



Installation Instructions for DeviceNet™ E50 Limit Switches



DESCRIPTION

General Information

- Network Media - DeviceNet
- Protocol - DeviceNet Rel 2.0
- Type - Group 2 Only Slave Device using Predefined Master Slave Connection Set
- Bandwidth - 125, 250, 500 Kbaud

All E50 Limit Switches consist of two modular, interchangeable plug-in components: operating head and a solid state switch body. Operating heads (side rotary, top and side push, and wobble stick) are mounted on top of the switch body in any of four positions. All assembled limit switches are rated NEMA 3, 3S, 4, 4X, 6, 6P and 13. Obtain renewal parts by ordering the catalog number labeled on each of the two limit switch components.

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

MODELS COVERED BY THIS MANUAL

Catalog Number	Description
E50DNA	Solid State Switch Body with 2-meter cable
E50DNAC	Solid State Switch Body with 5-pin DeviceNet micro-connector

INSTALLATION



WARNING

DO NOT INSTALL OR PERFORM MAINTENANCE ON THIS DEVICE WHILE THE CONTROLLER IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH INSTALLATION OR MAINTENANCE. Only qualified persons, as defined in the National Electric Code, who are familiar with the installation, maintenance and operation of this device and the equipment onto which is to be installed, as well as applicable local, state and national regulations and industry standards and accepted practices regarding safety of personnel and the equipment safety should be permitted to install, maintain or operate this device. These instructions are provided only as a general guide to such qualified persons and are not all-inclusive. They do not cover every application or circumstances which may arise in the installation, maintenance or operation of this equipment. Users are advised to comply with all local, state and national regulations and industry standards and accepted practices regarding safety of personnel and the equipment safety.

TORQUE REQUIREMENTS FOR LIMIT SWITCH ASSEMBLY

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

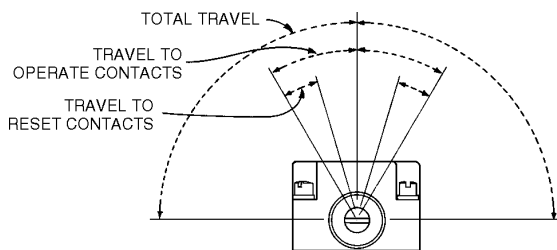
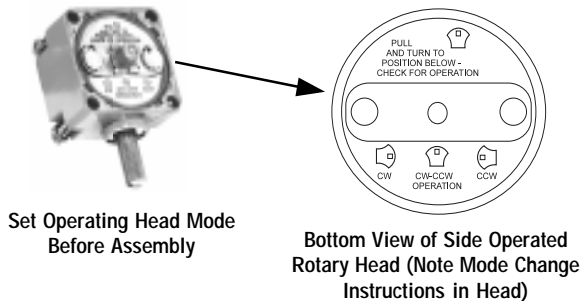
Operating Head Screws — Tighten to ensure contact of head to switch body: **14 - 18 lb. in.**

OPERATING HEAD POSITIONING

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

OPERATING HEADS — 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. Remove the head from 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°). The operating shaft screwdriver slot can be used to maintain shaft position during lever installation.



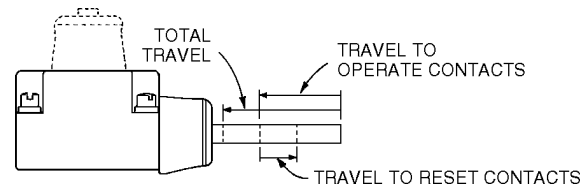
Side Rotary Operational Head

OPERATING HEADS — 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.



Push Operational Head

OPERATING HEADS — 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.

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 1 only.

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 1 for the type of operating head used to the concentricity tolerance of Table 2 for the type of roller used on the lever or operator. The combination of these two tolerances is the limit switch repeat accuracy.

