

MICRO SWITCH™ HDLS Series

Heavy-Duty Limit Switches

DESCRIPTION

Honeywell Sensing and Control's MICRO SWITCH™ heavy-duty limit switches' modular construction allows for a wide variety of actuator styles, operating heads, and electrical circuitry options. The plug-in versions greatly reduce downtime on high production lines as replacement of the switch is accomplished in seconds. The base receptacle contains all the wiring and conduit connection while the switching component with operating head easily assembles to the base and is attached with two screws.

FEATURES AND BENEFITS

- Rugged, zinc die-cast housings with epoxy coating for indoor and outdoor applications
- Sealed to NEMA 1, 3, 4, 4X, 6, 6P, 12, 13; IP 65/66/67
- Full complement of bodies and head styles for design flexibility
- Wide variety of actuators and electrical circuitry options available
- Conduit options available for global applications
- Rotary actuated heads are field adjustable for CW actuation, CCW actuation or both to reduce inventory
- Keyed head design for secure head-to-body retention and 90 degree head rotation
- Plug-in and non plug-in bodies have identical operating characteristics and dimensionally interchangeable
- Actuating levers for single and double pole, plug-in and non plug-in bodies provide same tracking and minimize inventory
- UL, CSA, CE, and CCC for global use
- Fluorosilicone seals available for low temperature applications
- Fluorocarbon seals available for chemically harsh environments and higher temperature applications.
- Self-lifting pressure plate terminals saves wiring time



APPLICATIONS

- Material handling
- Balers/compactors
- Automotive machine tools
- Conveyors
- Food & beverage machinery
- Machine tools
- Power plants
- Off-road equipment
- Agricultural equipment
- Valves
- Shipboard and dockside

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MICRO SWITCH™ HDLS Series

Figure 1. MICRO SWITCH™ HDLS SERIES FEATURES AND OPTIONS



Heavy Duty Limit Switches

Table 1. General MICRO SWITCH™ HDLS Series Specifications

Characteristic	Parameter
Product Type	MICRO SWITCH™ Heavy-Duty Limit Switches
Actuators	Side plunger - adjustable Side roller plunger Top plunger - adjustable Top rotary Wobble - coil spring Side plunger - pin Side rotary Top plunger - pin Wobble - cable Wobble - plastic rod Side plunger maintained - pin Side rotary maintained Top roller plunger Wobble - cat whisker Wobble - spring wire
Circuitry	1NC 1NO SPDT snap action, double break 2NC 2NO DPDT center neutral, snap action, double break 2NC 2NO DPDT snap action, double break 2NC 2NO DPDT sequential, snap action, double break
Electrical	10 A thermal Single and double pole: AC15 A600; DC13 R300
Housing Material	Zinc die-cast with an electrostatic epoxy coating
Termination Types	0.5 in - 14NPT conduit PG 13,5 conduit 4-pin mini-style connector 6 ft cable 0.75 in - 14NPT conduit 20 mm conduit 5-pin mini-style connector Manifold mounting 12 ft cable 4-pin micro-style connector 9-pin mini-style connector
Housing Type	HDLS Plug-in, HDLS Non-Plug-in
Sealing	IP65/66/67; NEMA 1, 3, 4, 4X, 6, 6P, 12, 13
Operating Temperature	-12 °C to 121 °C [10 °F to 250 °F]; optional: -40 °C to 121 °C [-40 °F to 250 °F]
Agency Approvals and Standards	UL, CE, CSA, CCC
UNSPSC Code	302119
UNSPSC Commodity	302119 Switches and controls and relays
Sealed	Industrial

MICRO SWITCH™ HDLS Series

MICRO SWITCH™ HDLS SERIES OPERATING HEADS

SIDE ROTARY: Available levers provide greater versatility. Heads may be positioned with shaft on any side. All are momentary action except maintained head (LSN Series).



LSA - Standard: 60° minimum overtravel, 15° maximum pretravel, 5° (single pole) and 7° (double pole) maximum differential travel. Operating temperature range from -12 °C to 121 °C [10 °F to 250 °F].*

LSR - Low operating torque: 60° minimum overtravel, 15° maximum pretravel, 0.19 Nm [1.7 in lb] maximum operating torque. Operating temperature range from -1 °C to 121 °C [250 °F to 250 °F].*

LSN - Maintained contact: Maintained on counterclockwise rotation and reset on clockwise rotation, and vice versa. Operating temperature range from -1 °C to 121 °C [30 °F to 250 °F].

LSP - Low differential: 68° minimum overtravel, 7° maximum pretravel, 3° (single pole) and 4° (double pole) maximum differential travel. Operating temperature range from -12 °C to 121 °C [10 °F to 250 °F].*

LSH - Low torque, low differential travel: 68° minimum overtravel. Features low operating torque and narrow differential travel. Operating temperature range from -1 °C to 121 °C [30 °F to 250 °F].*

LSU - Low pretravel: 5° max. pretravel, 70° min. overtravel, and a second step of 18° max. Operating temperature range from -12 °C to 121 °C [10 °F to 250 °F].*

LSL - Sequence action: 48° minimum overtravel. Delayed action between operation of two poles. Operating temperature range from -12 °C to 121 °C [10 °F to 250 °F].*

LSM - Center neutral: 53° minimum overtravel. One set of contacts operates on the clockwise rotation, and another set on the counterclockwise rotation. Operating temperature range from -1 °C to 121 °C [30 °F to 250 °F].*

LST - Momentary action with extra low torque: 12 in oz of operating and full travel torque with momentary action. Operating temperature range from -12 °C to 121 °C [10 °F to 250 °F].*

LSS - Gravity return: Has no return spring mechanism so weight of the lever must provide the return force. Extremely light operating torque (5 in oz max.) is useful in conveyor applications and can be operated by small or lightweight objects. Operating temperature range from -1 °C to 121 °C [30 °F to 250 °F].*

TOP ROTARY: Available levers provide greater versatility. Heads may be positioned with shaft on any side. All are momentary action except maintained head.



LSB: With 100° minimum overtravel. Various levers that fit side rotary shafts may be used on the top rotary shaft. Switch is ideal when increased overtravel is required. Momentary action. Standard operating temperature range from -1 °C to 121 °C [30 °F to 250 °F].*

TOP PLUNGERS: Available with 4,83 mm [0.19 in] minimum overtravel. Top pin plungers are offered in pin plunger, an adjustable plunger, and a roller plunger. Standard temperature range of -12 °C to 93 °C [10 °F to 200 °F].



LSC - Top pin plunger: A corrosion-resistant steel plunger for in-line actuating motion. Oil-tight seals on plunger and between the operating head and housing keep out coolant, dust, and chips. Momentary action.



LSD - Top roller plunger: A corrosion-resistant steel roller and plunger that is adjustable to 90° angles to accept cam or slide operation from any of two directions. Boot seal on the plunger. Momentary action



LSV - Adjustable top pin plunger: Provides easy application and saves on installation time. The operating points of the switch can be adjusted from 52,8 mm to 59,3 mm [2.085 in to 2.335 in]. Seals are the same as the pin plunger. Momentary action.

*(Fluorocarbon seals are preferred for temperatures above 93 °C [200 °F]).

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MICRO SWITCH™ HDLS SERIES OPERATING HEADS

SIDE PLUNGERS: Available with 4,83 mm [0.19 in] minimum overtravel. Side plungers are offered in plain plunger, an adjustable plain plunger, a roller plunger, and a maintained plunger. Standard temperature range of -12 °C to 93 °C [10 °F to 200 °F].

	LSE - Side pin plunger: For actuating motion inline with the plunger travel. Actuating head may be faced in any of four positions, 90° apart. A boot seal on the plunger and a gasket seal between the head and housing keep out coolant, dust, and chips. Momentary action.
	LSF - Side roller plunger: Fits close quarters under cams and slides. The head may be faced in any of four positions, 90° apart. <u>The roller can be turned vertical or horizontal to the switch.</u> Boot seal on plunger. Momentary action.
	LSW - Adjustable side pin plunger: Has the same features of the side plain plunger plus the means to adjust the operating points of the switch from 41 mm to 47,4 mm [1.615 in to 1.865 in]. Momentary action.
	LSG - Maintained contact side pin plunger: Offers a maintained contact on actuation of the switch. A reverse motion of the plunger resets the switch. Sealing is the same as other side plunger actuation heads. Operating temperature range is -1 °C to 93 °C [30 °F to 200 °F].

WOBBLE LEVER ACTUATING HEADS: Heads come with either a spring wire, Delrin® plastic rod, or steel cat whisker. Any movement of the lever (except pull) will actuate the switch. Standard temperature range of -12 °C to 93 °C [10 °F to 200 °F].

				
LSJ1A-7M - Spring wire: 300 Series SST wire may be formed for special applications.	LSJ1A-7N - Flexible actuator: Designed with a tin-plated cable.	LSK1A-8C - Coil spring: Designed with a 300 Series SST coil spring.	LSJ1A-7A - Plastic rod: Recommended where possible scratching or marring by the actuator is to be avoided.	LSK1A-8A - Cat whisker: 300 Series SST actuator designed for low operating force applications.

*(Fluorocarbon seals are preferred for temperatures above 93 °C [200 °F]).

MICRO SWITCH™ HDLS Series

SPECIAL OPTIONS

HIGH TEMPERATURE/CHEMICAL RESISTANT SWITCHES

Completely fluorocarbon (FC)-sealed switches have a full FC body gasket coving the switch cavity. Rotary types have an extra FC seal on the operating shaft, while plunger versions have FC boot seals. They are for use in applications where the environment includes fire-resistant synthetic fluids. In addition to most all fluids, the FC-sealed switches may be used with such industrial fluids such as Cellulube, Fyrquell, Houghto-Safe, Pydraul, and other special cutting and hydraulic fluids. The additional FC seals also promote longer operating life for rotary-actuated HDLS switches in applications where the temperatures are normally -12 °C to 121 °C [10 °F to 250 °F]. If pre-wired with cable, then temperature limits are 105 °C [221 °F] dry and 60 °C [140 °F] wet.

