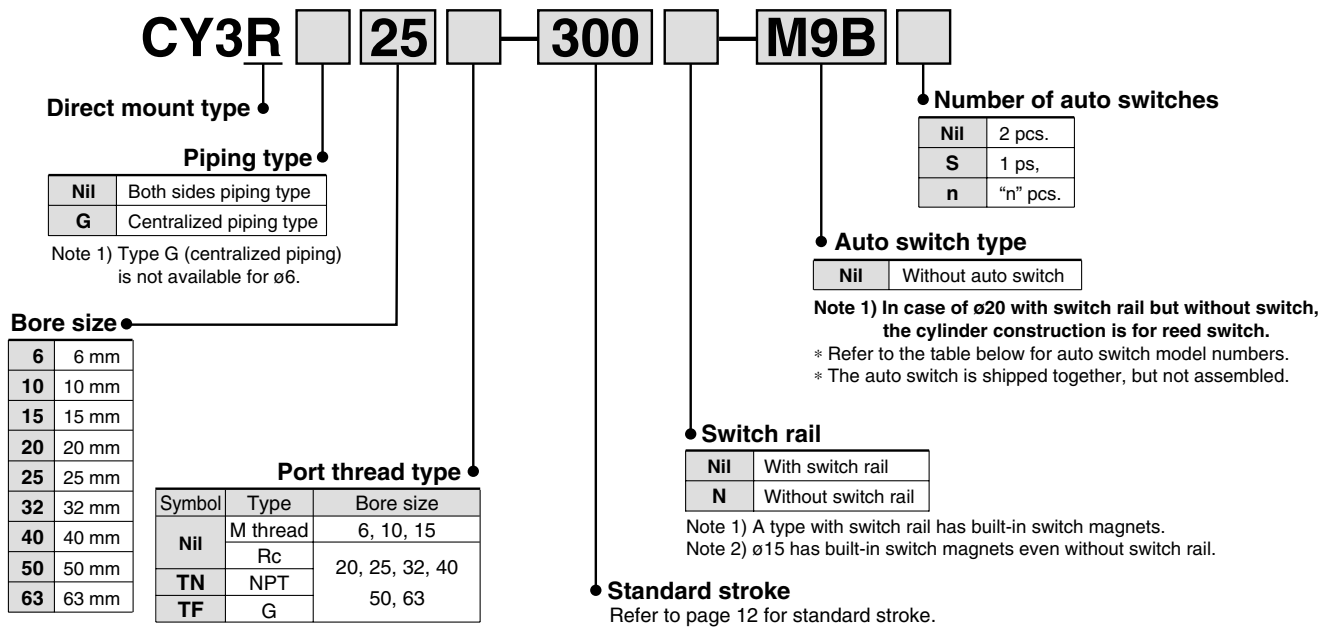


# Magnetically Coupled Rodless Cylinder: Direct Mount Type

## Series **CY3R**

ø6, ø10, ø15, ø20, ø25, ø32, ø40, ø50, ø63

### How to Order



**Applicable Auto Switches**/The applicable auto switch is determined by the bore size. Refer to pages 21 to 23 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage		Auto switch model	Lead wire length (m)*			Pre-wired connector	Applicable load		
					DC	AC		0.5 (Nil)	3 (L)	5 (Z)		IC circuit	Relay, PLC	
Reed switch	—	Grommet	No	2-wire	24 V	5 V, 12 V	100 V or less	A90	●	●	—			—
						12 V	100 V	A93	●	●	—	—		
				3-wire (NPN equiv.)	—	5 V	—	A96	●	●	—	—	IC circuit	—
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9N	●	●	○	○	IC circuit	Relay, PLC
								M9P	●	●	○	○		
				3-wire (PNP)				M9B	●	●	○	○	—	
				2-wire				F9NW	●	●	○	○	IC circuit	
				3-wire (NPN)				F9PW	●	●	○	○		
				3-wire (PNP)				F9BW	●	●	○	○	—	
				2-wire										

\* Lead wire length symbols: 0.5 m..... Nil (Example) M9N  
3 m..... L (Example) M9NL  
5 m..... Z (Example) M9NZ

\*\* Solid state switches marked "○" are produced upon receipt of order.

- For ø25, 32, 40, 50, and 63, other than the applicable auto switches listed in "How to Order", the other auto switches can be mounted. For detailed specifications, refer to page 18.
- With pre-wired connector is also available in solid state auto switches. For specifications, refer to "SMC Best Pneumatics" catalog vol. 8, page 8-30-52.

### Specifications



<b>Fluid</b>	Air
<b>Proof pressure</b>	1.05 MPa
<b>Max. operating pressure</b>	0.7 MPa
<b>Min. operating pressure</b>	Refer to the minimum operating pressure table.
<b>Ambient and fluid temperature</b>	-10 to 60°C
<b>Piston speed</b>	50 to 500 mm/s
<b>Cushion</b>	Rubber bumper on both ends
<b>Lubrication</b>	Non-lube
<b>Stroke length tolerance</b>	0 to 250 st: $+1.0_0$ , 251 to 1000 st: $+1.4_0$ , 1001 st to: $+1.8_0$
<b>Mounting</b>	Direct mount type
<b>Mounting orientation</b>	Horizontal, Inclined, Vertical <small>Note 2)</small>

Note 1) When an auto switch is installed at an intermediate position of a type with auto switch, keep the maximum piston speed at 300 mm/s or below to ensure operation of relays or other devices.

Note 2) When vertically mounting, it is impossible to perform an intermediate stop by means of a pneumatic circuit.



**Made to Order**  
(Refer to page 24 for details.)

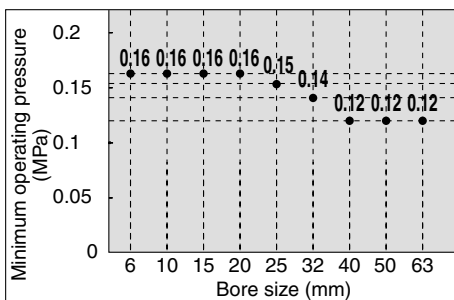
Symbol	Specifications
-X116	Hydro specifications
-X160	High speed specifications
-X322	Outside of cylinder tube with hard chrome plating
-X1468	Interchangeable specification with CY1□6
-XC57	With floating joint

### Standard Stroke

Bore size (mm)	Standard stroke (mm)	Max. stroke without switch (mm)	Max. stroke with switch (mm)
6	50, 100, 150, 200	300	300
10	50, 100, 150, 200, 250, 300	500	500
15	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	1000	750
20	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1500	1000
25			1200
32	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000	2000	1500
40			
50			
63			

Note) The longer the stroke, the larger the amount of deflection in a cylinder tube. Pay attention to the mounting bracket and clearance value.

### Minimum Operating Pressure



Note) Values show when the cylinder is operating without a load.

