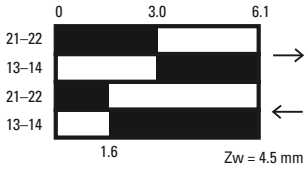
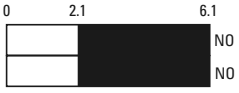
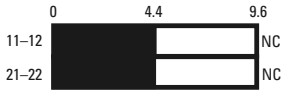
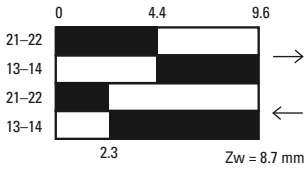
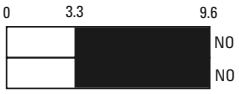
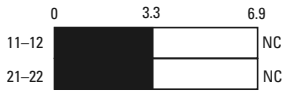
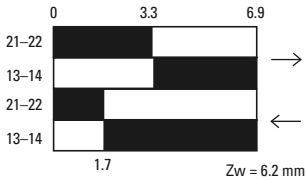
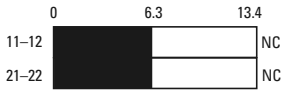
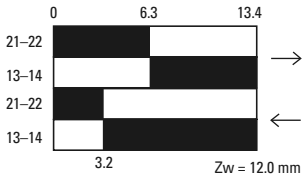
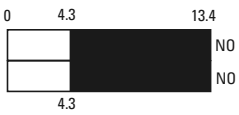
Contact Travel Diagrams

LSE

Contact Travel
■ = contact closed
□ = contact open

Description	LSE-11	LSE-02
Basic Units		
Operating Heads		
Roller plunger		
LS-XP LSM-XP		
Roller lever		
LS-XL LSM-XL LS-XL LS-XLB		
Angled roller lever		
LS-XLA LSM-XLA		
Rotary lever		
LS-XRL LSM-XRL		
Adjustable roller lever		
LS-XRLA LSM-XRLA LS-XRLA30 LS-XRLA40 LS-XRLA40R		
Actuating rod		
LS-XRR LSM-XRR LS-XRRM LSM-XRRM		
Spring rod		
LS-XS LSM-XS		

LS and LSM

Description	Contact Travel ■ = contact closed □ = contact open	LS-02, LS-S02, LSM-02 NC 12 11 NC 22 21	LS-11S, LS-S11S, LSM-11S NO 14 13 NC 22 21	LS-20A, LS-S20A, LSM-20A NO 14 13 NO 24 23
Basic Units				
Operating Heads				
Roller plunger				
LS-XP, LSM-XP				
Roller lever				
LS-XL, LSM-XL				
Roller lever, short				
LS-XLS				
Roller lever, large				
LS-XLB				

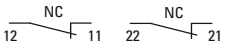
LS and LSM, continued

46

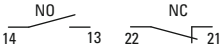
Contact Travel
■ = contact closed
□ = contact open