TABLE 1










Side Operated	Operating Head	Repeat Accuracy ¹
	Standard Construction	within 0.0012"
	Low Operating Force	within 0.0024"
	Two-Step	within 0.006"
	Neutral Position	within 0.006"
Top Operated	Side Push	within 0.003"
	Top Push	within 0.002"

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

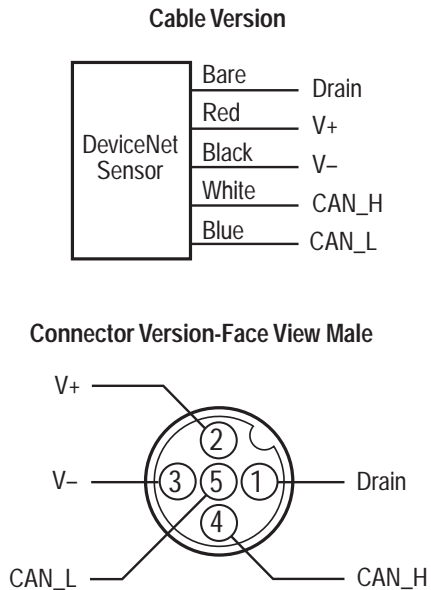
TABLE 2

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

OPERATING HEAD DATA

Description Operating Heads			Operating Data —Nominal				Operating	Temp. Range (See Table)	Catalog No.
			Travel To Operate Contacts	Travel To Reset Contacts	Total Travel	Force To Operate Contacts	Minimum Return Force		
Side Rotary 	Standard Spring Return		5°	2°	90°	3 in.-lbs.	4.5 in.-oz.	A	E50DR1
	Low Temperature Spring Return		5°	2°	90°	3 in.-lbs.	4.5 in.-oz.	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 Adjustable Spring Return		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
	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.	4 lbs.	8 oz.	C	E50DT1
	Pushbutton Adjustable Spring Return		0.040 in.	0.020 in.	0.280 in.	4 lbs.	8 oz.	C	E50DT2
	Push Roller Spring Return		0.040 in.	0.020 in.	0.280 in.	4 lbs.	8 oz.	C	E50DT3
Wobble Head 	Spring Return	Standard Duty	10°	6°	15°	2 in.-lbs.	2.4 in.-oz.	C	E50DW1
		Heavy Duty	10°	6°	15°	2 in.-lbs.	2.4 in.-oz.	C	E50DW2

WIRING CONSIDERATIONS



ATTENTION

THE DEVICENET CABLE IS NEC (UL) TYPE CL2 RATED. THE CABLE IS NOT SUITABLE FOR USE IN ENVIRONMENTS REQUIRING RESISTANCE TO CERTAIN OILS AND CUTTING FLUIDS. PLEASE CONSULT FACTORY FOR CABLING OPTIONS FOR THESE APPLICATIONS.

DEVICE CONFIGURATION

Before using the E50 limit switch, you must configure the device's baud rate and network address. The baud rate defaults to 125 kbaud, and the address defaults to 63. Additional parameters you may wish to configure include the on, off, and one-shot delay, and the operate mode. After connecting the device to the network, use NetView or another configuration tool to configure device.

Network Address

After connecting the E50 to the network, use the Netview configuration software (or other configuration software) to configure the device. Unless pre-configured, a new device will have a default address of 63 at a baud rate of 125 Kbaud when connected to the network.



CAUTION

Since all new DeviceNet devices are factory set to address 63, it is usually not a good idea to leave an address set at 63. Two nodes at the same address will cause a network fault!

