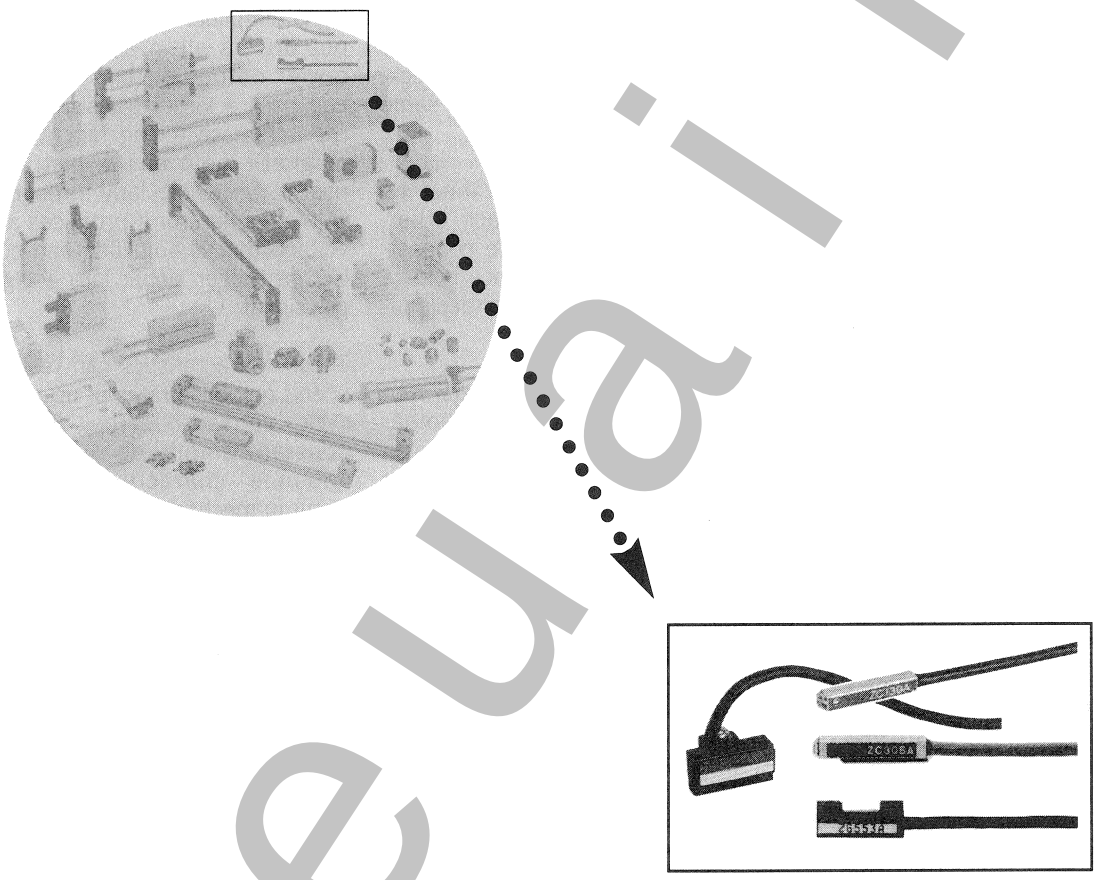
Sensors



SENSOR SWITCHES

Sensor switches are available for Humphrey Actuators. A sensor switch is an electrical switch that is actuated when it passes through a magnetic field. The magnetic field is created by placing a magnet on the piston of the cylinder. As this rather narrow magnetic field moves perpendicularly through the switch sensing area it causes the switch to close. As it passes beyond the sensing area, the switch will open. The thin width of the magnetic field allows an accurate switch setting. Switches can be used to control motion, activate PLC systems, control computer generated systems, be adapted into micro circuits, etc.

Humphrey sensor switches are two types. Hall effect sensor switches are electronic switches with no moving parts. They operate only on low DC supply voltage (10 to 28 VDC). Reed sensor switches are electro-mechanical switches which will operate on either AC or DC voltages (5 to 28 VDC or 115 AC).

Reed sensor switches are subject to current "spikes" which can occur with capacitive, reactive or inductive loads and may require arc-suppression devices to protect the switch. Protection devices can include a capacitor and resistor for reactive loads and a diode for DC inductive loads. Hall effect sensor switches are not subject to this damage.

Hall effect sensor switches have ratings of maximum voltage and maximum current. Reed sensor switches are usually rated in maximum watts. Usually, reed sensor switches have higher ratings than Hall effect sensor switches.

Hall effect sensor switches are usually designated as "sourcing" or "sinking" power output. If the switch is between ground (-) and load, the current "sinks" as it travels to ground. If the switch is between positive (+) and load, the current "sources" as it travels from positive to load.

Never reverse the current of a Hall effect sensor switch. It will destroy the sensor switch. LED lights are available on certain sensor switches. When this type of sensor switch closes, a red LED light turns on. It will go off when the sensor switch again opens. It is not a recommended practice to use a light in the circuit to signal the switching function: it can damage the sensor switch. A LED light does not induce the resistive current which might cause the damage. Do not use a light for checking the switching action for the same reason.

Hall effect sensor switches cannot be connected in series with each other. Reed Sensor switches can be connected in series but will experience voltage drops across each and these accumulate.

Both types of sensor switches are subject to erroneous operation if another magnetic field interferes with the system. Care should be used to prevent this. Typical of this might be two or more such cylinders operating side by side (without magnetic shielding to suppress the stray magnetic field) causing the adjoining sensor switch to operate erratically. Consult the factory for recommendations for this type of installation.

If piston travel is very rapid, the magnetic field can pass by a sensor switch too quickly for the magnetic field to trip the switch and thus fail to close. To help this condition, a latching relay in the circuit may be required. Again, consult the factory for assistance.

Reed Sensor Switches

The reed switch contains two low reluctance ferromagnetic switch blades that are hermetically sealed in a glass tube containing an inert gas. The blades overlap and are held open a small amount by the stiffness of the material. When the magnetic field created by the magnet (mounted on the cylinder piston) becomes large enough to overcome the stiffness of the reed switch material, the switch blades will deflect closing the switch. As the magnet continues to travel, the magnetic field decays and the stiff reed switch blades will assume their original shape opening the switch.

Hall Effect Sensor Switches

Hall effect sensor switches are electronic devices. They incorporate a voltage regulator, a Hall voltage generator, a signal amplifier, trigger circuits and output drivers all in a single chip. The power output of this sensor is small and uses a larger transistor to provide the actual switching function. As the magnetic field of the piston magnet passes perpendicularly through the Hall voltage generator it produces an analog voltage that is amplified and converted by the trigger circuit into a digital output signal.

These characteristics can result in high speed response rates of up to 100,000 cycles per second. They also provide a constant amplitude output (without "bounce" characteristics which can occur in mechanical switches).

Hall effect sensor switches can only be used in DC voltage circuits.

Applications

A sensor switch is mounted on the body of the actuator in several ways dependent on the construction of the actuator and of the sensor switch. It can be slid into a slot in the body of the actuator and locked in place by a setscrew. Or it can be clamped on the side of the actuator by a band. In either case, it is necessary to be able to make minor adjustments in the sensor switch position to assure the switch accurately performs its task. These adjustments typically can be as small as 3.0 mm (.01 in).

A sensor switch can be used to signal that an actuator has reached the end of its stroke. It can signal that the actuator is nearing the end of its stroke and that another function can safely begin. It can signal that an actuator has reached a given point and must stop moving. Two sensor switches could be mounted on an actuator in a manner

that would use one sensor switch to signal that an object had been clamped and the second sensor switch would signal if the object to be clamped was missing allowing the actuator to reach its full stroke. Sensor switches can be used to signal that the end of the stroke has been reached and reverse the stroke.

The magnet in the actuator is mounted on the piston. Some actuators have the magnet as standard, others have the magnet as an option.

Design Considerations

Reed sensor switches are more versatile. They can be used in either AC or DC voltage applications. Reed sensor switches can be used to provide actuator position information to low-power inputs (.25 watts) for programmable controllers or control circuits or to control low-power valve solenoids or control relays. H series reed sensor switches can have power ratings up to 10 watts. RS2, RS3, and RS4 reed sensor switches can have power ratings up to 50 watts. HE1 reed series sensor switches are rated up to 300 milliwatts power.
Reed sensor switches must be protected from voltage "spikes" generated by inductive devices. These can cause arcing across the contacts that result in failure when the contacts weld together. A single diode in parallel with the inductive device can be used to protect the reed sensor switch in a DC voltage circuit. A MOV (metal oxide varistor) across the reed sensor switch will provide protection from voltage "spikes" in either AC or DC voltage circuits. Never use reed sensor switches to control incandescent lamps -- the inrush current of an incandescent lamp is 10 times the steady state current and will result in welding the sensor switch contacts.

Hall effect sensor switches are used to provide information to programmable controllers or other very low power DC voltage circuits. With no moving parts, Hall effect sensor switches give a repeatable signal even at very high actuator speeds. With no moving parts, they have a long life expectancy if the rating is not exceeded.