Description

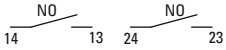
LS-02, LS-S02, LSM-02



LS-11S, LS-S11S, LSM-11S



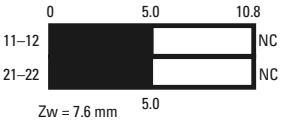
LS-20A, LS-S20A, LSM-20A

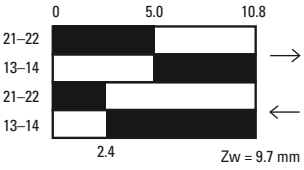


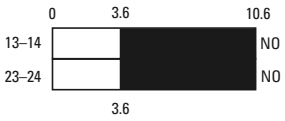
Operating Heads, continued

Angled roller lever

LS-XLA, LSM-XLA





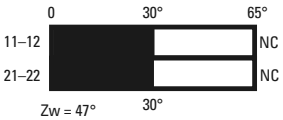


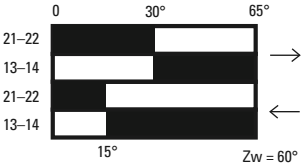
Rotary lever

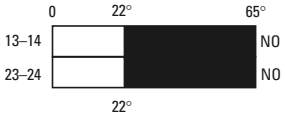
LS-XRL, LSM-XRL

Adjustable roller lever

LS-XRLA, LSM-XRLA
LS-XRLA30, LS-XRLA40
LS-XRLA40R





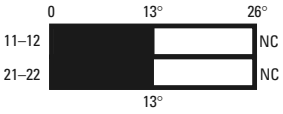


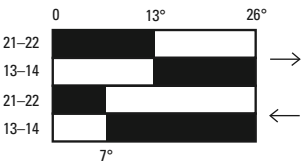
Actuating rod

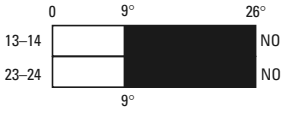
LS-XRR, LSM-XRR
LS-XRRM, LSM-XRRM

Spring rod

LS-XS, LSM-XS







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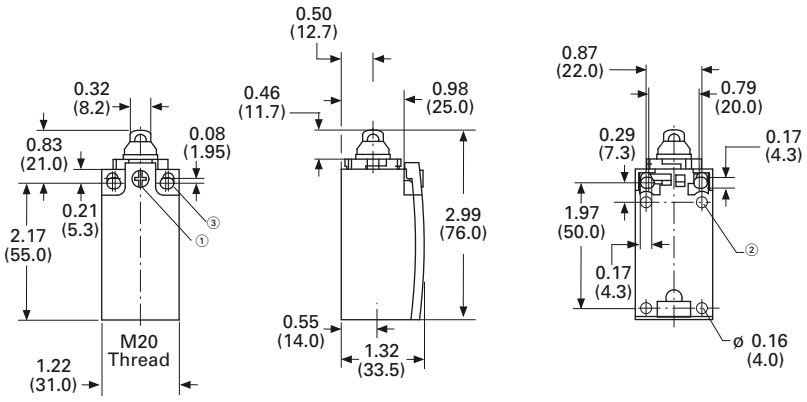
Dimensions

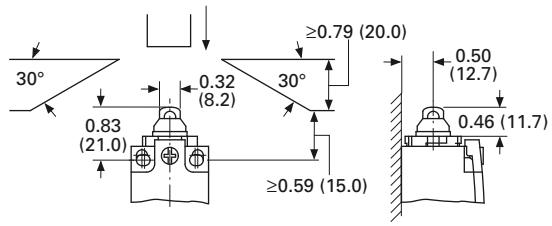
Approximate Dimensions in Inches (mm)

Position Switches

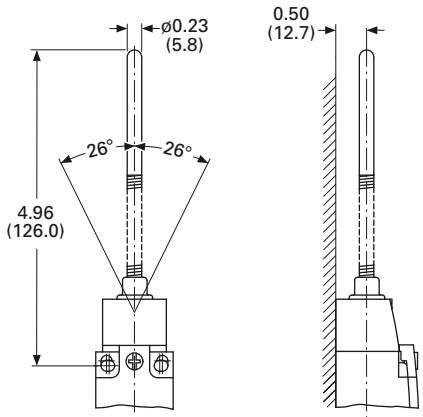
LS-_, LSM-_, LSE-_



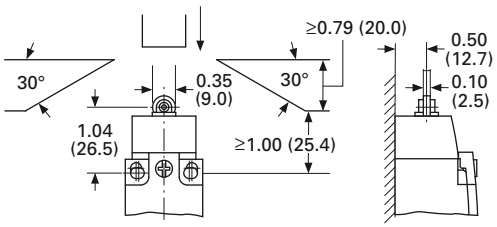
LS-_, LSM-_, LSE-_



LS(M)-_/S



LS(M)-_/P



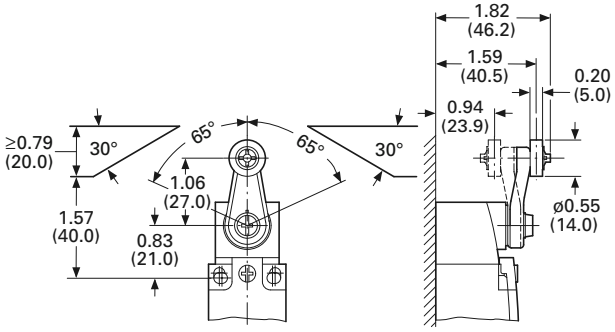
Notes

① Tightening torque of cover screws: 0.8 Nm ±0.2 Nm.
② Only with LS (insulated version).
③ Fixing screws 2 x M4 ≥30
M_A = 1.5 Nm

Approximate Dimensions in Inches (mm)

