

INSTRUCTION E50 SINGLE POLE DOUBLE THROW, DOUBLE POLE DOUBLE THROW LIMIT SWITCHES

INTRODUCTION

All E50 Limit Switches consist of three modular, interchangeable, plug-in components: operating head, switch body, and wiring receptacle. Operating heads (side rotary, top and side push, and wobble stick) are mounted on top of the switch body in any of four positions. Both SPDT and DPDT switch bodies employ snap-acting, leaf contact springs providing high reliability and extended life. All assembled limit switches are UL Listed, CSA Certified, and rated with Enclosure Types 3, 3S, 4, 4X, 6, 6P and 13. Obtain renewal parts by ordering the catalog number labeled on each of the three limit switch components.

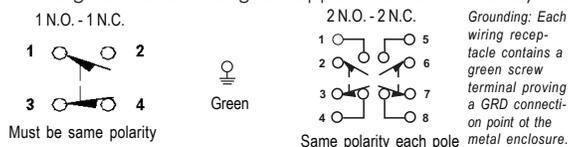
NEMA ICS 2-225 describes preferred installation recommendations which assures greatest reliability and longest life expectancy for Industrial Limit Switches.

TABLE 1 - DESIGN CHARACTERISTICS

Contacts	SPDT, DPDT Form Z (Four Terminal, Double-Break -Double Make)
Contact Ratings	Except gravity return: Without pilot light: NEMA A600, R300; With pilot light: NEMA A150, R150; Gravity return-only: Without pilot light: NEMA B600, With pilot light: NEMA B150
Repeat Accuracy	0.3% maximum deviation
Construction	Die-cast zinc alloy
Enclosure Type	IP67 / NEMA / UL Enclosure Types 3, 3S, 4, 4X, 6, 6P, & 13
Operating Temp.	See Operating Head Temperature Chart pg. 2

CONNECTION DIAGRAM – SPDT, DPDT

The following connection diagram appears on switch body nameplate.



For pre-wired cable or pin connector versions, refer to wiring label on side or receptacle.

ELECTRICAL DATA - CONTACT RATINGS PER POLE

TABLE 2 - SPDT, DPDT - EXCEPT GRAVITY RETURN SWITCH

Volts	AC (NEMA A600)						DC (NEMA R300)	
	Current Amperes			Voltamperes			Volts	Current Amperes
	Make	Break	Cont.	Make	Break			
120	60	6				120	0.25	
240	30	3				240	0.125	
480	15	1.5	10	7200	720			
600	12	1.2						

TABLE 3 - GRAVITY RETURN SWITCH ONLY - NEMA B600 RATING

AC Volts	Current Amperes			Voltamperes	
	Make	Break	Cont.	Make	Break
120	30	3			
240	15	1.5			
480	7.5	0.75	5	3600	360
600	6	0.60			

Contacts on same polarity ^{1&2}
¹ Gravity Return switches are rated AC only - DC ratings do not apply.
² Switch bodies with indicating light are for application on 120V or less.

TORQUE REQUIREMENTS FOR LIMIT SWITCH ASSEMBLY

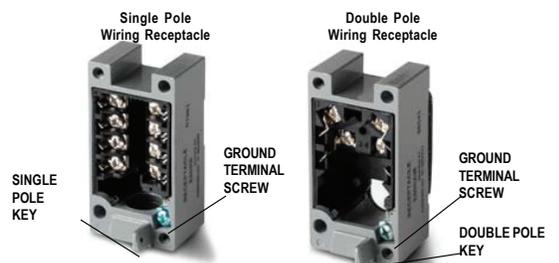
Tighten the operating head and switch body screws to a torque value within the following ranges to assure and maintain the Enclosure Type Ratings for the assembled limit switch.

Switch Body Screws – Tighten to insure contact of switch body to wiring receptacle: 25 – 30 in.-lb.

Operating Head Screws – Tighten to insure contact of head to switch body: 14 – 18 in.-lb.

The wiring receptacle provides the mounting means for an assembled limit switch. Two holes provide for front mounting with #10 screws. Two threaded holes provide for rear mounting using #10 – 32 screws. **Sealing of the ½ inch NPT or 20mm conduit entrance threads should be done by using the E50KH6 conduit sealing nut, sealing compound, or Teflon tape. This will assure and maintain the limit switch Enclosure Type Ratings.**

Switch bodies and receptacles are keyed to prevent a single pole switch from being plugged into a double pole receptacle or vice versa. Receptacle wiring terminals are numbered and correspond with diagram on switch body nameplate. Pressure plate terminals accept AWG #18 through #12 wire. A grounding screw (colored green) provides enclosure grounding. Limit switches should be rigidly mounted with suitable clearances to permit component replacement.