To order, insert the additional letters **Y** and **C** in the appropriate places in the standard catalog listing, as shown below:

LSA1A	standard, side-rotary plug-in switch
LSYAC1A	completely FC-sealed version of LSA1A

LOW TEMPERATURE SWITCHES

All forms of HDLS limit switches are also available in low-temperature construction. Design features include fluorosilicone diaphragm, shaft seals, and external booth seal (where applicable). If pre-wired with a cable, low temperature limits are -10 °C [14 °F] flex and -30 °C [-22 °F] non-flex.

To order, insert the additional letters **Y** and **B** in the appropriate places in the standard catalog listing, as shown below:

LSA1A	standard, side-rotary plug-in switch
LSYAB1A	low-temperature version of LSA1A

CONDUIT OPENINGS

For conduit openings other than 1/2-NPT and 3/4-NPT, substitute the following after LS in the catalog listing:

LS3 PG13,5

LS4 20 mm

LSA1A	side rotary with 1/2-14 NPT conduit
LS4A1A	side rotary with 20 mm conduit

TEMPERATURE LIMITS

	Standard HDLS				Low Temperature HDLS (Fluorosilicone Sealed): Y_B				High Temperature HDLS (Fluorocarbon Sealed)*: Y_C		
	Low Limit		High Limit		Low Limit		High Limit		Low Limit		High Limit
	-12 °C [10 °F]	-1 °C [30 °F]	93 °C [200 °F]	121 °C [250 °F]	-40 °C [-40 °F]	-29 °C [-20 °F]	93 °C [200 °F]	121 °C [250 °F]	-12 °C [10 °F]	-1 °C [30 °F]	121 °C [250 °F]
LSA - Side Rotary Momentary	X			X	X			X	X		X
LSB - Top Rotary		X		X		X		X		X	X
LSC - Top Plain Plunger	X		X		X		X		X		X
LSD - Top Roller Plunger	X		X		X		X		X		X
LSE - Side Plain Plunger	X		X		X		X		X		X
LSF - Side Roller Plunger	X		X		X		X		X		X
LSG - Side Plunger, Maintained		X	X			X	X			X	X
LSH - Side Rotary, Low PT, Low Torque		X		X		X		X		X	X
LSJ - Wobble Stick	X		X		X			X	X		X
LSK - Cat Whisker	X		X			X		X	X		X
LSL - Side Rotary, Sequence	X			X	X			X	X		X
LSM - Side Rotary, Center Neutral		X		X	X			X		X	X
LSN - Side Rotary, Maintained		X		X		X		X		X	X
LSP - Side Rotary, Low Pretravel	X			X	X			X	X		X
LSR - Side Rotary, Low Torque		X		X		X		X		X	X
LSV - Top Adjustable Plunger	X		X		X		X		X		X
LSW - Side Adjustable Plunger	X		X		X		X		X		X

* For HDLS application wherein the upper temperature limit is normally above 93 °C [200 °F], much longer switch life can be obtained by using completely fluorocarbon-sealed switches rather than standard HDLS.

Heavy Duty Limit Switches

FACTORY SEALED PRE-WIRED LIMIT SWITCHES

Features

- Pre-wired with 6 ft STOW-A cable or other 4, 5, or 9-pin connectors (other lengths available)
- Wire entry area completely factory sealed
- (Cable version) NEMA 1, 6, 6P, 12; IP67
- (Connector version) NEMA 1, 6, 6P, 12, 13; IP67

How to order:

To order factory sealed switches, add the modification codes shown below to the standard HDLS listings:

Circuitry	Cable	1/2 in connector
SPDT	C	A (4-pin mini-style) B (5-pin mini-style) DD (4-pin micro-style)
DPDT	M	R (9-pin mini-style)

Examples:

LSA1A**C** = LSA1A with 6 feet of 5-conductor STOW-A cable

LSJ2B**BM**-7N = LSJ2B-7N with 6 feet of 9-conductor STOW-A cable

LSA1A**B** = LSA1A with a 5-pin mini-style connector

LSA1A**DD** = LSA1A with a 4-pin micro-style connector

NOTE: Connector versions available with 1/2 in conduit only.

WIRING DIAGRAMS

Connectors = Numbers (mini-style)

Cables = Colors



Electrical Ratings: Connector Versions

Mini	600 VAC, 7A
Micro	300 VAC, 3A

SWITCH WIRE POINTS FOR CONNECTOR/CABLE

Single-Pole Circuitry



3 = Ground

Double-Pole Circuitry



7 = Ground

MICRO SWITCH™ HDLS Series

ASSEMBLY MODIFICATIONS

Momentary action rotary switches can be furnished in other than the normal assembled conditions. To specify modifications, add the numbers shown below to the catalog listings. Modification number suffixes are:

- 1** Clockwise actuation only
- 2** Counterclockwise actuation only
- 3** Shaft to right of switch front
- 4** Shaft to left of switch front
- 5** Shaft to back of switch
- 7** Indicator light wired to NC circuit

For example,

Catalog listing LSA1A**23** is an LSA1A switch adjusted for counterclockwise actuation only. The operating shaft is to the right side of the switch when viewing it from the front (label side). No lever.

Catalog listing LSA8A**7** is an LSA8A switch with the 240 volt indicator light wired to the NC circuit. No lever.

PLUNGER ASSEMBLY MODIFICATIONS

Add the following modification numbers to the catalog listing in the plunger switch:

- 3** Side plunger to right of switch front
- 4** Side plunger to left of switch front
- 5** Side plunger to back of switch
- 6** Roller on top plungers perpendicular to mounting surface
- 7** Light on indicator versions wired to NC circuit
- 8** Roller on side plungers in vertical position

For example,

Catalog listing LSF1A**3** is an LSF1A switch with the side roller plunger to the right side.

PLUG-IN VS. NON-PLUG-IN MODELS

Honeywell HDLS limit switches are offered in two styles: non-plug-in design and plug-in design. With plug-in construction, the wiring and conduit connection is made to the base receptacle. This feature reduces downtime as the plug-in unit can be removed and replaced without disconnecting the wiring or conduit connections to the switch.

MICRO SWITCH™ HDLS SERIES ELECTRICAL RATINGS ac Volts; Pilot Duty: AC15, A600/B600

Electrical Rating	Circuitry	Vac	Amps at 0.35 Power Factor Make	Amps at 0.35 Power Factor Break
A* AC15, A600	SPDT DPDT	120	60	6
		240	30	3
		480	15	1.5
		600	12	1.2
B AC15, B600	Δ	120	30	3
		240	15	1.5
		480	7.5	0.75
		600	6	0.60

Δ Gravity return (Model LSS..) and extra-low torque (Model LST..)

MICRO SWITCH™ HDLS SERIES ELECTRICAL RATINGS dc Volts; Pilot Duty: DC13, R300

Electrical Rating	Circuitry	Vdc	Make & Break Amps Inductive	Make & Break Amps Resistive
A, B*	SPDT DPDT	120	0.25	0.8
		240	0.15	0.4

* For switches with an indicator light, use only at voltage stated for indicator light.

MICRO SWITCH™ HDLS limit switches are capable of the following low voltage dc loads

Circuitry	Vdc	Amps Inductive	Amps Resistive
SPDT	24	10	10
DPDT	24	10	10

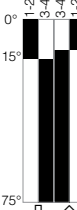
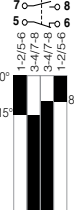
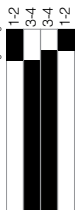
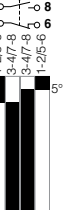


Heavy Duty Limit Switches

Side Rotary

MICRO SWITCH™ HDLS SERIES ORDER GUIDE/RECOMMENDED LISTINGS



	Standard (LSA)		Low Differential (LSP)		5° Pretravel (LSU)		
Description	Standard		Low pretravel & low differential travel		Low pretravel		
Contact closed ■ Contact open □	SPDT	DPDT	SPDT	DPDT	SPDT	DPDT	
	Snap Action 1NO/1NC  	Snap Action 2NO/2NC  	Snap Action 1NO/1NC  	Snap Action 2NO/2NC  	Snap Action 1NO/1NC  	Snap Action 2NO/2NC  	
	Pretravel	15° max.	15° max.	9° max.	9° max.	5° max.	5° max.
	Different. travel	5° max.	7° max.	3° max.	4° max.	3° max.	4° max.
	Overtravel	60° min.	60° min.	66° min.	66° min.	70° min.	70° min.
Oper. torque	0,45 Nm [4 in-lb] max.		0,45 Nm [4 in-lb] max.		0,45 Nm [4 in-lb] max.		
Action	CW & CCW (Spring return)						
Op. temp range ³	-12 °C to 121 °C [10 °F to 250 °F] (for low temp, high temp, or preloaded versions, see page 6)						

Circuitry	Contacts	Body Style ²	Conduit (NPT)	Options			
SPDT 	Silver	Plug-in	0.5 in		LSA1A	LSP1A	LSU1A
	Gold ⁴	Plug-in	0.5 in		LSA1E	LSP1E	LSU1E
	Silver	Plug-in	0.5 in	120 V Ind. lite*	LSA5A	LSP5A	LSU5A
	Silver	Plug-in	0.5 in	240 V Ind. lite*	LSA8A	LSP8A	LSU8A
	Silver	Plug-in	0.5 in	24 V LED lit 1.5 mA max. auto polarity	LSA9A	LSP9A	LSU9A
	Silver	Non-plug-in	0.5 in		LSA3K	LSP3K	LSU3K
DPDT 	Silver	Plug-in	0.75 in		LSA2B	LSP2B	LSU2B
	Gold ⁴	Plug-in	0.75 in		LSA2S	—	—
	Silver	Plug-in	0.5 in		LSA6B	LSP6B	LSU6B
	Gold ⁴	Plug-in	0.5 in		LSA6S	—	—
	Silver	Plug-in	0.75 in	120 V Ind. lite*	LSA2R	LSP2R	LSU2R
	Silver	Non-plug-in	0.75 in		LSA4L	LSP4L	LSU4L
	Silver	Non-plug-in	0.5 in		LSA7L	LSP7L	LSU7L

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93 °C [200 °F]

² Plug-in listings include base receptacle

³ Completely fluorocarbon sealed switches are preferred for use in temperatures above 93 °C [200 °F]

⁴ Gold-plated contacts

To order a fluorocarbon sealed switch, insert the letters **Y** and **C** into the catalog listing as follows. The LSA1A limit switch is changed to a LSA**Y****C**1A limit switch.

