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E51 Modular Limit Switch Style Sensors

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Product Description

The E51 Inductive Proximity Sensor family from Eaton's Electrical Sector combines high performance with a familiar limit switch style housing. Modular, plug-in components provide application flexibility, ease of maintenance, less downtime and reduced inventory. Choose from two-wire sensors with AC/DC operation, or four-wire sensors in either AC or DC styles. Connection options include terminal, mini-connector or various lengths of cable.

Choose from standard sensors that detect all types of metallic targets. The next page provides more detail on these sensors.

Features

- Rugged construction is ideal for industrial environments
- Viton gaskets ensure a positive seal and high resistance to industry chemicals
- Direct replacement for worn out limit switches
- Sensor heads and bodies feature captive screws to eliminate loss
- All sensor heads include a selector switch to program output function to either NO or NC
- Sensor bodies feature bifurcated engagement prongs for a reliable connection when plugging into receptacle stabs
- Engagement key between sensor body and receptacle prevents improper assembly
- Sensors accommodate both U.S. and DIN mounting dimensions
- Wiring terminals feature captive pressure plate saddles for #18 to #12 AWG wire. A green screw identified ground terminal is also included
- Logic modules are available to provide additional control functions

Standards and Certifications

- UL Listed
- CSA Certified
- CE (where shown)

Listed

DANGER

THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.

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

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.
For Application Assistance in the U.S. and Canada call 1-800-426-9184.

Product Selection

Standard Sensors—Assembled with Terminal Wiring

Standard E51 sensors feature long sensing ranges and a choice of top or side sensing heads. Alternate frequency units eliminate interference when mounted close to standard frequency units. Order sensors in component form, as assembled plug-in units, or in a sealed version where the sensor body is factory assembled to an epoxy filled receptacle with tamper-proof screws to ensure a lasting seal.

Assembled Sensor

Assembled Sensors—Standard (with Terminal Wiring)

Sensor Body and Receptacle

		Two-Wire Sensors	Four-Wire Sensors			
	Operating voltage	20–264 Vac/dc	120 Vac		10–30 Vdc	
	Output	NO or NC ①	NO and NC complementary		NO and NC complementary	
	Sensor body	**E51SAL**	**E51SCL**	**E51SCN** Accepts logic modules ②	**E51SPL** PNP	**E51SNL** NPN
	Receptacle ③	**E51RA**	**E51RC**	**E51RCB**	**E51RN**	**E51RN**

Sensor Heads ①

Sensing Range	Shielding	Frequency	Sensor Head Only Catalog Number	Assembled Sensors with Head, Sensor Body and Receptacle Catalog Number				
Top Sensing								
0.51 in (13 mm)	Shielded	Standard	**E51DT1**	**E51ALT1** CE	**E51CLT1**	**E51CNT1**	**E51PLT1** CE	**E51NLT1** CE
		Alternate	**E51DT2**	**E51ALT2** CE	**E51CLT2**	**E51CNT2**	**E51PLT2** CE	**E51NLT2** CE
0.94 in (24 mm)	Unshielded	Standard	**E51DT5**	**E51ALT5** CE	**E51CLT5**	**E51CNT5**	**E51PLT5** CE	**E51NLT5** CE
		Alternate	**E51DT6**	**E51ALT6** CE	**E51CLT6**	**E51CNT6**	**E51PLT6** CE	**E51NLT6** CE
Side Sensing								
0.51 in (13 mm)	Shielded	Standard	**E51DS1**	**E51ALS1** CE	**E51CLS1**	**E51CNS1**	**E51PLS1** CE	**E51NLS1** CE
		Alternate	**E51DS2**	**E51ALS2** CE	**E51CLS2**	**E51CNS2**	**E51PLS2** CE	**E51NLS2** CE
0.94 in (24 mm)	Unshielded	Standard	**E51DS5**	**E51ALS5** CE	**E51CLS5**	**E51CNS5**	**E51PLS5** CE	**E51NLS5** CE
		Alternate	**E51DS6**	**E51ALS6** CE	**E51CLS6**	**E51CNS6**	**E51PLS6** CE	**E51NLS6** CE

Top Sensing

Side Sensing

Notes

① All sensor heads feature a programmable output selector switch for NO or NC operation. Operation is as follows:

For This Output Type:	Set Selector Position: "TARGET"	"NO TARGET"
NO	Target present	Target absent
NC	Target absent	Target present

② Logic module must be ordered separately, see **Page V8-T3-91**. These sensor bodies are rated NEMA 4, 4X and 13.

