NS20-130A

SMC

Large Bore Compact Cylinder

Series CQ2

ø180, ø200

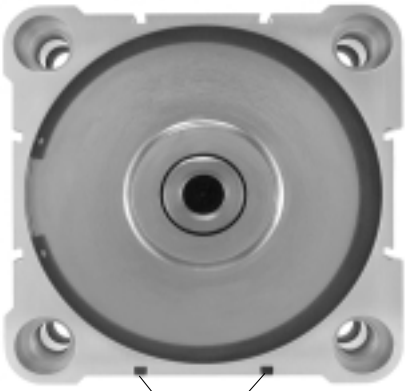
Single or Double Rod Versions
Switch Capable
Space Saving

Large Bore Compact Cylinder
ø180, ø200 Series CQ2

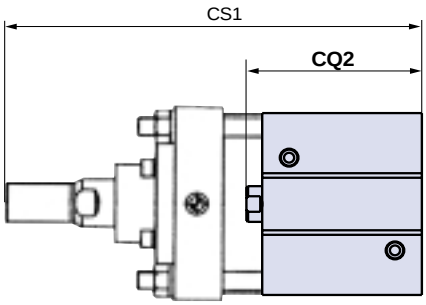
ø180 and ø200 added to CQ2 compact cylinder series.

Large bore sizes
ø180 and ø200 newly introduced

Compact and light weight
Substantial reductions in dimensions and weight compared to tie-rod type cylinders



Auto switches
- No protrusion from cylinder body
- Can be mounted on four sides



1in = 25.4mm

Series		Overall length mm	Weight kg (lb)
CQ2	**ø180**	**219**	**16.6 (36.6)**
	ø200	**226**	**20.6 (45.4)**
CS1	ø180	385	30.4 (67.0)
	ø200	390	39.5 (87.1)

Comparison with 100mm stroke and rod end male threads

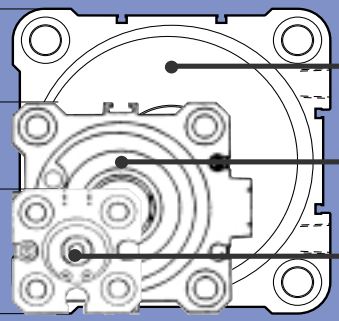
Variations

Series	Action	Type	Size	Standard strokes	Rod end configuration	Applicable auto switch models
CQ2	**Double acting**	**Single rod**	**180**	10 20 30 40 50 75 100 125 150 175 200 250 300	Female threads Male threads	Reed switches: D-Z7, Z8 Solid state switches: D-Y5, Y6, Y7
		Double rod	**200**			

New ø180 and ø200

Compact cylinder variations — A wide range of 15 sizes from ø12 to ø200

Compact cylinder series	Bore size (mm)														
	12	16	20	25	32	40	50	63	80	100	125	140	160	180	200
CQ2 Large bore											●	●	●	●	●
CQ2	○	○	○	○	○	○	○	○	○	○					
CQS	○	○	○	○											



∗ Refer to N320 "CQ2" and CAT.E256-A "CQS" regarding series marked with a "◯" symbol.

Compact Cylinder/
Double Acting:
Single Rod

Series CQ2

ø180, ø200

How to Order

With Auto Switch

CQ2B 180 – 50 D C □

CDQ2B 180 – 50 D C □ – Z76 □

With auto switch (built-in magnet)

Mounting

B	Standard (through hole/double end tapped)

Bore size

180	180mm
200	200mm

Cylinder stroke (mm)

Refer to the standard stroke table on page 2.

Action

D	Double acting

Cushion

C	Rubber bumper

Rod end threads

Nil	Standard (rod end female threads)
M	Rod end male threads

Auto switch type

Nil	Without auto switch (built-in magnet cylinder)

∗ Refer to the table below for auto switch models.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Applicable auto switches

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch models		*Lead wire length (mm)			Applicable loads		Detailed specifications
					DC		AC	Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)			
								Perpendicular	In-line						
Reed switch	–	Grommet	Yes	3 wire	–	5V	–	–	**Z76**	●	●	–	IC circuit	–	P.9
				2 wire	24V	12V	100V	–	**Z73**	●	●	●	–	Relay, PLC	
			No			5V, 12V	100V or less	–	**Z80**	●	●	–	IC circuit		
Solid state switch	–	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	–	**Y69A**	**Y59A**	●	●	○	IC circuit	Relay, PLC	P.10
				3 wire (PNP)				**Y7PV**	**Y7P**	●	●	○	IC circuit		
				2 wire		12V		**Y69B**	**Y59B**	●	●	○	–		
	Diagnostic indication (2 color indicator)			3 wire (NPN)		5V, 12V		**Y7NWV**	**Y7NW**	●	●	○	IC circuit		P.11
				3 wire (PNP)				**Y7PWV**	**Y7PW**	●	●	○			
				2 wire		12V		**Y7BWV**	**Y7BW**	●	●	○	–		
	Water resistant (2 color indicator)							–	**Y7BA**	–	●	○			P.12

∗ Lead wire length symbols: 0.5m ..... Nil (Example) Y69B
3m ..... L Y69BL
5m ..... Z Y69BZ

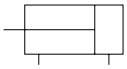
∗∗ Auto switches marked with a "○" symbol are produced upon receipt of order.

Specifications

Fluid	Air
Proof pressure	1.05MPa (150psi)
Maximum operating pressure	0.7MPa (101psi)
Minimum operating pressure	0.05MPa (72psi)
Ambient and fluid temperature	Without auto switch: –10 to 70°C (14 to 158°F) (with no freezing)
	With auto switch: –10 to 60°C (14 to 140°F) (with no freezing)
Lubrication	Non-lube
Cushion	Rubber bumper
Rod end threads	Female threads
Thread tolerance	JIS class 2
Stroke length tolerance	$^{+1.4}_{0}$mm ($^{+0.06}_{0}$in)
Mounting brackets	Basic type
Mounting	Through hole/Double end tapped

Symbol

Double acting: Single rod



Standard Strokes

1in = 25.4mm

Bore size (mm)	Standard strokes (mm)
180, 200	10, 20, 30, 40, 50, 75, 100, 125, 150, 175, 200, 250, 300

• Manufacture of intermediate strokes
Intermediate strokes in 5mm increments can be manufactured by installing spacers inside standard stroke cylinders.
Example) CQ2B180-160DC is produced by installing a 15mm spacer in a standard stroke cylinder CQ2B180-175DC.

Minimum Strokes for Mounting of Auto Switches

Unit: mm (in)

		D-Z7, Z8	D-Y5, Y6, Y7	DD-Y7□W, D-Y7BAL
180, 200	2 pcs. (different sides, same side)	10 (0.4)	5 (0.2)	15 (0.6)
	1 pc.	5 (0.2)	5 (0.2)	10 (0.4)

Theoretical Output/Double Acting Type

Unit: N

Bore size (mm)	Operating direction	Operating Pressure MPa (psi)					
		0.2 (29)	0.3 (43.5)	0.4 (58)	0.5 (72.5)	0.6 (87)	0.7 (101.5)
180	IN	4838	7257	9676	12095	14514	16933
	OUT	5089	7634	10179	12724	15268	17812
200	IN	6032	9048	12064	15080	18096	21112
	OUT	6283	9425	12566	15708	18850	21991

Do not apply loads greater than 50% of the theoretical output.

1N = 0.2248lb_f

Weight Table

Unit: 1kg

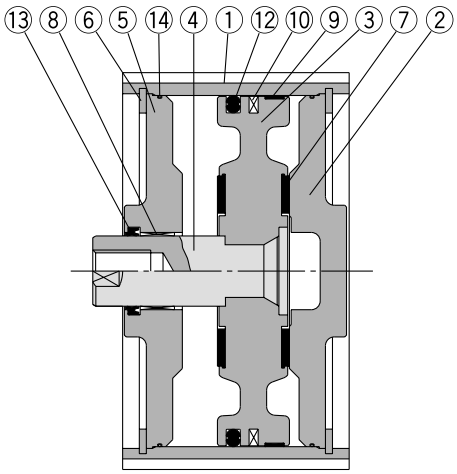
Bore size (mm)	Standard strokes (mm)													With magnet	Rod end male threads
	10	20	30	40	50	75	100	125	150	175	200	250	300	Additional weight	Additional weight
180	11.97	12.39	12.81	13.24	13.67	14.73	15.80	16.87	17.93	18.99	20.05	22.18	24.31	0.08	0.74
200	15.30	15.87	16.35	16.84	17.33	18.55	19.77	20.99	22.21	23.43	24.74	27.08	29.52	0.09	0.74