Side Rotary

MICRO SWITCH™ HDLS SERIES ORDER GUIDE/RECOMMENDED LISTINGS



	Low Torque (LSR)		Low Diff., Low Torque (LSH)	
Description	Low operating torque		Momentary, low pretravel and low torque	
	SPDT	DPDT	SPDT	DPDT
	Snap Action 1NO/1NC 15° 10°	Snap Action 2NO/2NC 15° 8°	Snap Action 1NO/1NC 9° 6°	Snap Action 2NO/2NC 9° 5°
Contact closed ■ Contact open □				
Pretravel	15° max.	15° max.	9° max.	9° max.
Different. travel	5° max.	7° max.	3° max.	4° max.
Overtravel	60° min.	60° min.	66° min.	66° min.
Oper. torque	0,19 Nm [1.7 in-lb] max.		0,19 Nm [1.7 in-lb] max.	
Action	CW & CCW (Spring return)			
Op. temp range ³	-1 °C to 121 °C [30 °F to 250°F] (for low temp, high temp, or preloaded versions, see page 6)			

Circuitry		Contacts	Body Style ²	Conduit (NPT)	Options		
SPDT		Silver	Plug-in	0.5 in		LSR1A	LSH1A
		Gold ⁴	Plug-in	0.5 in		LSR1E	LSH1E
		Silver	Plug-in	0.5 in	120 V Ind. lite*	LSR5A	LSH5A
		Silver	Plug-in	0.5 in	240 V Ind. lite*	LSR8A	LSH8A
		Silver	Plug-in	0.5 in	24 V LED lit 1.5 mA max. auto polarity	LSR9A	LSH9S
		Silver	Non-plug-in	0.5 in		LSR3K	LSH3K
DPDT		Silver	Plug-in	0.75 in		LSR3B	LSH2B
		Silver	Plug-in	0.5 in		LSR6B	LSH6B
		Silver	Plug-in	0.75 in	120 V Ind. lite*	LSR2R	LSH2R
		Silver	Non-plug-in	0.75 in		LSR4L	LSH4L
		Silver	Non-plug-in	0.5 in		LSR7L	LSHJ7L

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93°C [200 °F]

² Plug-in listings include base receptacle

³ Completely fluorocarbon sealed switches are preferred for use in temperatures above 93 °C [200 °F]

⁴ Gold-plated contacts

To order a fluorocarbon sealed switch, insert the letters **Y** and **C** into the catalog listing as follows. The LSA1A limit switch is changed to a **LSYAC1A** limit switch.

Heavy Duty Limit Switches

Side Rotary

MICRO SWITCH™ HDLS SERIES ORDER GUIDE/RECOMMENDED LISTINGS



	Maint. Contact (LSQ)	Maint. Contact (LSN)	Center Neutral (LSM)	Sequence Action (LSL)
Description	Maint. ² 360° Alt. Action	Maintained, 2-pos ^{1,2} . Std.	Center Neutral (Pole 1 operates CCW; Pole 2 operates CW)	Sequential (Pole 1 operates before Pole 2, either CW, CCW, or both)
	SPDT	SPDT DPDT	DPDT	DPDT
Contact closed ■ Contact open □				
Pretravel	65° max.	65° max.	18° max.	1 st : 15° 2 nd : add'l 10°
Different. travel	40° max.	40° max.	10° max.	each pole: 5°
Overtravel	20° min.	20° min.	57° min.	48° min.
Oper. torque	0,45 Nm [4 in-lb]		0,45 Nm [4 in-lb]	0,45 Nm [4 in-lb]
Action	Maintained		CW & CCW (Spring return)	
Op. temp range³	-1 °C to 121 °C [30 °F to 250°F] (for low temp, high temp, or preloaded versions, see page 6)			-12 °C to 121 °C [10 °F to 250°F]

Circuitry	Contacts	Body Style ²	Conduit (NPT)	Options				
SPDT 	Silver	Plug-in	0.5 in		LSQ300	LSN1A	CENTER NEUTRAL (Momentary) 	SEQUENCE (Momentary)
	Gold ³	Plug-in	0.5 in		—	LSN1E		
	Silver	Plug-in	0.5 in	120 V Ind. lite*	—	LSN5A		
	Silver	Plug-in	0.5 in	240 V Ind. lite*	—	LSN8A		
	Silver	Non-plug-in	0.5 in		—	LSN3K		
DPDT 	Silver	Plug-in	0.75 in		—	LSN2B	LSM2D	LSL2C
	Silver	Plug-in	0.5 in		—	LSN6B	LSM6D	LSL6C
	Gold ³	Plug-in	0.5 in		—	—	LSM6U	—
	Silver	Non-plug-in	0.75 in		—	LSN4L	LSM4N	LSL4M
	Silver	Non-plug-in	0.5 in		—	LSN7L	LSM7N	LSL7M

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93°C [200 °F].

** Plug-in listings include base receptacle

*** Completely fluorocarbon-sealed switches are preferred for temperatures above 93 °C [200 °F].

¹ Mechanical trip before electrical trip.

² Total travel is approximately 80° max. Maintained contact switch normally used with LSZ53 yoke actuator.

³ Gold-plated contacts

To order a fluorocarbon sealed switch, insert the letters **Y** and **C** into the catalog listing as follows. The LSA1A limit switch is changed to a LSYAC1A limit switch.

MICRO SWITCH™ HDLS Series

Side Rotary

Figure 2. MICRO SWITCH™ HDLS side rotary (single pole) dimensions

SPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



Figure 3. MICRO SWITCH™ HDLS side rotary (double pole) dimensions

DPDT Plug-in (mm[in])



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

Top Rotary

MICRO SWITCH™ HDLS SERIES OPERATING CHARACTERISTICS BY OPERATING HEAD/MODEL



Top Rotary (LSB)	
Description	High overtravel – often ideal when increased overtravel is required (100° min.). Uses same levers as side rotary
	SPDT Snap Action 1NO/1NC 0° 15° 25° 135° ↓ ↑ DPDT Snap Action 2NO/2NC 0° 13° 25° 135° ↓ ↑
Pretravel	25° max.
Different. travel	10° max.
Overtravel	110° min.
Oper. torque	0,28 Nm [2.5 in lb] max.
Op. temp range³	-12 °C to 121 °C [10 °F to 250 °F] (for low temp, high temp, or preloaded versions, see page 6)

Circuitry		Contacts	Body Style ²	Conduit (NPT)	Options		
SPDT		Silver	Plug-in	0.5 in		LSB1A	—
		Gold ⁴	Plug-in	0.5 in		LSB1E	—
		Silver	Plug-in	0.5 in	120 V Ind. lite*	LSB5A	—
		Silver	Plug-in	0.5 in	240 V Ind. lite*	LSB8A	—
		Silver	Plug-in	0.5 in	24 V LED lit 1.5 mA max. auto polarity	LSB9A	—
		Silver	Non-plug-in	0.5 in		LSB3K	—
DPDT		Silver	Plug-in	0.75 in		—	LSB2B
		Silver	Plug-in	0.5 in		—	LSB6B
		Silver	Plug-in	0.75 in	120 V Ind. lite*	—	LSB2R
		Silver	Non-plug-in	0.75 in		—	LSB4L
		Silver	Non-plug-in	0.5 in		—	LSB7L

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93 °C [200 °F]

² Plug-in listings include base receptacle

³ Completely fluorocarbon sealed switches are preferred for use in temperatures above 93 °C [200 °F]

⁴ Gold-plated contacts

MICRO SWITCH™ HDLS Series

Top Rotary

Figure 4. MICRO SWITCH™ HDLS top rotary (single pole) dimensions

SPDT Plug-in (mm[in])



Figure 5. MICRO SWITCH™ HDLS top rotary (double pole) dimensions

DPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

Levers

Table 2. Common levers for use with MICRO SWITCH™ HDLS Rotary Switches

Levers for use with side or top rotary actuated switches are available in a wide choice of sizes and materials. The most common listings are shown below. Rollers may be on either side of the lever to best match the external actuating mechanism.