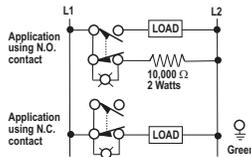
SWITCH BODIES WITH INDICATING LIGHT

Switch bodies with the indicating light should be used at 120V or less. The light is factory-connected. The lamp may be reconnected by lifting the gasket and reconnecting the light across terminals. Replace the gasket. See typical connection diagrams below.

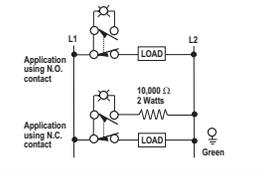
Notes: Solid state devices with leakage or residual current may cause false operation of indicating light.

TYPICAL CONNECTION DIAGRAMS - WITH INDICATING LIGHT

Light is on when switch is in tripped position.

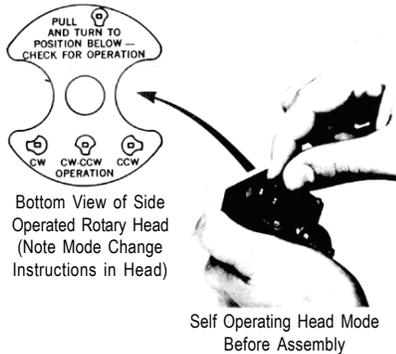


Light is on when switch is in spring return or reset position.

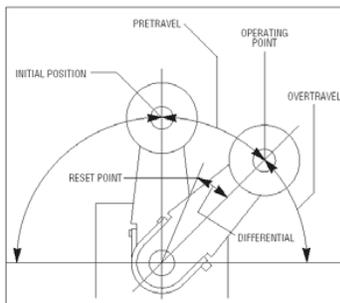


OPERATING HEAD POSITIONING

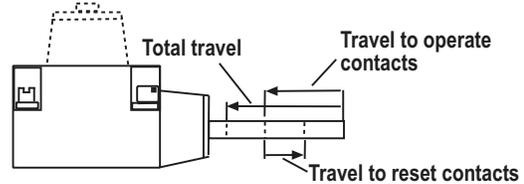
Heads can be mounted on the switch body in any of 4 directions, 90° apart. Torque screws according to requirements on pg 1.



Side Rotary - The operating mode (CW, CCW or CW and CCW) of these spring return operating heads is easily changed without tools as shown in the illustration above. Remove the head from the switch body. Pull out the plunger and turn until its position matches that shown on the diagram for the desired operation mode. Levers are adjustable to any angle (360 degrees). The operating shaft screwdriver slot can be used to maintain shaft position during lever installation.



Push Operated - These spring return top push or side push operating heads are available in pushbutton and roller styles. The push roller style can be converted from vertical to horizontal operation or vice versa. Pull roller out of the head until it can be rotated 90° to the desired orientation. When released, it will snap into the set position. The Maintained Contact head has the reset pushbutton located opposite of the actuator pushbutton.



Wobble Stick - These spring return, top operated heads use different rod-type operators to detect motion in any direction perpendicular to the operator. The operator screws onto the threaded head stub.

TABLE 4 - OPERATING TEMPERATURE³

Table	Operation	Temp. Range	
A	Side Rotary	Spring Rtn. CW only or CCW only	-20°F (-29°C) to +250°F (121°C)
		Spring Return CW & CCW	-20°F (-29°C) to 200°F (94°C)
B	Side Rotary	Maintained	-20°F (-29°C) to 200°F (94°C)
	Side Push	Spring Return	
C	Top Push	Spring Return	-20°F (-29°C) to +250°F (121°C)
	Wobble Head	Spring Return	
D	Side Rotary	Spring Return	-40°F (-40°C) to +175°F (79°C)
	Low Temp	CW & CCW	

³Temperature ranges below +32 °F are based on absence of freezing moisture or water.

REPEAT ACCURACY

The type of operating head used on an assembled limit switch determines repeat accuracy for the switch assembly. Assembled limit switches, without rollers used on operating heads or levers, have a repeat accuracy as listed in Table 5 below.

TABLE 5 - OPERATING HEAD REPEAT ACCURACY SPECIFICATIONS

Operating Head	Repeat Accuracy ⁴
Side Operated:	
Standard Construction	within 0.0012"
Low Operating Force	within 0.0024"
Two-Step	within 0.006"
Neutral Position	within 0.006"
Side Push	within 0.003"
Top Operated:	
Top Push	within 0.002"

⁴Measured along arc for 1-1/2" lever or measured along push operator axis.

Assembled limit switches **with rollers** used on operating heads or levers have a repeat accuracy determined as follows: add the repeat accuracy tolerance of Table 6 for the type of operating head used to the concentricity tolerance of Table 6 for the type of roller used on the lever or operator. The combination of these two tolerances is the limit switch repeat accuracy.