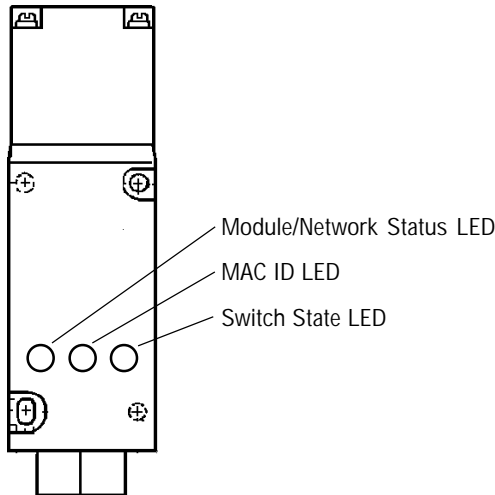
Built into the Cutler-Hammer Netview configuration software is a function to locate nodes by continually flashing the Module/Network Status LED between green and red. Once the Netview configuration software is communicating to the E50, the address and all other user configurable parameters can then be programmed. (See the Netview manual for specific information on how to change attributes.) A list of configurable attributes can be found on page 5 of this manual.

Off-line Configuration

An E50 switch may be configured off-line by connecting it directly to the configuration tool (PC with software or a hand-held type tool) and following the instructions for on-line configuration. 24 VDC must still be supplied to the switch in order to configure it off-line.

LED DEFINITIONS AND DIAGNOSTICS

The E50 includes three LED status indicators: Switch state indication, MAC ID, and network/module status indication.



LED	Status
MODULE/NETWORK STATUS LED	
OFF	Device is neither on-line nor faulted - Device has not yet completed the Dup_MAC_ID test - Device may not be powered
Solid Green	Device is operating properly and properly allocated by a master.
Flashing Green	Device is operating properly and on-line but not allocated by a master.
Flashing Red	Device has detected a recoverable fault or a connection is in the timed-out state.
Solid Red	Device has detected an unrecoverable fault or is in the communications faulted state.
Flashing Green/Red Alternately	Device is faulted and visibly identifying itself.
MAC ID LED	
Flashing Red	The number of blinks is the ten's digit of the device MAC ID.
Flashing Green	The number of blinks is the one's digit of the device MAC ID.
SWITCH STATE LED	
Solid Red	Switch mechanism is actuated
OFF	Switch mechanism is not actuated

SPECIFICATIONS

Material of Construction

Zinc Die-Cast Alloy

Enclosure Ratings

IP67

NEMA 3, 3S, 4, 4X, 6, 6P, and 13

Operating Temperature Range

-25° to 70° C (-13° to 158° F)

Storage Temperature Range

-40° to 150° C (-40° to 302° F)