③ Receptacles feature terminal wiring with a 1/2 in NPT thread at the conduit entrance. Other connection options are available:

Connection Option		Catalog Number	Code Suffix	Example
20 mm thread at the conduit entrance		—	**20**	**E51ALT120**
Mini-connector termination with epoxy filled receptacle, see **Page V8-T3-92** for additional receptacle options	Two-wire, 3-pin connector	**CSMS3F3CY1602**	**P3**	**E51ALT1P3**
	Four-wire, 5-pin connector	**CSMS5D5CY1602**	**P5**	**E51CLT1P5**
Pre-wired cable with epoxy filled receptacle	8 ft long	—	**S**	**E51ALT1S**
	12 ft long	—	**S12**	**E51ALT1S12**
	20 ft long	—	**S20**	**E51ALT1S20**

Standard Sensors—Assembled with Receptacles

Sensor body is attached to receptacle with tamper-proof screws.

Assembled Sensor

Assembled Sensors—Standard (with Epoxy Filled Receptacles and Pre-wired Cables)

Sensor Base Type with 8 ft Cable ②

		Two-Wire Sensors	Four-Wire Sensors		
	Operating voltage	20–264 Vac/dc	120 Vac	10–30 Vdc	
	Output	NO or NC ①	NO and NC complementary	NO and NC complementary PNP	NPN

Sensor Heads ①	Sensing Range	Shielding	Frequency	Sensor Head Only Catalog Number	Assembled Sensors with Head and Sensor Base Catalog Number						
Top Sensing											
	0.51 in (13 mm)	Shielded	Standard	**E51DT1**	**E51ALT16P**	CE	**E51CLT16P**	**E51PLT16P**	CE	**E51NLT16P**	CE
			Alternate	**E51DT2**	**E51ALT26P**		**E51CLT26P**	**E51PLT26P**	CE	**E51NLT26P**	CE
	0.94 in (24 mm)	Unshielded	Standard	**E51DT5**	**E51ALT56P**	CE	**E51CLT56P**	**E51PLT56P**	CE	**E51NLT56P**	CE
			Alternate	**E51DT6**	**E51ALT66P**	CE	**E51CLT66P**	**E51PLT66P**	CE	**E51NLT66P**	CE
Side Sensing											
	0.51 in (13 mm)	Shielded	Standard	**E51DS1**	**E51ALS16P**	CE	**E51CLS16P**	**E51PLS16P**	CE	**E51NLS16P**	CE
			Alternate	**E51DS2**	**E51ALS26P**	CE	**E51CLS26P**	**E51PLS26P**	CE	**E51NLS26P**	CE
	0.94 in (24 mm)	Unshielded	Standard	**E51DS5**	**E51ALS56P**	CE	**E51CLS56P**	**E51PLS56P**	CE	**E51NLS56P**	CE
			Alternate	**E51DS6**	**E51ALS66P**	CE	**E51CLS66P**	**E51PLS66P**	CE	**E51NLS66P**	CE

Sensor Heads

Sensor Heads ①

	Sensing Range	Shielding	Frequency	Target Material	Catalog Number
Top Sensing					
	0.51 in (13 mm)	Shielded	Standard	All metals	**E51DT1**
			Alternate		**E51DT2**
	0.94 in (24 mm)	Unshielded	Standard	All metals	**E51DT5**
			Alternate		**E51DT6**
Side Sensing					
	0.51 in (13 mm)	Shielded	Standard	All metals	**E51DS1**
			Alternate		**E51DS2**
	0.94 in (24 mm)	Unshielded	Standard	All metals	**E51DS5**
			Alternate		**E51DS6**

Notes

① All sensor heads feature a programmable output selector switch for NO or NC operation. Operation is as follows:

For This Output Type:	Set Selector Position: "TARGET"	"NO TARGET"
NO	Target present	Target absent
NC	Target absent	Target present

② Switch bases feature 8 ft of SOOW-A cable. Other connection options are available:

Connection Option ③	Suffix	Example
Mini-connector mounted on 3 ft (0.9m) pigtail cable	**T**	**E51ALT16PT**
Mini-connector mounted to switch base	**C**	**E51ALT16PC**
Cable longer than 8 feet, add required length in 1 ft increments to listed catalog number—20 ft maximum	**Length in ft**	**E51ALT16P12 for 12 ft**

③ See listing of compatible connector cables on **Page V8-T3-93**.