TABLE 6 - OPERATING HEAD TOLERANCE SPECIFICATIONS

	Type	Diameter	Width	Concentricity Tolerance
Lever Roller	Nylon	3/4"	5/16"	+/- 0.002"
	Metal	3/4"	5/16"	+/- 0.001"
	Nylon	3/4"	1"	+/- 0.005"
	Ball Brg.	11/16"	1/4"	+/- 0.002"
Push Roller	Nylon	1-1/2"	9/32"	+/- 0.005"
	Metal	7/16"	5/32"	+/- 0.002"
	Metal	3/4"	5/32"	+/- 0.005"

Mechanical life can be extended if the following guidelines are followed:

- a.) Cam arrangement should be such that: the actuator does not receive a severe impact; the actuator does not suddenly slip back freely.
- b.) Minimum amount of overtravel should be used. See NEMA ICS 2-225 for additional guidelines.

SPECIAL PURPOSE LIMIT SWITCHES

Gravity Return Limit Switch - These limit switches require a very low operating force. Table 8. The weight of the rod-type lever supplies the return force instead of a return spring. Limit switch operation is either CW or CCW, and may be mounted in any position where the shaft is horizontal (parallel to ground).

Adjustment – After mounting in the selected position, adjust for proper operation. Set the rod extension and lock it in place with setscrew. Loosen other setscrew and rotate the INPUT SHAFT in the direction it will turn when operated (clockwise or counterclockwise) until a resistance is felt and a click is heard (contacts trip). Back the shaft away from this point until the contacts reset as indicated by another click – This is about 10°, the minimum pretravel for the Gravity Return limit switch. The shaft may be set for any desired pretravel between 10° and 170° - at more than 170° the contacts may trip. In noisy locations, where the click of contact operation might not be heard, connect a test lamp in series with the normally open contacts for visual indication of contact operation. With the shaft set for the desired amount of pretravel, 10° to 170°, lock the operator in place with setscrew. Check for repeatable switch operation.

Neutral Position Limit Switch - This spring return limit switch has two independently operated poles. One pole operates when the shaft rotates clockwise, and the other operates when the shaft is rotated counterclockwise. Both poles are reset in the neutral position (center off). See Table 8 below.

Two Step Limit Switch - The mode of operation of this side rotary operated two pole limit switch can be changed for CW, CCW or CW and CCW mode as described for the standard side rotary head on page 2. Two independently-operated poles function as a degree of head shaft rotation. One pole operates after 10° of shaft rotation and the second after an additional 10° of shaft rotation in the same direction (20° total for step two). Both poles reset when the shaft returns to the spring return or neutral position.

TABLE 7 - OPERATING HEAD DATA

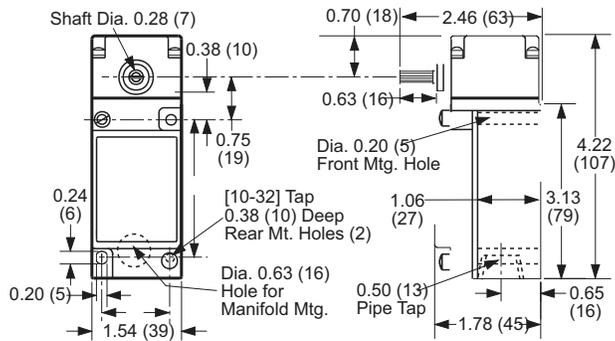
Description Operating Heads	Operating Data - Nominal					Minimum Temp. Range (Table 4)	Catalog Number	
	Travel to Operate Contacts	Travel to Reset Contacts	Total Travel	Operate Contacts	Force to Return Contacts			
 Side Rotary	Standard Spring Return	5°	2°	90°	3 in. - lbs.	4.5 in.-oz.	A	E50DR1
	Low Temp. Spring Return						D	E50DR19
	Low Force Spring Return	15°	6°	90°	1.5 in.-lbs.	2.5 in.-oz.	A	E50DL1
	Maintained Two Position	50°	50°	90°	3 in.-lbs.	-	B	E50DM1
 Side Push	Pushbutton Spring Return	0.065 in.	0.030 in.	0.290 in.	4 lbs.	8 oz.	B	E50DS1
	Pushbutton Adj. Spring Rtn.	0.065 in.	0.030 in.	0.290 in.	4 lbs.	8 oz.	B	E50DS2
	Push Roller Spring Return	0.065 in.	0.030 in.	0.290 in.	4 lbs.	8 oz.	B	E50DS3
	Push Roller Spring Return	0.075 in.	0.030 in.	0.290 in.	4 lbs.	8 oz.	B	E50DS4
	Pushbutton Maintained	0.200 in.	0.130 in.	0.320 in.	5 lbs.	5 lbs.	B	E50DH1
 Top Push	Pushbutton Spring Return	0.040 in.	0.020 in.	0.280 in.	4lbs.	8 oz.	C	E50DT1
	Pushbutton Adj. Spring Rtn.	0.040 in.	0.020 in.	0.280 in.	4lbs.	8 oz.	C	E50DT2
	Push Roller Spring Return	0.040 in.	0.020 in.	0.280 in.	4lbs.	8 oz.	C	E50DT3
 Wobble Head	Spring Rtn. (Standard Duty)	10°	6°	15°	2 in.-lbs.	2-4 in.-oz.	C	E50DW1
	Spring Rtn. (Heavy Duty)	10°	6°	15°	2 in.-lbs.	2-4 in.-oz.	C	E50DW2

