

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.

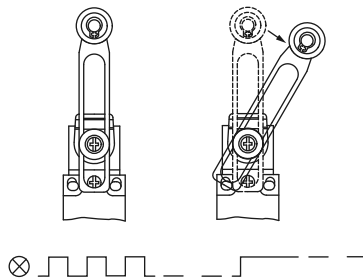
The LSE-AI (4–20 mA) and LSE-AU (0–10V) analog position switches take position data and convert to an analog current or voltage value that can then be continuously fed into an automation system. These two switches also feature a diagnostic output for additional data processing.

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.

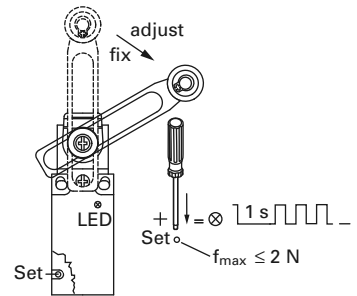
Like the electromechanical position switches, LS-Titan electronic position switches meet Category 3 or 4 of the EN 954-1 standard for machine safety when configured as a redundant system. All devices are thus suitable for safety applications that are used for the protection of persons or processes.

Operating Point Adjustment

LSE-11

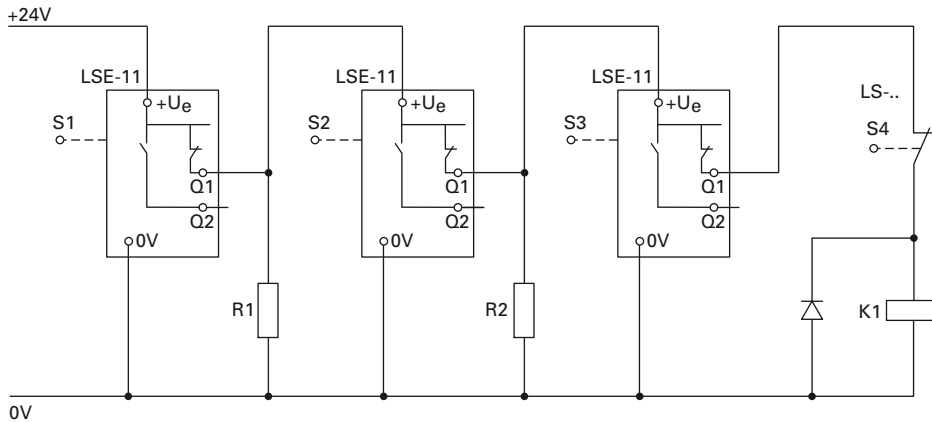


LSE-02



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

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



Note: 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)

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	°C	–25 to +70		–25 to +70	–25 to +70	–25 to +70
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.

2.3

Limit Switches

LS-Titan Miniature DIN Switches

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
At 5 Vdc/1 mA	H_F	Fault probability	$<10^{-6}$, <1 failure at 5×10^6 operations	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		g	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	$\alpha = 0^\circ/30^\circ$	m/s	1/0.5	1/0.5	1/0.5	1/0.5
LS(M)-XRL for angle of actuation	$\alpha = 0^\circ$	m/s	1.5	1.5	1.5	1.5
LS(M)-XRLA for angle of actuation	$\alpha = 30^\circ, L = 125 \text{ mm}$	m/s	1.5	1.5	1.5	1.5
LS(M)-XRR for angle of actuation	$L = 130 \text{ mm}$	m/s	1.5	1.5	1.5	1.5
LS(M)-XL for angle of actuation	$\alpha = 30^\circ/45^\circ$	m/s	1	1	1	1
LS(M)-XLA for angle of actuation	$\alpha = 30^\circ/45^\circ$	m/s	1	1	1	1
LS(M)-XP for angle of actuation	$\alpha = 0^\circ/30^\circ$	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

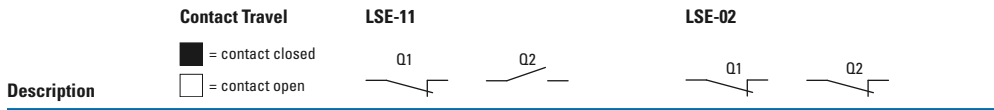
2.3

Limit Switches

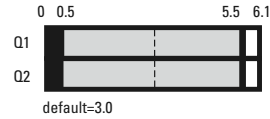
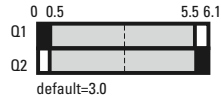
LS-Titan Miniature DIN Switches

Contact Travel Diagrams

LSE



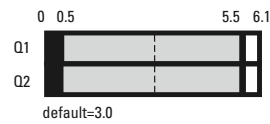
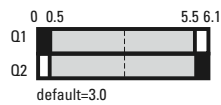
Basic Units



Operating Heads

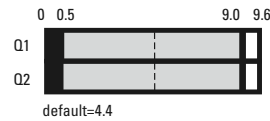
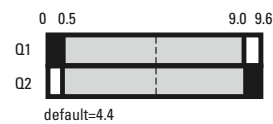
Roller plunger

LS-XP
LSM-XP



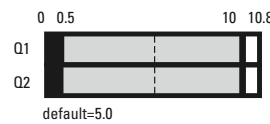
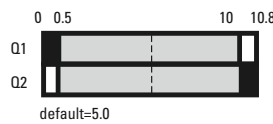
Roller lever