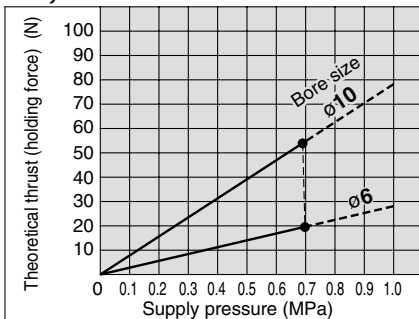
### Magnetic Holding Force

Bore size (mm)	6	10	15	20	25	32	40	50	63
Holding force (N)	19.6	53.9	137	231	363	588	922	1471	2256

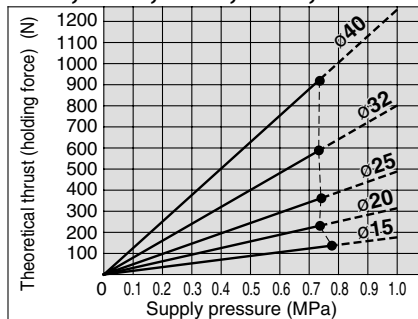
### Theoretical Cylinder Thrust

**Caution** When calculating the actual thrust, design should consider the minimum actuating pressure.

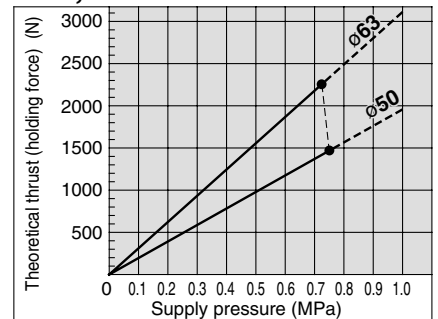
#### ø6, ø10



#### ø15, ø20, ø25, ø32, ø40



#### ø50, ø63



### Weight

Unit: kg

Bore size (mm)		6	10	15	20	25	32	40	50	63
Basic weight (at 0 st)	With switch rail	0.086	0.111	0.272	0.421	0.622	1.217	1.98	3.54	5.38
	Without switch rail	0.069	0.08	0.225	0.351	0.542	1.097	1.82	3.25	5.03
Additional weight per 50 mm of stroke	With switch rail	0.016	0.034	0.040	0.051	0.056	0.076	0.093	0.159	0.188
	Without switch rail	0.004	0.014	0.015	0.020	0.023	0.033	0.040	0.077	0.096

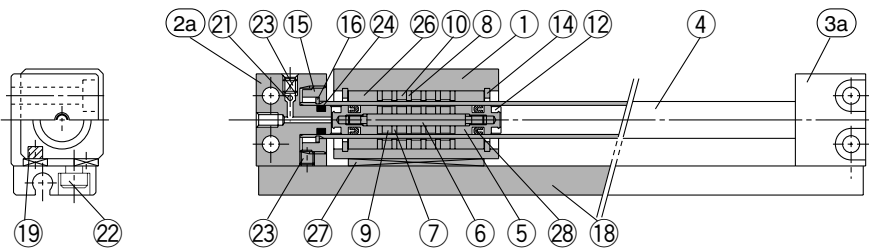
Calculation method/Example: CY3R25-500 (with switch rail) Basic weight...0.622 (kg), Additional weight...0.056 (kg/50 st), Cylinder stroke...500 (st)  
0.622 + 0.056 x 500 ÷ 50 = 1.182 (kg)

# Series CY3R

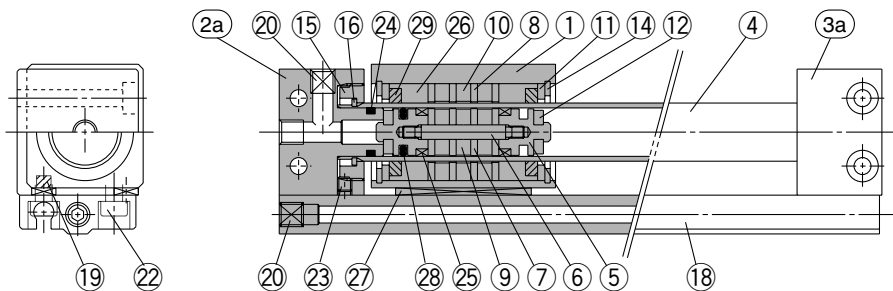
## Construction

### Both sides piping type

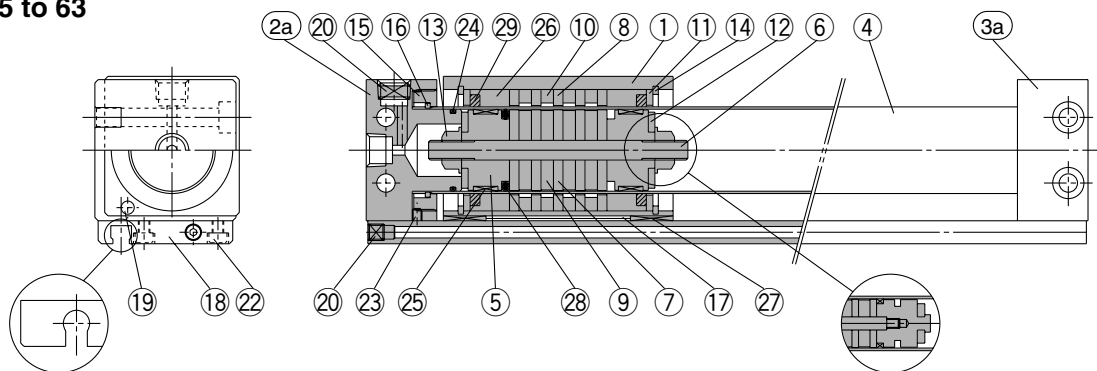
#### CY3R6



#### CY3R10



#### CY3R15 to 63



CY3R15, 20

CY3R15

### Component Parts

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2a	End cover A	Aluminum alloy	Electroless nickel plated
2b	End cover C	Aluminum alloy	Electroless nickel plated
3a	End cover B	Aluminum alloy	Electroless nickel plated
3b	End cover D	Aluminum alloy	Electroless nickel plated
4	Cylinder tube	Stainless steel	
5	Piston	ø6 to ø15: Brass ø20 to ø63: Aluminum alloy	ø6 to ø15: Electroless nickel plated ø20 to ø63: Chromate
6	Shaft	Stainless steel	
7	Piston side yoke	Rolled steel plate	Zinc chromated
8	External slider side yoke	Rolled steel plate	Zinc chromated
9	Magnet A	Rare earth magnet	
10	Magnet B	Rare earth magnet	
11	Spacer	Aluminum alloy	Black anodized (ø6: not available)
12	Bumper	Urethane rubber	
13	Piston nut	Carbon steel	Zinc chromate (ø6 to ø15: not available)
14	C type snap ring for hole	Carbon tool steel	Nickel plated
15	Attachment ring	Aluminum alloy	Chromate
16	C type snap ring for shaft	Hard steel wire	
17	Magnetic shielding plate	Rolled steel plate	Chromated (ø6, ø10: not available)
18	Switch rail	Aluminum alloy	White anodized
19	Magnet	Rare earth magnet	
20	Hexagon socket head plug	Chromium steel	Nickel plated

No.	Description	Material	Note
21	Steel balls	Chromium steel	ø40: Hexagon socket head plug ø20, ø50, ø63: None
22	Hexagon socket head screw	Chromium steel	Nickel plated
23	Hexagon socket head set screw	Chromium steel	Nickel plated
24*	Cylinder tube Gasket	NBR	
25*	Wear ring A	Special resin	
26*	Wear ring B	Special resin	
27*	Wear ring C	Special resin	
28*	Piston seal	NBR	
29*	Lubretainer	Special resin	
30*	Switch rail gasket	NBR	Both sides piping type: None

\* Seal kits are sets consisting of numbers 24 through 30. Order using the kit number corresponding to each bore size.