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Sensor Bodies

Two-Wire Sensors

AC/DC

Operating Voltage	Output	Protection	Output Rating Continuous	Type	Catalog Number
AC/DC					
20–264 Vac/dc, 50/60 Hz	1 output, load powered, NO or NC, programmable from head; off state leakage current: <1.7 mA at 120 Vac/dc, <2.0 mA at 240 Vac	Latching short circuit and overload	0.5 A	—	**E51SAL** ① CE

Four-Wire Sensors

AC (E51SCN Shown)

Operating Voltage	Output	Protection	Output Rating Continuous	Type	Catalog Number
AC					
120 Vac, 50/60 Hz	2 complementary outputs, line powered, NO and NC	—	1.0 A to 158 °F (70 °C), linearly derated to 0.6 A at 176 °F (80 °C)	—	**E51SCL** ①
			1.0 A to 113 °F (45 °C), linearly derated to 0.3 A at 176 °F (80 °C)	—	**E51SCN** ②③

DC

Operating Voltage	Output	Protection	Output Rating Continuous	Type	Catalog Number
DC					
10–30 Vdc	2 complementary outputs, line powered, NO and NC	Reverse polarity	0.6 A to 104 °F (40 °C), linearly derated to 0.36A at 176 °F (80 °C)	NPN	**E51SNL** ①
				PNP	**E51SPL** ①

Logic Module

Logic Module (for E51SCN Sensor Body Only)

Logic Module ⑤

Type	Description	Timing Range ④	Catalog Number
ON and OFF delay	Adjustable delay between time object is sensed and time switch function occurs Adjustable delay between time object leaves sensing field and time switch transfers back to non-sensing state	0.15 to 15.0 seconds	**E51MTB**

Notes

① This sensor body is available in a factory-sealed, non plug-in configuration (with 8-ft cable), add **6P** to listed catalog number. Example: E51SAL**6P**.
② Sensor body is black. E51SCN sensor bodies are rated NEMA 4, 4X and 13.
③ This sensor accepts logic modules, as seen in chart above.
④ Repeatability of the timing cycle is ±1% at constant voltage, ambient temperature and reset time.
⑤ Reset time is 25 ms minimum. Rated NEMA 4, 4X and 13.

Receptacles

Receptacles

Surface Mount

Mini-Connector

Pigtail with Mini-Connector

Pre-Wired Cable

Description	Style	Details	Cable Length	Conduit Entrance 1/2 in NPT Catalog Number	Conduit Entrance 20 mm Catalog Number
Surface Mount					
Conduit entrance, front or rear mounting	Two-wire, AC/DC	—	—	**E51RA**	**E51RA20**
	Four-wire, AC	Gray	—	**E51RC**	**E51RC20**
		Black ①	—	**E51RCB**	**E51RCB20**
	Four-wire, DC	—	—	**E51RN**	**E51RN20**
Mini-Connector					
Epoxy filled receptacle with pre-wired mini-connector	Two-wire, AC/DC	3-pin	—	**E51RAP3** ㉒	—
	Four-wire, AC	5-pin	—	**E51RCP5** ㉓	—
	Four-wire, DC	5-pin	—	**E51RNP5** ㉓	—
Pigtail with Mini-Connector					
Epoxy filled receptacle with mini-connector mounted on 3 ft (0.9m) cable	Two-wire, AC/DC	3-pin	3 ft (0.9m)	**E51RAPT3** ㉒	—
	Four-wire, AC	5-pin	3 ft (0.9m)	**E51RCPT5** ㉓	—
	Four-wire, DC	5-pin	3 ft (0.9m)	**E51RNPT5** ㉓	—
Pre-Wired Cable					
Epoxy filled receptacle with pre-wired 16 gauge, yellow jacketed, type SOOW-A cable. Cable enters through hole threaded for conduit	Two-wire, AC/DC	3-conductor	8 ft (2.4m)	**E51RAS**	**E51RA20S**
			12 ft (3.6m)	**E51RAS12**	—
			20 ft (6m)	**E51RAS20**	—
	Four-wire, AC	5-conductor	8 ft (2.4m)	**E51RCS**	**E51RC20S**
			12 ft (3.6m)	**E51RCS12**	—
			20 ft (6m)	**E51RCS20**	—
	Four-wire, DC	5-conductor	8 ft (2.4m)	**E51RNS**	**E51RN20S**
			12 ft (3.6m)	**E51RNS12**	—
			20 ft (6m)	**E51RNS20**	—

Notes

㉒㉓ See listing of compatible connector cables on **Page V8-T3-93**.