TABLE 8 - OPERATING DATA - SPECIAL PURPOSE LIMIT SWITCHES

Image	Switch Body Connection Diagram	Operating Data - Nominal						Temp. Range	
		Travel to Operate Contacts	Travel to Reset Contacts	Total Travel	Force to Return Contacts	Minimum Return Force	Catalog Number		
	Single Pole 1 N.O. - 1 N.C. 1 2 3 4 Must be Same Polarity	ASSEMBLED SWITCH						0°F (-17°C) to 200°F (94°C)	
		10°-170°	8°	360°	3 in.-oz.	Gravity	E50GG1		
		SEPERATE COMPONENTS FOR ABOVE SWITCH							
		Switch Body Only							E50SG
		Receptacle Only							E50RA
		Switch Body (Optional with Indicating LED, 120 VAC)							E50SGN
	CW CCW 1 5 2 6 3 7 4 8 Same Polarity Each Pole	ASSEMBLED SWITCH						14°F (-10°C) to 200°F (94°C)	
		5°	2°	90°	1.8 in.-lbs.	2.5 in.-oz.	E50NN1		
		15°	2°	90°	1.8 in.-lbs.	2.5 in.-oz.	E50NN2		
		SEPERATE COMPONENTS FOR ABOVE SWITCH							
		Switch Body Only							E50SN
		Receptacle Only							E50RB
	1 5 2 6 3 7 4 8 Same Polarity Each Pole	ASSEMBLED SWITCH						CW or CCW 14°F (-10°C) to 250°F (121°C) ⁵	
		1st Step 10°	4°	90°	3 in.-lbs.	4.5 in.-oz.	E50TD1		
		SEPERATE COMPONENTS FOR ABOVE SWITCH							
		Switch Body Only							E50ST
		Receptacle Only							E50RB
		Operating Head Only							E50DD1

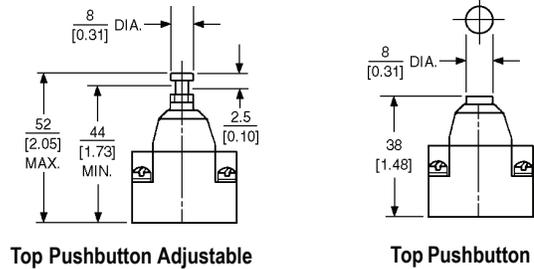
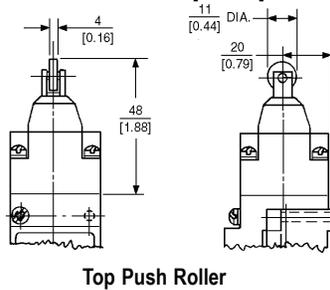
⁵ For CW or CCW only operation. For CW and CCW operation, operating temperature is -20°F (-29°C) to 200°F (94°C)

DIMENSION DIAGRAM - Inches [mm]⁶

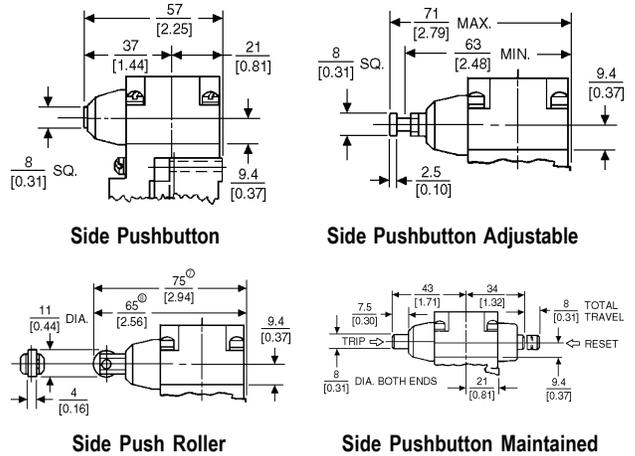


⁶Can accommodate both U.S., 29.4 [1.16] x 59.5 [2.34] and DIN, 30 [1.18] x 60 [2.36] mounting options.

TOP PUSH OPERATORS - mm [inches]



SIDE PUSH OPERATORS - mm [inches]



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