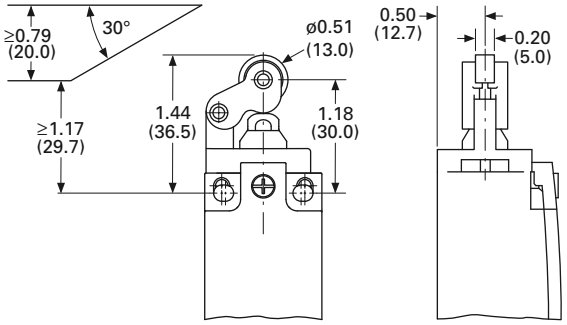
Rotary Lever

LS(M)-_/RL



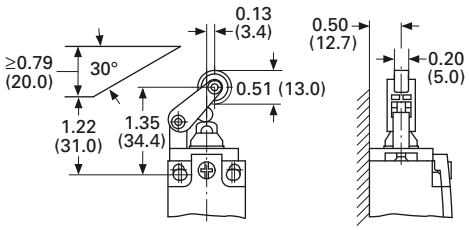
Roller Lever, Short

LS(M)-_/LS



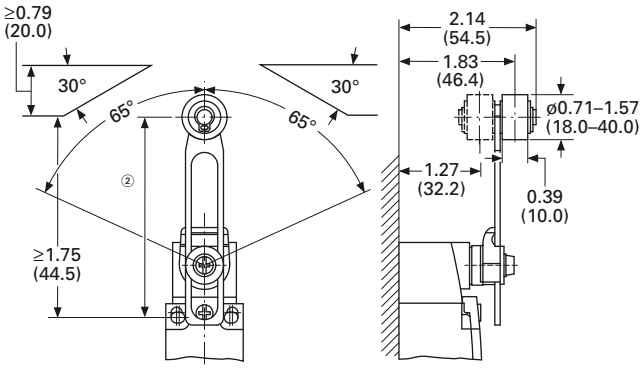
Roller Lever

LS(M)-_/L



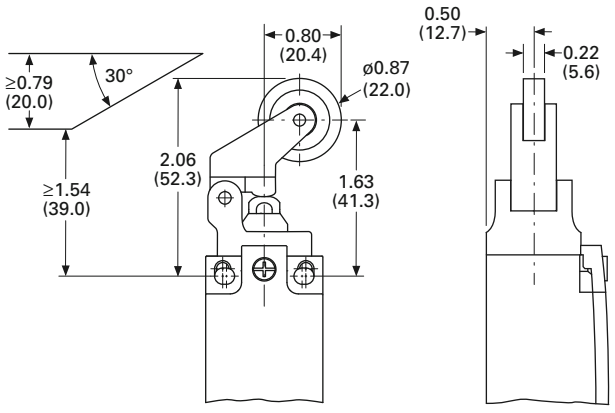
Adjustable Roller Lever

LS(M)-_/RLA



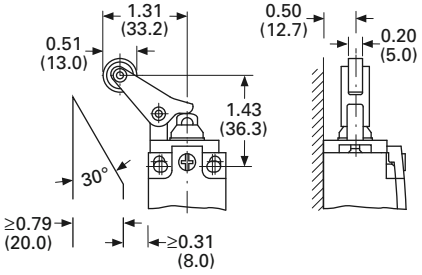
Roller Lever, Large

LS(M)-_/LB ①



Angled Roller Lever

LS(M)-_/XLA



Notes

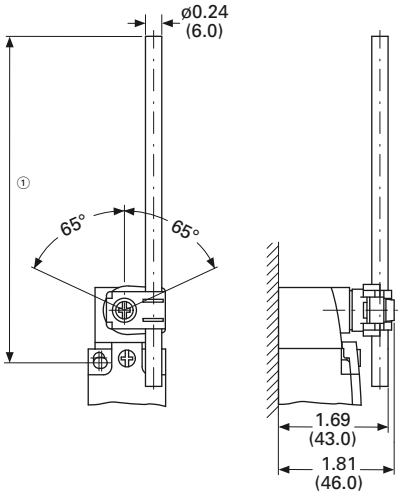
① Tightening torque of cover screws: 0.8 Nm ±0.2 Nm.

② Setting range of 54.5 to 97.

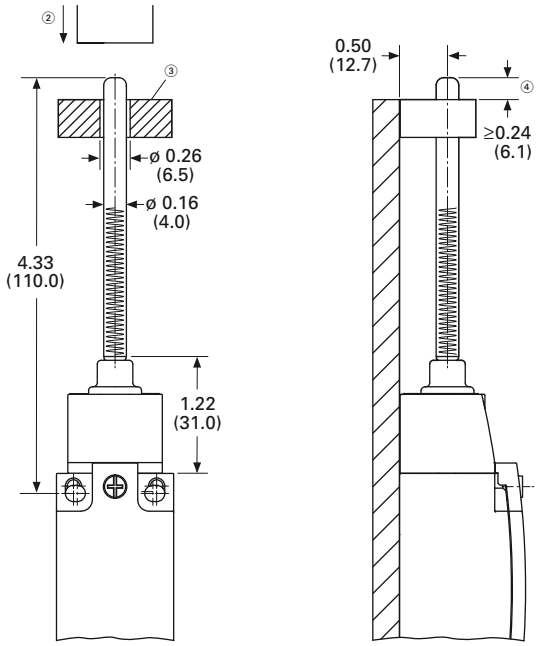
Approximate Dimensions in Inches (mm)

Actuating Rod

LS(M)-_/RR



LS(M)-_/OR



Notes

① LS_/RR ≤150
LS_/RRM ≤210
② Approach direction, vertical.
③ Guide is done by customer, not included.
④ Maximum push-through.

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LS-Titan Safety Interlock Switches



Contents

Description	*Page*
LS-Titan Safety Interlock Switches	
Product Identification	25
Product Selection	
LS-Titan Miniature DIN Safety Interlock Switches	26
LS-Titan Full-Size DIN Safety Interlock Switches	27
LS-Titan Solenoid Safety Interlock Switches	27
LS-Titan Solenoid Safety Interlock Keys	28
Technical Data and Specifications	29
Mounting Instructions	30
Dimensions	31

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

total isoliert

SUVA CNA INSAI

Safety Notes

Do not use as a mechanical stop/shipping brace.

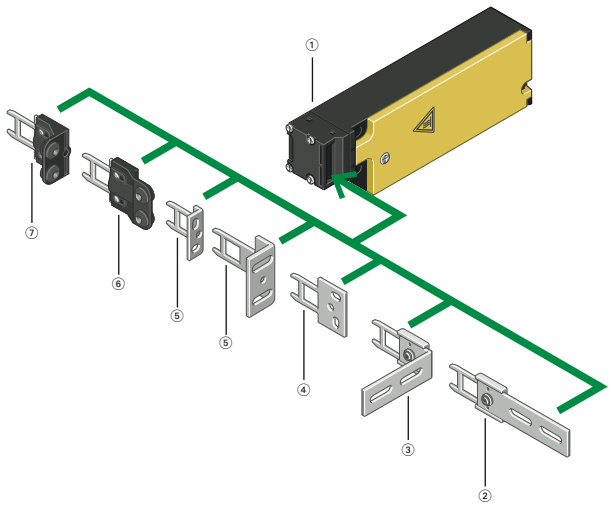
Any change to an original Eaton safety position switch is not permitted and automatically leads to the loss of all approvals.