Operating Humidity

<95% RH, non-condensing

Operating Voltage

11 to 24 Vdc

Minimum Operational Current

33 mA @ 25 Vdc

Maximum Operational Current

120 mA @ 11 Vdc

Maximum Inrush Current

305 mA @ 25 Vdc

Electromagnetic Compatibility Compliance

Immunity

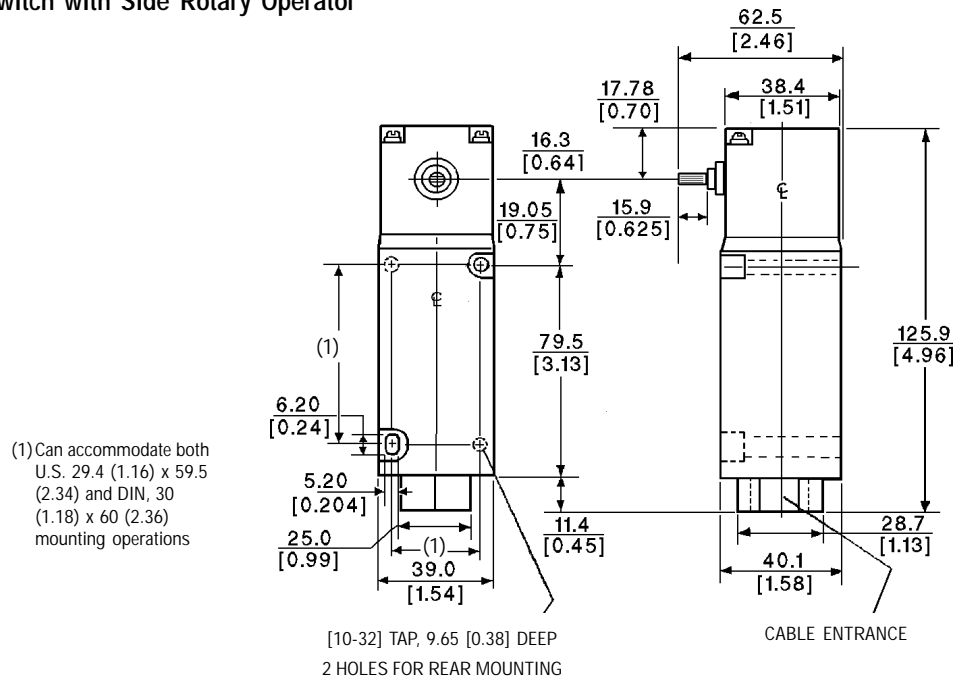
ESD per IEC 1000-4-2: +/- 8 kV

RFI per IEC 1000-4-3: 50 V/m

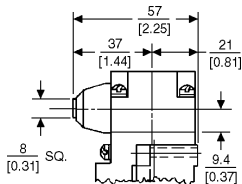
EFT per IEC 1000-4-4: 2 kV

APPROXIMATE DIMENSIONS Shown in mm (inches)

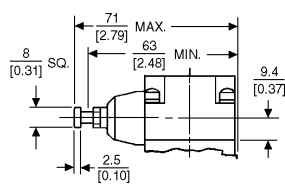
Limit Switch with Side Rotary Operator



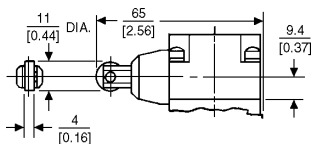
Side Push Operators



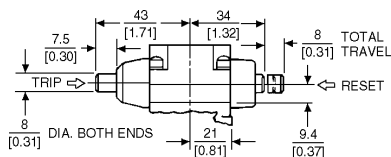
Side Pushbutton



Top Pushbutton Adjustable

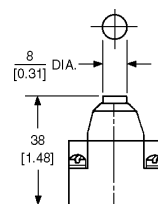


Side Push Roller

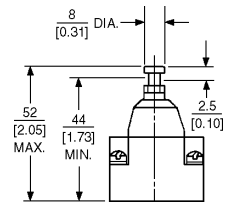


Side Pushbutton Maintained

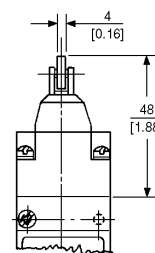
Top Push Operators



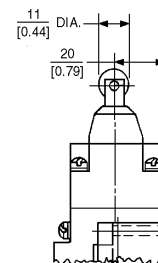
Top Pushbutton



Top Pushbutton Adjustable



Top Push Roller



APPENDIX: ELECTRONIC DATA SHEETS (Programming Information)

Connection Object - Class 5 (05_{HEX}), Instances 1, 2 and 3

This device supports Explicit Messaging (Instance 1), I/O Poll (Instance 2), and I/O Bit Strobe (Instance 3).

DeviceNet Object - Class 3 (03_{HEX}), Instance 1

Attribute	Attribute ID	Access
MAC ID (0..63)	1	Get/Set
Baud Rate (0=125K, 1=250K, 2=500K)	2	Get/Set
Bus-Off Interrupt	3	Get/Set
Bus-Off Counter	4	Get/Set
Allocation Information	5	Get
Bus-Off Separation	100	Get/Set

If *Bus-Off Interrupt* is true, the device automatically attempts to recover from a bus-off condition if it is on-line and hasn't been bus-off since power-up, or if it has sent and received at least *Bus-Off Separation* messages since the last bus-off condition.