Sensor switch Information

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Specifications

Sensor switch information

NOTE: NPN = sinking, PNP = sourcing

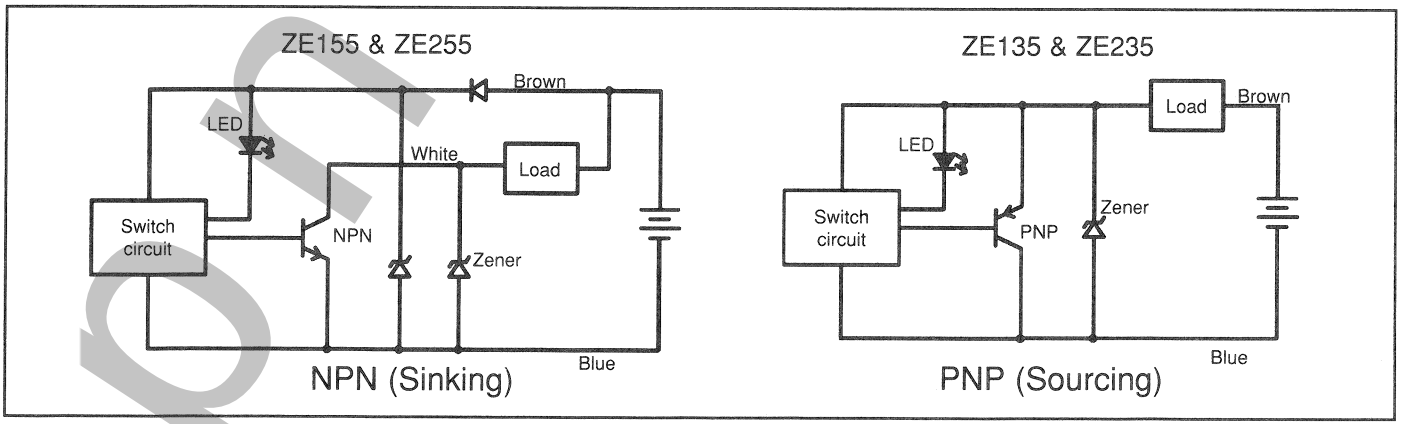
ITEM	HE1	RS2	RS3	RS4	CS9H	CS3H	CS4H	CS5H
TYPE	HALL	REED	REED	REED	HALL	REED	REED	REED
LEADS	3 WIRE	2 WIRE	3 WIRE	3 WIRE	3 WIRE	2 WIRE	2WIRE	2 WIRE
VOLTS DC	5-25 VDC	200 VDC	5-30 VDC	200 VDC	4-28 VDC	10-30 VDC	10-30 VDC	3-30 VDC
LOAD DC	25 MA	1A	1A	1A	150 MA	10-50 MA	5-25 MA	.1-60 MA
VOLTS AC	—	141 VAC	5-30 VAC	141 VAC	—	85-115 VAC	85-115 VAC	85-115 VAC
LOAD AC	—	1A	1A	1A	—	10-50 MA	5-20 MA	2-25 MA
LED	ON RED	NONE	ON RED	ON RED	ON RED	ON RED	ON RED	NONE
WT gm(oz)	20(.71)	20(.71)	20(.71)	20(.71)	30 (1.06)	20(.71)	20(.71)	20(.71)
	NPN	NPN	NPN	NPN	NPN	NPN	NPN	NPN
USE	**STAINLESS STEEL**	**STAINLESS STEEL**	**STAINLESS STEEL**	**STAINLESS STEEL**	**BLOCK & SLIDE**	**BLOCK & SLIDE**	**BLOCK & SLIDE**	**BLOCK & SLIDE**

ITEM	ZE135	ZE155	ZE235	ZE255	ZC130	ZC153	CS5T	CS11T
TYPE	HALL	HALL	HALL	HALL	HALL	HALL	REED	REED
LEADS	2 WIRE	3 WIRE	2 WIRE	3 WIRE	2 WIRE	3 WIRE	2 WIRE	2 WIRE
VOLTS DC	10-28 VDC	4.5-28 VDC	10-28 VDC	4.5-28 VDC	10-28 VDC	4.5-28 VDC	5-28 VDC	10-28 VDC
LOAD DC	4-20 MA	50 MA	4-20 MA	50 MA	4-50 MA	100 MA	.1-40 MA	5-40 MA
VOLTS AC	—	—	—	—	—	—	85-115 VAC	—
LOAD AC	—	—	—	—	—	—	2-25 MA	—
LED	ON RED	ON RED	ON RED	ON RED	ON RED	ON RED	NONE	ON RED
WT gm(oz)	15(.53)	15(.53)	15(.53)	15(.53)	20(.71)	20(.71)	20(.71)	20(.71)
	PNP	NPN	PNP	NPN	NPN	NPN	NPN	NPN
USE	**GRIPPER**	**GRIPPER**	**GRIPPER**	**GRIPPER**	**MULTIMT**	**MULTIMT**	**MULTIMT**	**MULTIMT**

ITEM	ZG553	CS4M	ZC130	ZC153	CS5T	CS11T	ZC153	CS5T	CS11T
TYPE	HALL	REED	HALL	HALL	REED	REED	HALL	REED	REED
LEADS	3 WIRE	2 WIRE	2 WIRE	3 WIRE	2 WIRE	2 WIRE	3 WIRE	2 WIRE	2 WIRE
VOLTS DC	4.5-28 VDC	10-30 VDC	10-28 VDC	4.5-28 VDC	5-28 VDC	10-28 VDC	4.5-28 VDC	5-28 VDC	10-28 VDC
LOAD DC	100 MA	5-25 MA	4-50 MA	100 MA	.1-40 MA	5-40 MA	100 MA	.1-40 MA	5-40 MA
VOLTS AC	—	85-115 VAC	—	—	85-115 VAC	—	—	85-115 VAC	—
LOAD AC	—	5-20 MA	—	—	2-25 MA	—	—	2-25 MA	—
LED	ON RED	ON RED	ON RED	ON RED	NONE	ON RED	ON RED	NONE	ON RED
WT gm(oz)	20(.71)	20(.71)	20(.71)	20(.71)	20(.71)	20(.71)	20(.71)	20(.71)	20(.71)
USE	**TWNPRT SMALL (6)**	**TWNPRT SMALL (6)**	**TWN ROD SMALL (6)**	**TWN ROD SMALL (6)**	**TWN ROD ROTARY**	**TWN ROD ROTARY**	NPN **ROTARY**	NPN	NPN

ITEM	ZC153	ZG553	CS4M	CS5T	CS11T	ZE101	ZE102	ZE201	ZE202
TYPE	HALL	HALL	REED	REED	REED	REED	REED	REED	REED
LEADS	3 WIRE	3 WIRE	2 WIRE	2 WIRE	2 WIRE	2 WIRE	2WIRE	2 WIRE	2 WIRE
VOLTS DC	4.5-28 VDC	4.5-28 VDC	5-30 VDC	5-28 VDC	10-28 VDC	5-28 VDC	10-28 VDC	5-28 VDC	10-28 VDC
LOAD DC	100 MA	100 MA	5-25 MA	.1-40 MA	5-40 MA	40 MA	5-40 MA	40 MA	5-40 MA
VOLTS AC	—	—	85-115 VAC	85-115 VAC	—	85-115 VAC	85-115 VAC	85-115 VAC	85-115 VAC
LOAD AC	—	—	5-20 MA	2-25 MA	—	20 MA	5-20 MA	20 MA	5-20 MA
LED	ON RED	ON RED	NONE	NONE	ON RED	NONE	ON RED	NONE	ON RED
WT gm(oz)	20(.71)	20(.71)	20(.71)	20(.71)	20(.71)	15(.53)	15(.53)	15(.53)	15(.53)
	NPN	NPN	NPN	NPN	NPN				
USE	**SWING ROTARY**	**SWING LINEAR**	**SWING LINEAR**	**SWING SWING**	**SWING SWING**	**RODLESS**	**RODLESS**	**RODLESS**	**RODLESS**