Switch must never be used as a mechanical stop.

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

Product Identification

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



Notes

① **Basic device** (see **Page 27**)
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 28**)
For doors that do not close precisely

③ **Angled flexible actuator** (see **Page 28**)
For doors that do not close precisely

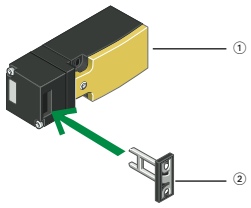
④ **Flat actuator** (see **Page 28**)
For sliding doors

⑤ **Angled actuator** (see **Page 28**)
For swing doors

⑥ **Flat compensating actuator** (see **Page 28**)
For increased tolerance compensation in the direction of door closure

⑦ **Angled compensating actuator** (see **Page 28**)
For increased tolerance compensation in the direction of door closure

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

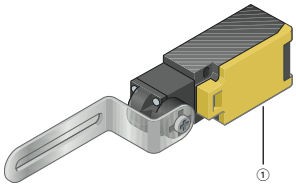


Notes

① **Complete device** (see **Page 26**)
For personnel protection
Contacts: 1NC, 1NO-1NO or 2NC
Five directions of operation possible

② **Actuator** (see **Page 26**)
Included with switch
Multiple coding protection against tampering

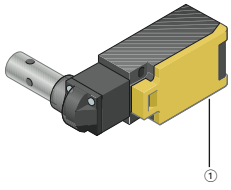
Door Flap Safety Switch (LSR-...TKG)



Note

① **Complete device** (see **Page 26**)
For personnel protection
Contacts: 1NO-1NC or 2NC
For swing doors with fixed connection to the door/hinge pin

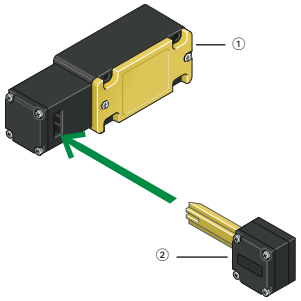
Door Hinge Safety Switch (LSR-...TS)



Note

① **Complete device** (see **Page 26**)
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 27**)
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

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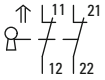
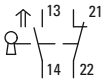
Product Selection

LS-Titan Miniature DIN Safety Interlock Switches

Key Interlock Switch



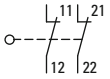
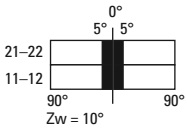
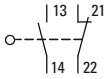
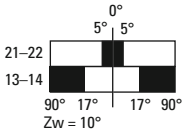
Key Interlock Switch—LS-…ZB ①

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



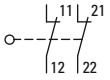
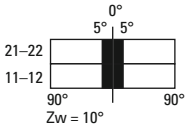
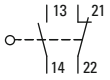
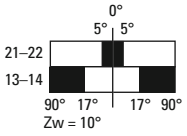
Door-Flap Switch—LSR-…TKG ①

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**

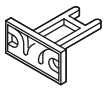
Door-Hinge Switch



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

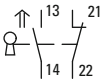
① For dimensions, see **Page 31**.

LS-Titan Full-Size DIN Safety Interlock Switches

Key Interlock Switch



Full-Size DIN—LS4-…ZB ①②

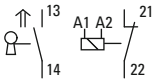
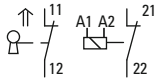
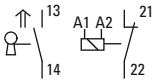
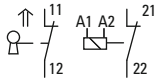
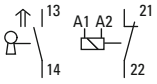
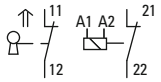
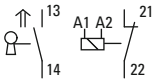
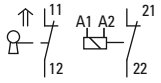
Contacts	Contact Sequence	Contact Travel	Connection	Catalog Number (Includes Key)
1NO and 1NC with positive opening		—	Screw terminal	**LS4-S11-1-I-ZB**

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 31**.
② For mounting instructions, see **Page 30**.
③ Key ordered separately, see **Page 28**.

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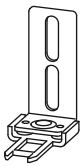
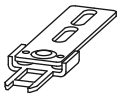
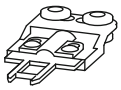
LS-Titan Solenoid Safety Interlock Keys

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 27**.
② For mounting instructions, see **Page 30**.

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.

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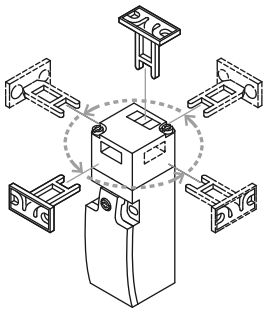
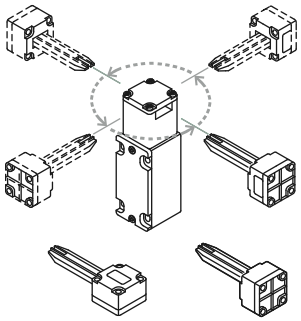
Mounting Instructions

LS-…ZB, TKG, TS



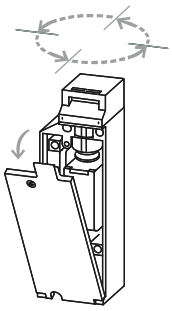
Actuator can be repositioned for horizontal or vertical installation. The operating heads can be rotated manually in 90° steps to suit the specified direction of operation.