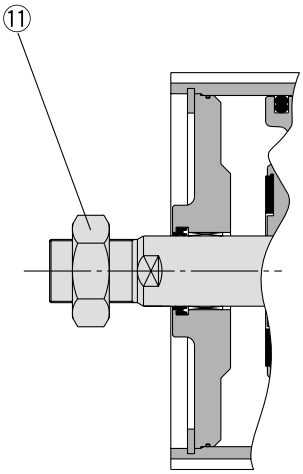
Example) CDQ2B180-100DCM

Basic weight	CQ2B180-100DC	15.80kg
Additional weight	Built-in magnet	0.08kg
	Rod end male threads	0.74kg
	Total	16.62kg

1in = 25.4mm
1kg = 2.2248lb

Construction





Rod end male threads

Parts list

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Cast iron	Nickel plated
3	**Piston**	Aluminum alloy casting	Chromated
4	**Piston rod**	Carbon steel	Hard chrome plated
5	**Rod cover**	Cast iron	Nickel plated
6	**Snap ring**	Carbon tool steel	Phosphate coated
7	**Bumper**	Polyurethane	
8	**Bushing**	Lead-bronze casting	
9	**Wear ring**	Resin	
10	**Magnet**	–	CDQ2B only

Parts list

No.	Description	Material	Note
11	**Rod end nut**	Rolled steel	Nickel plated
12	**Piston seal**	NBR	
13	**Rod seal**	NBR	
14	**Tube gasket**	NBR	

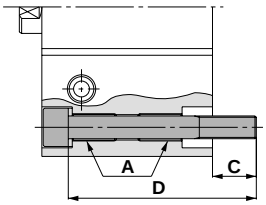
Replacement parts: Seal kits

Bore size (mm)	Seal kit No.	Contents
180	CQ2B180-PS	A set of Nos.12, 13 and 14 from the table above
200	CQ2B200-PS	

Mounting

1in = 25.4mm

Mounting/Through hole type mounting bolts are available.
How to order: Add "Bolt" in front of the bolts to be used.
(Example) Bolt M18 x 125 *l*



Note1) When mounting with through hole type mounting bolts, be sure to use the flat washers which are included.

Note 2) When mounting a cylinder with a stroke over 100mm, use the section A mounting threads.

Model	C	D	Mounting bolt (mm)
C (D) Q2B180- 10DC	36	125	M18 x 125 *l*
C (D) Q2B180- 20DC		135	M18 x 135 *l*
C (D) Q2B180- 30DC		145	M18 x 145 *l*
C (D) Q2B180- 40DC		155	M18 x 155 *l*
C (D) Q2B180- 50DC		165	M18 x 165 *l*
C (D) Q2B180- 75DC		190	M18 x 190 *l*
C (D) Q2B180-100DC		215	M18 x 215 *l*

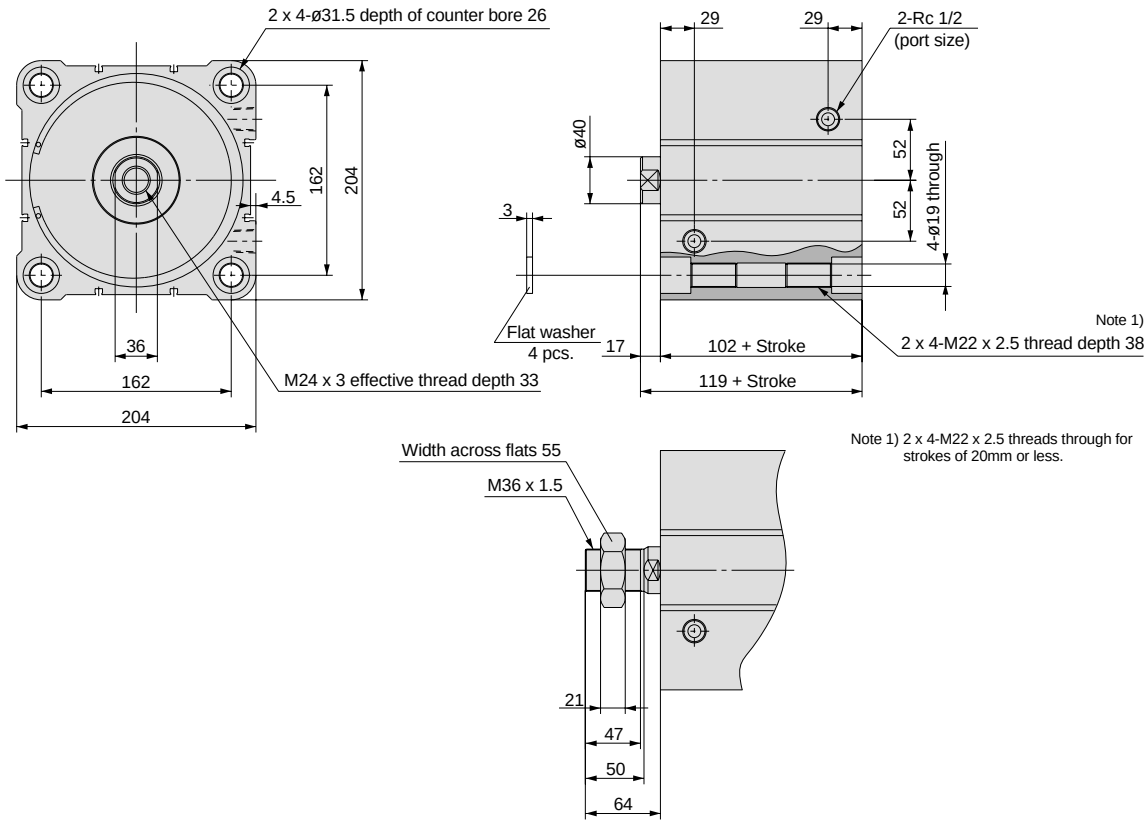
Model	C	D	Mounting bolt (mm)
C (D) Q2B200- 10DC	39	135	M18 x 135 *l*
C (D) Q2B200- 20DC		145	M18 x 145 *l*
C (D) Q2B200- 30DC		155	M18 x 155 *l*
C (D) Q2B200- 40DC		165	M18 x 165 *l*
C (D) Q2B200- 50DC		175	M18 x 175 *l*
C (D) Q2B200- 75DC		200	M18 x 200 *l*
C (D) Q2B200-100DC		225	M18 x 225 *l*

Dimensions (mm)

Dimensions are the same with and without auto switches.

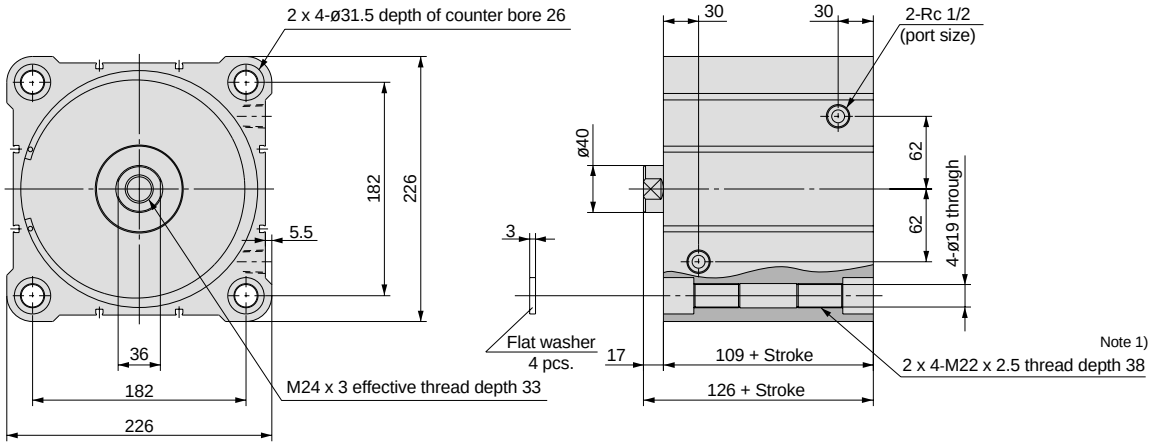
1in = 25.4mm

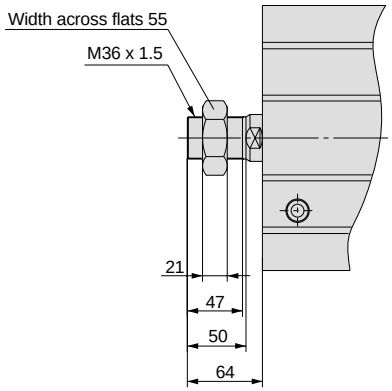
ø180



Note 1) 2 x 4-M22 x 2.5 threads through for strokes of 20mm or less.

ø200





Note 1) 2 x 4-M22 x 2.5 threads through for strokes of 20mm or less.