### Replacement Parts: Seal Kit

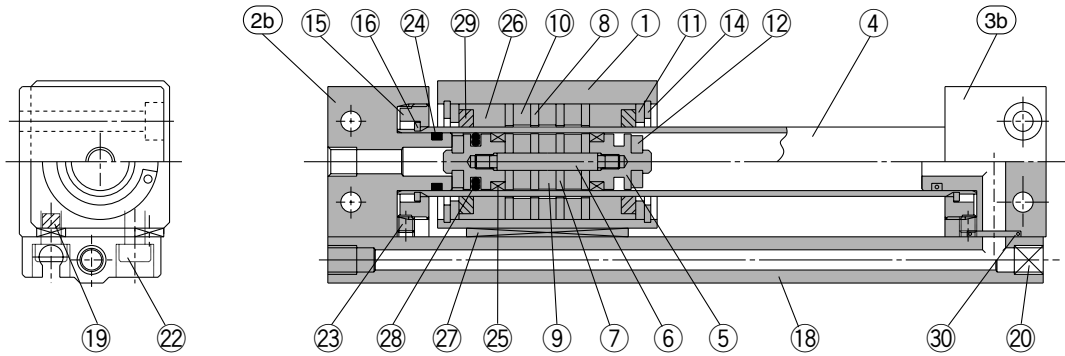
Bore size (mm)	Kit no.	Contents
6	CY3R6-PS	Numbers 24, 26, 27, 28 above
10	CY3R10-PS	Numbers 24, 25, 26, 27, 28, 29, 30 above
15	CY3R15-PS	
20	CY3R20-PS	
25	CY3R25-PS	
32	CY3R32-PS	
40	CY3R40-PS	
50	CY3R50-PS	
63	CY3R63-PS	

\* Seal kits are the same for both the both sides piping type and the centralized piping type.

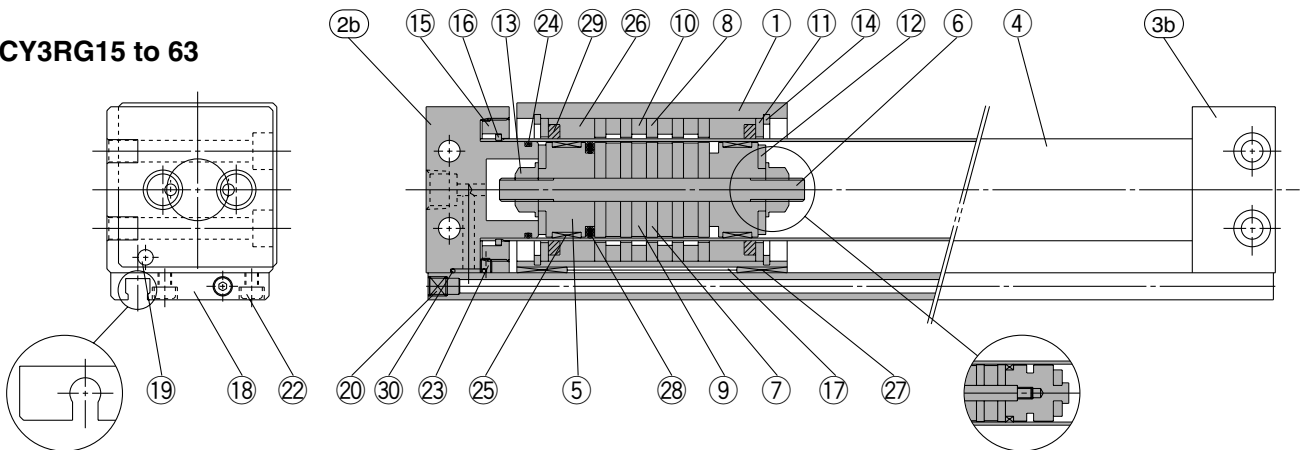
## Construction

### Centralized piping type

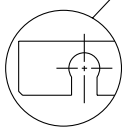
#### CY3RG10



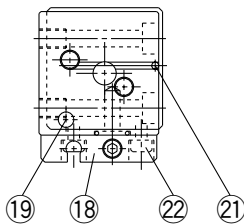
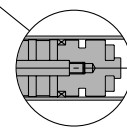
#### CY3RG15 to 63



#### CY3RG15, 20

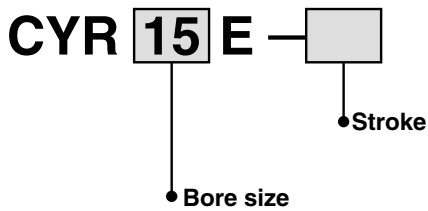


#### CY3RG15



#### CY3RG15

## Switch Rail Accessory



### Switch Rail Accessory Kit

Bore size (mm)	Kit no.	Contents
6	CYR6E-□-N	Numbers 18, 19, 22, 27 on the left
10	CYR10E-□	Numbers 18, 19, 20, 22, 27 on the left
15	CYR15E-□	Numbers 17, 18, 20, 22, 27 on the left <small>Note 2)</small>
20	For reed switch CYR20E-□	Numbers 17, 18, 19, 20, 22, 27 on the left
	For solid state switch CYR20EN-□	
25	CYR25E-□	Numbers 17, 18, 19, 20, 22, 27 on the left
32	CYR32E-□	
40	CYR40E-□	
50	CYR50E-□	
63	CYR63E-□	

Note 1) □ indicates the stroke.

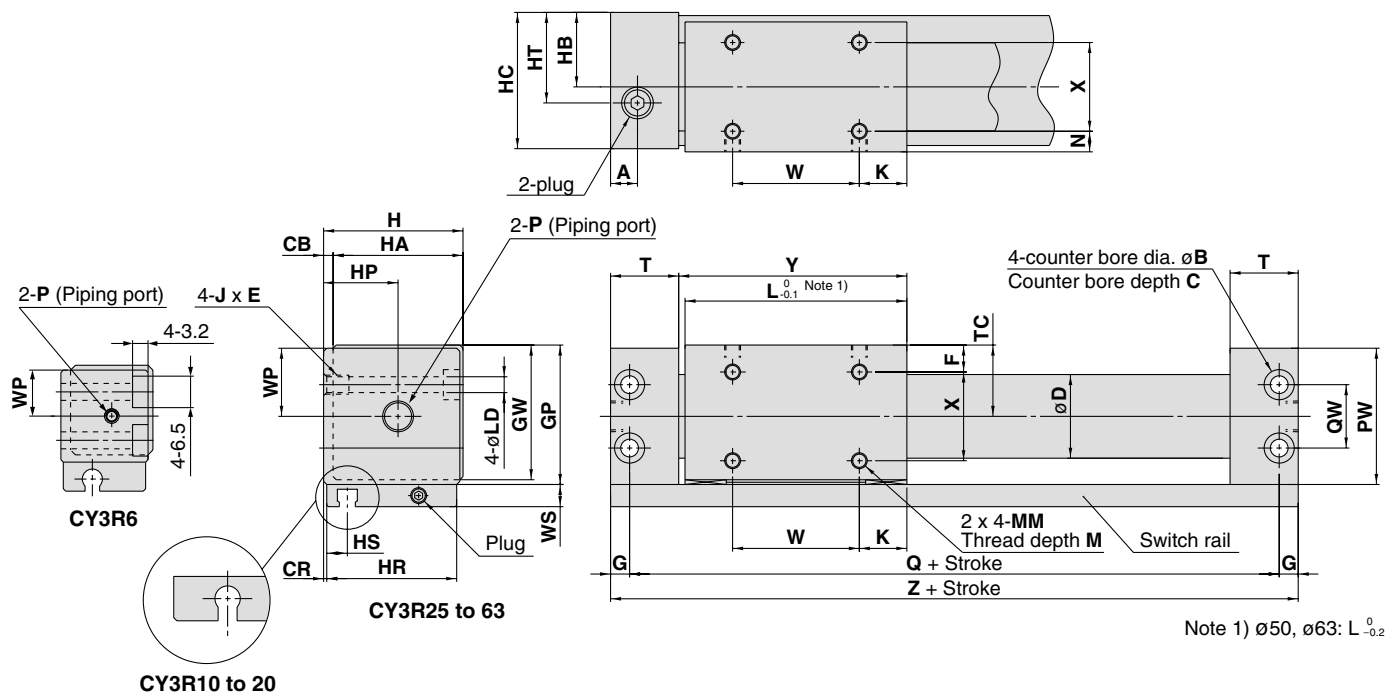
Note 2) A magnet is already built in for ø15.