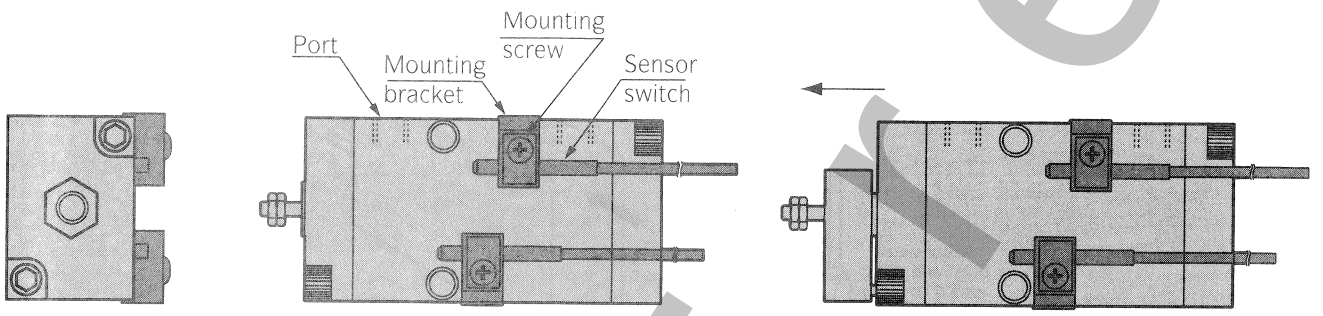
Circuit Diagrams



Multi-Mount

Sensor switch information

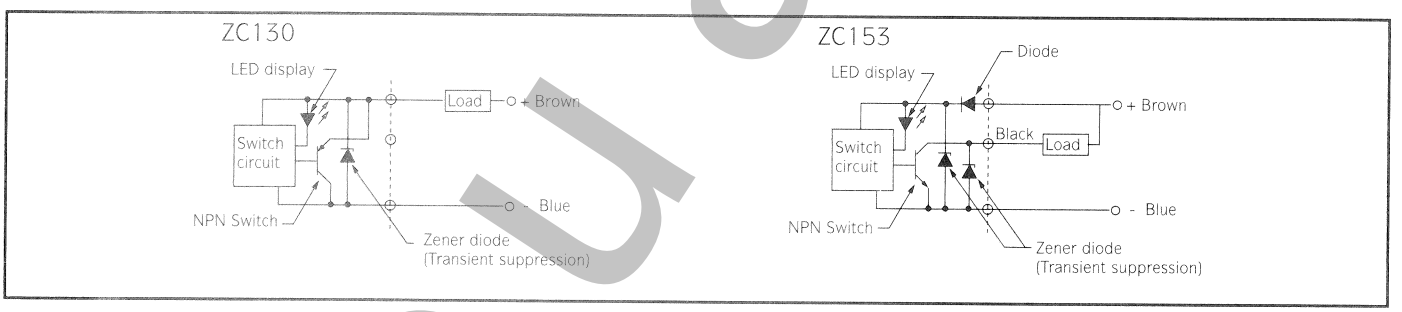
Mounting



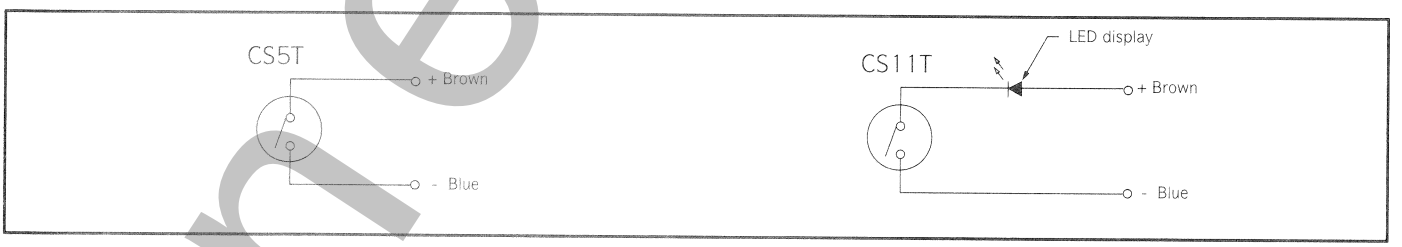
1. Apply air to desired port to move cylinder to end of stroke.
2. Insert sensor switch in direction of arrow in the groove of the cylinder body.
3. Continue inserting sensor switch in direction of arrow. If sensor switch has LED light it will turn on.
4. After sensor switch closes, move it .3 mm (.01 in) in direction of arrow and secure sensor switch with mounting screw.
5. If second sensor switch is needed, apply air to other port (if double acting) or disconnect air supply and install other sensor switch in same manner.

NOTE: See page 120 when using multi-mounts in close pitch applications.

Circuit diagrams

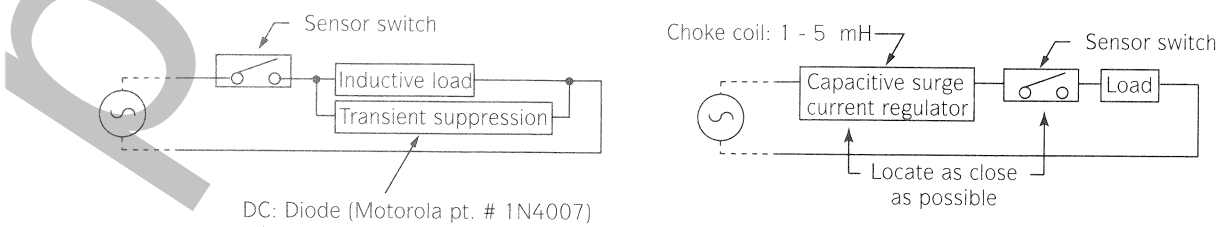


Hall effect



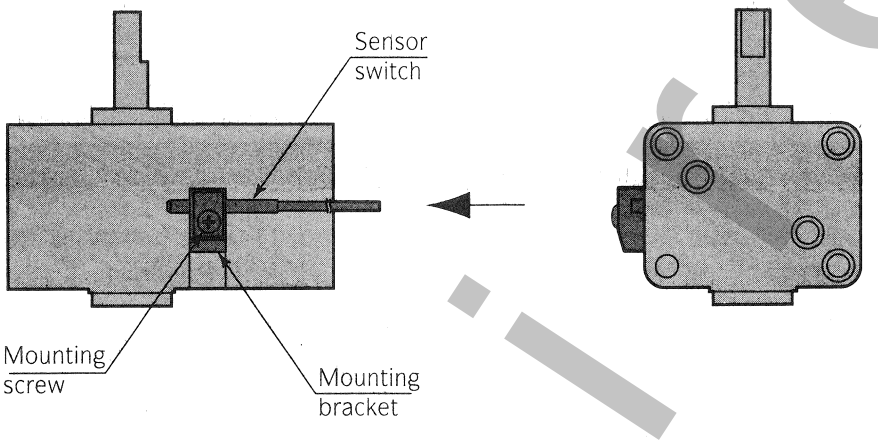
Reed

Recommended protection for reed sensor switch



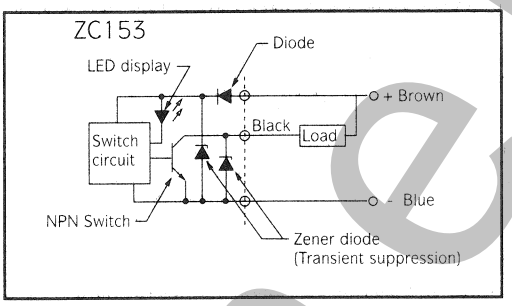
Sensor switch information

Mounting

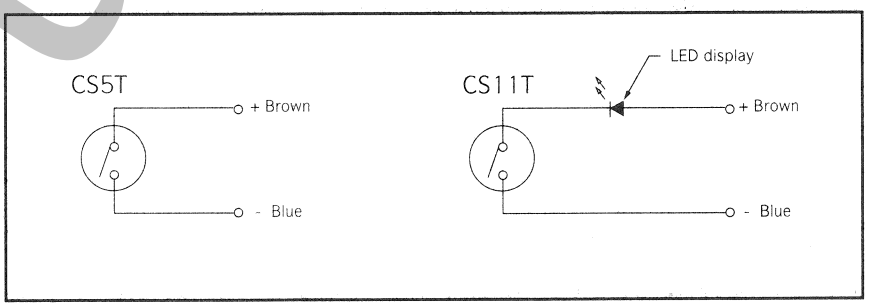


1. Apply air to desired port to move swing arm to end of stroke.
2. Insert sensor switch in direction of arrow in the groove of the rotary actuator body.
3. Continue inserting sensor switch in direction of arrow. If sensor switch has LED light it will turn on.
4. If second sensor switch is needed, apply air to other port and install other sensor switch in same manner.

Circuit diagrams

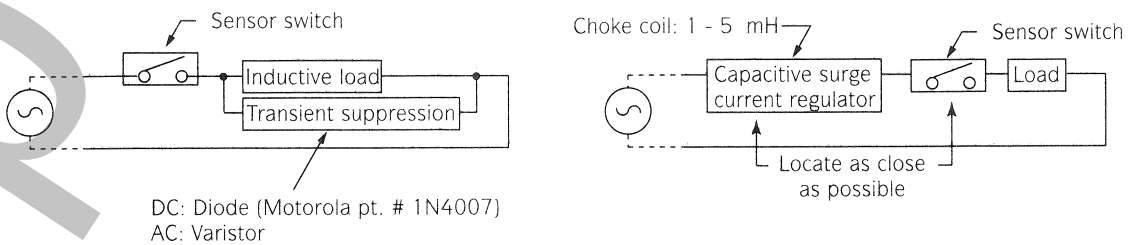


Hall effect



Reed

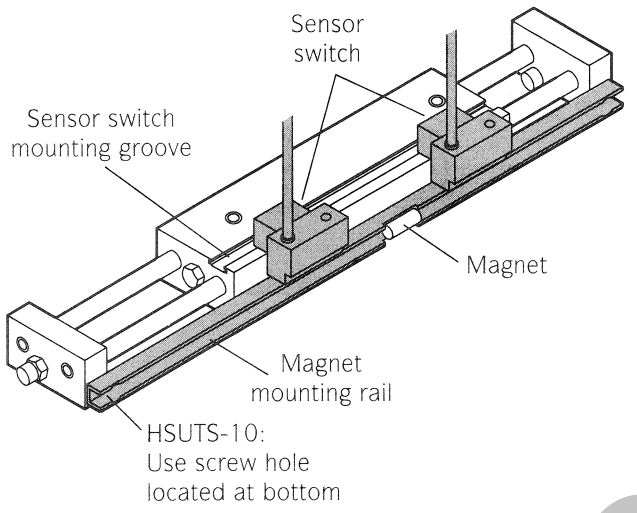
Recommended protection for reed sensor switch