① Black receptacle is for color compatibility with E51SCN sensor body.

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Compatible Connector Cables

Standard Cables ①

Micro-Style Straight Female

Current Rating at 600 V	Voltage Style	Number of Pins	Gauge	Length	Pin Configuration/Wire Colors (Face View Female Shown)	Catalog Number
Micro-Style, Straight Female						
13 A	—	3-pin	16 AWG	6 ft (2m)	① ③ ② 1-Green 2-Black 3-White	**CSMS3F3CY1602**
10 A	AC/DC	4-pin, four-wire	16 AWG	6 ft (2m)	④ ① ③ ② 1-Black 2-Blue 3-Brown 4-White	**CSMS4A4CY1602**
8 A	—	5-pin	16 AWG	6 ft (2m)	⑤ ① ④ ② ③ 1-White 2-Red 3-Green 4-Orange 5-Black	**CSMS5D5CY1602**

Accessories

E51 Modular Limit Switch Style Sensors

One Hole

Description	Catalog Number
Universal Mounting Bracket	
One hole, includes mounting hardware, stainless steel	**E51KH2**

Two Holes

Two holes, includes mounting hardware, steel	**E51KH4**

Machine Mounting Bracket

Machine Mounting Bracket	
Zinc die cast construction	**E50KH3**

Stand-Off Mounting Bracket

Stand-Off Mounting Bracket	
Steel construction	**E51KH3**

Remote Sensor Head Assembly

Remote Sensor Head Assembly	
Permits mounting sensor head up to 3 ft (0.9m) from sensor body	**E51KRM**

Dimensions, see **Page V8-T3-95**.

Note

① For a full selection of connector cables, see **Tab 10**, **section 10.1**.

Technical Data and Specifications

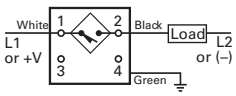
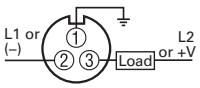
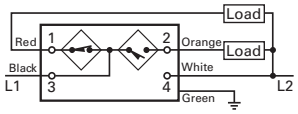
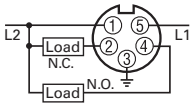
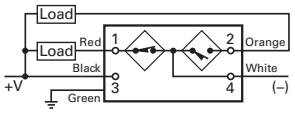
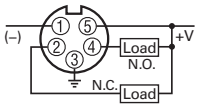
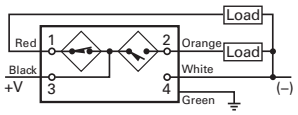
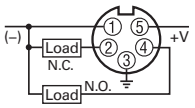
E51 Modular Limit Switch Style Sensors

Description	Specification
Output rating (NEMA D150)	
AC/DC models	0.5 A continuous
AC models	1 A continuous
DC models	0.6 A continuous
Protection	Latching short-circuit protection on two-wire AC/DC models; DC models: resettable short-circuit protection
Switching rate	AC models: 15 Hz; DC models: 50 Hz
Indicator LEDs	Lights when output is ON. One LED for each output
Alternate frequency	Standard and alternate frequencies allow side-by-side operation without interference
Enclosure material	Zinc die cast
Gasket material	Viton
Enclosure ratings	NEMA 3, 3S, 4, 4X, 6, 6P, 12 and 13 (IP67); E51SCN sensor body only: NEMA 4, 4X and 13
Hazardous locations ratings	
Class I	Division II—GRPS ABCD
Class II	Division II—GRPS F and G
Class III	Division 2
Temperature range	–13 to 158 °F (–25 to 70 °C)
Torque requirements	Switch body screws: 25–30 in-lbs; sensing head screws: 14–18 in-lbs
Vibration	10–55 Hz, 1 mm amplitude
Shock	30 g, 11 ms, 1/2 sine wave
Humidity	95% non-condensing
Burden current	<25 mA
OFF-state leakage	DC version: 120 µA; two-wire AC: 1.9 mA maximum; three-wire AC: 1.1 mA
ON-state leakage	<2.5 Vdc
Power-up delay	<150 ms

Wiring Diagrams

Pin numbers are for reference, rely on pin location when wiring.