				
LSZ51A&C fixed rotary lever, nylon roller, front/ back	LSZ51B&D fixed rotary lever, steel roller, front/ back	LSZ59A,LSZ59B, LSZ59C,LSZ59D short fixed lever, front/back		LSZ69CA spoke lever - 6 inches
				
LSZ55A,LSZ55B, LSZ55C,LSZ55D offset lever, front/back	LSZ60 one-way roller lever	LSZ53A, LSZ53B, LSZ53C, LSZ53D yoke lever, nylon and steel rollers, front/back placement	LSZ54R spring wire 304,8 mm [12 in]	
				
LSZ52A, LSZ52B, LSZ52C, LSZ52D adj. lever, nylon/ steel, front/back	LSZ52J adjustable lever, nylon roller 25,4 mm [1 in]	LSZ52K adjustable lever, nylon roller 38,1 [1.5 in]	LSZ54M aluminum rod 139,7 mm [5.5 in]	LSZ61 loop 152,4 mm [6 in]
				
				
				
				LSZ67CA Plastic conveyor roller
				LSZ68 rod w/ spring 304,8 mm [12 in]
				LSZ54N stainless steel rod 330,2 mm [13 in]

MICRO SWITCH™ HDLS Series

Levers

Table 3. HDLS SERIES ACTUATOR CODE TABLE (see previous page)

	Catalog Listing	Material	Roller Dia. (in)	Roller Width (in)	Roller Mounting
	Fixed 1.5 inch radius				
	–	Rollerless	n/a	n/a	n/a
	LSZ51A	Nylon	0.75	0.25	Front
	LSZ51B	Steel	0.75	0.25	Front
	LSZ51C	Nylon	0.75	0.25	Back
	LSZ51D	Steel	0.75	0.25	Back
	LSZ51F	Nylon	1.0	0.520	Front
	LSZ51G	Nylon	1.5	0.25	Front
	LSZ51J	Nylon	1.0	0.520	Back
	LSZ51L	Ball bearing	0.75	0.25	Back
	LSZ51M	Nylon	0.75	1.25	Back
	LSZ51N	Steel	0.75	1.25	Front
	LSZ51P	Nylon	0.75	0.50	Front
	Adjustable 1.5 in to 3.5 in radius				
	–	Rollerless	n/a	n/a	n/a
	LSZ52A	Nylon	0.75	0.25	Back
	LSZ52B	Steel	0.75	0.25	Back
	LSZ52C	Nylon	0.75	0.25	Front
	LSZ52D	Steel	0.75	0.25	Front
	LSZ52E	Nylon	0.75	1.30	Front
	LSZ52J	Nylon	1.0	0.50	Front
	LSZ52K	Nylon	1.5	0.25	Front
	LSZ52L	Ball bearing	0.75	0.25	Front
	LSZ52M	Nylon	2.0	0.25	Front
	LSZ52N	Nylon	0.75	0.50	Front
	Yoke – 1.5 in radius				
	LSZ53A	Nylon	0.75	0.25	Front/Back
	LSZ53B	Steel	0.75	0.25	Front/Back
	LSZ53D	Steel	0.75	0.25	Front/Front
	LSZ53E	Nylon	0.75	0.25	Back/Front
	LSZ53M	Nylon	0.75	1.25	Back/Front
	LSZ53P	Steel	0.75	0.25	Back/Back
	LSZ53S	Nylon	0.75	0.25	Back/Back
	Rod				
	–	Hub only	n/a	n/a	n/a
	LSZ54M	Alum, 5.5 in	Ø 0.125	n/a	n/a
	LSZ54N	Stainless, 13 in	Ø 0.125	n/a	n/a
	LSZ54R	SST spring wire, 12 in	Ø 0.075	n/a	n/a
	LSZ54V	Flex cable (tin plated steel), 4.8 in	Ø 0.19	n/a	n/a
	LSZ54P	Plastic rod, 12 in	Ø 0.27	n/a	n/a
	LSZ54W	Plastic rod, 7.2 in	Ø 0.27	n/a	n/a
	LSZ59T	13 in stainless steel	Ø 0.19	n/a	n/a
	Spoke				
	LSZ69CA	Stainless	6.0	n/a	n/a

	Catalog Listing	Material	Roller Dia. (in)	Roller Width (in)	Roller Mounting
	Offset – 1.5 in radius				
	–	Rollerless	n/a	n/a	n/a
	LSZ55A	Nylon	0.75	0.25	Back
	LSZ55B	Steel	0.75	0.25	Back
	LSZ55C	Nylon	0.75	0.25	Front
	LSZ55D	Steel	0.75	0.25	Front
	LSZ55E	Nylon	0.75	0.50	Front
	LSZ55K	Nylon	1.5	0.25	Front
	Short fixed - 1.3 in radius				
	LSZ59A	Nylon	0.75	0.25	Front
	LSZ59B	Steel	0.75	0.25	Front
	LSZ59C	Nylon	0.75	0.25	Back
	LSZ59D	Steel	0.75	0.25	Back
	One-way roller lever				
	LSZ60A	Nylon	0.75	0.25	Front
	LSZ60B	Steel	0.75	0.25	Front
	Flexible loop				
	LSZ61	Ø 0.19 Nylatron	6 inch flexible loop/cap screw		
	LSZ618	Ø 0.19 Nylatron	9.5 inch flexible loop/cap screw		
	LSZ54	Hub only	n/a	n/a	n/a
	Spring rod				
	LSZ68	Delrin rod, 12 in	Ø 0.25	n/a	n/a
	LSZ617	Delrin rod, 16 in	Ø 0.25	n/a	n/a
	LSZ686	Delrin rod, 6 in	Ø 0.25	n/a	n/a
	Rubber roller levers				
	LSZ51Y (standard)	Rubber	2.0	0.5	front
	LSZ55Y (offset)	Rubber	2.0	0.5	front
	LSZ52Y (adjustable)	Rubber	2.0	0.5	front
	Plastic roller levers				
	LSZ67AA (conveyor)	Plastic	1.5	3.8	n/a

MICRO SWITCH™ HDLS side rotary levers' cam tracking

Levers for side and top rotary switches are normally ordered as separate catalog listings. They also may be ordered by including a suffix to the switch catalog listing (see nomenclature tree in this document) and adding the lever price.

Figure 6. LSZ51 type levers cam tracking



Figure 7. LSZ52 type levers cam tracking



Figure 8. LSZ54 type levers cam tracking



Figure 9. LSZ55 type levers cam tracking



MICRO SWITCH™ HDLS Series

Plungers

MICRO SWITCH™ HDLS SERIES ORDER GUIDE/RECOMMENDED LISTINGS

All top plungers are momentary action.



	Plain (LSC)	Roller (LSD)	Adjustable (LSV)				
							
Description	Top plain plunger for in-line operating motion	Roller plunger – can be set at 90° increments to accept cam or slide actuation	Adjustable top plain plunger simplifies installation since operating point can be adjusted from 2.085 in to 2.335 in				
Contact closed ■ Contact open □	SPDT  Snap Action 1NO/1NC 3 0 4 1 2 7 8 5 6	DPDT  Snap Action 2NO/2NC 3 0 4 1 2 7 8 5 6	SPDT  Snap Action 1NO/1NC 3 0 4 1 2 7 8 5 6	DPDT  Snap Action 2NO/2NC 3 0 4 1 2 7 8 5 6	SPDT  Snap Action 1NO/1NC 3 0 4 1 2 7 8 5 6	DPDT  Snap Action 2NO/2NC 3 0 4 1 2 7 8 5 6	
	1,78 mm [0.07 in]						
	Different. travel	0,38 mm [0.015 in]	0,51 mm [0.02 in]	0,38 mm [0.015 in]	0,51 mm [0.02 in]	0,38 mm [0.015 in]	0,51 mm [0.02 in]
	Overtravel	4,83 mm [0.19 in]					
	Operating force	17,8 N [4 lb] max.					
Op. temp range ³	-12 °C to 93 °C [10 °F to 200 °F] (for low temp, high temp, or preloaded versions, see page 6)						

Circuitry	Contacts	Body Style ²	Conduit (NPT)	Options			
SPDT 	Silver	Plug-in	0.5 in		LSC1A	LSD1A	LSV1A
	Gold ⁴	Plug-in	0.5 in		LSC1E	LSD1E	LSV1E
	Silver	Plug-in	0.5 in	120 V Ind. lite*	LSC5A	LSD5A	LSV5A
	Silver	Plug-in	0.5 in	240 V Ind. lite*	LSC8A	LSD8A	LSV8A
	Silver	Non-plug-in	0.5 in		LSC3K	LSD3K	LSV3K
DPDT 	Silver	Plug-in	0.75 in		LSC2B	LSD2B	LSV2B
	Silver	Plug-in	0.5 in		LSC2R	LSD2R	LSV2R
	Silver	Plug-in	0.75 in	120 V Ind. lite*	LSC6B	LSD6B	LSV6B
	Silver	Non-plug-in	0.75 in		LSC4L	LSD4L	LSV4L
	Silver	Non-plug-in	0.5 in		LSC7L	LSD7L	LSV7L

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93 °C [200 °F]

² Plug-in listings include base receptacle

³ Completely fluorocarbon sealed switches are preferred for use in temperatures above 93 °C [200 °F]

⁴ Gold-plated contacts

Heavy Duty Limit Switches

Plungers

Figure 10. MICRO SWITCH™ HDLS LSC Series (single pole plunger dimensions)

SPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



Figure 11. MICRO SWITCH™ HDLS LSC Series (double pole plunger dimensions)

DPDT Plug-in (mm[in])



DPDT Non-plug-in (mm[in])



MICRO SWITCH™ HDLS Series

Plungers

Figure 12. MICRO SWITCH™ HDLS LSD Series (single pole) top roller plunger dimensions

SPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



Figure 13. MICRO SWITCH™ HDLS LSD Series (double pole) top roller plunger dimensions

DPDT Plug-in (mm[in])



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

Plungers

Figure 14. MICRO SWITCH™ HDLS LSV Series top adjustable plunger (single pole) dimensions

SPDT Plug-in (mm[in])



Figure 15. MICRO SWITCH™ HDLS LSV Series top adjustable plunger (double pole) dimensions

DPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



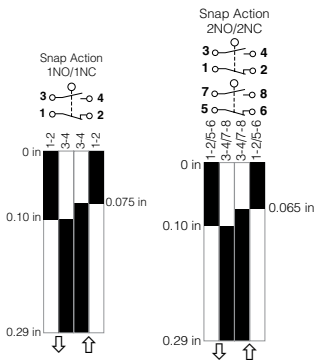
MICRO SWITCH™ HDLS Series

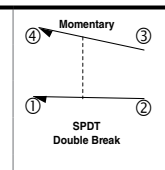
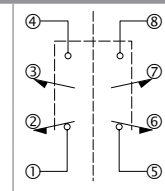
Plungers

MICRO SWITCH™ HDLS SERIES OPERATING CHARACTERISTICS BY OPERATING HEAD/MODEL

Heads may be positioned to accept actuation from any of four directions, 90° apart.