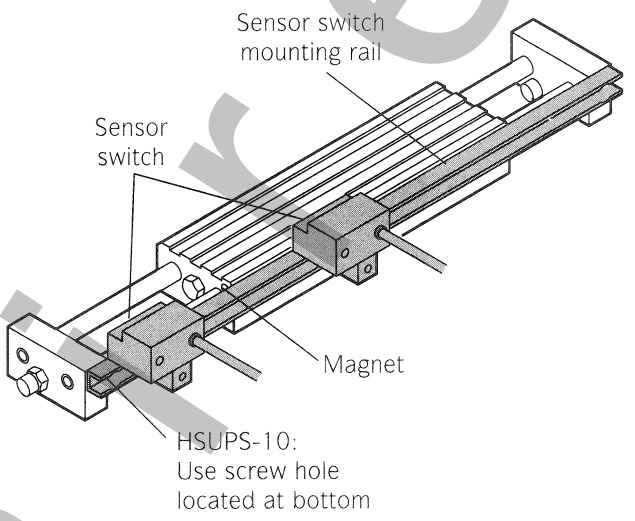
Slide

Sensor switch information

Mounting for HSUTS and HUSTKS

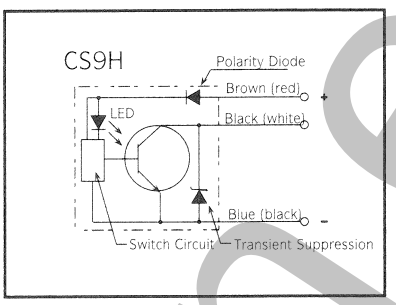


Mounting for HSUPS, HSUPKS, HSULS, and HUSLKS

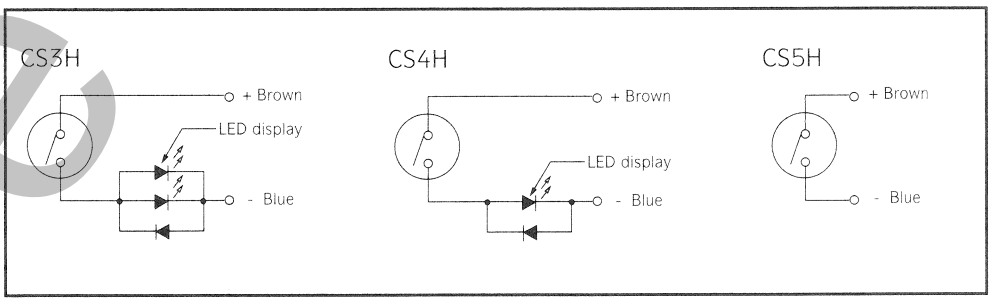


1. Apply air to desired port to move table to end of stroke.
2. Insert sensor switch in direction of arrow in the groove of the table body.
3. Continue inserting sensor switch in direction of arrow. If sensor switch has LED light it will turn on.
4. After sensor switch closes, move it .3 mm (.01 in) in direction of arrow and secure sensor switch with mounting screw.
5. If second sensor switch is needed, apply air to other port (if double acting) or disconnect air supply and install other sensor switch in same manner.

Circuit diagrams

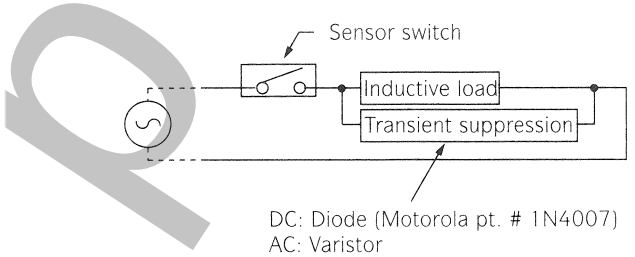


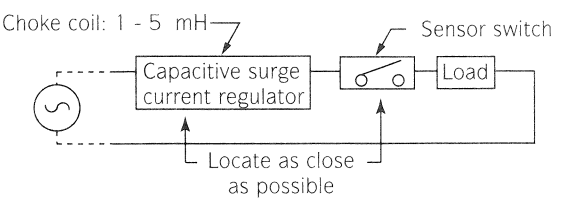
Hall effect



Reed

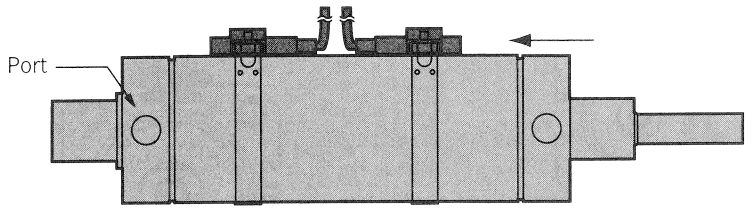
Recommended protection for reed sensor switch

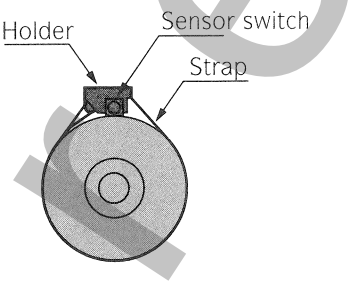


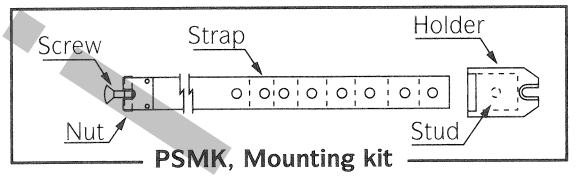


Sensor switch information

Mounting



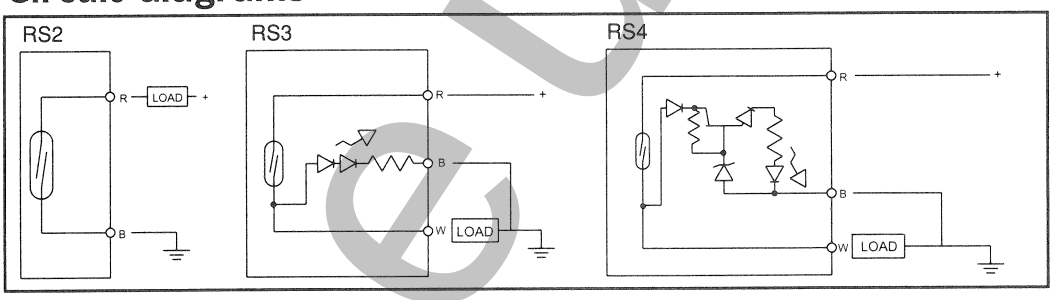




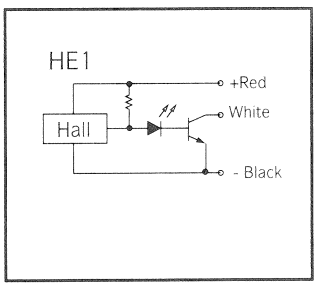
PSMK, Mounting kit

1. Insert screw into nut in strap. Cut strap to length and insert into slot in holder snapping hole over stud in holder. Wrap strap around cylinder barrel and insert head of screw into slot in holder.
2. Apply air to desired port to move cylinder to end of stroke.
3. Insert sensor switch in direction of arrow in the groove of the cylinder body.
4. Continue inserting sensor switch in direction of arrow. If sensor switch has LED light it will turn on.
5. After sensor switch closes, move it .3 mm (.01 in) in direction of arrow and secure sensor switch with mounting screw.
6. If second sensor is used, apply air to other port (if two way cylinder) and follow same steps to install other sensor switch.

Circuit diagrams



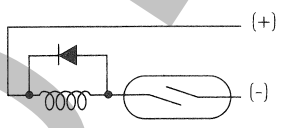
Reed



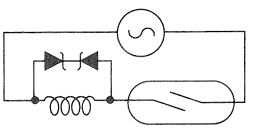
Hall effect

Recommended protection for reed sensor switch

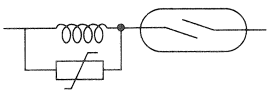
Contact protection is recommended in applications where the power of back EMF of inductive loads is greater than the contact rating.



Diode



Back to back Zener diodes



Varistor

⚠ CAUTION

Damage to switch will occur if improperly wired and/or exposed to voltage or voltage spikes in excess of 25 V DC.

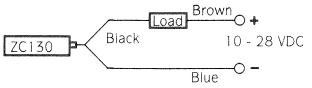
Sensor switch
Connections

Connecting procedure guidelines

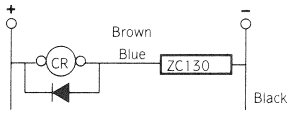
1. Follow wire color code for proper connection; otherwise switch will malfunction or may be damaged.
2. Use of a surge protection diode is recommended.
3. Avoid using sensor switches in places where other strong magnetic forces are present as they may be unintentionally actuated.
4. Use care with lead wires. Do not pull or bend lead wires excessively.
5. Do not use sensor switches in areas where chemically active agents are present.
6. Consult factory before using switches in oily or wet surroundings.
7. Ensure that programmable controller inputs have sufficient current limiting. Excess current will result in sensor damage. If required, use a resistor in series with the sensor to limit current.
8. Do not use Model ZC130 in TTL or CMOS circuits.