Presence Sensing Object - Class 14 (0E_{HEX}), Instance 1

Attribute	Attribute ID	Access
Output (0..1)	1	Get
Diagnostic (0=OK, 1=fault)	4	Get
On Delay (0..65535 mS)	5	Get/Set
Off Delay (0..65535 mS)	6	Get/Set
One Shot Delay (0..65535 mS)	7	Get/Set
Operate Mode (0=normally open, 1=normally closed)	8	Get/Set
Switch State (0=nonactuated, 1=actuated)	100	Get
Head Actuation Count	101	Get/Set
Maximum Head Actuation Count	102	Get/Set

Service	Service ID
Diagnose Nonactuated Switch	50

Output takes into account the *On Delay*, *Off Delay*, *One Shot Delay*, and *Operate Mode*. *Switch state* represents the physical location of the limit switch.

Head Actuation Count increments each time the head is actuated. When *Head Actuation Count* reaches 80% or 100% of the *Max Head Actuation Count*, a fault is added to the diagnostic object. Maximum

head actuation count is based on Mean Time Between Failure (MTBF) data and therefore statistically some units could potentially fail earlier than that, as well as operate well past that number.

The *Diagnose Nonactuated Switch* service causes the device to perform a self diagnostic on its sensing circuitry. The test is only valid if the limit switch is in the nonactuated position. Running this test is the only way to clear the *Diagnostic* bit.

Assembly Object Data - Class 4 (04_{HEX}), Instance 1

Attribute	Attribute ID	Access
Data	3	Get

Use Assembly Object Data to read diagnostic and output status. Data bit 0 is output status, which is obtained from Attribute 1 of the Presence Sensing Object. Data bit 1 is diagnostic status, which is obtained from Attribute 4 of the Presence Sensing Object. The remaining bits (2..7) are 0.

The I/O Poll and I/O Bit Strobe connections consume 0 bytes and product 1 byte. The one produced byte is *Data*.

Identity Object - Class 1 (01_{HEX}), Instance 1

Attribute	Attribute ID	Access
Vendor (68)	1	Get
Device Type (4)	2	Get
Product Code (50)	3	Get
Revision	4	Get
Status	5	Get
Serial Number	6	Get
Product Name ("E50")	7	Get
State	8	Get

Message Router Object - Class 2 (02_{HEX}), Instance 1

Attribute	Attribute ID	Access
Object List	1	Get

APPENDIX: ELECTRONIC DATA SHEETS (Continued)**Diagnostic Object - Class 198 (C6_{HEX}), Instance 1**

Attribute	Attribute ID	Access
Number of Faults	1	Get
Fault List	2	Get
Overwrite (0 = preserve oldest faults) (1 = preserve newest faults)	3	Get/Set
Timestamp (0..65535)	4	Get/Set
Resolution (0..65535 mS)	5	Get/Set
Maximum Number of Faults (8)	6	Get

The **Fault List** is accessible via the *Get Member* service. Each member has the following structure:

Parameter	Data Type
Class	UINT
Instance	UINT
Error Code	USINT
Additional Error Code	USINT
Status	UINT
Timestamp	UINT

Test Object - Class 199 (C7_{HEX}), Instance 1

Attribute	Attribute ID	Access
Power OK	5	Get
LED Disable	6	Get/Set

SOFTWARE TIMING

The E50 is not capable of responding to all DeviceNet messages at all baud rates if multiple messages are sent in rapid succession. For best results, a master should wait for a response to a previous request before sensing a subsequent request.

HARDWARE SPECIFICATIONS**DeviceNet Wiring Connections**

V+ Power	Operating range: 11..27 V Protected range: -30..30 V referenced against V-
V- Common	
CH CAN high	Protected range: -30..30 V referenced against V-
CL CAN low	Protected range: -30..30 V referenced against V-
D Drain	

Still Need Help?

Contact Cutler-Hammer Advanced Product Support

Phone: 1-800-809-2772

Select 2 for Sensor and Application Assistance

Select 6 for DeviceNet Communication and Configuration Assistance

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