Series CQ2W

ø180, ø200

How to Order

CQ2WB 180 — 50 D C

With Auto Switch **CDQ2WB 180 — 50 D C — Z76**

With auto switch (built-in magnet)

Mounting

B	Standard (through hole/double end tapped)

Bore size

180	180mm
200	200mm

Cylinder stroke (mm)

Refer to the standard stroke table on page 6.

Action

D	Double acting

Cushion

C	Rubber bumper

Rod end threads

Nil	Standard (rod end female threads)
M	Rod end male threads

Auto switch type

Nil	Without auto switch (built-in magnet cylinder)

∗ Refer to the table below for auto switch models.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Applicable auto switches

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch models		Lead wire length (mm) ∗			Applicable loads		Detailed specifications
					DC		AC	Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)			
								Perpendicular	In-line						
Reed switch	—	Grommet	Yes	3 wire	—	5V	—	—	**Z76**	●	●	—	IC circuit	—	P.9
				2 wire	24V	12V	100V	—	**Z73**	●	●	●	—	Relay, PLC	
			No			5V, 12V	100V or less	—	**Z80**	●	●	—	IC circuit		
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	—	**Y69A**	**Y59A**	●	●	○	IC circuit	Relay, PLC	P.10
				3 wire (PNP)				**Y7PV**	**Y7P**	●	●	○	IC circuit		
				2 wire		12V		**Y69B**	**Y59B**	●	●	○	—		
	Diagnostic indication (2 color indicator)			3 wire (NPN)		5V, 12V		**Y7NWV**	**Y7NW**	●	●	○	IC circuit		P.11
				3 wire (PNP)				**Y7PWV**	**Y7PW**	●	●	○			
				2 wire		12V		**Y7BWV**	**Y7BW**	●	●	○	—		
	Water resistant (2 color indicator)							—	**Y7BA**	—	●	○			P.12

∗ Lead wire length symbols: 0.5m ... Nil (Example) Y69B
3m ..... L Y69BL
5m ..... Z Y69BZ

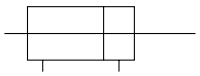
∗∗ Auto switches marked with a "○" symbol are produced upon receipt of order.

Specifications

Fluid	Air
Proof pressure	1.05MPa (152psi)
Maximum operating pressure	0.7MPa (101psi)
Minimum operating pressure	0.05MPa (7psi)
Ambient and fluid temperature	Without auto switch: –10°C to 70°C (with no freezing) (14° to 158°F)
	With auto switch: –10°C to 60°C (with no freezing) (14° to 140°F)
Lubrication	Non-lube type
Cushion	Rubber bumper
Rod end threads	Female thread
Thread tolerance	JIS class 2
Stroke length tolerance	$^{+1.4}_{0}$mm $^{+0.06}_{0}$in
Mounting brackets	Basic type
Mounting	Through hole/Double end tapped

Symbol

Double acting: Double rod



Standard Strokes

Bore size (mm)	Standard strokes (mm)
180, 200	10, 20, 30, 40, 50, 75, 100, 125, 150, 175, 200, 250, 300

Minimum Strokes for Auto Switch Mounting

Unit: mm (in)

		D-Z7, Z8	D-Y5, Y6, Y7	D-Y7□W, D-Y7BAL
180, 200	2 pcs. (different sides, same side)	10 (0.4)	5 (0.2)	15 (0.6)
	1 pc.	5 (0.2)	5 (0.2)	10 (0.4)

Theoretical Output/Double Acting

Unit: N (lbf)

Bore Size (mm)	Operating pressure MPa (psi)					
	0.2 (29)	0.3 (43.5)	0.4 (58)	0.5 (72.5)	0.6 (87)	0.7 (101.5)
180	4838 (1088)	7257 (1631)	9676 (2175)	12,095 (2719)	14,514 (3263)	16,933 (3807)
200	6032 (1356)	9048 (2034)	12,064 (2712)	15,080 (3390)	18,096 (4068)	21,112 (4746)

Do not apply loads greater than 50% of the theoretical output.

Weight Table

Unit: 1kg

	Standard strokes (mm)													With magnet	Rod end male threads
	10	20	30	40	50	75	100	125	150	175	200	250	300	Additional weight	Additional weight
180	12.18	12.70	13.23	13.75	14.28	15.59	16.90	18.21	19.52	20.83	22.14	24.76	27.39	0.08	1.48
200	15.63	16.22	16.80	17.39	17.97	19.44	20.91	22.37	22.84	25.30	26.77	29.70	32.63	0.09	1.48

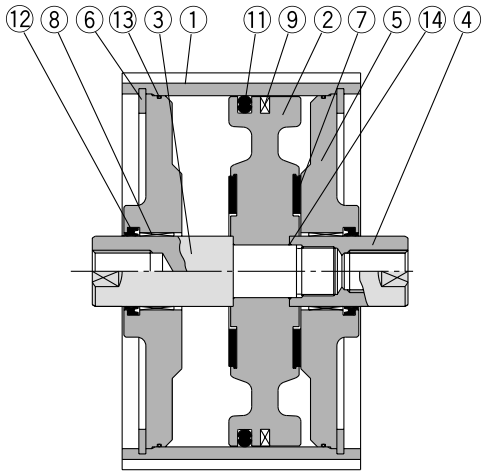
Example) CDQ2WB200-100DCM

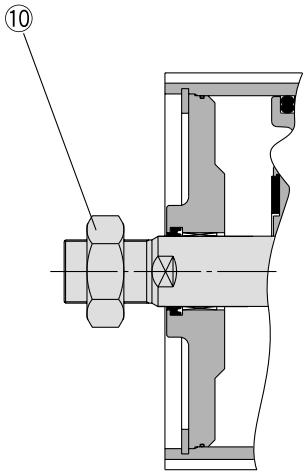
Basic weight	CQ2WB200-100DC	20.91kg
Additional weight	Built-in magnet	0.09kg
	Rod end male threads	1.48kg
	Total	22.48kg

1in = 25.4mm

1kg = 2.2248lb

Construction





Rod end male threads

Parts list

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Piston**	Aluminum alloy casting	Chromated
3	**Piston rod A**	Carbon steel	Hard chrome plated
4	**Piston rod B**	Carbon steel	Hard chrome plated
5	**Rod cover**	Cast iron	Nickel plated
6	**Snap ring**	Carbon tool steel	Phosphate coated
7	**Bumper**	Polyurethane	
8	**Bushing**	Lead-bronze casting	
9	**Magnet**	–	CDQ2B only
10	**Rod end nut**	Rolled steel	Nickel plated

Parts list

No.	Description	Material	Note
11	**Piston seal**	NBR	
12	**Rod seal**	NBR	
13	**Tube gasket**	NBR	
14	**Piston gasket**	NBR	

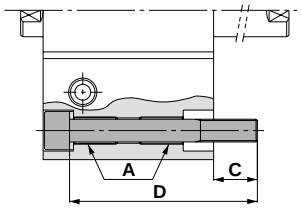
Replacement parts: Seal kits

Bore size (mm)	Seal kit No.	Contents
180	CQ2WB180-PS	A set of Nos.11, 12 and 13 from the table above
200	CQ2WB200-PS	

Mounting

1in = 25.4mm

Mounting/Through hole type mounting bolts are available.
How to order: Add "Bolt" in front of the bolts to be used.
(Example) Bolt M18 x 125 *l*



Note1) When mounting with through hole type mounting bolts, be sure to use the flat washers which are included.
Note 2) When mounting a cylinder with a stroke over 100mm, use the section A mounting threads.

Model	C	D	Mounting bolt (mm)
C (D) Q2WB180- 10DC	36	125	M18 x 125 *l*
C (D) Q2WB180- 20DC		135	M18 x 135 *l*
C (D) Q2WB180- 30DC		145	M18 x 145 *l*
C (D) Q2WB180- 40DC		155	M18 x 155 *l*
C (D) Q2WB180- 50DC		165	M18 x 165 *l*
C (D) Q2WB180- 75DC		190	M18 x 190 *l*
C (D) Q2WB180-100DC		215	M18 x 215 *l*