# Series CY3R

## Dimensions

### Both sides piping type: $\varnothing 6$ to $\varnothing 63$

Note) This figure shows types with switch rail (Nil).



Model	A	B	C	CB	CR	D	F	G	GP	GW	H	HA	HB	HC	HP	HR	HS	HT	J x E	K
CY3R6	7*	—*	—*	2	0.5	7.6	5.5	3*	20	18.5	19	17	10.5	18	10.5*	17	6	10.5*	M4 x 0.7 x 6	7
CY3R10	9	6.5	3.2	2	0.5	12	6.5	4	27	25.5	26	24	14	25	14	24	5	14	M4 x 0.7 x 6	9
CY3R15	10.5	8	4.2	2	0.5	16.6*	8	5	33	31.5	32	30	17	31	17	30	8.5	17	M5 x 0.8 x 7	14
CY3R20	9	9.5	5.2	3	1	21.6*	9	6	39	37.5	39	36	21	38	24	36	7.5	24	M6 x 1 x 8	11
CY3R25	8.5	9.5	5.2	3	1	26.4*	8.5	6	44	42.5	44	41	23.5	43	23.5	41	6.5	23.5	M6 x 1 x 8	15
CY3R32	10.5	11	6.5	3	1.5	33.6*	10.5	7	55	53.5	55	52	29	54	29	51	7	29	M8 x 1.25 x 10	13
CY3R40	10	11	6.5	5	2	41.6*	13	7	65	63.5	67	62	36	66	36	62	8	36	M8 x 1.25 x 10	15
CY3R50	14	14	8.2	5	2	52.4*	17	8.5	83	81.5	85	80	45	84	45	80	9	45	M10 x 1.5 x 15	25
CY3R63	15	14	8.2	5	3	65.4*	18	8.5	95	93.5	97	92	51	96	51	90	9.5	51	M10 x 1.5 x 15	24

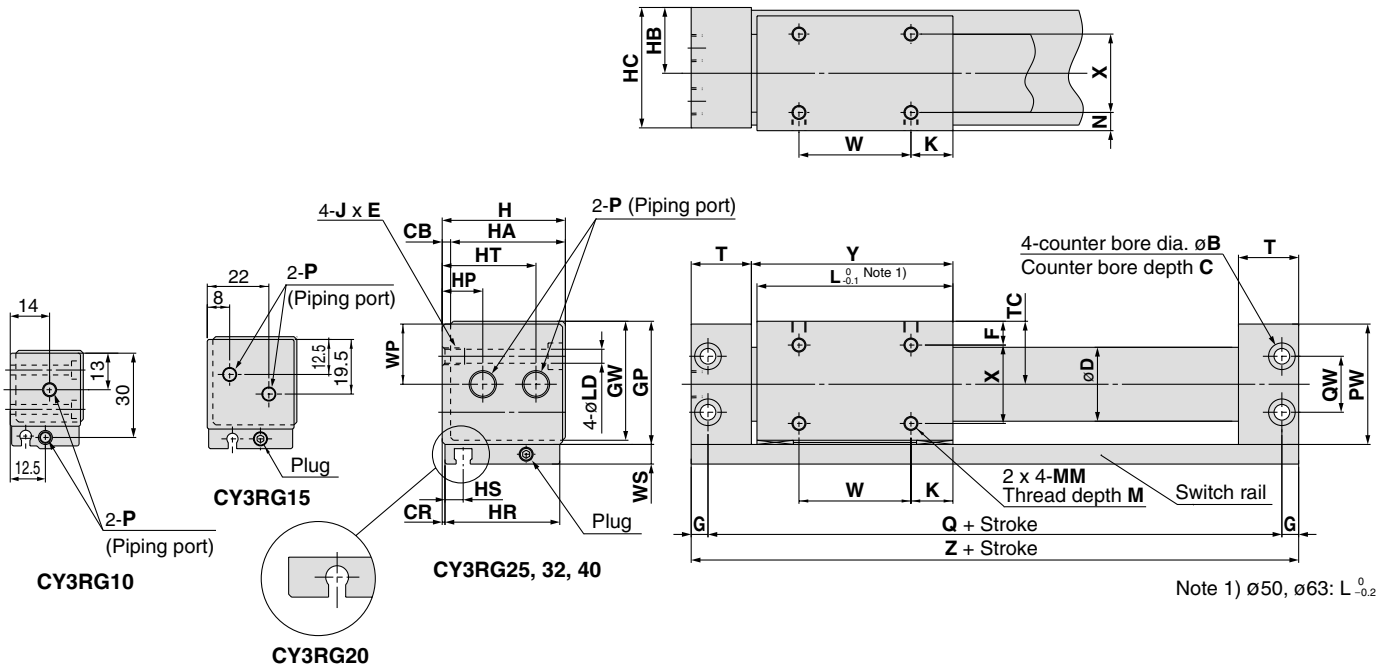
Model	L	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	WS	X	Y	Z
CY3R6	34	3.5	3.5	M3 x 0.5	3.5	19	60*	10	14.5*	10.5	20	9.5	6	10	35.5	66*
CY3R10	38	3.5	4	M3 x 0.5	4.5	26	68	14	17.5	14	20	13	8	15	39.5	76
CY3R15	53	4.3	5	M4 x 0.7	6	32	84	18	19	17	25	16	7	18	54.5	94
CY3R20	62	5.4	5	M4 x 0.7	7	38	95	17	20.5	20	40	19	7	22	64	107
CY3R25	70	5.4	6	M5 x 0.8	6.5	43	105	20	21.5	22.5	40	21.5	7	28	72	117
CY3R32	76	7	7	M6 x 1	8.5	54	116	26	24	28	50	27	7	35	79	130
CY3R40	90	7	8	M6 x 1	11	64	134	34	26	33	60	32	7	40	93	148
CY3R50	110	8.6	10	M8 x 1.25	15	82	159	48	30	42	60	41	10	50	113	176
CY3R63	118	8.6	10	M8 x 1.25	16	94	171	60	32	48	70	47	10	60	121	188

Model	P (Piping port)		
	Nil	TN*	TF*
CY3R6	M3 x 0.5*	—	—
CY3R10	M5 x 0.8	—	—
CY3R15	M5 x 0.8	—	—
CY3R20	Rc 1/8	NPT 1/8	G 1/8
CY3R25	Rc 1/8	NPT 1/8	G 1/8
CY3R32	Rc 1/8	NPT 1/8	G 1/8
CY3R40	Rc 1/4	NPT 1/4	G 1/4
CY3R50	Rc 1/4	NPT 1/4	G 1/4
CY3R63	Rc 1/4	NPT 1/4	G 1/4

Note 2) The astrisk denotes the dimensions which are different from the CY1R series.