LS4-…ZB

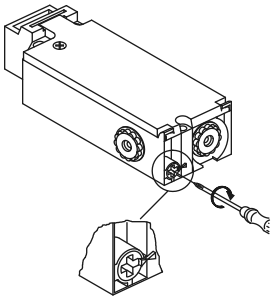


Actuator can be repositioned for horizontal or vertical installation. The operating heads can be rotated manually in 90° steps to suit the specified direction of operation.

LS-…ZBZ



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



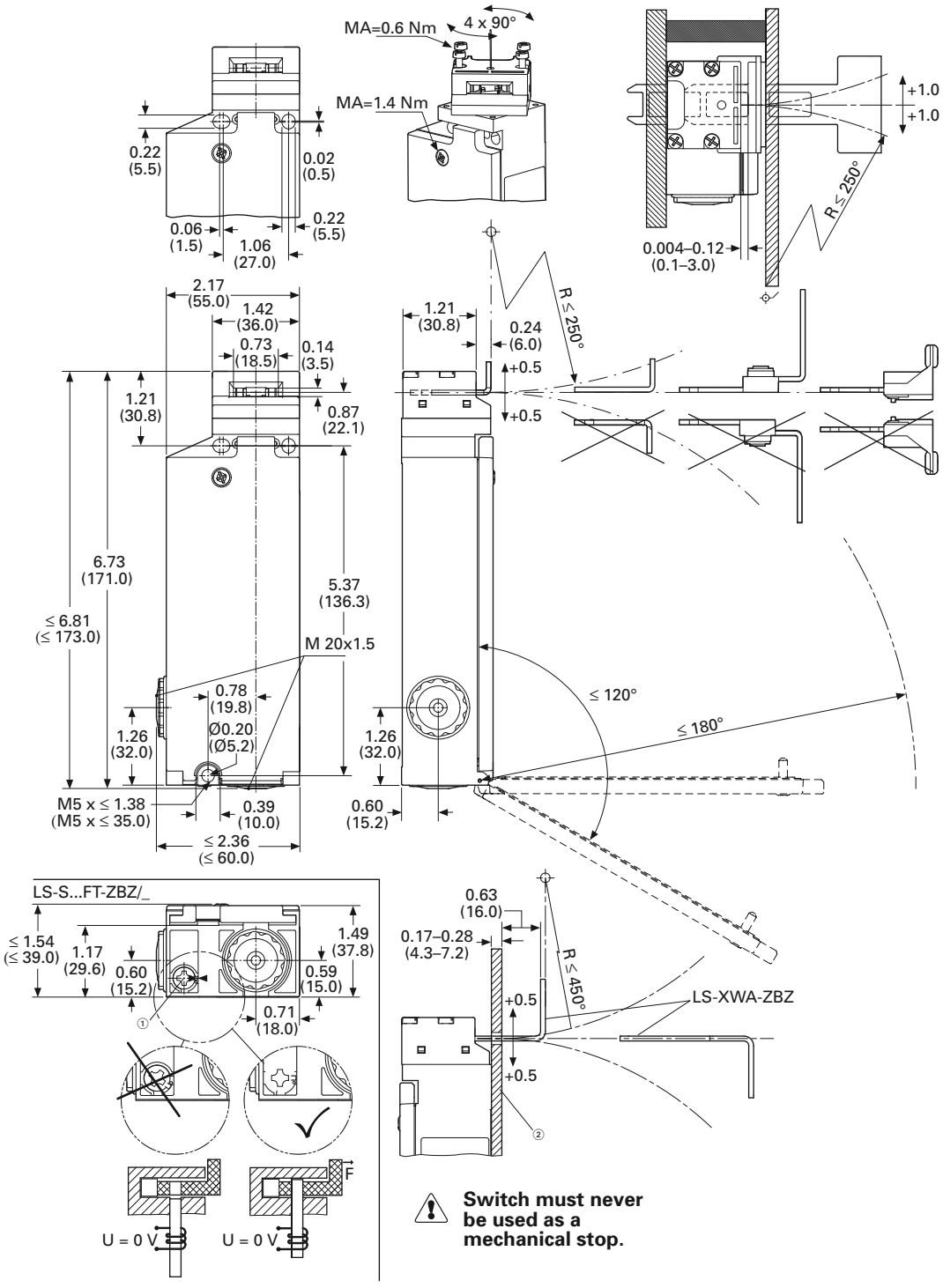
In the event of a loss of voltage, (e.g., during commissioning), the spring-powered LS-…-….FT-ZBZ can be released with a screwdriver. **The auxiliary release mechanism must be sealed**.