LS-XL
LSM-XL
LS-XL
LS-XLB



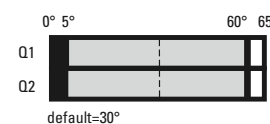
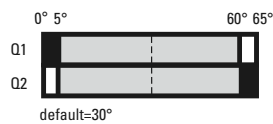
Angled roller lever

LS-XLA
LSM-XLA



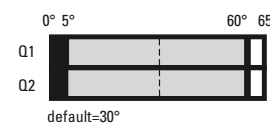
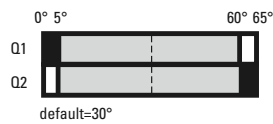
Rotary lever

LS-XRL
LSM-XRL



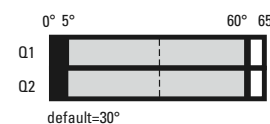
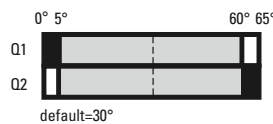
Adjustable roller lever

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



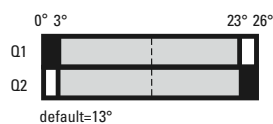
Actuating rod

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



Spring rod

LS-XS
LSM-XS



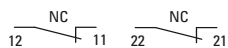
LS and LSM

Contact Travel

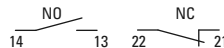
= contact closed
 = contact open

Description

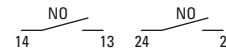
LS-02, LS-S02, LSM-02



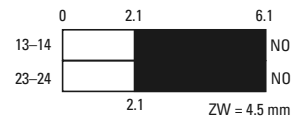
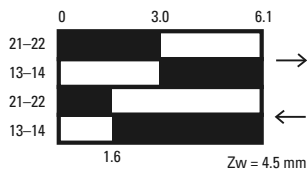
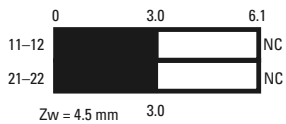
LS-11S, LS-S11S, LSM-11S



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



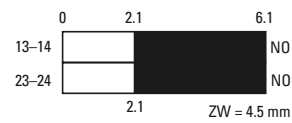
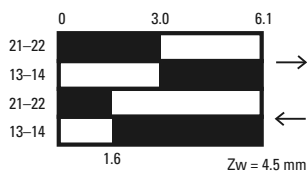
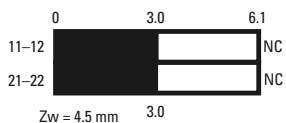
Basic Units



Operating Heads

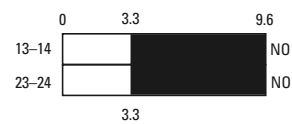
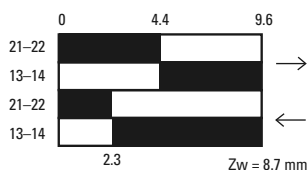
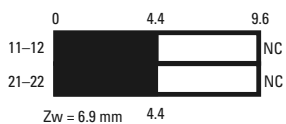
Roller plunger

LS-XP, LSM-XP



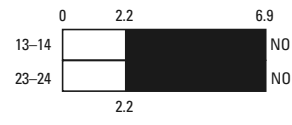
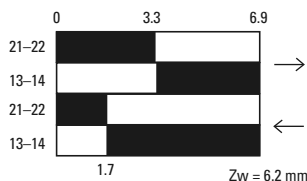
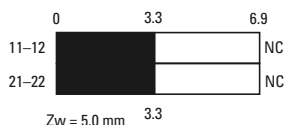
Roller lever

LS-XL, LSM-XL



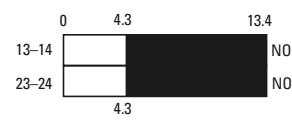
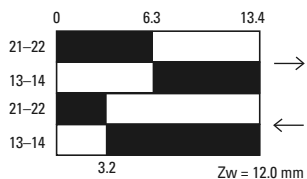
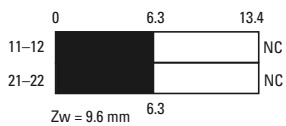
Roller lever, short

LS-XLS



Roller lever, large

LS-XLB

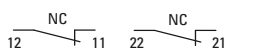
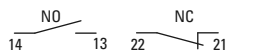
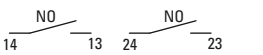
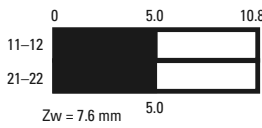
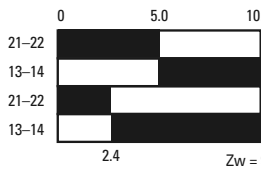
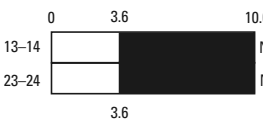

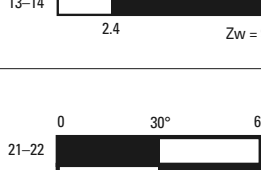



2.3

Limit Switches

LS-Titan Miniature DIN Switches

LS and LSM, continued

Description	Contact Travel	LS-02, LS-S02, LSM-02	LS-11S, LS-S11S, LSM-11S	LS-20A, LS-S20A, LSM-20A
Operating Heads	■ = contact closed □ = contact open			
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		