	Plain (LSE)	Roller (LSF)	Adjustable (LSW)	Maintained (LSG)
				
Description	Side plain plunger for in-line actuating (momentary)	Side roller plunger (momentary)	Adjustable side plain plunger (momentary)	Side plain plunger with maintained contact
				
Pretravel	2,54 mm [0.10 in]			4,32 mm [0.17 in]
Different. travel	Single pole: 0,64 mm [0.025 in] Double pole: 0,89 mm [0.035 in]			2,29 mm [0.09 in]
Overtravel	4,83 mm [0.19 in]			2,0 mm [0.08 in]
Operating force	26,7 N [6 lb] max.			44,5 N [10 lb] max.
Op. temp range³	-12 °C to 93 °C [10 °F to 200 °F] (for low temp, high temp, or preleaded versions, see page 6)			-1 °C to 93 °C [30 °F to 200 °F]

Circuitry		Contacts	Body Style ²	Conduit (NPT)	Options				
SPDT		Silver	Plug-in	0.5 in		LSE1A	LSF1A	LSW1A	LSG1A
		Gold ⁴	Plug-in	0.5 in		LSE1E	LSF1E	LSW1E	LSG1E
		Silver	Plug-in	0.5 in	120 V Ind. lite*	LSE5A	LSF5A	LSW5A	LSG5A
		Silver	Plug-in	0.5 in	240 V Ind. lite*	LSE8A	LSF8A	LSW8A	LSG8A
		Silver	Non-plug-in	0.5 in		LSE3K	LSF3K	LSW3K	LSG3K
DPDT		Silver	Plug-in	0.75 in		LSE2B	LSF2B	LSW2B	LSG2B
		Silver	Plug-in	0.5 in		LSE2R	LSF2R	LSW2R	LSG2R
		Silver	Plug-in	0.75 in	120 V Ind. lite*	LSE6B	LSF6B	LSW6B	LSG6B
		Gold ⁴	Plug-in	0.5 in		LSE6S	—	—	—
		Silver	Non-plug-in	0.75 in		LSE4L	LSF4L	LSW4L	LSG4L
		Silver	Non-plug-in	0.5 in		LSE7L	LSF7L	LSW7L	LSG7L

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93 °C [200 °F]

² Plug-in listings include base receptacle

³ Completely fluorocarbon sealed switches are preferred for use in temperatures above 93 °C [200 °F]

⁴ Gold-plated contacts

Heavy Duty Limit Switches

Plungers

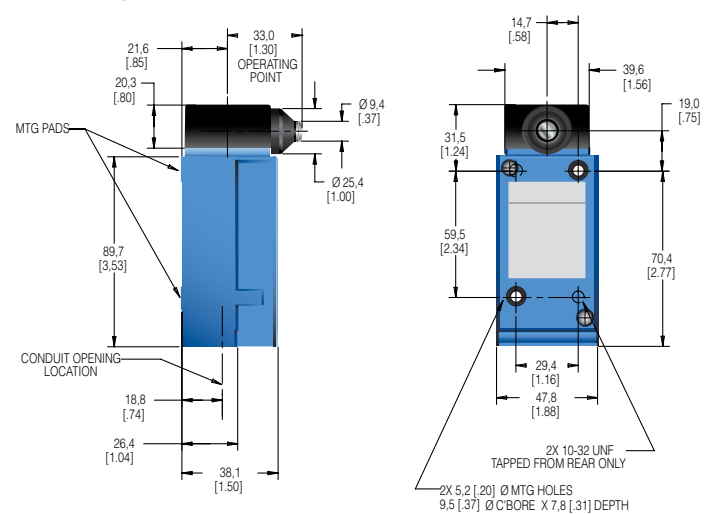
Figure 16. MICRO SWITCH™ HDLS LSE Series side plain plunger (single pole) dimensions

SPDT Plug-in (mm[in])



Figure 17. MICRO SWITCH™ HDLS LSE Series side plain plunger (double pole) dimensions

DPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



MICRO SWITCH™ HDLS Series

Plungers

Figure 18. MICRO SWITCH™ HDLS LSF Series side roller plunger (single pole) dimensions

SPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



Figure 19. MICRO SWITCH™ HDLS LSF Series side roller plunger (double pole) dimensions

DPDT Plug-in (mm[in])



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

Plungers

Figure 20. MICRO SWITCH™ HDLS LSW Series side adjustable plunger (single pole) dimensions

SPDT Plug-in (mm[in])



Figure 21. MICRO SWITCH™ HDLS LSW Series side adjustable plunger (double pole) dimensions

DPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



MICRO SWITCH™ HDLS Series

Plungers

Figure 22. MICRO SWITCH™ HDLS LSG Series maintained contact side plunger (single pole) dimensions

SPDT Plug-in (mm[in])



Figure 23. MICRO SWITCH™ HDLS LSG Series maintained contact side plunger (double pole) dimensions

DPDT Plug-in (mm[in])



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

Wobblers



LSJ1A-7M - Spring wire
LSJ1A-7N - Flexible actuator
LSK1A-8C - Coil spring
LSJ1A-7A - Plastic rod
LSK1A-8A - Cat whisker

	LSJ Series 7A Actuator	LSJ Series 7N Actuator	LSJ Series 7M Actuator	LSK Series 8A-8C Actuator	
Description	Delrin® plastic rod lever (wobble stick)	Flexible cable lever	Spring wire lever - may be formed for special needs	Cat whisker actuator for low operating force applications	
				-8A** 	-8C
	Contact closed Contact open				
Length	Actuator: 5.5 in	Actuator: 5.5 in	Actuator: 13 in	8A act.: 5.5 in SST 8C act.: 5.5 in steel plated	
Pretravel	25,4 mm [1.0 in]	38,0 mm [1.5 in]	102 mm [4.0 in]	51,0 mm [2.0 in]	
Oper. force	2,78 Nm [10 oz]	1,95 Nm [7 oz]	1,39 Nm [5 oz]	8A: 1,39 Nm [5 oz]; 8C 1,95 Nm [7 oz]	
Op. temp range ³	-12 °C to 93 °C [10°F to 200 °F] (for low temp, high temp, or preloaded versions, see page 6)				

Circuitry	Contacts	Body Style ²	Conduit (NPT)	Options					
SPDT 	Silver	Plug-in	0.5 in		LSJ1A-7A	LSJ1A-7N	LSJ1A-7M	LSK1A-8A	LSK1A-8C
	Gold ⁴	Plug-in	0.5 in		—	—	LSJ1E-7M	—	—
	Silver	Plug-in	0.5 in	120 V Ind. lite*	LSJ5A-7A	LSJ5A-7N	LSJ5A-7M	LSK5A-8A	LSK5A-8C
	Silver	Plug-in	0.5 in	240 V Ind. lite*	LSJ8A-7A	LSJ8A-7N	LSJ8A-7M	LSK8A-8A	LSK8A-8C
DPDT 	Silver	Non-plug-in	0.5 in		LSJ3K-7A	LSJ3K-7N	LSJ3K-7M	LSK3K-8A	LSK3K-8C
	Silver	Plug-in	0.75 in		LSJ2B-7A	LSJ2B-7N	LSJ2B-7M	LSK2B-8A	LSK2B-8C
	Silver	Plug-in	0.5 in		LSJ6B-7A	LSJ6B-7N	LSJ6B-7M	LSK6B-8A	LSK6B-8C
	Silver	Plug-in	0.75 in	120 V Ind. lite*	LSJ2R-7A	LSJ2R-7N	LSJ2R-7M	LSK2R-8A	LSK2R-8C
	Silver	Non-plug-in	0.75 in		LSJ4L-7A	LSJ4L-7N	LSJ4L-7M	LSK4L-8A	LSK4L-8C
	Silver	Non-plug-in	0.5 in		LSJ7L-7A	LSJ7L-7N	LSJ7L-7M	LSK7L-8A	LSK7L-8C

* Use at voltage indicated for light. Wired to NO circuit. Upper temperature limit for lighted units is 93°C [200 °F]

² Plug-in listings include base receptacle

³ Completely fluorocarbon sealed switches are preferred for use in temperatures above 93 °C [200 °F]

⁴ Gold-plated contacts

** These cat whiskers have a 5.5 inch long actuator. To specify a 7.5 inch length actuator, substitute **-8B** for **-8A**.