Dimensions

Approximate Dimensions in Inches (mm)

Safety Position Switches

LS...-ZB



Notes

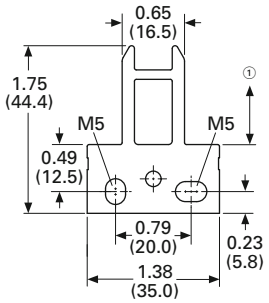
① The auxiliary release mechanism must be sealed for proper operation.

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

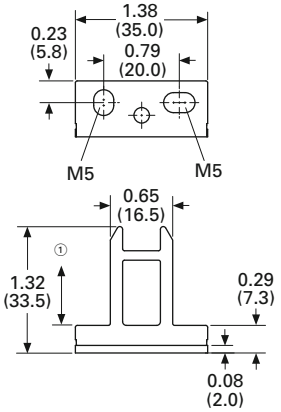
Approximate Dimensions in Inches (mm)

Actuators

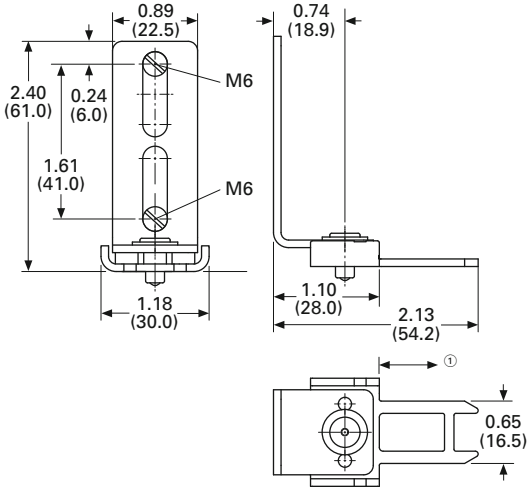
LS-XG-ZBZ



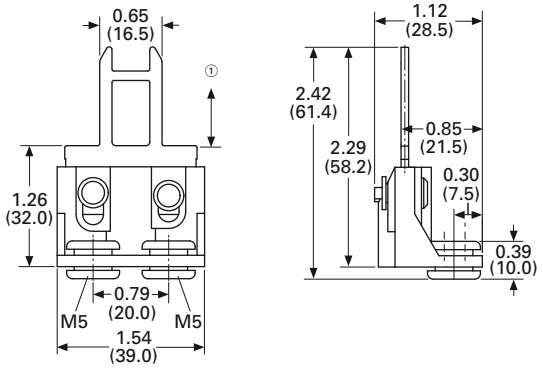
LS-XW-ZBZ



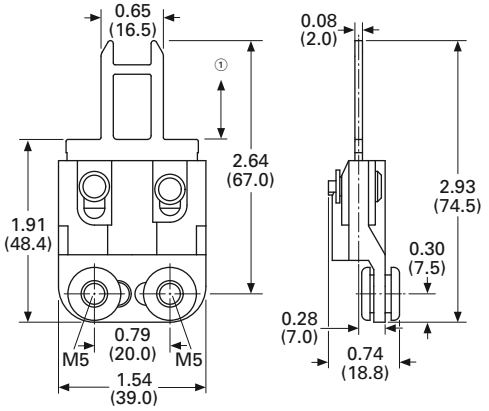
LS-XF-ZBZ



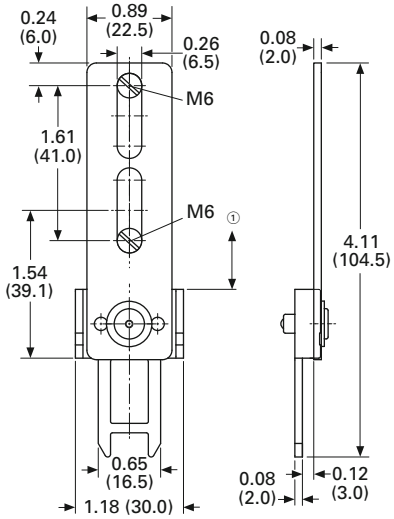
LS-XNW-ZBZ ②



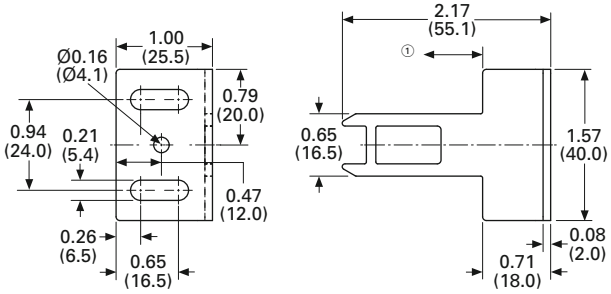
LS-XNG-ZBZ ②



LS-XFG-ZBZ



LS-XWA-ZBZ ③



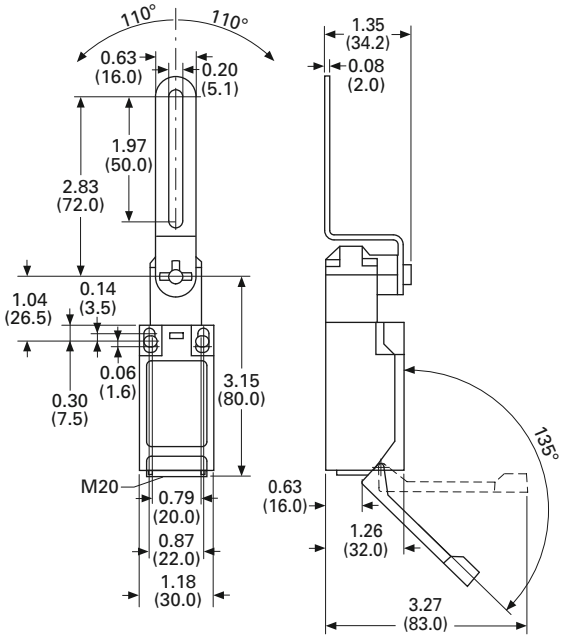
Notes

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.