ZC130, ZE135, ZE235

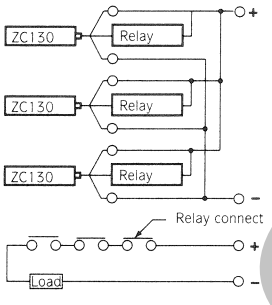
Basic Connection



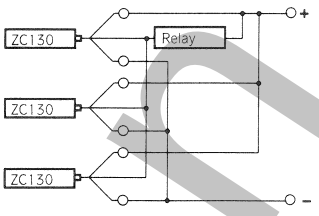
Connection to relay



AND Connection

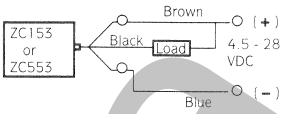


OR Connection

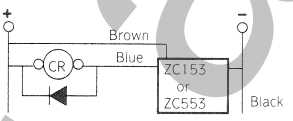


ZC153, ZC533, ZE155, ZE255

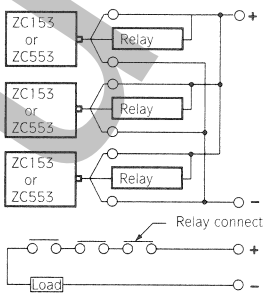
Basic Connection



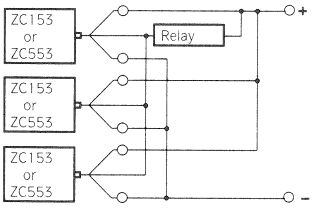
Connection to relay



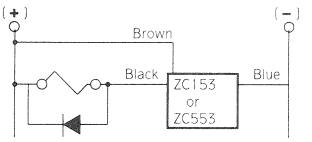
AND Connection



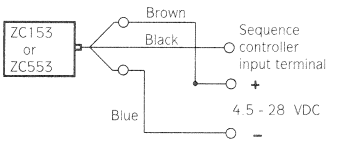
OR Connection



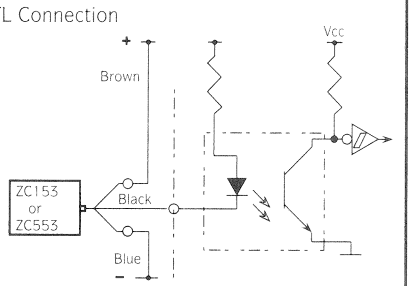
Connection to solenoid



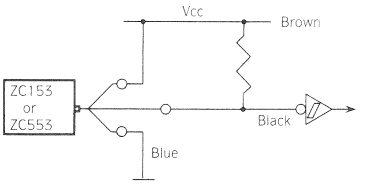
Connection to sequencer



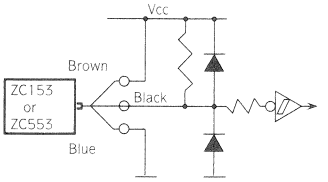
TTL Connection



Direct Connection



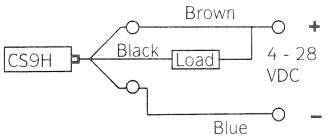
CMOS Connection



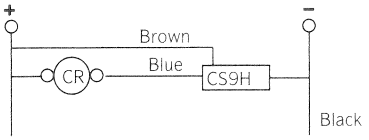
Connections

CS9H

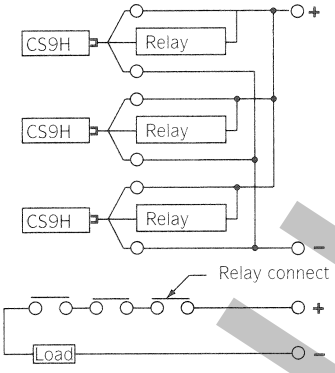
Basic Connection



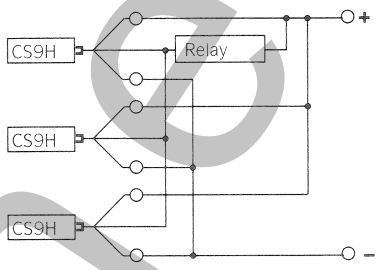
Connection w/ relay



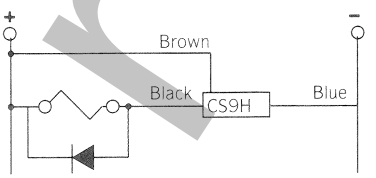
AND Connection



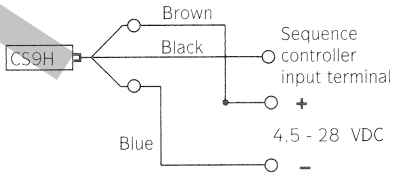
OR Connection



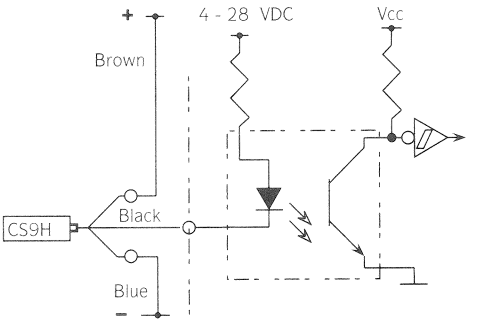
Connection to solenoid



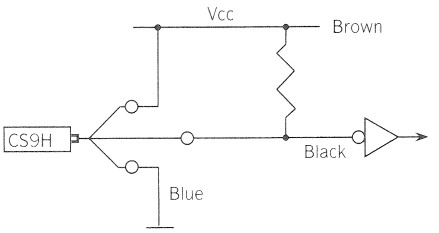
Connection to sequencer



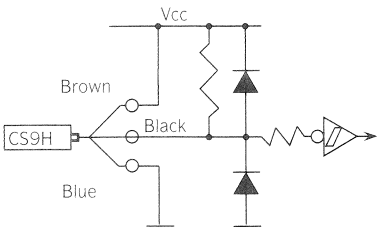
Separate Connection



Common Connection

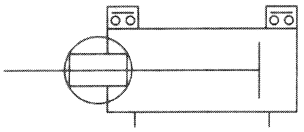


CMOS Connection

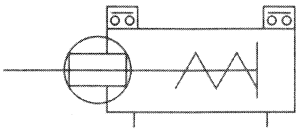


Symbol

●Double acting type



●Single acting push type



Specifications

●Solid state type

Item \ Model	ZE135	ZE155	ZE235	ZE255
Sensor type	DC 2-wire type	DC 3-wire type	DC 2-wire type	DC 3-wire type
Lead wire direction	Horizontal		Vertical	
Power supply voltage	—	DC4.5～28V	—	DC4.5～28V
Load voltage	DC10～28V	DC4.5～28V	DC10～28V	DC4.5～28V
Load current	4～20mA(at 25°C, 10mA at 60°C)	50mA MAX.	4～20mA(at 25°C, 10mA at 60°C)	50mA MAX.
ON current consumpsion	—	10mA MAX.（DC24V）	—	10mA MAX.（DC24V）
Internal voltage drop note 1	4.5V MAX.	0.5V MAX.(Less than 10V at 20mA)	4.5V MAX.	0.5V MAX.(Less than 10V at 20mA)
Leakage current	1mA MAX.（DC24V、25°C）	50μA MAX.（DC24V）	1mA MAX.（DC24V、25°C）	50μA MAX.（DC24V）
Delay time	1ms MAX.			
Insulation resistance	100MΩ MIN.（At DC500V Megger between case and lead wire）			
Dielectric strength	AC500V（50/60Hz）1min.（between case and lead wire）			
Shock resistance note 2	294m/s² {30.0G}（Non repeated shock）			
Vibration resistance note 2	88.3m/s²(9.0G) Total amplitude 1.5mm, 10～55Hz			
Environmental protection	IP67 IEC standard（JIS C0920）			
Indicator lamp	ON : Red LED			
Lead wire	PCCV insulated cable（2X0.15SQ） Brown/Blue× ℓ note 3	PCCV insulated cable（3×0.15SQ） Brown/Blue/Black× ℓ note 3	PCCV insulated cable（2X0.15SQ） Brown/Blue× ℓ note 3	PCCV insulated cable（3×0.15SQ） Brown/Blue/Black× ℓ note 3
Temperature range	32~140°F (0~60°C)			
Storage temperature	14~158°F (-10~70°C)			
Weight	15g（For lead wire length A：1000mm）、35g（For lead wire length B：3000mm）			

Note1 : Internal voltage drop depends on load current.
2 : Test procedures are our internal standards.
3 : Lead wire length A : 1000mm B : 3000mm

●Reed switch type

Item \ Model	ZE101		ZE102		ZE201		ZE202	
Sensor type	DC 2-wire type							
Lead wire direction	Horizontal				Vertical			
Load voltage	DC5～28V	AC85～115V (r.m.s)	DC10～28V	AC85～115V (r.m.s)	DC5～28V	AC85～115V (r.m.s)	DC10～28V	AC85～115V (r.m.s)
Load current	40mA MAX.	20mA MAX.	5～40mA	5～20mA	40mA MAX.	20mA MAX.	5～40mA	5～20mA
Internal voltage drop note 1	10mV MAX. (at load current DC40mA)		3.0V MAX.		10mV MAX. (at load current DC40mA)		3.0V MAX.	
Leakage current	0mA							
Delay time	1ms MAX.							
Insulation resistance	100MΩ MIN.（At DC500V Megger between case and lead wire）							
Dielectric strength	AC500V（50/60Hz）1min.（between case and lead wire）							
Shock resistance note 2	294m/s² {30.0G}（Non repeated shock）							
Vibration resistance note 2	88.3m/s²(9.0G) Total amplitude 1.5mm, 10～55Hz, Resonance frequency 2750±250Hz							
Environmental protection	IP67 IEC standard（JIS C0920）							
Indicator lamp	None		ON : Red LED		None		ON : Red LED	
Lead wire	PCCV insulated cable（2×0.15SQ） Brown/Blue× ℓ note 3							
Temperature range	32~140°F (0~60°C)							
Storage temperature	14~158°F (-10~70°C)							
Sensor switch protection	Required（For more details, refer to page ⑲）							
Weight	15g（For lead wire length A：1000mm）、35g（For lead wire length B：3000mm）							

Note1 : Internal voltage drop depends on load current.
2 : Test procedures are our internal standards.
3 : Lead wire length A : 1000mm B : 3000mm

Order Code

ZE135 | A | - HP

Lead wire length
A : 1000mm
B : 3000mm

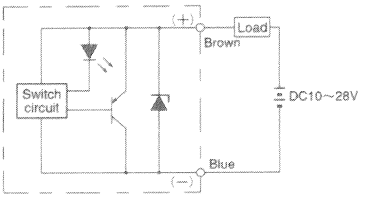
Sensor Switch model

ZE135 - Two lead wires, Hall effect type with indicator	DC10~28V	Horizontal lead wire type	**ZE155** - Three lead wires, Hall effect type with indicator	DC4.5~28V	Horizontal lead wire type
ZE235 - Two lead wires, Hall effect type with indicator	DC10~28V	Vertical lead wire type	**ZE255** - Three lead wires, Hall effect type with indicator	DC4.5~28V	Vertical lead wire type
ZE101 - Two lead wires, Reed switch type w/o indicator	DC5~28V AC85~115V	Horizontal lead wire type	**ZE102** - Two lead wires, Reed switch type with indicator	DC10~28V AC85~115V	Horizontal lead wire type
ZE201 - Two lead wires, Reed switch type w/o indicator	DC5~28V AC85~115V	Vertical lead wire type	**ZE202** - Two lead wires, Reed switch type with indicator	DC10~28V AC85~115V	Vertical lead wire type