MICRO SWITCH™ HDLS Series

Wobblers

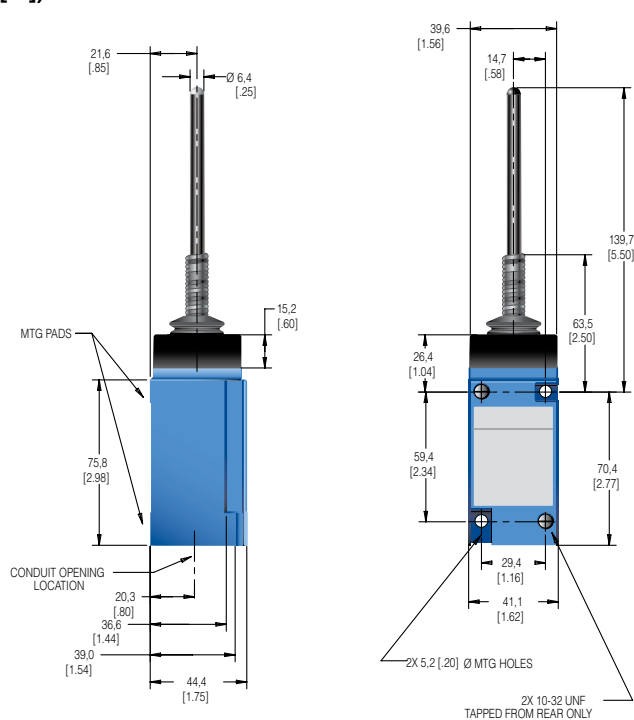
Figure 24. MICRO SWITCH™ HDLS LSJ_ _-7A Series wobble (single pole) dimensions



Figure 25. MICRO SWITCH™ HDLS LSJ_ _-7A Series wobble (double pole) dimensions



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

Wobblers

Figure 26. MICRO SWITCH™ HDLS LSJ __-7N Series wobble (single pole) dimensions



Figure 27. MICRO SWITCH™ HDLS LSJ __-7N Series wobble (double pole) dimensions



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



MICRO SWITCH™ HDLS Series

Wobblers

Figure 28. MICRO SWITCH™ HDLS LSJ _ _-7M Series wobble (single pole) dimensions



Figure 29. MICRO SWITCH™ HDLS LSJ _ _-7M Series wobble (double pole) dimensions



Heavy Duty Limit Switches

Wobblers

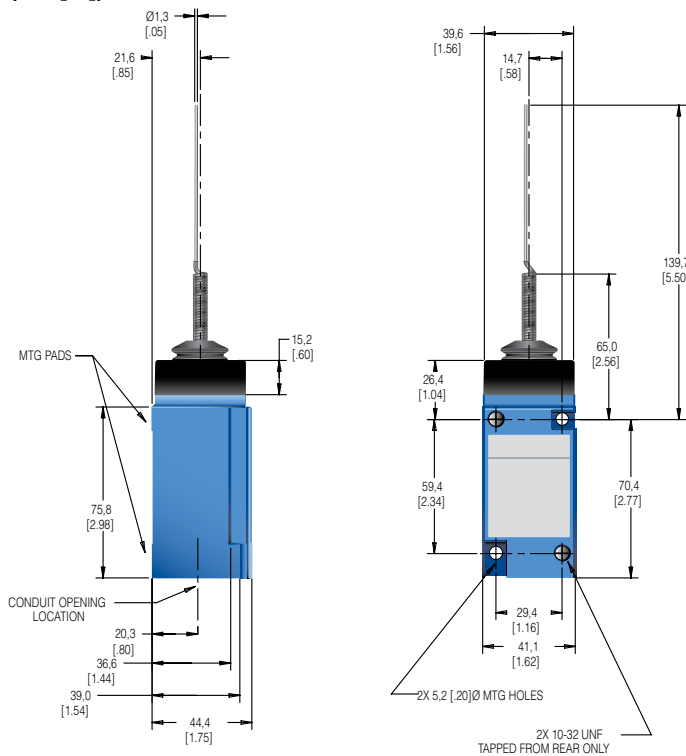
Figure 30. MICRO SWITCH™ HDLS LSK__-8A Series wobble (single pole) dimensions



Figure 31. MICRO SWITCH™ HDLS LSK__-8A Series wobble (double pole) dimensions



SPDT Non-plug-in (mm[in])



DPDT Non-plug-in (mm[in])



MICRO SWITCH™ HDLS Series

Wobblers

Figure 32. MICRO SWITCH™ HDLS LSK__-8C Series wobble (single pole) dimensions



SPDT Non-plug-in (mm[in])



Figure 33. MICRO SWITCH™ HDLS LSK__-8C Series wobble (double pole) dimensions



DPDT Non-plug-in (mm[in])



Heavy Duty Limit Switches

SPECIAL APPLICATIONS

HIGH CAPACITY LIMIT SWITCH

Features

- High dc current ratings
- 20 A rating at 120 Vac (single pole)
- Plug-in or non-plug in
- Positive retention lever arm
- High resistance to seismic shock

This series has a wide gap contact block that handles a higher make/break dc load. In addition, a special lever arm has a serrated shaft hole and a cap screw with locking nut for attaching the lever to the rotary shaft. This assures a firm grip on the operating shaft and positive retention of the lever adjustment.

The need for precise operation, coupled with severe environmental conditions places rigid demands on any control. Honeywell satisfies these demands with its high capacity HDLS, designed to perform reliably under these conditions.



Voltage	Single Pole		Double Pole	
	Resistive Load	Inductive Load	Resistive Load	Inductive Load
125 Vdc	2.0 A	1.0 A	1.0 A	0.4 A
250 Vdc	0.7 A	0.4 A	0.4 A	0.2 A
120 Vac	20 A	20 A	10 A	10 A
240 Vac	15 A	15 A	7.5 A	7.5 A
480 Vac	10 A	10 A	5 A	5 A
600 Vac	5 A	5 A	2.5 A	2.5 A

Maximum operating rate - 15 operations per minute.

Listings

LSQ051	Double pole, non-plug-in, 0.75 in conduit	0° 17° 75° 9° 1-2/5-6 3-4/7-8 3-4/7-8 1-2/5-6 ⇓ ⇑
LSQ052	Double pole, plug-in, 0.75 in conduit	
LSQ053	Single pole, non-plug-in, 0.5 in conduit	
LSQ054	Single pole, plug-in, 0.5 in conduit	
LSZ616	Replacement lever for above listings	
Pretravel	17° max.	
Diff. travel	8° max.	
Overtravel	58° min.	
Oper. torque	0,45 Nm (4 in-lb) max.	
Action	CW and CCW (spring return)	

MICRO SWITCH™ HDLS Series

SPECIAL APPLICATIONS

GRAVITY RETURN SIDE ROTARY SWITCHES (LSS)

LSS1H gravity-return, side-rotary switches have no return spring mechanism. The weight of the actuating lever must provide the force to restore it to the free position. The extremely light 5 in-oz. max. operating torque is useful in conveyor applications since it enables operation by small or lightweight objects. Because the head is unsealed, the **LSS1H** is classified as NEMA 1. However, the switch cavity is sealed to protect the switch contacts.

	LSS1H
Description	Gravity-return side rotary
Circuitry	SPDT, double break
Contacts	Silver
Sealing	NEMA 1
Electrical rating	(B) NEMA B600
Body style	Plug-in
Conduit (NPT)	0.5 in
Differential travel	12° max.
Total travel (no stop)*	360°
Operating torque	0,035 Nm [5 in-oz] max.

* Switch has approximately 180° dwell of the normally closed and normally open switch contacts.



EXTRA LOW TORQUE SIDE ROTARY SWITCHES (LST)

LST1H extra-low torque, side-rotary switches have a low force return spring and a maximim operation torque of 12 in-oz. It is rated as NEMA 1 due to an unsealed head. The switch cavity is sealed to protect the switch contacts.

	LST1H
Description	Extra-low torque side rotary
Circuitry	SPDT, double break
Contacts	Silver
Sealing	NEMA 1
Electrical rating	(B) NEMA B600
Body style	Plug-in
Conduit (NPT)	0.5 in
Pretravel	15° max.
Differential travel	5° max.
Overtravel	60' min.
Total travel	75° nom.
Operating torque	0,085 Nm [12 in-oz] max.



Heavy Duty Limit Switches

MICRO SWITCH™ HDLS SERIES NOMENCLATURE

Switch Type	Head Style	Body/Basic Switch Code		Modification Code
LS	A	1A	6B	See table
HDLS Series Heavy-Duty Limit Switch * 3 or 4 after the "LS" indicates special metric conduit threads: 3 = PG 13,5 4 = 20 mm	A Side rotary; momentary 10° to 14° pretravel	1A Plug-in, single pole standard switch	6B Plug-in, double pole standard switch, 1/2 in conduit	
	B Top rotary; momentary 10° to 22° pretravel	1E Plug-in, single pole gold contacts	6C Plug-in, double pole sequential, 1/2 in conduit	
	C Top plunger, plain	1F Plug-in, single pole manifold mounting	6D Plug-in, double pole center neutral, 1/2 in conduit	
	D Top plunger, roller	1G Plug-in, single pole gold ctcs, manifold mtg	6R Plug-in, double pole 120 V neon indicator, 1/2 in conduit	
	E Side plunger plain; momentary	1H Plug-in, single pole low force	6S Plug-in, double pole stnd switch, gold ctcs., 1/2 in conduit	
	F Side plunger roller; momentary	5A Plug-in, single pole 120 V neon indicator	6T Plug-in, double pole sequential, gold ctcs., 1/2 in conduit	
	G Side plunger plain; maintained	8A Plug-in, single pole 240 V neon indicator	6U Plug-in, double pole cntr neutral, gold ctcs., 1/2 in conduit	
	H Side rotary, momentary; low PT, low torque	9A Plug-in, single pole 24 V LED indicator	4L Non-plug-in, dbl pole standard switch 3/4 in conduit	
	J Wobble stick	3K Non-plug-in, single pole standard switch	4M Non-plug-in, dbl pole sequential 3/4 in conduit	
	K Whisker	3N Non-plug-in, single pole NC direct acting	4N Non-plug-in, dbl pole center neutral	
	L Side rotary; sequential	3P Non-plug-in, single pole low force, low differen.	4S Non-plug-in, dbl pole standard switch, gold contacts	
	M Side rotary; central neutral	2B Plug-in, double pole standard switch	4T Non-plug-in, dbl pole sequential, gold contacts	
	N Side rotary; maintained	2C Plug-in, double pole sequential	4U Non-plug-in, dbl pole center neutral, gold contacts	
	P Side rotary, momentary; low PT and DT	2D Plug-in, double pole center neutral	7L Non-plug-in, dbl pole standard switch, 1/2 in conduit	
	R Side rotary, momentary; low torque	2F Plug-in, double pole standard switch, manifold mounting	7M Non-plug-in, dbl pole sequential, 1/2 in conduit	
	S Side rotary, gravity return, ex. low torque	2G Plug-in, double pole sequential, manifold mounting	7N Non-plug-in, dbl pole center neutral, 1/2 in conduit	
	T Side rotary, momentary; extremely low torque	2H Plug-in, double pole center neutral, manifold mounting	7S Non-plug-in, dbl pole stnd switch, gold ctcs., 1/2 in conduit	
	U Side rotary, momentary; 5° max. pretravel	2R Plug-in, double pole 120 V neon indicator 3/4 in conduit	7T Non-plug-in, dbl pole sequential, gold ctcs., 1/2 in conduit	
	V Top plunger, adjustable	2S Plug-in, double pole standard switch, gold contacts	7U Non-plug-in, dbl pole cntr neutral, gold ctcs., 1/2 in conduit	
	W Side plunger, adjustable	2T Plug-in, double pole sequential, gold contacts		
		2U Plug-in, double pole center neutral, gold contacts		

NOTE: Not all combinations of model code are available. Please contact your local Honeywell provider for assistance.