E51 Modular Limit Switch Style Sensors

Operating Voltage	Output	Terminal and Cable Models	Mini-Connector Models (Face View Male Shown)
Two-Wire Sensors			
20–264 Vac or Vdc 50/60 Hz	NO or NC (NO shown, can be changed to NC using switch on sensor head)		
Four-Wire Sensors			
120 Vac 50/60 Hz	NO and NC ①		
10–30 Vdc	NO and NC NPN ①		
	NO and NC PNP ①		

Note

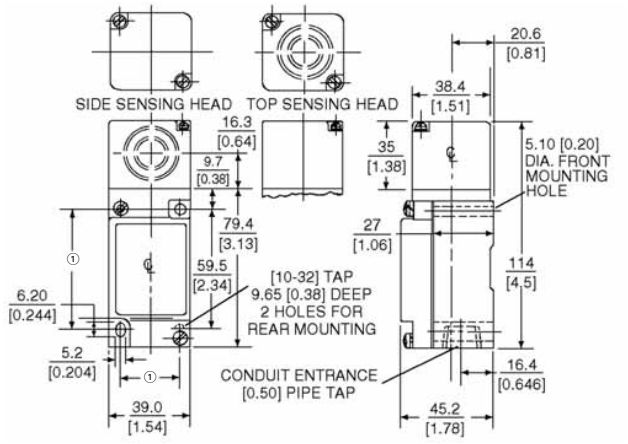
① Changing output switch on sensor head will reverse output function (NO becomes NC, and NC becomes NO).

Dimensions

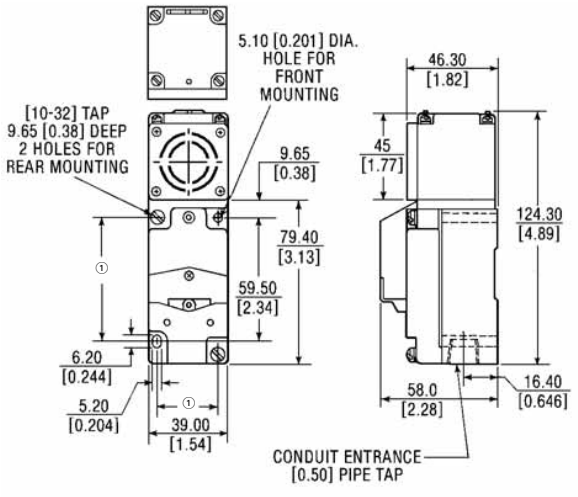
Approximate Dimensions in mm [in]

E51 Modular Limit Switch Style Sensors

Standard Sensors



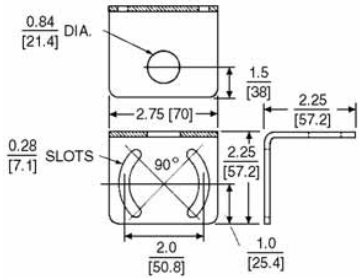
Sensor with Logic Module



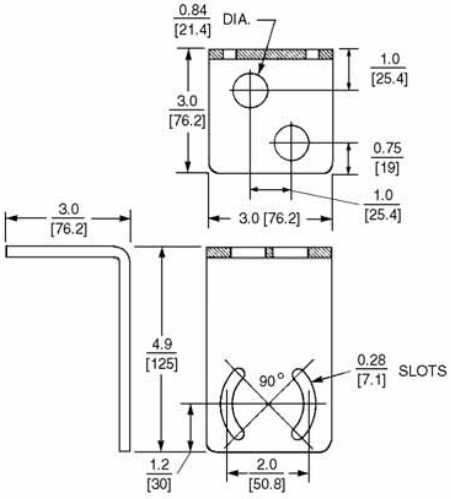
Accessories

Approximate Dimensions in Inches [mm]

Universal Mounting Bracket—One Hole



Universal Mounting Bracket—Two Holes



Note

① Can accommodate both U.S., 29.4 [1.16] x 59.5 [2.34] and DIN, 30 [1.18] x 60 [2.36], mounting dimensions are in mm [in].

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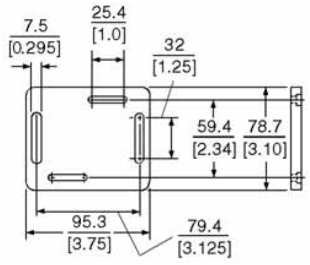
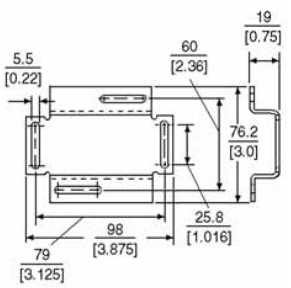
Approximate Dimensions in mm [in]

Machine Mounting Bracket



Stand-Off Mounting Bracket



Remote Sensor Head Assembly