

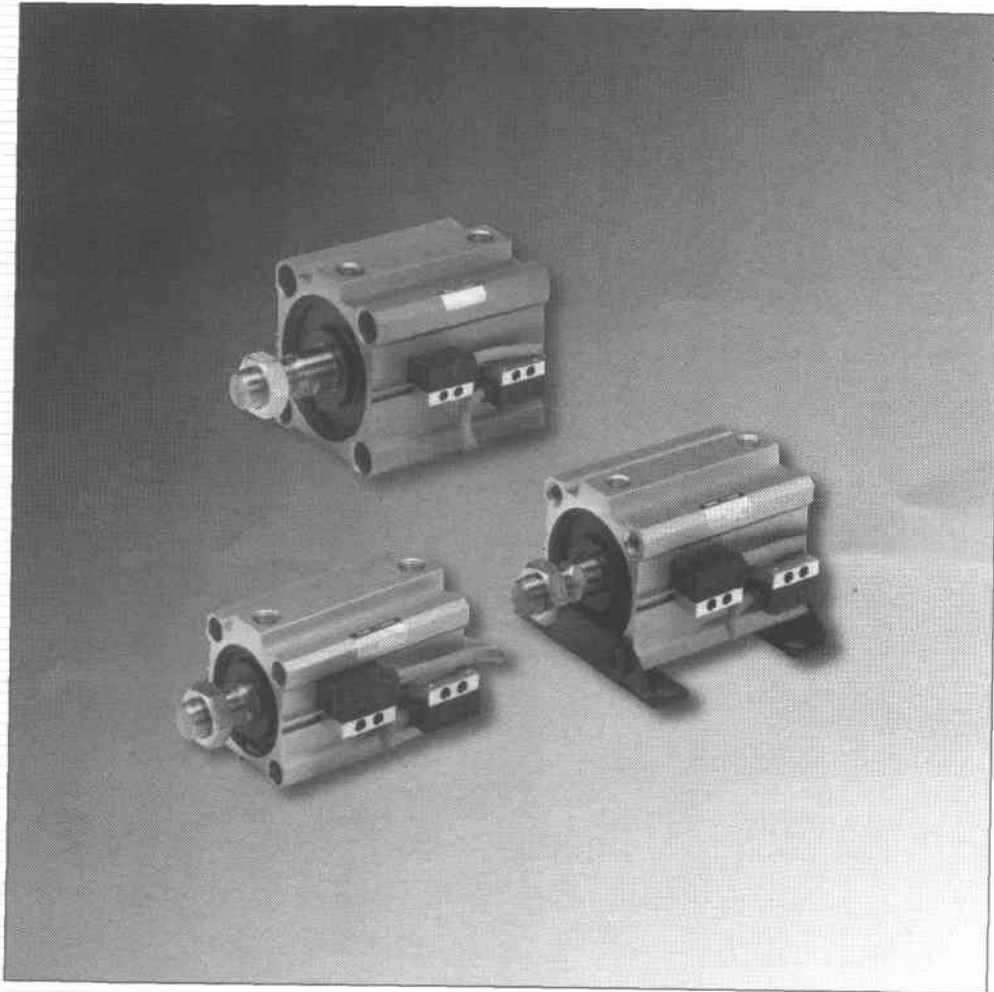


N320.5

Compact Cylinder  
High Magnetic Field Design

# *CDQ2BP Series*

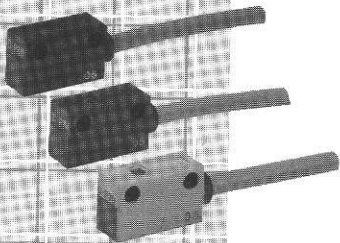
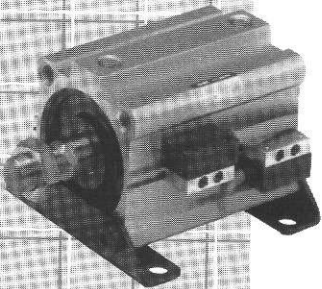
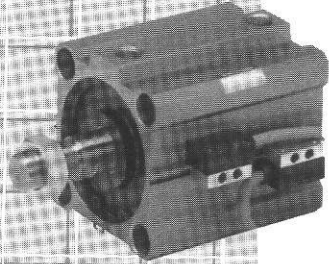
ø50, ø63, ø80