HDLS SERIES MODIFICATION CODE TABLE

Mod. code	Description
A	4-pin mini-style
B	5-pin mini-style
C	5-conductor STOW-A cable, 6 ft
E	4-conductor SJTOW-A cable, 6 ft
J	8-pin mini-style
M	9-conductor STOOW-A cable, 6 ft
P	5-conductor STOOW-A cable, 12 ft
R	9-pin mini-style
S	5-pin micro-style
X	9-conductor STOOW-A cable, 12 ft
BB	3-foot mini-style pigtail, single pole
DD	4-pin micro-style with jumper
PA	5-conductor STOOW-A cable, 8 ft
XA	9-conductor STOOW-A cable, 8 ft
PB	5-conductor STOOW-A cable, 30 ft
1	Clockwise head rotation
2	Counterclockwise head rotation
3	Head assembled with actuator to right side
4	Head assembled with actuator to left side
5	Head assembled with actuator toward mounting surface
6	Roller perpendicular to mounting surface
7	Indicator light wired to normally closed circuit
8	Roller on side plunger in vertical position

MICRO SWITCH™ HDLS Series

This datasheet supports the following MICRO SWITCH™ HDLS Series Heavy-Duty Limit Switches.

LS3A1A	LSA1A3-1B	LSA3KA	LSB1A1	LSF1A4	LSJ1AC-7N
LS3A1A	LSA1A3-5C	LSA3KC	LSB1A-1B	LSF1A5	LSJ1ADD-7A
LS3A2B	LSA1A3A-1A	LSA3N	LSB1A2	LSF1A8	LSJ1E-7A
LS3A3K	LSA1A4	LSA3N14-2J	LSB1A-4M	LSF1E	LSJ1E-7M
LS3A3K-7AA	LSA1A-4	LSA4L	LSB1A-4N	LSF1F	LSJ1J-7A
LS3D3K	LSA1A-4M	LSA4L1	LSB1AC	LSF2B	LSJ1JDD-7A
LS3F1A8	LSA1A-4N	LSA4L-1A	LSB1E	LSF2C	LSJ2B-7A
LS3F1E	LSA1A-4R	LSA4L-1B	LSB1J	LSF3K	LSJ3K
LS3M2D	LSA1A5	LSA4L-1D	LSB2B	LSF3K3	LSJ3K-7A
LS3YDC1A	LSA1A-9B	LSA4L23	LSB2R	LSF3K-3B	LSJ4L-7A
LS3YDC1E	LSA1AA	LSA4L-2A	LSB3K	LSF3K4	LSJ4L-7M
LS3YVC1A	LSA1AB	LSA4L-2B	LSB3K-1B	LSF3K5	LSJ5A-7A
LS3YVC1E	LSA1AB-1B	LSA4L3-1D	LSB3K-1D	LSF3K8	LSJ5A-7M
LS4A1A	LSA1AC	LSA4L4	LSB3K-2C	LSF3N	LSJ5A-7N
LS4A1E	LSA1AC-2C	LSA4L4-1D	LSB4L	LSF4L	LSJ6B
LS4A2B	LSA1AC-4M	LSA4L-4N	LSB5A	LSF5A	LSJ6B-7A
LS4A3K	LSA1AP-1B	LSA4S	LSB5A-2D	LSF6B	LSJ7L-7A
LS4A3K-1B	LSA1APA	LSA5A	LSB6B	LSF6B3	LSJ7L-7N
LS4A3K-2B	LSA1E	LSA5A15	LSB6B-4N	LSF6C	LSJ8A-7A
LS4A3K-7AA	LSA1E-1B	LSA5A-1A	LSB7L	LSF7L	LSK1A
LS4C1A	LSA1E-2A	LSA5A-1B	LSB7L-1B	LSF7L3	LSK1A-8A
LS4C3K	LSA1E-2D	LSA5A-1C	LSB9A	LSF7L4	LSK1A-8B
LS4D1A	LSA1F	LSA5A-1D	LSC1A	LSF7L5	LSK1A-8C
LS4D3K	LSA1J	LSA5A25	LSC1E	LSF7L8	LSK1E-8A
LS4F1A	LSA1J1B	LSA5A-4N	LSC1J	LSF8A	LSK1E-8C
LS4F2B	LSA2B	LSA5A7B	LSC2B	LSF9A	LSK2B-8A
LS4H1A	LSA2B15-5D	LSA5AB-1A	LSC2C	LSG1A	LSK3K
LS4J1A-7A	LSA2B-1A	LSA5AB-1B	LSC3K	LSG1E	LSK3K-8B
LS4J1A-7M	LSA2B-1B	LSA5ADD	LSC3KC	LSG2B	LSK4L-8C
LS4J1A-7N	LSA2B-1C	LSA6B	LSC4L	LSG3K	LSK5A-8A
LS4J2B-7N	LSA2B-1D	LSA6B1	LSC5A	LSG4L	LSK5A-8B
LS4K1A-8A	LSA2B25-5D	LSA6B-1A	LSC6B	LSG5A	LSK5A-8C
LS4K1A-8C	LSA2B-2A	LSA6B-1B	LSC6C	LSG7L	LSK6B
LS4L6C	LSA2B-2B	LSA6B-1D	LSC7L	LSG9A	LSK7L-8A
LS4M2D	LSA2B-2C	LSA6B-1F	LSC8A	LSH1A	LSK7L-8B
LS4N1A	LSA2B-2D	LSA6B-1L	LSD1A	LSH1A14	LSK7L-8C
LS4N2B	LSA2B3-5C	LSA6B-2B	LSD1A6	LSH1A-1B	LSK8A-8A
LS4P1A	LSA2B4	LSA6B-2C	LSD1E	LSH1A2	LSK8A-8B
LS4W1A	LSA2B5	LSA6B-2D	LSD1F	LSH1A-2B	LSK8A-8C
LS4YAC1A	LSA2BM	LSA6B-3D	LSD2B	LSH1A-2D	LSK9A-8C
LS4YDC1E	LSA2BM-1B	LSA6B4-2C	LSD2F	LSH1AB	LSL2C
LSA1A	LSA2F	LSA6BR	LSD3K	LSH1E	LSL2C-2D
LSA1A1	LSA2R	LSA6R	LSD3K6	LSH1E-1A	LSL2G
LSA1A1-1A	LSA2S	LSA6S	LSD4L	LSH2B	LSL4M
LSA1A1-1B	LSA3K	LSA7L	LSD5A	LSH2B-1B	LSL4M4
LSA1A1-2J	LSA3K1	LSA7L-1A	LSD5A7	LSH2B-2D	LSL6C
LSA1A13	LSA3K1-1A	LSA7L-1B	LSD6B	LSH3K	LSL6C-4N
LSA1A14	LSA3K1-1B	LSA7L-1C	LSD7L	LSH4L	LSL7M
LSA1A15	LSA3K-1A	LSA7L-1D	LSD8A	LSH4L13	LSL7M-1P
LSA1A-1A	LSA3K-1B	LSA7L2	LSD9A	LSH4L-1B	LSM2D
LSA1A-1B	LSA3K1C-1C	LSA7L-2D	LSE1A	LSH4L3	LSM2D-1A
LSA1A-1C	LSA3K-1D	LSA7L-2J	LSE1A3	LSH5A	LSM2D-1B
LSA1A-1D	LSA3K-1N	LSA7L3-1B	LSE1A4	LSH5A-1L	LSM2D-1D
LSA1A-1F	LSA3K-2A	LSA7L4	LSE1A5	LSH5A-4N	LSM2D-2B
LSA1A-1L	LSA3K-2B	LSA7L-4N	LSE1ADD	LSH6B	LSM2D-2D
LSA1A-1M	LSA3K-2C	LSA7L-4R	LSE1E	LSH6B-1B	LSM2D-2J
LSA1A1S	LSA3K-2D	LSA7L-5C	LSE1E4	LSH7L	LSM2DM
LSA1A2	LSA3K-2J	LSA7LR	LSE4L	LSH9A	LSM2H
LSA1A2-2J	LSA3K3	LSA8A	LSE5A	LSH9A7	LSM2U
LSA1A-2A	LSA3K4	LSA8A7	LSE6B	LSJ1A	LSM4N
LSA1A-2B	LSA3K4-1A	LSA9A	LSE6B5	LSJ1A-1N	LSM4N-1A
LSA1A-2C	LSA3K4-1B	LSA9A-1A	LSE6S	LSJ1A-7A	LSM4N-1B
LSA1A-2D	LSA3K4-1D	LSA9A23	LSE7L3	LSJ1A-7M	LSM4N-2B
LSA1A-2E	LSA3K-4M	LSA9A-2L	LSE7L4	LSJ1A-7N	LSM4N-2D
LSA1A-2J	LSA3K-4N	LSA9ADD	LSE9A	LSJ1AB-7M	LSM6D
LSA1A-2K	LSA3K-4R	LSA9EDD	LSF1A	LSJ1AB-7N	LSM6D-1B
LSA1A3	LSA3K-5C	LSB1A	LSF1A3	LSJ1AC-7M	LSM6D-1D