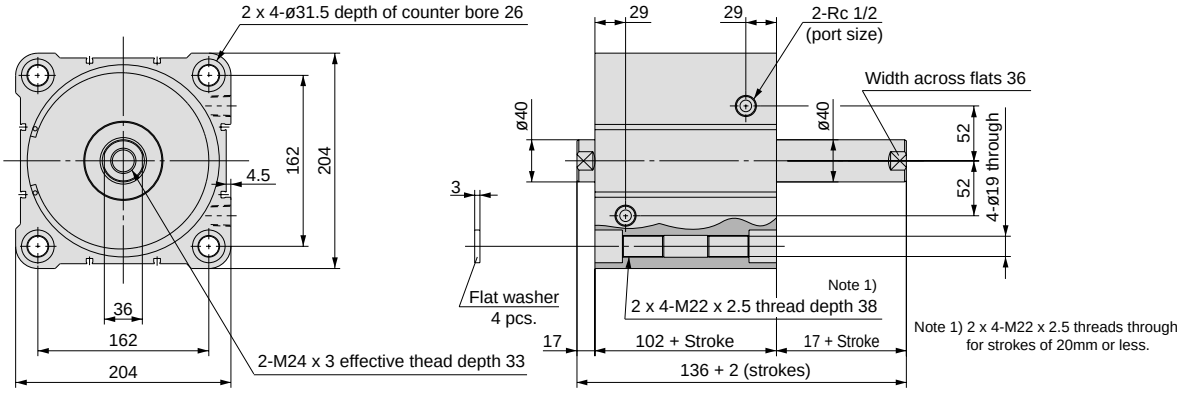
Model	C	D	Mounting bolt (mm)
C (D) Q2WB200- 10DC	39	135	M18 x 135 *l*
C (D) Q2WB200- 20DC		145	M18 x 145 *l*
C (D) Q2WB200- 30DC		155	M18 x 155 *l*
C (D) Q2WB200- 40DC		165	M18 x 165 *l*
C (D) Q2WB200- 50DC		175	M18 x 175 *l*
C (D) Q2WB200- 75DC		200	M18 x 200 *l*
C (D) Q2WB200-100DC		225	M18 x 225 *l*

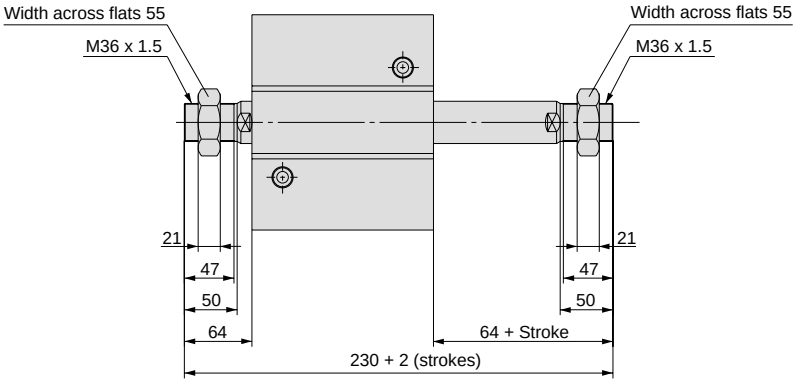
Dimensions (mm)

Dimensions are the same with and without auto switches.

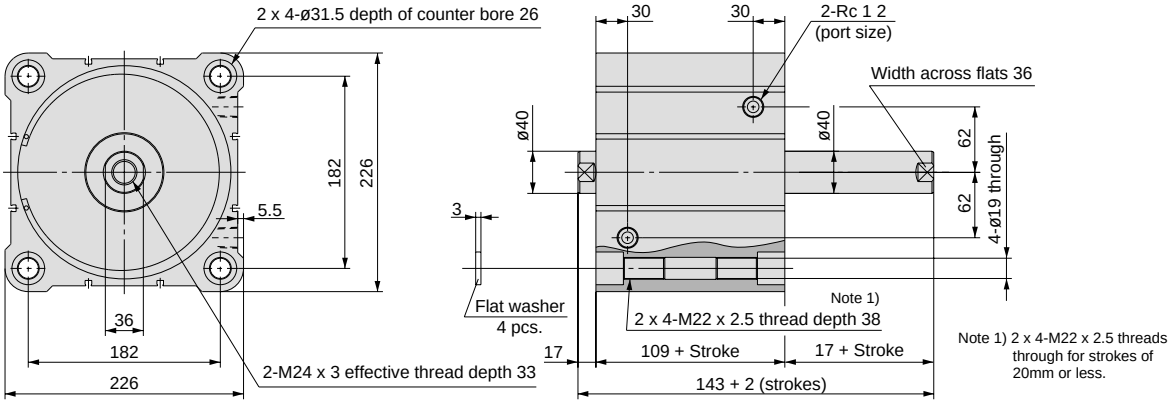
1in = 25.4mm

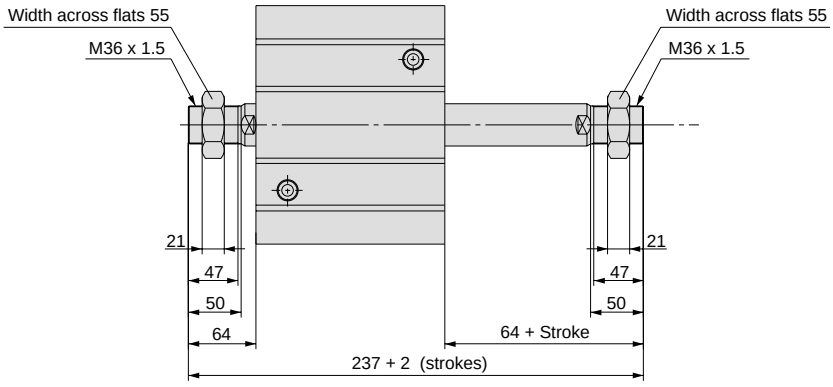
ø180





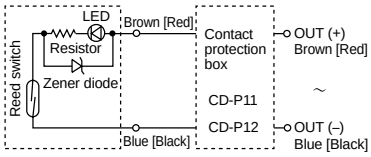
ø200



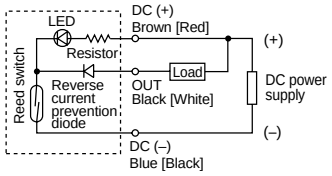


Internal circuits

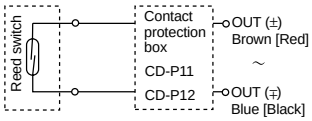
D-Z73



D-Z76



D-Z80



Note) 1. The load is an induction load
2. The lead wire length to the load is 5m or more
3. The load voltage is 100VAC

Use a contact protection box in any of the above situations, as the life of the contacts may otherwise be reduced. (Refer to page 14 for detailed specifications of the contact protection boxes.)

Auto Switch Specifications

With indicator light

Auto switch part no.	D-Z73		D-Z76
Electrical entry direction	In-line		
Applicable loads	Relay, PLC		IC circuit
Load voltage	24VDC	100VAC	4 to 8VDC
Maximum load current or current range	5 to 40mA	5 to 20mA	20mA
Contact protection circuit	None		
Internal voltage drop	2.4V or less (to 20mA)/3V or less (to 40mA)		0.8V or less
Indicator light	Red LED lights up when ON		

Without indicator light

Auto switch part no.	D-Z80		
Electrical entry direction	In-line		
Applicable load	Relay, PLC, IC circuit		
Load voltage	$24V^{AC}_{DC}$ or less	$48V^{AC}_{DC}$	$100V^{AC}_{DC}$
Maximum load current	50mA	40mA	20mA
Contact protection circuit	None		
Internal resistance	1Ω or less (including lead wire length of 3m)		

- **Leakage current** ..... None
- **Operating time** 1.2ms
- **Lead wires** ..... Heavy duty oil resistant vinyl cord, ø3.4, 0.2mm², 2 wire (Brown, Blue [Red, Black]), 3 wire (Brown, Black, Blue [Red, White, Black]), 0.5m* (D-Z73 only ø2.7, 0.18mm², 2 wire)
- **Impact resistance** ..... 300m/S² {30.6G}
- **Insulation resistance** .... 50MΩ or more at 500VDC (between lead wire and case)
- **Withstand voltage** .....1500VAC for 1min. (between lead wire and case)
- **Ambient temperature** … –10 to 60°C (14 to 140°F)
- **Enclosure** ……..... IEC529 standard IP67, watertight (JISC0920)

* For a lead wire length of 3m, "L" is shown at the end of the part number. Example) D-Z73L

Weight Table

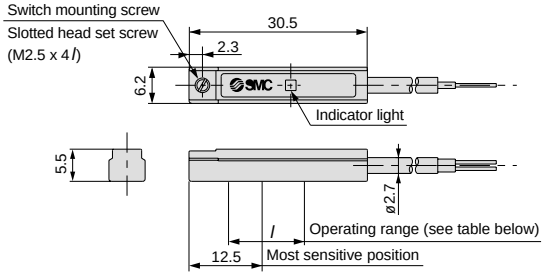
Unit: g (oz.)