## Dimensions

Centralized piping type:  $\varnothing 10$  to  $\varnothing 63$



Model	B	C	CB	CR	D	F	G	GP	GW	H	HA	HB	HC	HP	HR	HS	HT	J x E	K	L
CY3RG10	6.5	3.2	2	0.5	12	6.5	4	27	25.5	26	24	14	25	—	24	5	—	M4 x 0.7 x 6	9	38
CY3RG15	8	4.2	2	0.5	16.6*	8	5	33	31.5	32	30	17	31	—	30	8.5	—	M5 x 0.8 x 7	14	53
CY3RG20	9.5	5.2	3	1	21.6*	9	6	39	37.5	39	36	21	38	11	36	7.5	28	M6 x 1 x 8	11	62
CY3RG25	9.5	5.2	3	1	26.4*	8.5	6	44	42.5	44	41	23.5	43	14.5	41	6.5	33.5	M6 x 1 x 8	15	70
CY3RG32	11	6.5	3	1.5	33.6*	10.5	7	55	53.5	55	52	29	54	20	51	7	41	M8 x 1.25 x 10	13	76
CY3RG40	11	6.5	5	2	41.6*	13	7	65	63.5	67	62	36	66	25	62	8	50	M8 x 1.25 x 10	15	90
CY3RG50	14	8.2	5	2	52.4*	17	8.5	83	81.5	85	80	45	84	32	80	9	56	M10 x 1.5 x 15	25	110
CY3RG63	14	8.2	5	3	65.4*	18	8.5	95	93.5	97	92	51	96	35	90	9.5	63.5	M10 x 1.5 x 15	24	118

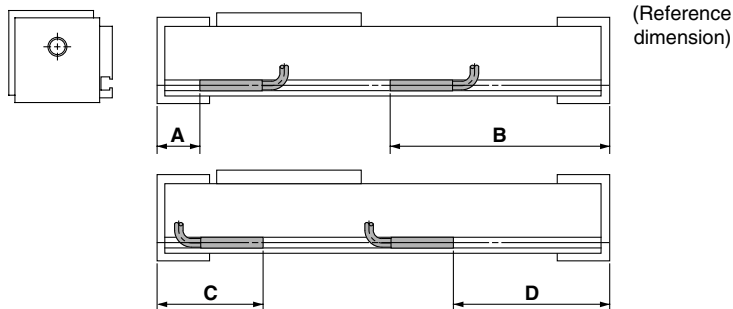
Model	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	WS	X	Y	Z
CY3RG10	3.5	4	M3 x 0.5	4.5	26	68	14	17.5	14	20	13	8	15	39.5	76
CY3RG15	4.3	5	M4 x 0.7	6	32	84	18	19	17	25	16	7	18	54.5	94
CY3RG20	5.4	5	M4 x 0.7	7	38	95	17	20.5	20	40	19	7	22	64	107
CY3RG25	5.4	6	M5 x 0.8	6.5	43	105	20	21.5	22.5	40	21.5	7	28	72	117
CY3RG32	7	7	M6 x 1	8.5	54	116	26	24	28	50	27	7	35	79	130
CY3RG40	7	8	M6 x 1	11	64	134	34	26	33	60	32	7	40	93	148
CY3RG50	8.6	10	M8 x 1.25	15	82	159	48	30	42	60	41	10	50	113	176
CY3RG63	8.6	10	M8 x 1.25	16	94	171	60	32	48	70	47	10	60	121	188

Model	P (Piping port)		
	Nil	TN*	TF*
CY3RG10	M5 x 0.8	—	—
CY3RG15	M5 x 0.8	—	—
CY3RG20	Rc 1/8	NPT 1/8	G 1/8
CY3RG25	Rc 1/8	NPT 1/8	G 1/8
CY3RG32	Rc 1/8	NPT 1/8	G 1/8
CY3RG40	Rc 1/4	NPT 1/4	G 1/4
CY3RG50	Rc 1/4	NPT 1/4	G 1/4
CY3RG63	Rc 1/4	NPT 1/4	G 1/4

Note 2) The asterisk denotes the dimensions which are different from the CY1RG series.

# Series CY3R

## Auto Switch Proper Mounting Position for Stroke End Detection



## Auto Switch Operation Range

Auto switch model	Bore size (mm)								
	6	10	15	20	25	32	40	50	63
D-A9□	8	11	8	6	6	7	9	8	8
D-M9□	3	4.5	2.5	3.5	3	3	4	3	3
D-F9□W	4	7	4	4.5	4	4.5	5.5	5	4.5
D-Z7□	—	—	—	—	9	9	11	9	10
D-Z80	—	—	—	—	—	—	—	—	—
D-Y59□	—	—	—	—	—	—	—	—	—
D-Y7□	—	—	—	—	5	5	6	6	6
D-Y7□W	—	—	—	—	—	—	—	—	—

\* Switches cannot be mounted in some cases.  
 \* Operating ranges are standards including hysteresis, and are not guaranteed. (variation on the order of ±30%)  
 Large variations may occur depending on the surrounding environment.

### ø6, ø10, ø15, ø20

Auto switch model Bore size (mm)	A		B		C		D	
	D-A9□	D-M9□ D-F9□W	D-A9□	D-M9□ D-F9□W	D-A9□	D-M9□ D-F9□W	D-A9□	D-M9□ D-F9□W
6	26	30	46	42	46	42	26	30
10	28	32	48	44	48	44	—	32
15	17.5	21.5	76.5	72.5	—	—	56.5	60.5
20	19.5	23.5	87.5	83.5	39.5	35.5	67.5	71.5

Note 1) Auto switches cannot be installed in Area C in the case of ø15.

### ø25, ø32, ø40, ø50, ø63

Auto switch model Bore size (mm)	A				B				C				D			
	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W
25	19	23	18	—	98	94	99	42	38	43	—	75	79	74	—	
32	22.5	26.5	21.5	—	107.5	103.5	108.5	45.5	41.5	46.5	—	84.5	88.5	83.5	—	
40	24.5	28.5	23.5	—	123.5	119.5	124.5	47.5	43.5	48.5	—	100.5	104.5	99.5	—	
50	28.5	32.5	27.5	—	147.5	143.5	148.5	51.5	47.5	52.5	—	124.5	128.5	123.5	—	
63	30.5	34.5	29.5	—	157.5	153.5	158.5	53.5	49.5	54.5	—	134.5	138.5	133.5	—	

Note 1) 50 mm is the minimum stroke available with 2 auto switches mounted.

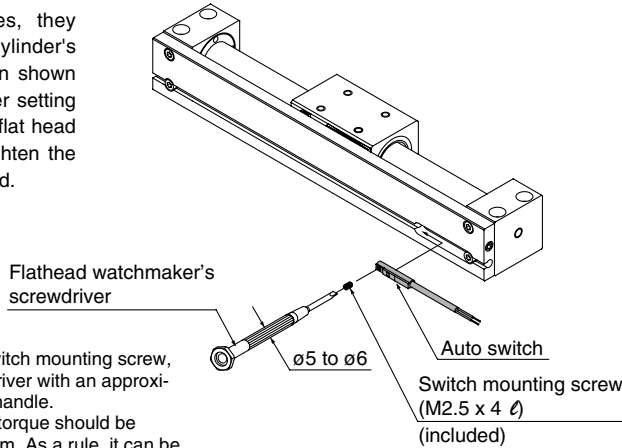
Note 2) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.

Note 3) Mounting brackets are additionally required for the D-A9□, M9□ and F9□W types. Refer to the auto switch mounting bracket part number on page 18.

## Auto Switch Mounting

### ø6 to ø20

When mounting auto switches, they should be inserted into the cylinder's switch groove from the direction shown in the drawing on the right. After setting in the mounting position, use a flat head watchmaker's screwdriver to tighten the mounting screw which is included.