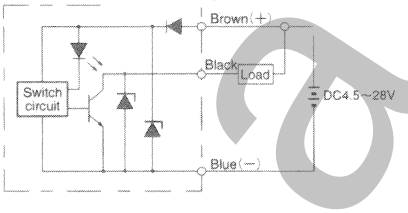
Circuitry

● Hall effect type

● 2-wire type
(PNP, sourcing)

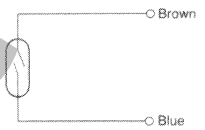


● 3-wire type
(NPN, sinking)

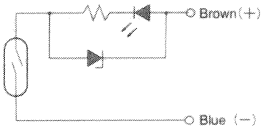


● Reed switch type

● Without indicator

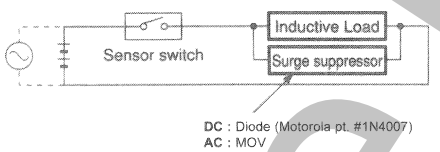


● With indicator

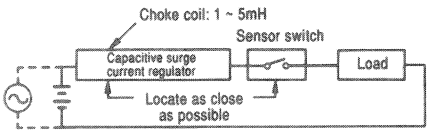


Recommended Protection for Reed Switch Sensors

● **Use with inductive loads (magnetic relays, etc.)**



● **Use with long lead wires (>32'/10m) between sensor switch and load**

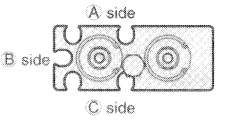


Sensor Switch Operating Range - Response Differential - Maximum Sensing Locations

●Operating range : ℓ
The distance the piston (magnet) travels in one direction while the switch is in the ON position.

●Response differential : C
The distance between the point where the piston (magnet) turns the switch ON in one direction, and the point where the switch turns OFF as the piston (magnet) travels in the opposite direction.

●Mounting surface of the sensor switches



●Solid state type

in (mm)

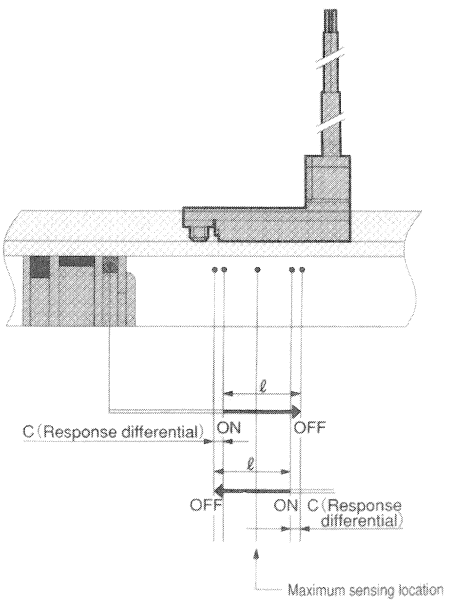
Item	Mounting surface \ Bore size	3/8 (10)	5/8 (16)	3/4 (20)	1 (25)	1 1/4 (32)
Operating range : ℓ	A side, C side	0.098~0.236(2.5~6)			.098~.236(2.5~6.5)	0.197~.472(5~12)
	B side	.098~.157(2.5~4)	0.078~.177(2~4.5)		.098~.217(2.5~5.5)	0.157~0.354(4~9)
Response differential : C	—	Less than .039(1.0)	Less than .047(1.2)		Less than .059(1.5)	Less than .079(2.0)
Maximum sensing location*(B)	—	0.236(6)				

Note : The chart indicates refernce value.

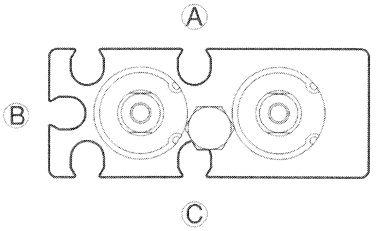
●Reed switch type

in (mm)

Mounting surface \ Bore size	3/8 (10)	5/8 (16)	3/4 (20)	1 (25)	1 1/4 (32)
Operating range : ℓ	0.236~0.335(6~8.5)		0.236~0.315(6~8)	0.276~0.374(7~9.5)	0.472~0.650(12~16.5)
Response differential : C	Less than .059(1.5)				Less than .098(2.5)
Maximum sensing location*(B)	0.394(10)				



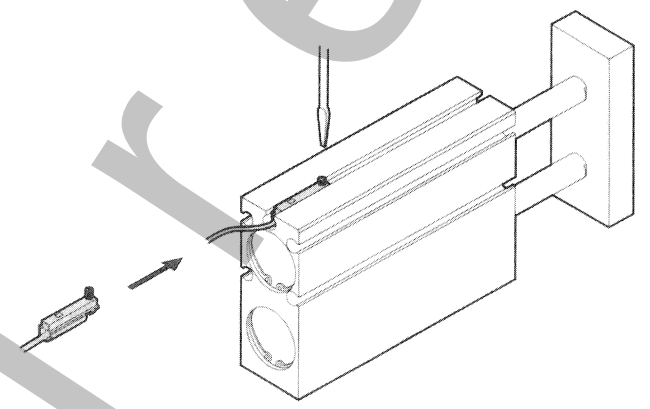
Sensor Switch Mounting Surfaces



Rod side and head side stroke end can be detected when mounting sensor switchs on one or two of the A, B or C sides. Drawing is showing the view from rod side.

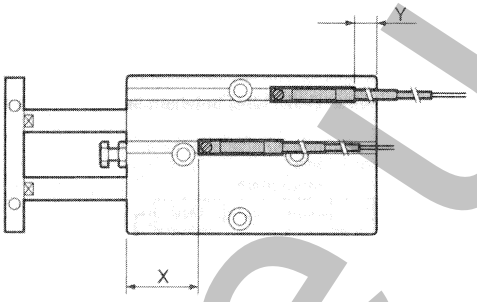
Sensor Switch Mounting

- Loose screw. Slide sensor switch along groove on cylinder body
- Orient switch to desired location and tighten screw. Maximum torque for tightening screw is 0.1N·m~0.2N·m{1kgf·cm~2kgf·cm}.

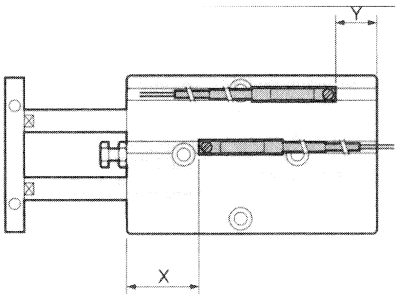


● Double acting type

- Direction of the lead wire is toward the head side

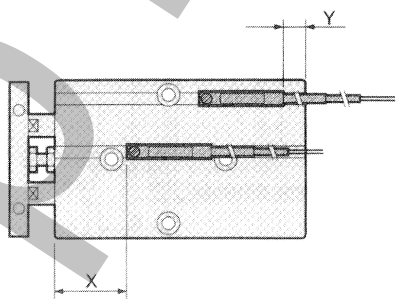


- Direction of the head side switch lead wire only is toward the rod side

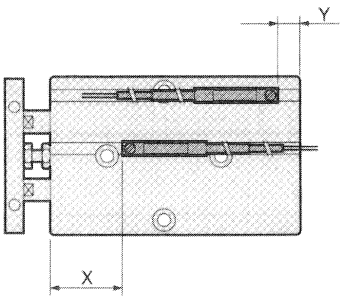


● Single acting push type

- Direction of the lead wire is toward the head side

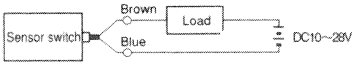


- Direction of the head side switch lead wire only is toward the rod side

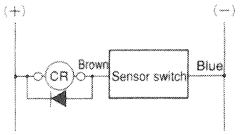


●2-wire type

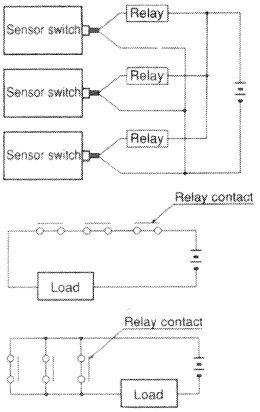
●Basic connection



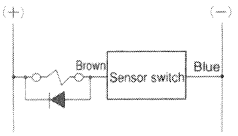
●Connection to relay



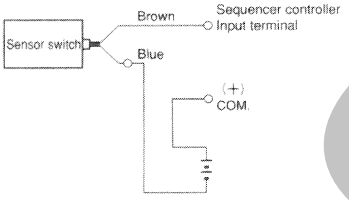
AND connection, OR connection



●Connection to solenoid

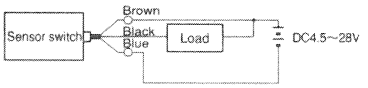


●Connection to seqencer

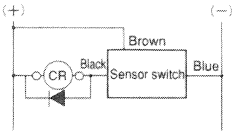


●3-wire type

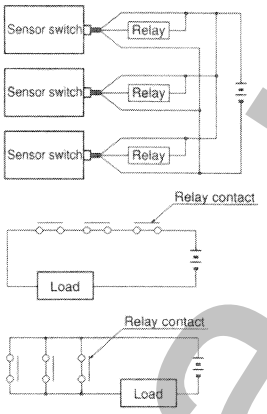
●Basic connection



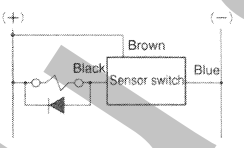
●Connection to relay



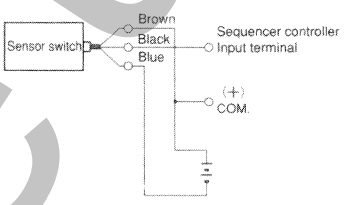
AND connection, OR connection



●Connection to solenoid

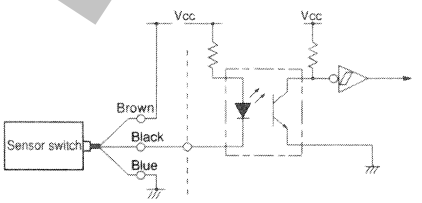


●Connection to seqencer

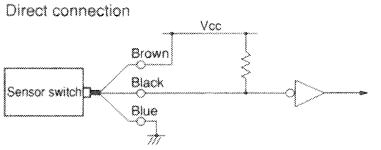


●Connection to TTL

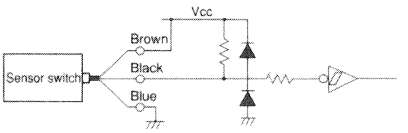
Separate connection



Direct connection



●C-MOS connection



Note 1.Follow wire color code for proper connection;other wise switch will malfunction or may be damaged.