Model	Lead wire length 0.5m (~1 1/2ft)	Lead wire length 3m (~9ft)
D-Z73	9 (0.3)	49 (1.7)
D-Z76	10 (0.35)	55 (1.9)
D-Z80	9 (0.3)	49 (1.7)

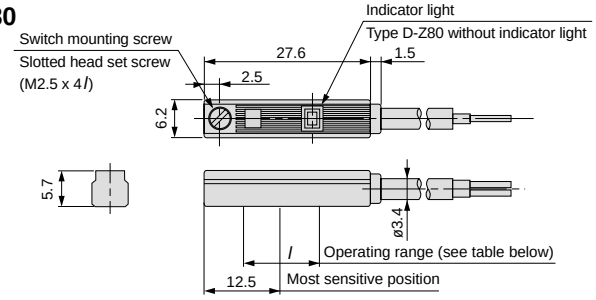
Dimensions (mm)

1in = 25.4mm

D-Z73



D-Z76, Z80



Bore size / Operating range	Bore size mm (in)	
	180	**200**
Operating range l (mm)	15 (0.6)	15 (0.6)

Note) This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).

Auto Switch Specifications

D-Y5, D-Y6, D-Y7P, D-Y7PV (with indicator light)

Auto switch model no.	D-Y59A	D-Y69A	D-Y7P	D-Y7PV	D-Y59B	D-Y69B
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3 wire				2 wire	
Output type	NPN		PNP		–	
Applicable loads	IC circuit, Relay, PLC				24VDC Relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)				–	
Current consumption	10mA or less				–	
Load voltage	28VDC or less		–		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less at 24VDC	
Indicator light	Red LED lights up when ON					

- Operating time ..... 1ms or less
- Lead wires ..... Heavy duty oil resistant flexible vinyl cord, ø3.4 , 0.15mm², 3 wire (brown, black, blue [red, white, black]), 2 wire (brown, blue [red, black]), 0.5m*

* For a lead wire length of 3m, "L" is shown at the end of the part number. (Example) D-Y59AL

- Impact resistance 1,000m/s² (102G)
- Insulation resistance ... 50MΩ or more at 500VDC (between lead wire and case)
- Withstand voltage ..... 1000VAC for 1 min. (between lead wire and case)
- Ambient temperature ... –10 to 60°C (14 to 140°F)
- Enclosure ..... IEC529 standard IP67, watertight (JISC0920)

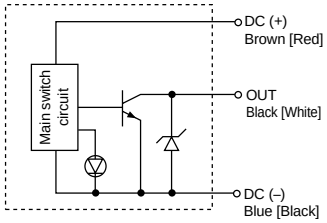
Weight Table

Unit: g (oz.)

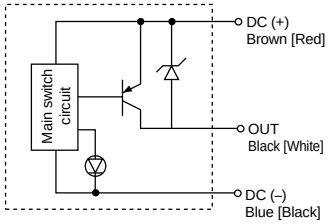
Model	Lead wire length	
	0.5m (~1 1/2ft)	3m (~9ft)
D-Y59A, Y69A, Y7P	10 (0.35)	53 (1.9)
D-Y59B, Y69B, Y7PV	9 (0.3)	50 (1.8)

Internal circuits

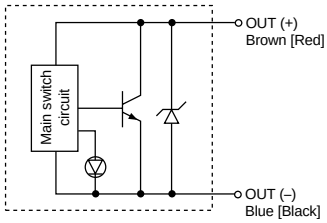
D-Y59A, Y69A



D-Y7P (V)



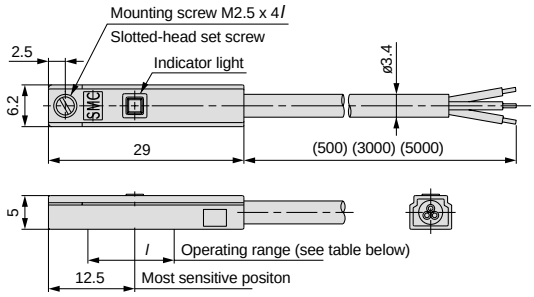
D-Y59B, Y69B



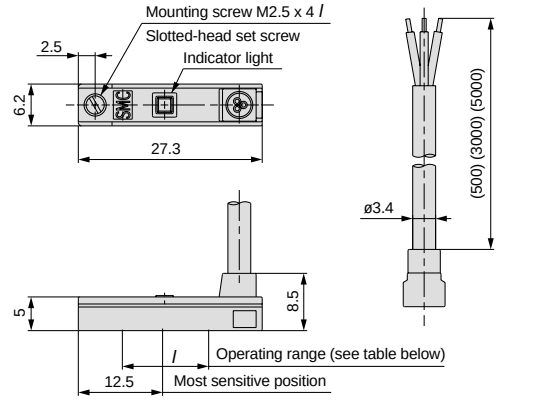
Dimensions (mm)

1in = 25.4mm

D-Y59A, Y59B
D-Y7P



D-Y69A, Y69B
D-Y7PV

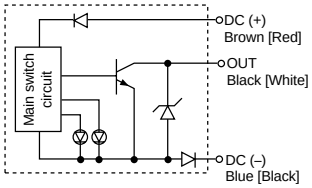


Operating range \ Bore size	Bore size mm (in)	
	180	**200**
Operating range l (mm)	8 (0.3)	8 (0.3)

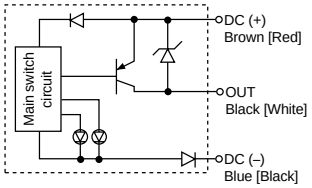
Note) This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).

Internal circuits

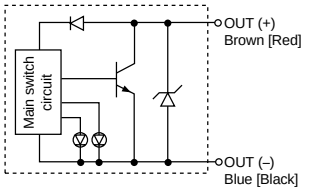
D-Y7NW(V)/3 wire NPN output



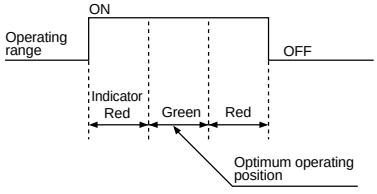
D-Y7PW(V)/3 wire PNP output



D-Y7BW(V)/2 wire



Indicator light/Display method



Auto Switch Specifications

D-Y7□W, D-Y7□WV (with indicator light)

Auto switch model no.	D-Y7NW	D-Y7NWV	D-Y7PW	D-Y7PWV	D-Y7BW	D-Y7BWV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3 wire				2 wire	
Output type	NPN		PNP		–	
Applicable loads	IC circuit, Relay, PLC				24VDC Relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28VDC)				–	
Current consumption	10mA or less				–	
Load voltage	28VDC or less		–		24VDC (10 to 28VDC)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less at 24VDC	
Indicator light	Operating position ..... Red LED lights up Optimum operating position ..... Green LED lights up					

- Operating time ..... 1ms or less
- Lead wires ..... Heavy duty oil resistant flexible vinyl cord, ø3.4, 0.15mm², 3 wire (brown, black, blue [red, white, black]), 2 wire (brown, blue [red, black]), 0.5m*

* For a lead wire length of 3m, "L" is shown at the end of the part number. (Example) D-Y7NWL

- Impact resistance 1,000m/s² (102G)
- Insulation resistance .... 50MΩ or more at 500VDC (between lead wire and case)
- Withstand voltage ..... 1000VAC for 1 min. (between lead wire and case)
- Ambient temperature ... –10 to 60°C (14 to 140°F)
- Enclosure ..... IEC529 standard IP67, watertight (JISC0920)

Weight Table

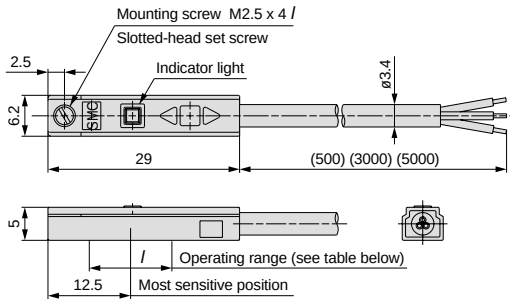
Unit: g (oz.)

Model	Lead wire length	
	0.5m (~1 1/2ft)	3m (~9ft)
D-Y7N, Y7P	10 (0.35)	53 (1.9)
D-Y7B	9 (0.3)	50 (1.8)

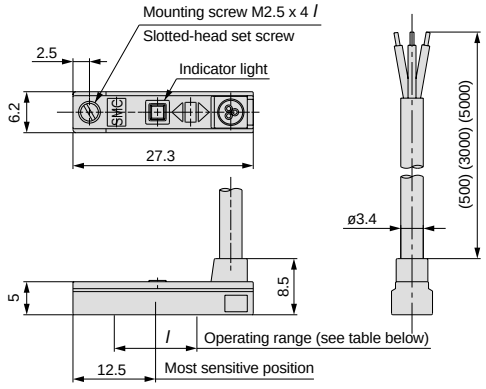
Dimensions (mm)

1in = 25.4mm

D-Y7□W



D-Y7□WV



Operating range \ Bore size	Bore size mm (in)	
	180	200
Operating range l (mm)	8 (0.3)	8.5 (0.3)

Note) This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).