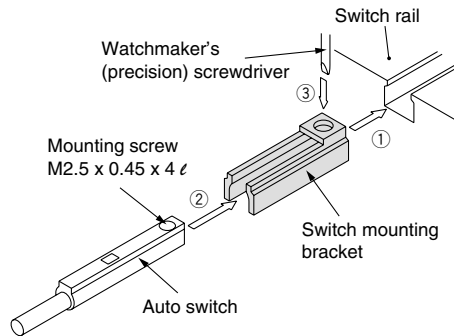


Note) When tightening the auto switch mounting screw, use a watchmaker's screwdriver with an approximately 5 to 6 mm diameter handle. Furthermore, the tightening torque should be approximately 0.1 to 0.15 N·m. As a rule, it can be turned about 90° past the point at which tightening can be felt.

### ø25 to ø63

- (1) Insert the front side of the auto switch into the auto switch groove and slide the switch to the desired position.
- (2) After the detection position is confirmed, securely tighten the mounting screw (M2.5) on the auto switch.
- (3) Changes to the detection position have to be performed during process (2).

Note) When tightening the mounting screw, use a watchmaker's screwdriver with a 5 to 6 mm handle diameter and tighten with a torque of 0.10 to 0.15 N·m. As a guide, an acceptable tightening level is reached by tightening the screw an additional 90 degrees from the point at which the screw is snug.



## Auto Switch Specifications

- (1) Switches (switch rail) can be added to the standard type (without switch rail). The switch rail accessory type is mentioned on page 14, and can be ordered together with auto switches.
- (2) Refer to the separate disassembly instructions for switch magnet installation procedures.

### Mounting Bracket Part No.

Bore size (mm)	Mounting bracket part no.	Weight	Applicable auto switches
25	BMG2-012	3 g	Reed switch: D-A9□ Solid state switch: D-M9□ D-F9□W
32			
40			
50			
63			

Other than the applicable auto switches listed in "How to Order", the following auto switches can be mounted. For detailed specifications, refer to "SMC Best Pneumatics" catalog vol. 8, 8-30-1.

Type	Model	Electrical entry	Features	Applicable bore size	
Reed switch	D-Z73	Grommet (In-line)	—	ø25 to ø63	
	D-Z76		Without indicator light		
	D-Z80		—		
Solid state switch	D-Y59A		Diagnostic indication (2-color display)		—
	D-Y59B				—
	D-Y7P				—
	D-Y7BW				—
	D-Y7NW	—	—		
	D-Y7PW	—	—		

\* With pre-wired connector is also available in solid state auto switches. For specifications, refer to "SMC Best Pneumatics" catalog vol. 8, page 8-30-52.  
\* Normally closed (NC = b contact), solid state switch (D-F9G/F9H/Y7G/Y7H type) are also available. For details, refer to "SMC Best Pneumatics" catalog vol. 8, page 8-30-31/8-30-32.



# Series CY3

# Auto Switch Specifications

## Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3-wire: 100 $\mu$ A or less 2-wire: 0.8 mA or less
Operating time	1.2 ms	1 ms or less
Impact resistance	300 m/s <sup>2</sup>	1000 m/s <sup>2</sup>
Insulation resistance	50 M $\Omega$ or more at 500 Mega VDC (between lead wire and case)	
Withstand voltage	1000 VAC for 1 minute (between lead wire and case)	
Ambient temperature	-10 to 60°C	
Enclosure	IEC529 standard IP67, JIS C 0920 waterproof construction	

## Lead Wire Length

Lead wire length indication

(Example) D-M9P **L**

Lead wire length

Nil	0.5 m
L	3 m
Z	5 m

Note 1) Applicable auto switch with 5 m lead wire "Z"

Reed switch: None

Solid state switch: Manufactured upon receipt of order as standard.

Note 2) The standard lead wire length of solid state switch with water-resistant 2-color indication is 3 meters. (Not available 0.5 m)

Note 3) To designate solid state switches with flexible specifications, add "-61" after the lead wire length.

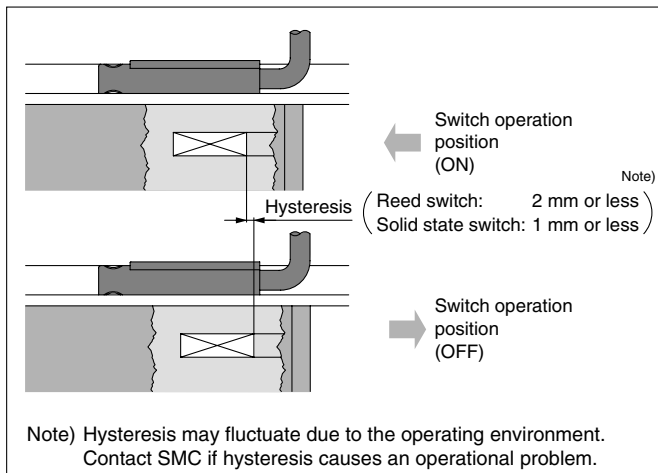
(Example) D-F9NWL- **61**

Flexible specification

Note) D-M9□ is a flexible cable specification as standard.

## Auto Switch Hysteresis

The hysteresis is the difference between the position of the auto switch as it turns "on" and as it turns "off". A part of operating range (one side) includes this hysteresis.



## Contact Protection Boxes: CD-P11, CD-P12

### <Applicable switch model>

D-A9/Z7/Z8

The auto switches above do not have a built-in contact protection circuit. Therefore, please use a contact protection box with the switch for any of the following cases:

- ① Where the operation load is an inductive load.
- ② Where the wiring length to load is greater than 5 m.
- ③ Where the load voltage is 100 VAC.

The contact life may be shortened. (Due to permanent energizing conditions.)

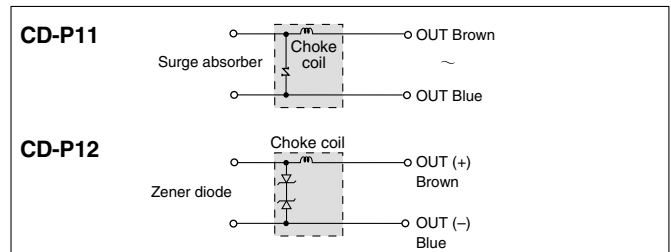
### Specifications

Part no.	CD-P11		CD-P12
Load voltage	100 VAC	200 VAC	24 VDC
Maximum load current	25 mA	12.5 mA	50 mA

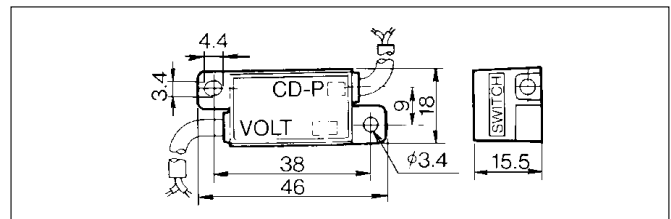
\* Lead wire length — Switch connection side 0.5 m  
Load connection side 0.5 m



### Internal Circuit



### Dimensions



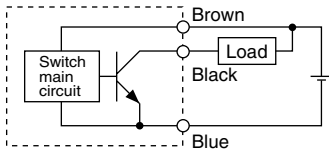
### Connection

To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit. Keep the switch as close as possible to the contact protection box, with a lead wire length of no more than 1 meter.