Approximate Dimensions in Inches (mm)

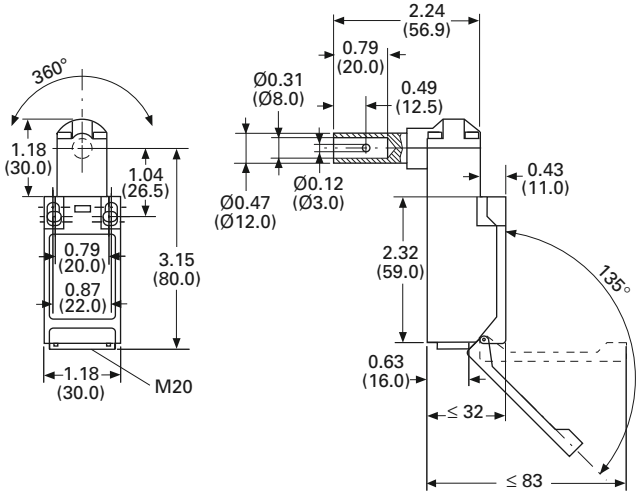
Safety Door Flap Switch

LSR-.../TKG



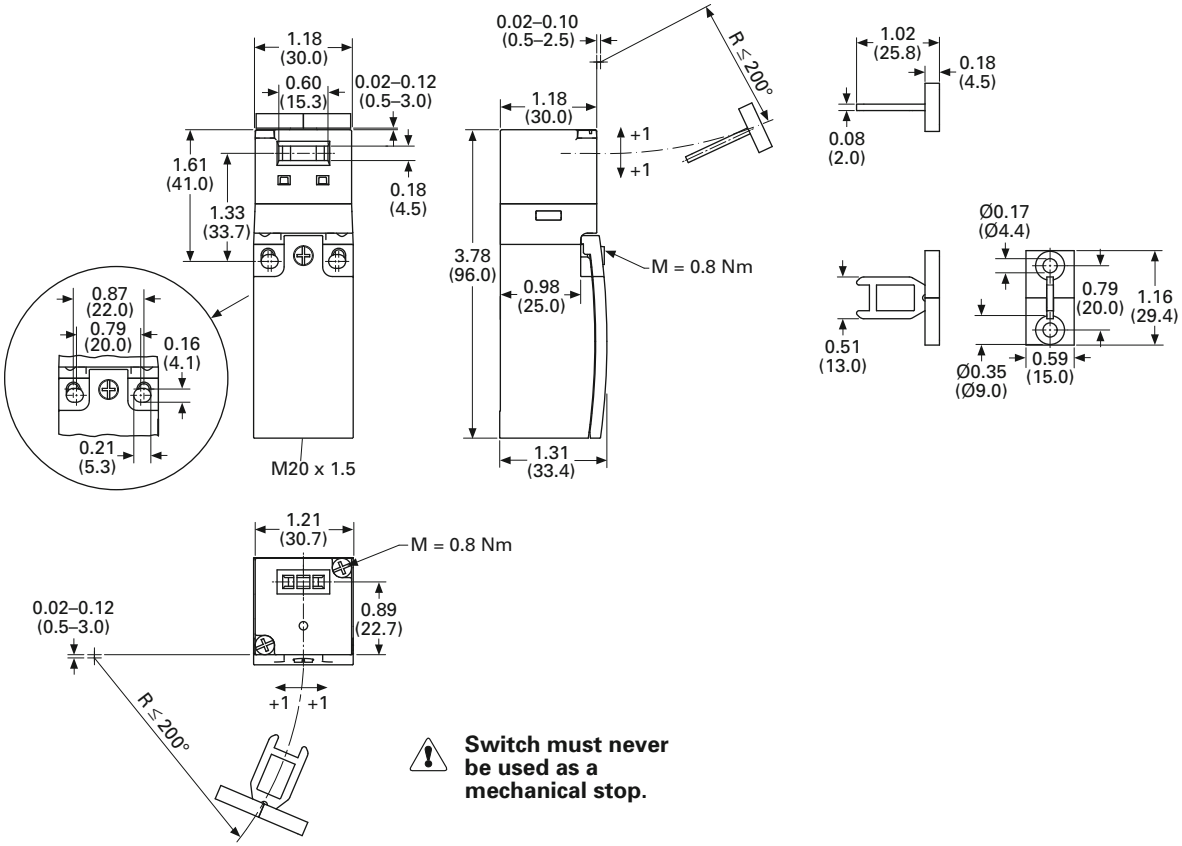
Safety Hinge Switch

LSR-.../TS



Safety Position Switches

LS...-ZB

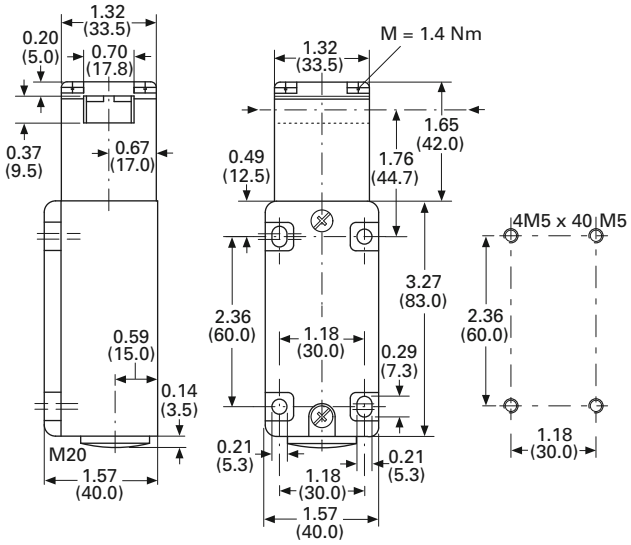