Improved water (coolant) resistant type

Auto Switch Specifications

D-Y7BAL (with indicator light)

Auto switch model no.	D-Y7BAL
Electrical entry direction	In-line
Wiring type	2 wire
Applicable loads	24VDC Relay, PLC
Load voltage	24VDC (10 to 28VDC)
Load current	5 to 40mA
Internal voltage drop	4V or less
Leakage current	1mA or less at 24VDC
Indicator light	Operating position ..... Red LED lights up Optimum operating position ..... Green LED lights up

- Operating time ..... 1ms or less
- Lead wires ..... Heavy duty oil resistant flexible vinyl cord, ø3.4, 0.15mm², 2 wire (brown, blue [red, black]), 3m
- Impact resistance ..... 1,000m/s²(102G)
- Insulation resistance .... 50MΩ or more at 500VDC (between lead wire and case)
- Withstand voltage ..... 1000VAC for 1 min. (between lead wire and case)
- Ambient temperature ... –10 to 60°C (14 to 140°F)
- Enclosure ..... IEC529 standard IP67, watertight (JISC0920)

Operating Precautions

⚠ Caution

1. Contact SMC if a solution other than water is to be used.

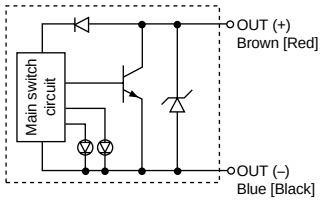
Weight Table

Unit: g (oz.)

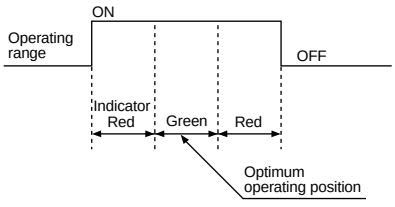
Model	Lead wire length
	3m (~9ft)
D-Y7BAL	51 (1.8)

Internal circuits

D-Y7BAL/2 wire



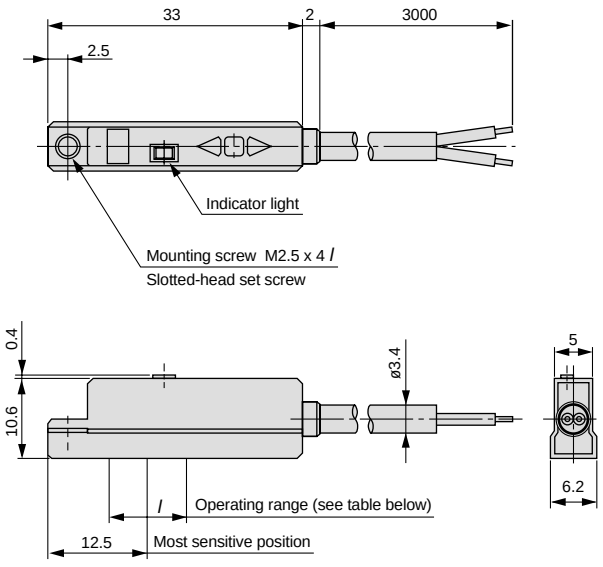
Indicator light/Display method



Dimensions (mm)

1in = 25.4mm

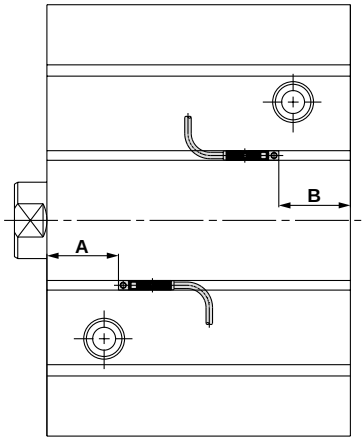
D-Y7BAL



Bore size / Operating range	Bore size mm (in)	
	180	**200**
Operating range l (mm)	7 (0.3)	7.5 (0.3)

Note) This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ± 30%).

Auto Switches/Proper Mounting Position for Stroke End Detection



Proper mounting position mm (in)

Bore size (mm)	A	B
180	38.5 (1.5)	38.5 (1.5)
200	42 (1.7)	42 (1.7)

∗ Dimensions are the same for single rod and double rod.

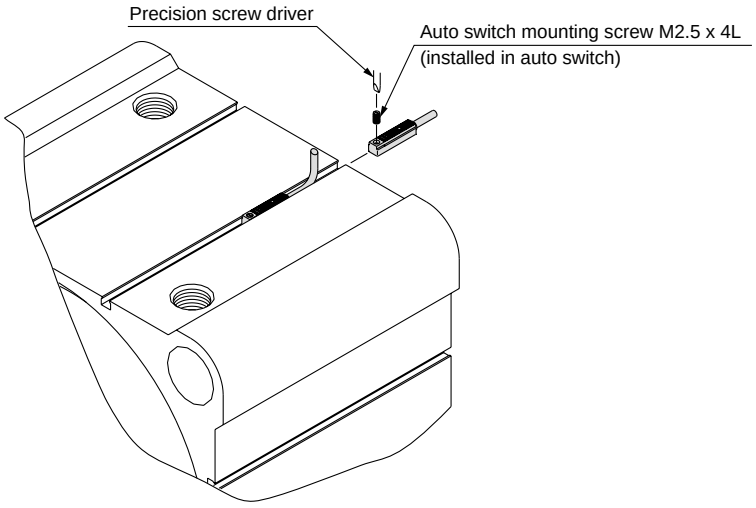
Minimum Strokes for Mounting of Auto Switches

		D-Z7, Z8	D-Y5, Y6, Y7	D-Y7□W D-Y7BAL
180, 200	2 pcs. (different sides, same side)	10 (0.4)	5 (0.2)	15 (0.6)
	1mm (in)	5 (0.2)	5 (0.2)	10 (0.4)

Auto Switch Mounting

When mounting an auto switch, insert it into the cylinder's switch mounting groove from the direction shown in the drawing below. After setting it in the desired mounting position, tighten the switch mounting screw which is included using a flat head watchmakers screw driver.

Note) When tightening the auto switch mounting screw (included with auto switch), use a watchmakers screw driver with a handle about 5 to 6mm in diameter. Also tighten with a torque of 0.05 to 0.1N·m. As a rule, it should be turned about 90° past the point at which tightening can be felt.



Contact Protection Boxes/CD-P11, CD-P12

D-Z7 and D-Z8 type switches do not have internal contact protection circuits.
A contact protection box should be used in any of the following cases.

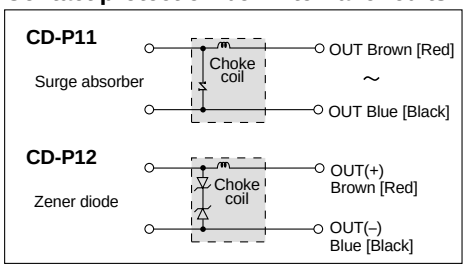
1. The operated load is an induction load.
2. The length of wiring to the load is 5m or more.
3. The load voltage is 100VAC.

Contact protection box specifications

Part No.	CD-P11		CD-P12
Load voltage	100VAC or less	200VAC	24VDC
Max. load current	25mA	12.5mA	50mA

∗ Lead wire length ..... Switch connection side 0.5m
Load connection side 0.5m

Contact protection box internal circuits

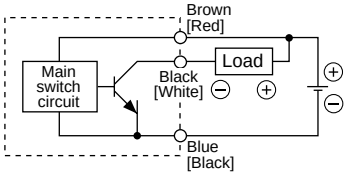


Contact Protection Box Connection

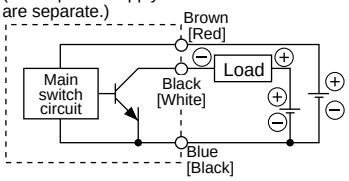
To connect a switch unit to a contact protection box, connect the lead wires from the side of the contact protection box marked SWITCH to the lead wires coming out of the switch unit.
Further, the switch unit and contact protection box should be placed as close together as possible with a lead wire length no greater than 1 meter.

Basic Wiring

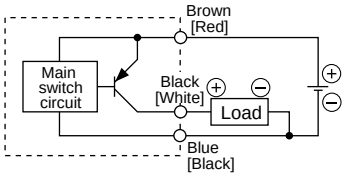
Solid state 3 wire, NPN



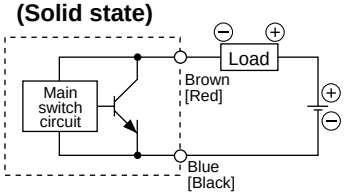
(When power supply for switch and load are separate.)