2.Solid state 2-wire type sensor switches should not be connected to TTL or C-MOS.

3.Use of a surge protection diode is recommended for inductive loads such as relays.

4.For OR Connection,it is possible to directly connect outputs of sensor switches (for example,two brown wires).But the amount of leakage current will increase proportionally by the number of sensor switches.Therefore,be cautious against load return failure.

5.Avoid using sensor switches in places where other strong magnetic forces are present or near large current such as power lines(switches are actuated by magnetism).

6.Use care with lead wires. Do not pull or bend lead wires excessively.

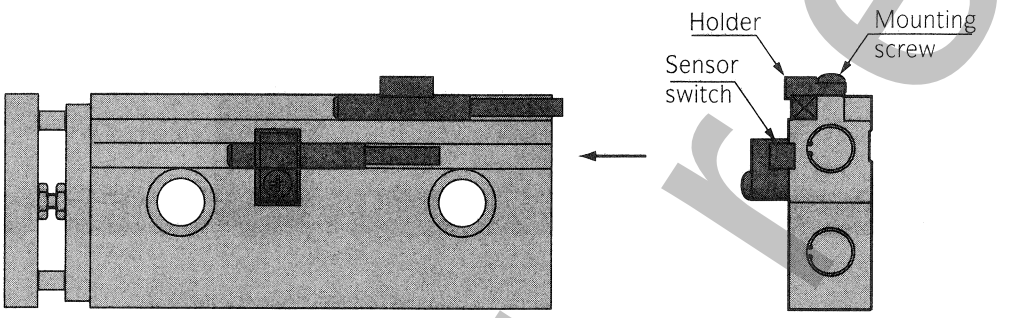
7.Do not use sensor switches in areas where chemically active agents or gas are present.

8.Consult us before using sensor switches in oily or wet surroundings.

Twin Rod (6 mm bore only)

Sensor switch information

Mounting



1. Apply air to desired port to move cylinder to end of stroke.

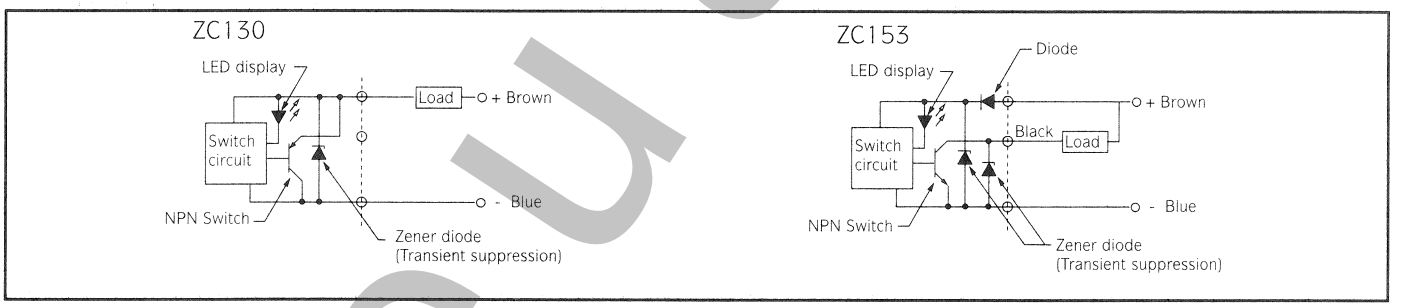
2. Insert sensor switch in direction of arrow in the groove of the cylinder body.

3. Continue inserting sensor switch in direction of arrow. If sensor switch has LED light it will turn on.

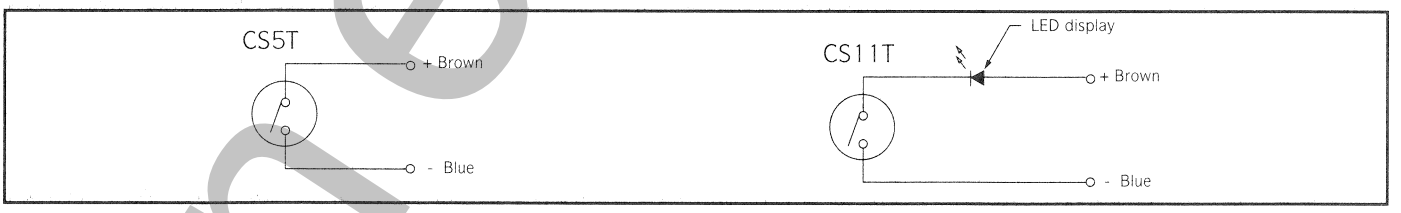
4. After sensor switch closes, move it .3mm (.01 in) in direction of arrow and secure sensor switch with mounting screw.

5. If second sensor switch is needed, apply air to other port (if double acting) or disconnect air supply and install other sensor switch in same manner.

Circuit diagrams

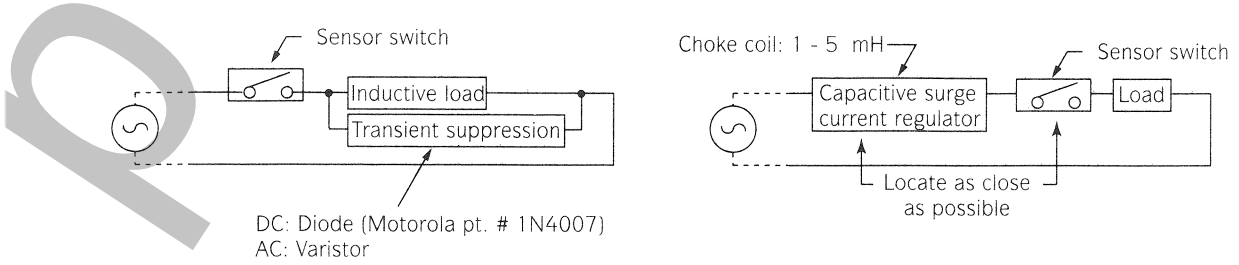


Hall effect



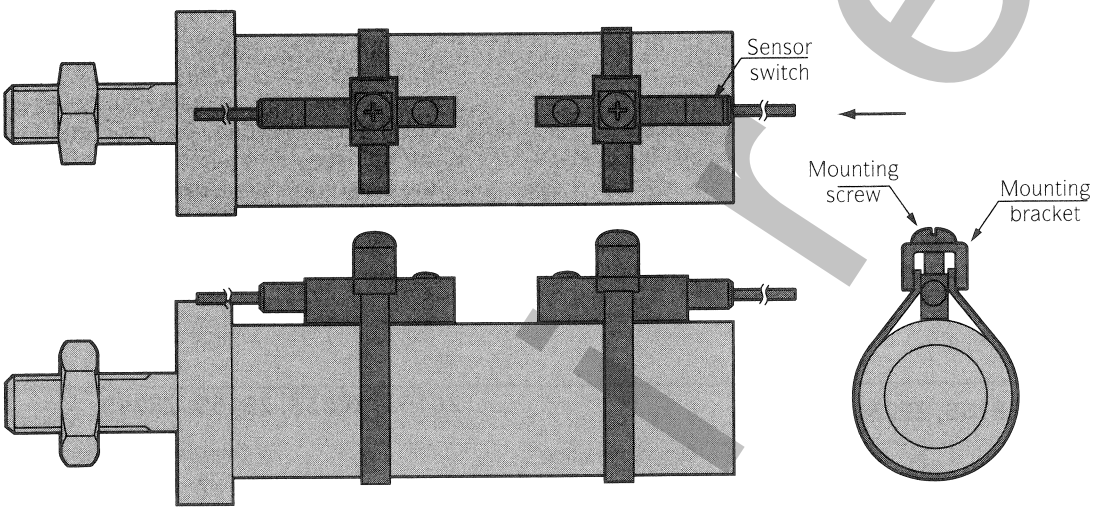
Reed

Recommended protection for reed sensor switch



Sensor switch information

Mounting



1. Apply air to desired port to move cylinder to end of stroke.
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3. Continue inserting sensor switch in direction of arrow. If sensor switch has LED light it will turn on.
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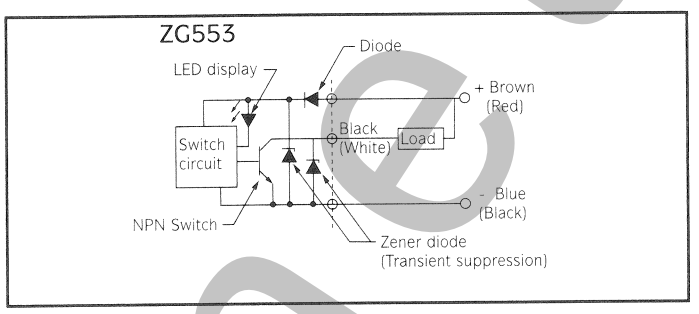
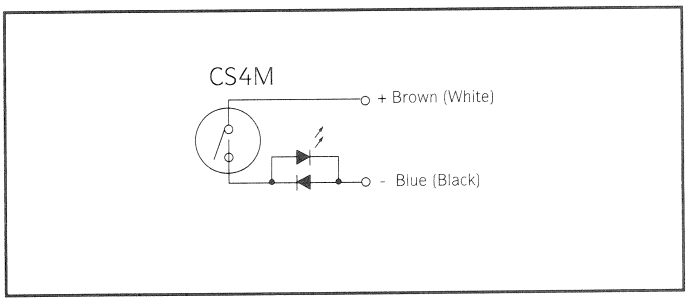
Circuit diagrams