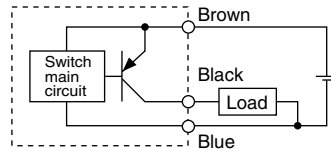
# Series CY3 Auto Switch Connections and Examples

## Basic Wiring

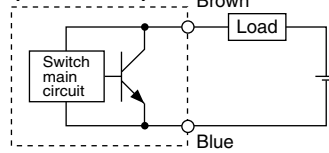
### Solid state 3-wire, NPN



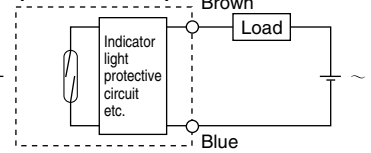
### Solid state 3-wire, PNP



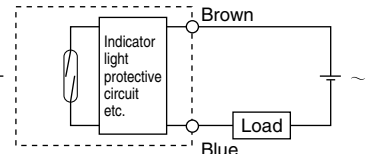
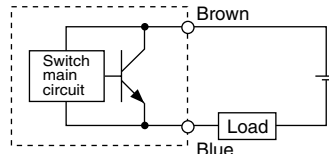
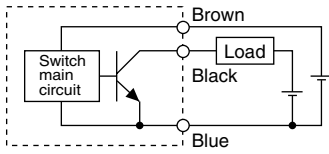
### 2-wire (Solid state)



### 2-wire (Reed switch)

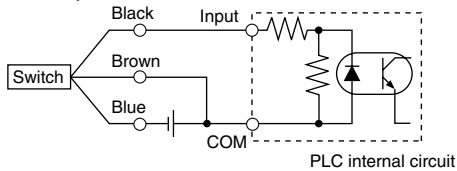


(Power supplies for switch and load are separate.)

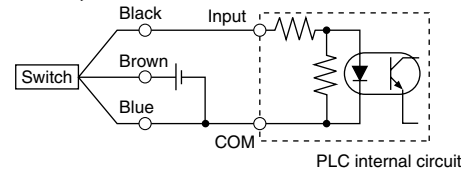


## Example of Connection to PLC (Programmable Logic Controller)

### • Sink input specifications 3-wire, NPN

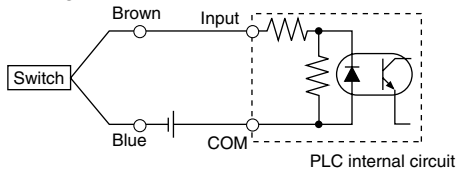


### • Source input specifications 3-wire, PNP

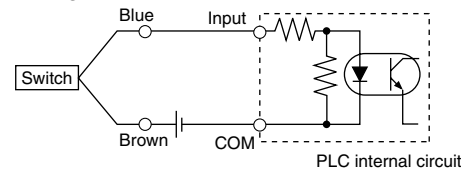


Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

### 2-wire



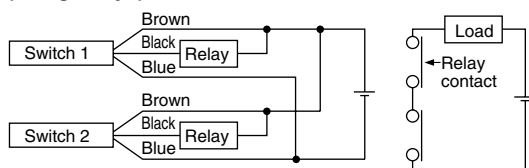
### 2-wire



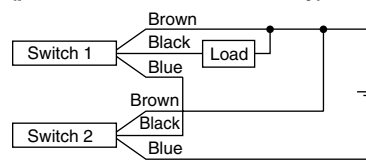
## Example of AND (Serial) and OR (Parallel) Connection

### • 3-wire

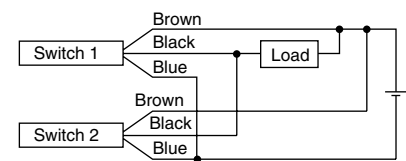
#### AND connection for NPN output (using relays)



#### AND connection for NPN output (performed with switches only)

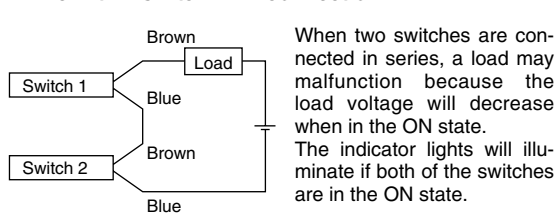


#### OR connection for NPN output



The indicator lights will illuminate when both switches are turned ON.

#### 2-wire with 2-switch AND connection

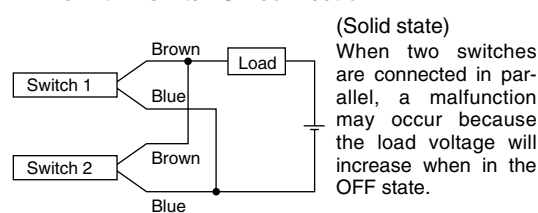


When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state. The indicator lights will illuminate if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \text{Internal voltage drop} \times 2 \text{ pcs.} \\ &= 24 \text{ V} - 4 \text{ V} \times 2 \text{ pcs.} \\ &= 16 \text{ V} \end{aligned}$$

Example: Power supply is 24 VDC.  
Internal voltage drop in switch is 4 V.

#### 2-wire with 2-switch OR connection



#### (Solid state)

When two switches are connected in parallel, a malfunction may occur because the load voltage will increase when in the OFF state.

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \\ &\quad \times \text{Load impedance} \\ &= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega \\ &= 6 \text{ V} \end{aligned}$$

Example: Load impedance is 3 kΩ.  
Leakage current from switch is 1 mA.

#### (Reed switch)

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light because of the dispersion and reduction of the current flowing to the switches.

# Reed Switch: Direct Mounting Style D-A90/D-A93/D-A96



For details about certified products conforming to international standards, visit us at [www.smcworld.com](http://www.smcworld.com).

## Auto Switch Specifications

PLC: Programmable Logic Controller

D-A90 (Without indicator light)			
Auto switch part no.	D-A90		
Applicable load	IC circuit, Relay, PLC		
Load voltage	24 V AC/DC or less	48 V AC/DC or less	100 V AC/DC or less
Maximum load current	50 mA	40 mA	20 mA
Contact protection circuit	None		
Internal resistance	1 Ω or less (including lead wire length of 3 m)		
D-A93/D-A96 (With indicator light)			
Auto switch part no.	D-A93	D-A96	
Applicable load	Relay, PLC	IC circuit	
Load voltage	24 VDC	100 VAC	4 to 8 VDC
Load current range and max. load current	5 to 40 mA	5 to 20 mA	20 mA
Contact protection circuit	None		
Internal voltage drop	2.4 V or less (to 20 mA)/3 V or less (to 40 mA)		0.8 V or less
Indicator light	Red LED illuminates when ON.		

### ● Lead wires

D-A90/D-A93 — Oilproof heavy-duty vinyl cable:  $\phi 2.7$ , 0.18 mm<sup>2</sup> x 2 cores (Brown, Blue), 0.5 m

D-A96 — Oilproof heavy-duty vinyl cable:  $\phi 2.7$ , 0.15 mm<sup>2</sup> x 3 cores (Brown, Black, Blue), 0.5 m

Note 1) Refer to page 19 for reed switch common specifications.

Note 2) Refer to page 19 for lead wire lengths.

## Grommet Electrical entry direction: In-line



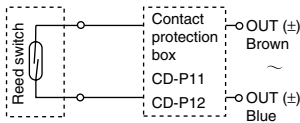
## ⚠ Caution

### Operating Precautions

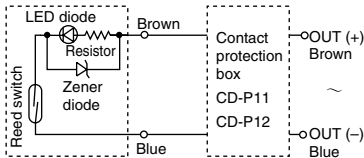
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

## Auto Switch Internal Circuit

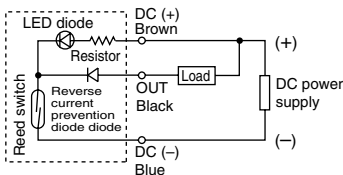
### D-A90



### D-A93



### D-A96



- Note) ① In a case where the operation load is an inductive load.  
 ② In a case where the wiring load is greater than 5 m.  
 ③ In a case where the load voltage is 100 VAC.

Use the auto switch with a contact protection box in any of the above mentioned cases. (For details about the contact protection box, refer to page 19.)