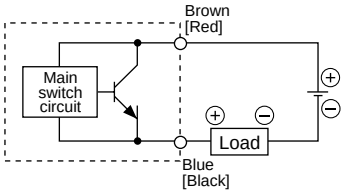


Solid state 3 wire, PNP

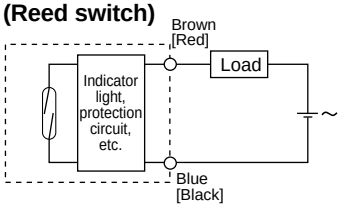


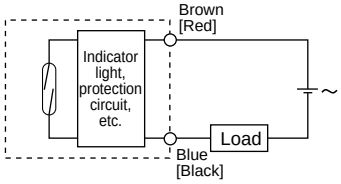
2 wire (Solid state)





2 wire (Reed switch)

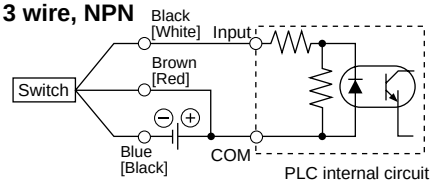




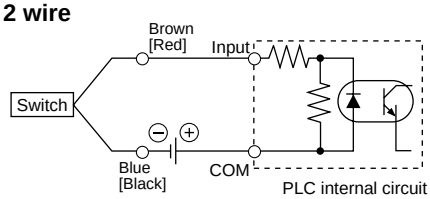
Examples of Connection to PLC

Sink input specifications

3 wire, NPN

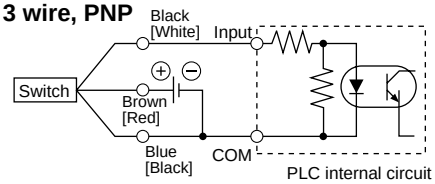


2 wire

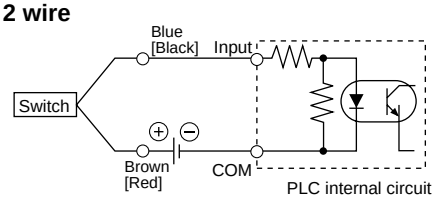


Source input specifications

3 wire, PNP



2 wire

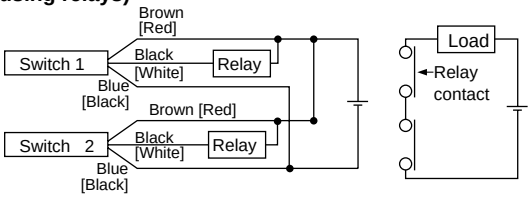


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

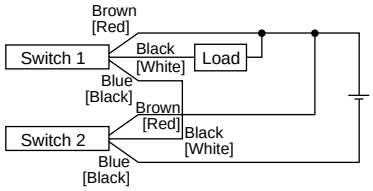
Connection Examples for AND (Series) and OR (Parallel)

3 wire

AND connection for NPN output (using relays)

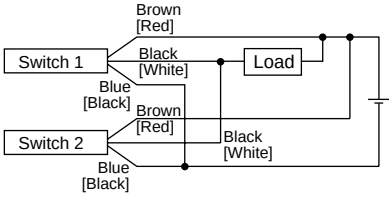


AND connection for NPN output (performed with switches only)

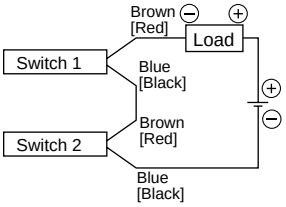


The indicator lights will light up when both switches are turned ON.

OR connection for NPN output



2 wire with 2 switch AND connection



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

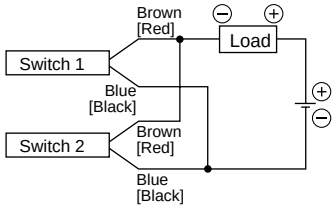
$$\text{Load voltage at ON} = \text{Power supply voltage} - \text{Residual voltage} \times 2 \text{ pcs.}$$

$$= 24\text{V} - 4\text{V} \times 2 \text{ pcs.}$$

$$= 16\text{V}$$

Example: Power supply is 24VDC
Voltage decline in switch is 4V

2 wire with 2 switch OR connection



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

(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 get dark or not light up, because of dispersion and reduction of the current flowing to the switches.

$$\text{Load voltage at OFF} = \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance}$$

$$= 1\text{mA} \times 2 \text{ pcs.} \times 3\text{k}\Omega$$

$$= 6\text{V}$$

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

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of **"Caution", "Warning" or "Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠ Caution : Operator error could result in injury or equipment damage.

⚠ Warning : Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Precautions on design

⚠ Warning

1. There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc. and changes in forces occur.

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

2. A protective cover is recommended to minimize the risk of personal injury.

If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

3. Securely tighten all stationary parts and connected parts so that they will not become loose.

When a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

4. A deceleration circuit or shock absorber, etc., may be required.

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact. In this case, the rigidity of the machinery should also be examined.

5. Consider a possible drop in operating pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and/or human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

6. Consider a possible loss of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

7. Design circuitry to prevent sudden lurching of driven objects.

When a cylinder is driven by an exhaust center type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching because, there is a danger of human injury and/or damage to equipment when this occurs.

8. Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9. Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install manual safety equipment.

Selection

⚠ Warning

1. Confirm the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.)

Consult SMC if you use a fluid other than compressed air.

2. Intermediate stops

When intermediate stopping of a cylinder piston is performed with a 3 position closed center type directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure due to the compressibility of air.

Furthermore, since valves and cylinders, etc., are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

⚠ Caution

1. Operate within the limits of the maximum usable stroke.

The piston rod will be damaged if operated beyond the maximum stroke. Refer to the air cylinder model selection procedure for the maximum useable stroke.

2. Operate the piston within a range such that collision damage will not occur at the stroke end.

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the range within which damage will not occur.

3. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

Mounting

⚠ Caution

1. Be certain to match the rod shaft center with the load and direction of movement when connecting.

When not properly matched, problems may arise with the rod and tube, and damage may be caused due to friction on areas such as the inner tube surface, bushings, rod surface and seals.

2. When an external guide is used, connect the rod end and the load in such a way that there is no interference at any point within the stroke.

3. Do not scratch or gouge the sliding parts of the cylinder tube or piston rod, etc., by striking or grasping them with other objects.

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction. Also, scratches or gouges, etc., in the piston rod may lead to damaged seals and cause air leakage.

4. Prevent the seizure of rotating parts.

Prevent the seizure of rotating parts (pins, etc.) by applying grease.

Mounting

⚠ Caution

5. Do not use until you can verify that equipment can operate properly.

Verify correct mounting by suitable function and leakage inspections after compressed air and power are connected following mounting, maintenance or conversions.

6. Instruction manual

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.

Piping

⚠ Caution

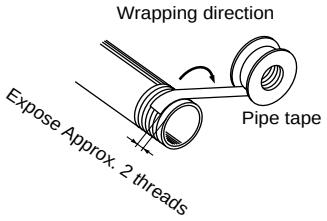
1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

2. Wrapping of pipe tape

When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



Lubrication

⚠ Caution

1. Lubrication of lube type cylinders

Install a lubricator in the circuit and supply with class 1 turbine oil (without additives) ISO VG32.

Do not use machine oil or spindle oil.

2. Lubrication of non-lube type cylinder

The cylinder is lubricated at the factory and can be used without any further lubrication.

However, in the event that it will be lubricated, use class 1 turbine oil (without additives) ISO VG32.

Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

Air Supply

⚠ Warning

1. Use clean air.

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can cause damage or malfunction.

Air Supply

⚠ Caution

1. Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be 5μm or finer.

2. Install an after cooler, air dryer or Drain Catch, etc.

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after cooler air dryer or Drain Catch, etc.

3. Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing, since moisture in circuits will be frozen under 5°C, and this may cause damage to seals and lead to malfunction.

Refer to SMC's "Air Cleaning Equipment" catalog for further details on compressed air quality.

Operating Environment

⚠ Warning

1. Do not use in environments where there is a danger of corrosion.

Refer to the construction drawings regarding cylinder materials.

2. In dusty locations or where water, oil, etc. splash on the equipment, take suitable measures to protect rod.

Use water resistant cylinders in areas where liquids are scattered.

3. When using auto switches, do not operate in an environment with strong magnetic fields.

Maintenance

⚠ Warning

1. Maintenance should be performed according to the procedure indicated in the instruction manual.

If handled improperly, malfunction and damage of machinery or equipment may occur.

2. Removal of equipment, and supply/exhaust of compressed air.

When equipment is removed, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.

When machinery is restarted, proceed with caution after confirming measures to prevent cylinder lurching.

⚠ Caution

1. Drain flushing

Remove drainage from air filters regularly.

(Refer to specifications.)

Design & Selection

⚠ Warning

1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for current load, voltage, temperature or impact.

2. Take precautions when multiple cylinders are used close together.

When multiple auto switch cylinders are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm.