Switch must never be used as a mechanical stop.

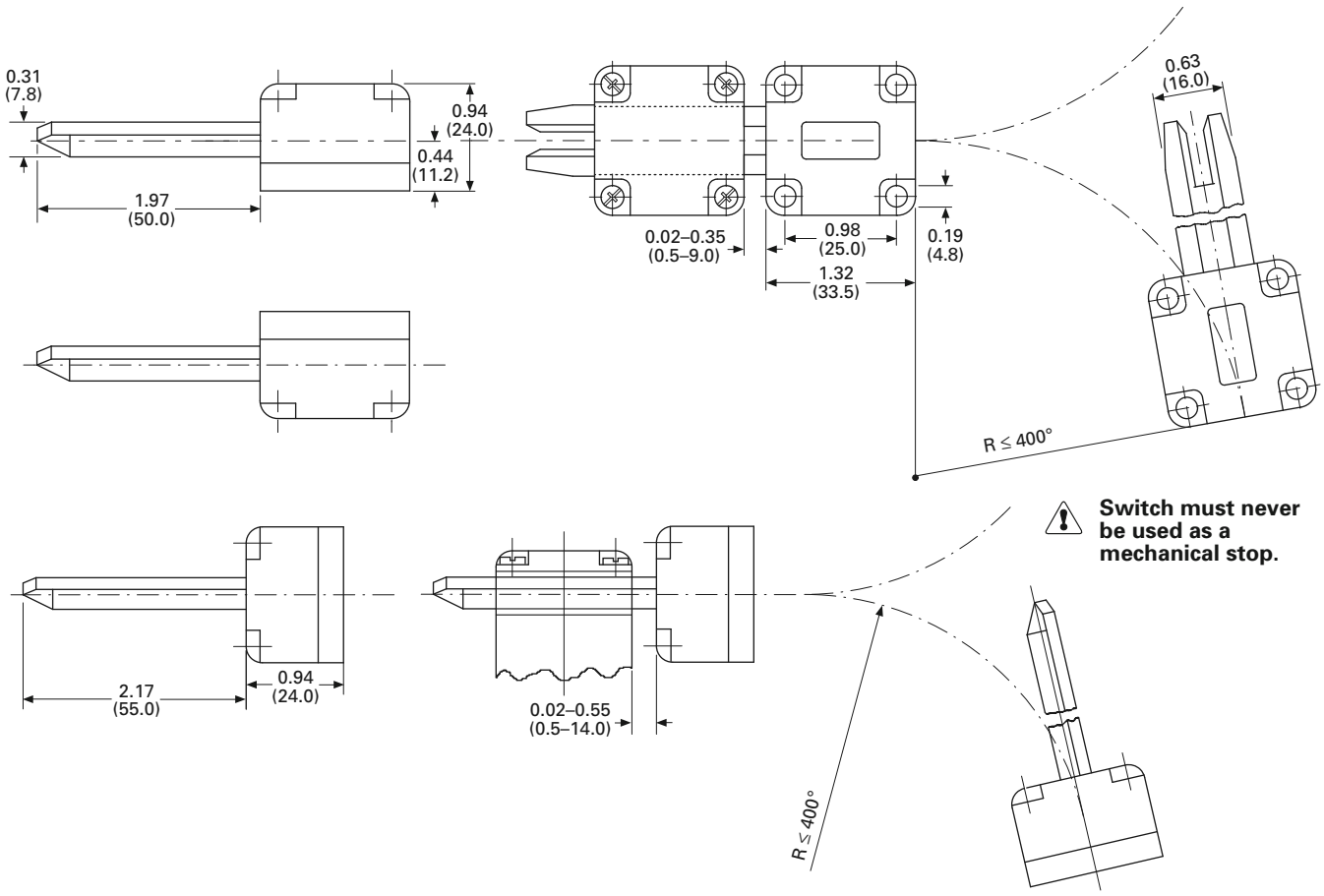
Approximate Dimensions in Inches (mm)

Safety Position Switches

LS4...ZB



Actuator—Included with Switch Above



Switch must never be used as a mechanical stop.

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