Heavy Duty Limit Switches

LSM6D-1F	LSP3K	LSV5A	LSYBC1A	LSYMB4N
LSM6D-1P	LSP3K-1B	LSV6B	LSYBC3K	LSYMB4N-2K
LSM6D-2A	LSP3K-1D	LSW1A	LSYBC5A	LSYMB6D
LSM6D-2B	LSP3K3	LSW1A4	LSYBC9A-1D	LSYMB6D-2D
LSM6D3	LSP4L	LSW1A5	LSYCB1A	LSYMB7N
LSM6D-3D	LSP4L3	LSW1AC	LSYCB1E	LSYMB7N-1C
LSM6D4	LSP5A	LSW1E	LSYCB1J	LSYMB7N-1D
LSM6D4-5D	LSP5A7	LSW2B	LSYCB4L	LSYMB7N3-1A
LSM6D-4N	LSP6B	LSW4L	LSYCB4SX-FP	LSYMC4N
LSM6D-5B	LSP7L	LSW5A	LSYCB6B	LSYMC6D
LSM6U	LSP7L-2D	LSYAB1A	LSYCC1A	LSYMC6DF
LSM7N	LSP7L3	LSYAB1A-1B	LSYCC1ADD	LSYMC7N
LSM7N-1A	LSP7S3	LSYAB1A-2A	LSYCC1AE	LSYNB1A
LSM7N-1B	LSP8A	LSYAB1AB	LSYCC3K	LSYNB1AC
LSM7N-1D	LSQA1A313	LSYAB1AC	LSYCC4L	LSYNB2B
LSM7N3	LSQA1A341	LSYAB1E	LSYCC4LX-FP	LSYNB3K
LSM7N-4	LSQH1A322	LSYAB1E-2B	LSYCC5A	LSYNB4L
LSM7U	LSQR1A316	LSYAB1E4-2B	LSYCC6B	LSYNB5A
LSM7U-2D	LSR1A	LSYAB1F	LSYCC7L	LSYNB7L
LSN1A	LSR1A-1A	LSYAB1J	LSYDB1A	LSYNC1A
LSN1A-1B	LSR1A-1B	LSYAB2B	LSYDB2B	LSYNC1ADD
LSN1A-2C	LSR1A-2K	LSYAB2B3	LSYDB3K	LSYPB1A
LSN1A-3A	LSR1A-4N	LSYAB2F	LSYDB4L	LSYPB1AC
LSN1A-3B	LSR1A-5C	LSYAB2S	LSYDB6B	LSYPB2B
LSN1A-3D	LSR1ADD	LSYAB3K	LSYDB7L	LSYPB3K
LSN1A-3P	LSR1E	LSYAB3K-1B	LSYDC1A	LSYPB4L
LSN1A-3S	LSR2B	LSYAB3K-5D	LSYDC1ADD	LSYPB4L-1B
LSN1E	LSR2B-4N	LSYAB3N	LSYDC1AE	LSYPB6B
LSN1E-1A	LSR3K	LSYAB4L	LSYDC3K	LSYPB7L
LSN1F	LSR3K1	LSYAB4L-1B	LSYDC5A	LSYPC1A
LSN1F-1B	LSR4L	LSYAB4L24	LSYDC5AE	LSYPC1J
LSN2B	LSR5A	LSYAB4L-2A	LSYDC6B	LSYPC2B
LSN3K	LSR6B	LSYAB4L4	LSYDC7L	LSYPC3K
LSN3K3D	LSR6B-2D	LSYAB4S	LSYFB1A	LSYRB1A
LSN3N	LSR6B-2L	LSYAB5A	LSYFB3K	LSYRB6B
LSN4L	LSR6B-4M	LSYAB6B	LSYFB3K3	LSYRC1A
LSN4L-2D	LSR7L	LSYAB6B-1B	LSYFB3K4	LSYRC1ADD
LSN4L-3B	LSR7L-2D	LSYAB6B-2D	LSYFB4L	LSYRC2B
LSN4L-3D	LSR9A	LSYAB7L	LSYFB7L	LSYRC4L
LSN5A	LSS1H	LSYAB7L-1A	LSYFC1A	LSYRC9A
LSN5A-3P	LSS1H-4N	LSYAB7L-2B	LSYFC1ADD	LSYUB1A
LSN6B	LSS1HDD	LSYAC1A	LSYFC1AE	LSYUB1A13
LSN6B-3B	LST1H	LSYAC1A1-1D	LSYFC3K	LSYUB1A13-2D
LSN6B-3D	LST1H-1C	LSYAC1A-1B	LSYFC7L	LSYUB1A3
LSN7L	LSU1A	LSYAC1A-2D	LSYFC7L3	LSYUB2B
LSN7L3-3D	LSU1A-1	LSYAC1ADD	LSYFC7L4	LSYUB3K
LSN8A	LSU1A-1B	LSYAC1ADD-1B	LSYGB1A	LSYUB6B
LSN8A37	LSU1A-1D	LSYAC1AH	LSYHB1A	LSYUB9AC
LSN9A	LSU1A-2B	LSYAC1E	LSYHC1A	LSYUC1A
LSN9ADD	LSU1A-2D	LSYAC1J	LSYHC3K	LSYUC1A-1B
LSN9EDD	LSU1A4	LSYAC2B	LSYHC3KA	LSYUC1ADD
LSP1A	LSU1A-4R	LSYAC2R	LSYHC4L	LSYUC6B
LSP1A-1B	LSU1E	LSYAC2S	LSYHC7L	LSYUC9ADD
LSP1A-1C	LSU1J	LSYAC3K	LSYJB1A-7A	LSYVB3K
LSP1A-1D	LSU2B	LSYAC3KP	LSYJB1E-7A	LSYVC1A
LSP1A2	LSU3K	LSYAC3N	LSYJB1J-7A	
LSP1A25	LSU3K1	LSYAC4L	LSYJB3K-7A	
LSP1A-2A	LSU3K-1A	LSYAC5A	LSYJB5A-7A	
LSP1A-2D	LSU3K-2J	LSYAC6B	LSYJC1A-7A	
LSP1A4	LSU4L	LSYAC6B-1A	LSYJC1ADD-7A	
LSP1A4B	LSU5A	LSYAC6B-1B	LSYJC3K-7A	
LSP1A-4M	LSU6B	LSYAC6B-2L	LSYLB4M	
LSP1A5-1C	LSU7L	LSYAC7L	LSYLB6C	
LSP1AB	LSU8A	LSYAC9A	LSYLB6T	
LSP1E	LSU9A	LSYAC9AB	LSYLB7M	
LSP1E-1A	LSV1A	LSYBB2B	LSYLB7T	
LSP1F	LSV1A-2B	LSYBB3K	LSYLC2C	
LSP2B	LSV1E	LSYBB3KP-FP	LSYLC4M	
LSP2B-1B	LSV2B	LSYBB4L	LSYLC6C	
LSP2B-2D	LSV4L	LSYBB5KP-FP	LSYMB2D	

MICRO SWITCH™ HDLS Series

ALSO AVAILABLE



Fully potted MICRO SWITCH™ HDLS heavy-duty limit switches provide an extra degree of protection in harsh environments by sealing the basic switch cavity with epoxy. These switches are the same as the non-plug-in HDLS except that the entire switch cavity is filled with epoxy in addition to the conduit entrance. The fully potted HDLS switches are pre-leaded, with either cable or connectors.

- Excellent sealing capability for harsh-duty food and beverage wash downs and severe machine tool environments
- Extra diaphragm sealing
- 12 inch STOOW-A cable or connector version (other lengths available)
- Cable versions: NEMA 1, 6, 6P, 12
- Connector versions: NEMA 1, 6, 6P, 12, 13
- All fluorocarbon seals (low temperature available)
- UL, CSA, CE, CCC



MICRO SWITCH™ HDLS switches are also available in all stainless-steel versions. Designed for use in highly corrosive environments, such as petrochemical plants, food processing plants, shipboard, and dockside locations. The type 316 cast stainless steel body is designed to minimize crevices where food particles could become trapped in water. The actuator, operating head, and screws are also stainless steel. All seals are fluorocarbon to provide excellent chemical resistance and to withstand operating temperatures up to 121 °C [250 °F] and pressurized steam cleaning. Pre-leaded and epoxy-filled versions also available.

- Corrosion-resistant stainless steel non-plug in body, head, and rotary shaft
- Stainless steel levers
- Fluorocarbon seals
- NEMA 1, 3, 3R, 4, 4X, 6, 6P, and 13
- UL, CSA, CE, CCC

To learn more about Honeywell's HDLS products, call
+1-815-235-6847 or 1-800-537-6945.

MICRO SWITCH™ HDLS Series

Heavy-Duty Limit Switches

WARNING **PERSONAL INJURY**

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

WARNING **MISUSE OF DOCUMENTATION**

- The information presented in this datasheet is for reference only. DO NOT USE this document as product installation information.
- Complete installation, operation and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

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Sensing and Control
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422
www.honeywell.com

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Honeywell

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- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
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- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru

www.lifeelectronics.ru