3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V\ (mm/s) = \frac{\text{Auto switch operating range (mm)}}{\text{Time load applied (ms)}} \times 1000$$

4. Keep wiring as short as possible.

<Reed switches>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

Use a contact protection box when the wire length is 5m or longer.

<Solid state switches>

Although wire length should not affect switch function, use a wire 100m or shorter.

5. Pay attention to the internal voltage drop of the switch.

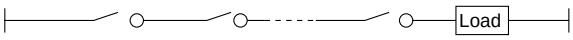
<Reed switches>

1) Switches with an indicator light (Except D-Z76)

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)

  [The voltage drop will be "n" times larger when "n" auto switches are connected.]

  Even though an auto switch operates normally, the load may not operate.



⚠ Warning

- In the same way, when operating under a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model D-Z80).

<Solid state switches>

3) Generally, the internal voltage drop will be greater with a 2 wire solid state auto switch than with a reed switch. Take the same precautions as in 1).

Also, note that a 12VDC relay is not applicable.

6. Pay attention to leakage current.

<Solid state switches>

With a 2 wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

Operating current of load (OFF condition) > Leakage current

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3 wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

7. Do not use a load that generates surge voltage.

<Reed switches>

If driving a load such as a relay that generates a surge voltage, use a contact protection box.

<Solid state switches>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

8. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.

Also perform periodic maintenance and confirm proper operation.

9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.

Auto Switch Precautions 2
Be sure to read before handling

Mounting & Adjustment

⚠ Warning

1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s² or more for reed switches and 1000m/s² or more for solid state switches) while handling. Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper tightening torque.

If a switch is tightened beyond the range of tightening torque, the mounting screws or switch may be damaged.

On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position. (Refer to switch mounting instructions for each series for switch mounting, moving, and tightening torque, etc.)

4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting position shown in the catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable.

Wiring

⚠ Warning

1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from repeatedly applying bending stress or stretching force to the lead wires.

2. Be sure to connect the load before power is applied.

<2 wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

Wiring

⚠ Warning

5. Do not allow short circuit of loads.

<Reed switches>

If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.

<Solid state switches>

All models of PNP output type switches do not have built-in short circuit protection circuits.

Note that if a load is short circuited, the switch will be instantly damaged as in the case of reed switches.

∗Take special care to avoid reverse wiring with the brown (red) power supply line and the black (white) output line on 3 wire type switches.

6. Avoid incorrect wiring.

<Reed switches>

A 24VDC switch with indicator light has polarity. The brown (red) lead wire is (+), and the blue (black) lead wire is (–).

1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models: D-Z73

<Solid state switches>

1) If connections are reversed on a 2 wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.

∗2)If connections are reversed (power supply line + and power supply line –) on a 3 wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue (black) wire and the power supply line (–) is connected to the black (white) wire, the switch will be damaged.

∗ Lead wire color changes

Lead wire colors of SMC switches and related products have been changed in order to meet NECA (Nippon Electric Control Equipment Industries Association) Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided.

Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

2 wire

	Old	New
Output (+)	Red	Brown
Output (–)	Black	Blue

3 wire

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black

Solid state with diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

Solid state with latch type diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange

Operating Environment

⚠ Warning

1. Never use in an atmosphere of explosive gases.

The structure of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside cylinders will become demagnetized. (Consult SMC regarding the availability of a magnetic field resistant auto switch.)

3. Do not use in an environment where the auto switch will be continually exposed to water.

Although switches satisfy IEC standard IP67 construction (JIS C 0920: watertight structure), do not use switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.

Consult SMC if switches are used where there are temperature cycles other than normal temperature changes, as there may be adverse effects inside the switches.

6. Do not use in an environment where there is excessive impact shock.

<Reed switches>

When excessive impact (300m/s2 or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment.

7. Do not use in an area where surges are generated.

<Solid state switches>

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to the switch. Avoid sources of surge generation and disorganized lines.

8. Avoid accumulation of iron waste or close contact with magnetic substances.

When a large amount of iron waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the cylinder.

Maintenance

⚠ Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

1) Secure and tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

3) Confirm the lighting of the green light on the 2 color indicator type switch.

Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

Other

⚠ Warning

1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.

Specific Product Precautions
Be sure to read before handling
Refer to pages 15 through 20 for safety instructions, actuator precautions and auto switch precautions

Installation and Removal of Snap Rings

⚠ Caution

1. **Use appropriate pliers (C type snap ring installing tool) for installation and removal.**
2. **Even when using appropriate pliers (C type snap ring installing tool), procede with caution as there is a danger of the snap ring flying off the end of the pliers (C type snap ring installing tool) and causing human injury or damage to nearby equipment. After installation, confirm that the snap ring is securely seated into the snap ring groove before supplying air.**

Mounting (for Double Rod End)

⚠ Caution

1. **When removing the load, be sure that the load side piston rod wrench flat section is secured to prevent turning.**
2. **Note that if this is done without securing the load side piston rod, the piston rod connection (screwed-**

Selection

⚠ Caution

1. **Large bore compact cylinders have a shorter overall length and are lighter in weight than conventional tie-rod type large bore cylinders. However, covers secured with snap rings, and rubber bumpers, etc., have operational design values lower than the tie-rod type. Be sure to consider factors such as the allowable kinetic energy and allowable lateral load, and operate within the specified ranges.**

Allowable kinetic energy

Piston speed

	180	200
Piston speed	20 to 400mm/s	
Allowable kinetic energy	12.4J	

$$\text{Kinetic energy } E\ (J) = \frac{(m1 + m2)\ V^2}{2}$$

m1: Weight of moving cylinder parts kg
m2: Load weight kg
V: Piston speed m/s

Kinetic energy computation

Example) Cylinder CDQ2B180-100DCM
Load weight 10kg
Piston speed 100mm/s = 0.1m/s

Computation of m2

Basic weight	CQ2B180-100DC	3.48kg
Additional weight	Built-in magnet	0.08kg
	Rod end male threads	0.74kg
		Total 4.30kg

Computation of E

$$E = \frac{(4.3 + 10)\ (0.1)^2}{2} = 0.0715J$$

Selection

⚠ Caution

Allowable kinetic energy

Weight of moving cylinder parts m1/ Without built-in magnet Unit: kg

Bore size (mm)		Cylinder stroke (mm)						
		10	20	30	40	50	75	100
Single rod	180	2.59	2.69	2.79	2.89	2.99	3.24	3.48
	200	3.06	3.16	3.26	3.35	3.45	3.70	3.95
Double rod	180	2.90	3.09	3.30	3.49	3.69	4.18	4.67
	200	3.47	3.67	3.87	4.06	4.26	4.76	5.25

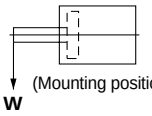
Bore size (mm)		Cylinder stroke (mm)					
		125	150	175	200	250	300
Single rod	180	3.73	3.98	4.22	4.47	4.96	5.46
	200	4.20	4.44	4.69	4.94	5.43	5.92
Double rod	180	5.17	5.66	6.16	6.65	7.64	8.63
	200	5.74	6.24	6.73	7.22	8.21	9.20

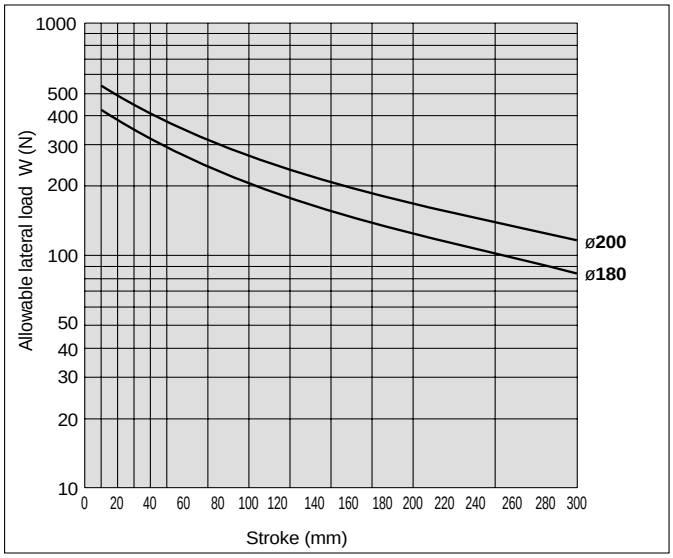
Weight of moving cylinder parts/Additional parts Unit: kg

		180	200
Built-in magnet		0.08	0.09
Rod end male threads (with end nut)	Single rod	0.74	0.74
	Double rod	1.48	1.48

Allowable lateral load at rod end

Use the graph as a guide and operate at no more than the allowable lateral load.





Note:
1in = 25.4mm
1N = 0.2248lbf
1kg = 2.2046lb
1J = 0.7375ft.lb

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