## Weight

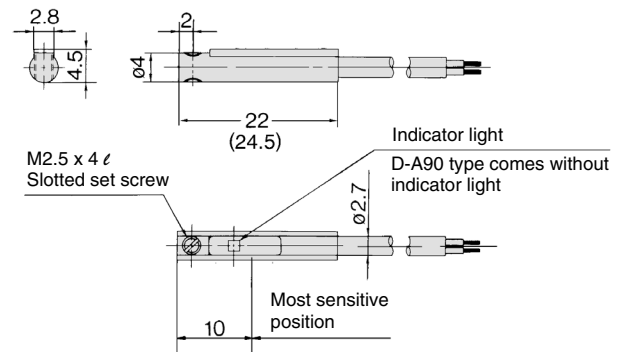
Unit: g

Auto switch part no.	D-A90	D-A93	D-A96
Lead wire length (m)	0.5	6	6
	3	30	41

## Dimensions

Unit: mm

### D-A90/D-A93/D-A96



( ): dimensions for D-A93.

# Solid State Switch: Direct Mounting Style D-M9N/D-M9P/D-M9B



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## Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□/D-M9□V (With indicator light)			
Auto switch part no.	D-M9N	D-M9P	D-M9B
Electrical entry direction	In-line		
Wiring type	3-wire		2-wire
Output type	NPN	PNP	—
Applicable load	IC circuit, Relay, PLC		24 VDC relay, PLC
Power supply voltage	5, 12, 24 VDC (4.5 to 28 V)		
Current consumption	10 mA or less		
Load voltage	28 VDC or less	—	24 VDC (10 to 28 VDC)
Load current	40 mA or less		2.5 to 40 mA
Internal voltage drop	0.8 V or less		4 V or less
Leakage current	100 μA or less at 24 VDC		0.8 mA or less
Indicator light	Red LED illuminates when ON.		

### ● Lead wires

Oilproof heavy-duty vinyl cable:  $\phi 2.7 \times 3.2$  ellipse

D-M9B 0.15 mm<sup>2</sup> x 2 cores

D-M9N, D-M9P 0.15 mm<sup>2</sup> x 3 cores

Note 1) Refer to page 19 for solid state switch common specifications.

Note 2) Refer to page 19 for lead wire lengths.

## Grommet

- 2-wire load current is reduced (2.5 to 40 mA)
- Lead free
- UL certified (style 2844) lead cable is used.



## ⚠ Caution

### Operating Precautions

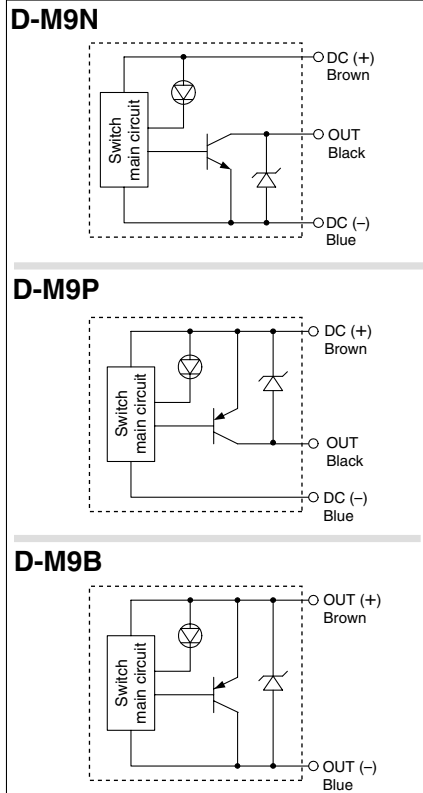
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

## Weight

Unit: g

Auto switch part no.	D-M9N	D-M9P	D-M9B	
Lead wire length (m)	0.5	8	8	7
	3	41	41	38
	5	68	68	63

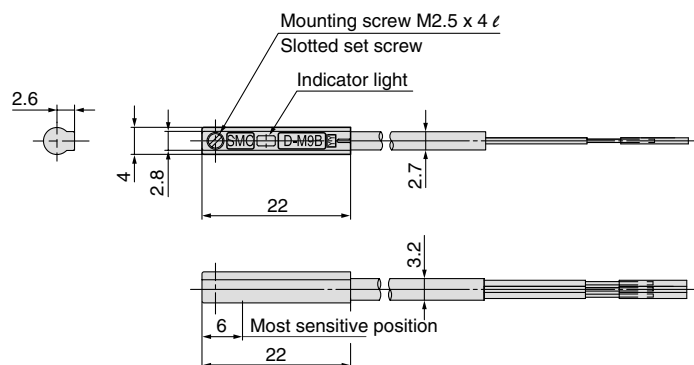
## Auto Switch Internal Circuit



## Dimensions

Unit: mm

### D-M9□



# 2-color Indication Solid State Switch: Direct Mounting Style

## D-F9NW/D-F9PW/D-F9BW



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### Auto Switch Specifications

PLC: Programmable Logic Controller

D-F9□W (With indicator light)			
Auto switch part no.	D-F9NW	D-F9PW	D-F9BW
Electrical entry direction	In-line		
Wiring type	3-wire		2-wire
Output type	NPN	PNP	—
Applicable load	IC circuit, Relay IC, PLC		24 VDC relay, PLC
Power supply voltage	5, 12, 24 VDC (4.5 to 28 VDC)		—
Current consumption	10 mA or less		—
Load voltage	28 VDC or less	—	24 VDC (10 to 28 VDC)
Load current	40 mA or less	80 mA or less	5 to 40 mA
Internal voltage drop	1.5 V or less (0.8 V or less at 10 mA load current)	0.8 V or less	4 V or less
Leakage current	100 μA or less at 24 VDC		0.8 mA or less
Indicator light	Operating position ..... Red LED illuminates. Optimum operating position ..... Green LED illuminates.		

### Grommet



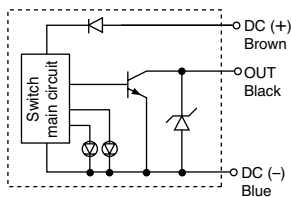
### Caution

#### Operating Precautions

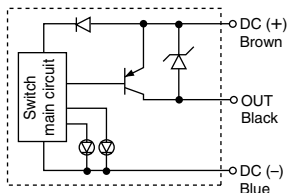
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

### Auto Switch Internal Circuit

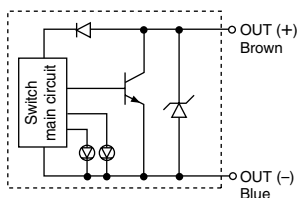
#### D-F9NW



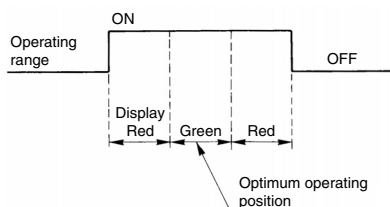
#### D-F9PW



#### D-F9BW



### Indicator light/Display method



#### Lead wires

Oilproof heavy-duty vinyl cable:  $\phi 2.7$ ,  $0.15 \text{ mm}^2 \times 3$  cores (Brown, Black, Blue),  $0.18 \text{ mm}^2 \times 2$  cores (Brown, Blue), 0.5 m

Note 1) Refer to page 19 for solid state switch common specifications.

Note 2) Refer to page 19 for lead wire lengths.

### Weight

Unit: g

Auto switch part no.	D-F9NW	D-F9PW	D-F9BW
Lead wire length (m)	0.5	7	7
	3	34	32
	5	56	52

### Dimensions

Unit: mm

#### D-F9□W