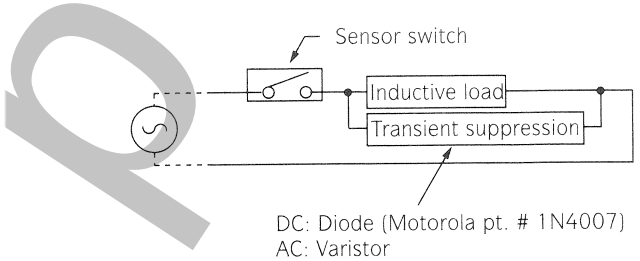


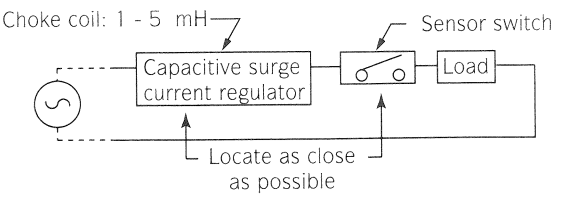
Hall effect



Reed

Recommended protection for reed sensor switch



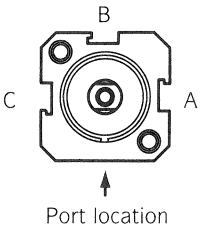


Block

Sensor switch information

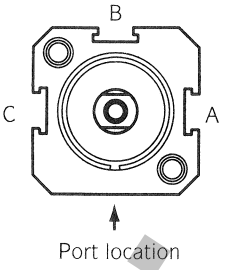
Mounting

12 (.472) bore



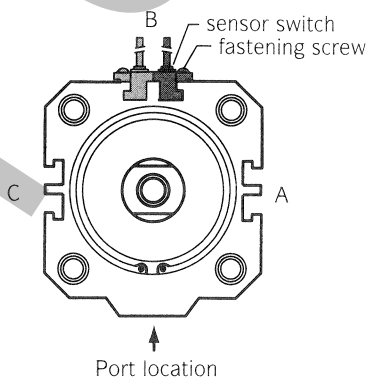
Use surface A or C to detect rod end of stroke. Surface B is best for detecting rear end of stroke. To detect both ends of stroke, consult factory. Sensor switches may extend beyond cylinder length.

16 (.630) bore



Use any of two surfaces to detect both ends of stroke. When using one surface to detect both ends of stroke, it is limited to range indicated on chart below.

20 (.787) to 100 (3.937) bores



Use any of above surfaces to mount either or both sensor switches to detect end of stroke.

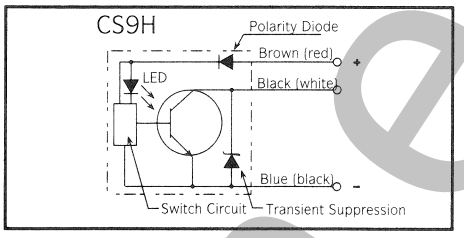
TO MOUNT SENSOR SWITCHES:

1. Loosen screw.
2. Slide sensor switch along groove in cylinder body.
3. Move sensor switch to desired location and tighten screw slightly.
4. Operate cylinder and note if sensor switch detects desired stroke position.
5. Adjust sensor switch position if necessary and tighten screw to 3 kg-cm (2.6 in-lb)

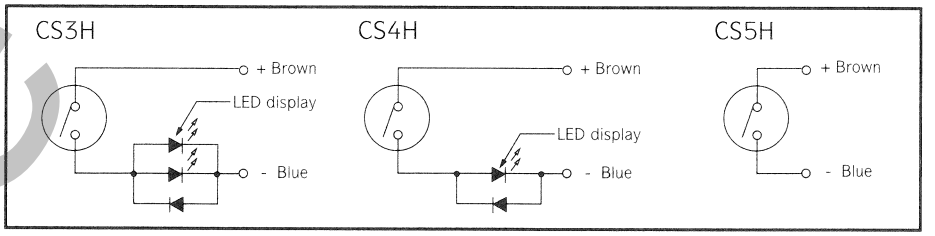
Minimum Stroke

Bore	Using two switches		Using one switch
	One mounting surface	Two mounting surfaces	
12 (.472)	30 (1.181)	12.5 (.492)	12.5 (.492)
16 (.630)	25 (.984)	12.5 (.492)	12.5 (.492)
20 (.787) to 40 (1.575)	12.5 (.492)	12.5 (.492)	12.5 (.492)
	12.5 (.492)	12.5 (.492)	12.5 (.492)

Circuit diagrams

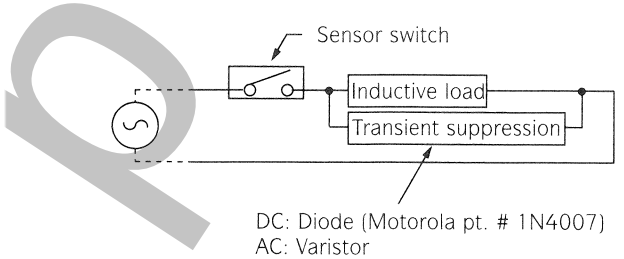


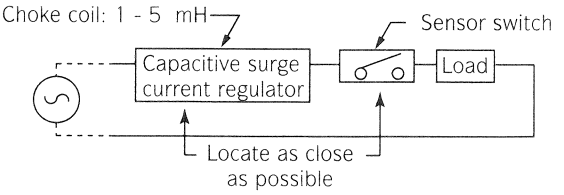
Hall effect



Reed

Recommended protection for reed sensor switch





Sensor switch
How to Order

ACTUATOR MODEL	SENSOR SWITCH MODEL HALL EFFECT	REED	LEAD LENGTH	SINKING (NPN) SOURCING (PNP)
STAINLESS STEEL				
*-S	HE1	RS2,RS3.RS4	L	(NPN)
*-SP	HE1	RS2,RS3.RS4	L	(NPN)
*-SH	HE1	RS2,RS3.RS4	L	(NPN)
*-SHP	HE1	RS2,RS3.RS4	L	(NPN)
*-SR	HE1	RS2,RS3.RS4	L	(NPN)
*-SRP	HE1	RS2,RS3.RS4	L	(NPN)
*-BFS	HE1	RS2,RS3.RS4	L	(NPN)
*-BFSR	HE1	RS2,RS3.RS4	L	(NPN)
*-D	HE1	RS2,RS3.RS4	L	(NPN)
*-DP	HE1	RS2,RS3.RS4	L	(NPN)
*-D2EY	HE1	RS2,RS3.RS4	L	(NPN)
*-BFD	HE1	RS2,RS3.RS4	L	(NPN)
PSMK		MOUNTING KIT		
BLOCK				
HJDAS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJSAS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJTAS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJDADS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJSADS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJDALS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJDATS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJSATS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJDAWS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJSAWS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HJTAWS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
GRIPPER				
HNHBDS	ZE135 Horizontal lead	N/A	A, B	(PNP)
HNHBRS	ZE235 Vertical lead	N/A	A, B	(PNP)
HNHBDP	ZE155 Horizontal lead	N/A	A, B	(NPN)
HNHBRP	ZE255 Vertical lead	N/A	A, B	(NPN)
MULTI-MOUNT				
HBDAS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBSAS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBTAS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBDADS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBDALS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBSALS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBTALS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
HBDADLS	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)

ACTUATOR MODEL	SENSOR SWITCH MODEL HALL EFFECT	REED	LEAD LENGTH	SINKING (NPN) SOURCING (PNP)
ROTARY				
HRAPS-1	ZG153	CS5T, CS11T	A, B, C	(NPN)
HRAPS-5	ZG153	CS5T, CS11T	A, B, C	(NPN)
HRAPS-10	ZG153	CS5T, CS11T	A, B, C	(NPN)
HRAPS-20	ZG153	CS5T, CS11T	A, B, C	(NPN)
SLIDE				
HSUTS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HSUPS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HSULS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HSUTKS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HSUPKS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
HSULKS	CS9H	CS3H, CS4, CS5	A, B, C	(NPN)
SWING				
HSDA	ZG553	CS4M	A, B, C	(NPN)
	ZC153	CS5T, CS5T	A, B, C	(NPN)
TWIN ROD (6mm only)				
HTDA	ZC130, ZC153	CS5T, CS11T	A, B, C	(NPN)
TWINPORT				
HTWDA	ZG553	CS4M	A, B, C	(NPN)
TWINROD (B series)				
— See Twinrod Section				
HORV RODLESS CYLINDER				
— See HORV Section				
HIGH MULTI CYLINDER				
— See High Multi Cylinder Section				
GUIDED BLOCK CYLINDER				
— See Guided Block Cylinder Section				
GUIDED ACTUATOR				
— See Guided Actuator Section				

Order example (except Stainless Steel Cylinders)

CS9H | A | – | HJDAS

Actuator model

Lead length:
A - 1000 mm (39.37 in)
B - 3000 mm (118.11 in)
C - 5000 mm (196.85 in)

Sensor switch model

Order example (Stainless Steel Cylinders only)

HE1 | L | – | PSMK

Mounting kit
Can be ordered separately

Lead length:
None - standard, 24 in (609.6 mm)
L - long, 144 in (3657.6 mm)

Sensor switch model