High Magnetic Field Auto Switches  
Compact  
Metallic "Coil" Rod Scraper  
Large Bearing Surface



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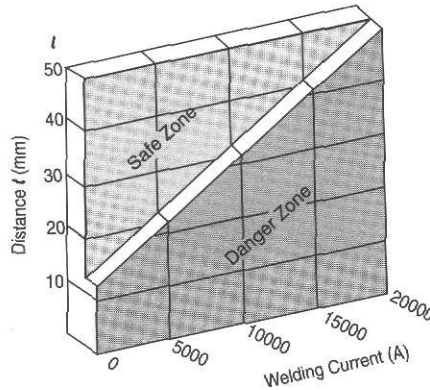
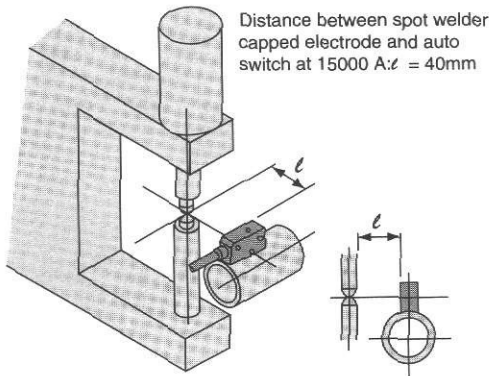
# Series CDQ2BP

ø50, ø63, ø80

## Auto switch capable for high magnetic field applications

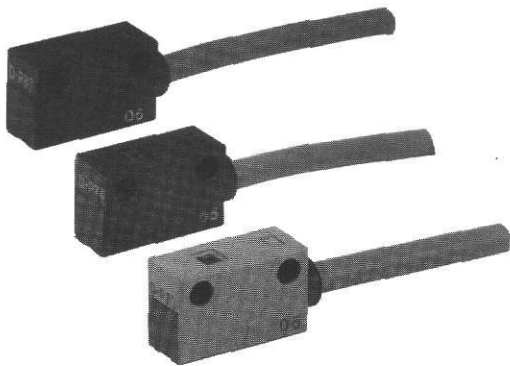
Eliminate the need for special external proximity or limit switches

Auto switch can be used in applications that previously could only be accomplished by utilizing an external limit switch. Reduction of man-hours required for mounting external proximity switches.



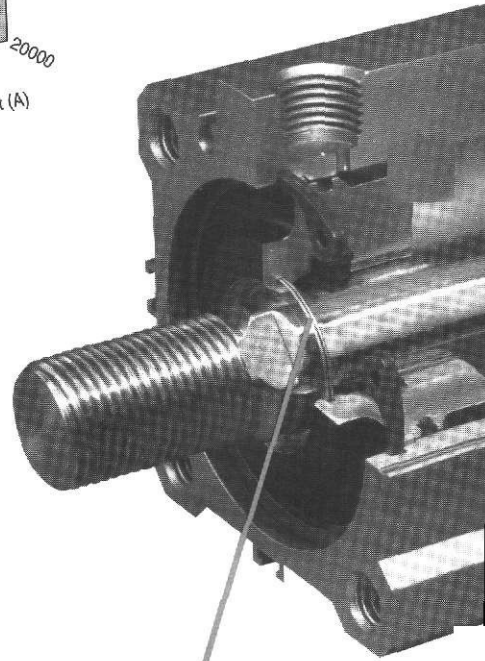
## Special High Magnetic Field Auto Switches

Auto switch is designed to function in high magnetic fields, unlike conventional types and can be used as close as 2" from a magnetic field environment displacing 20,000 Amps.



## Metallic "coil" rod scraper

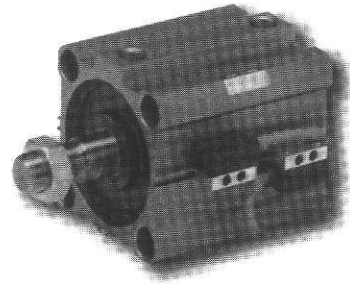
The incorporation of a metallic rod scraper protects the rod seal from foreign objects, such as weld spatter, adding to the life of the cylinder.



# HIGH MAGNETIC FIELD RESISTANT

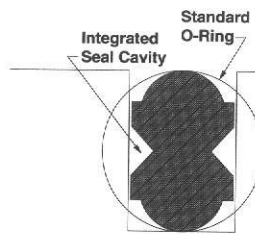
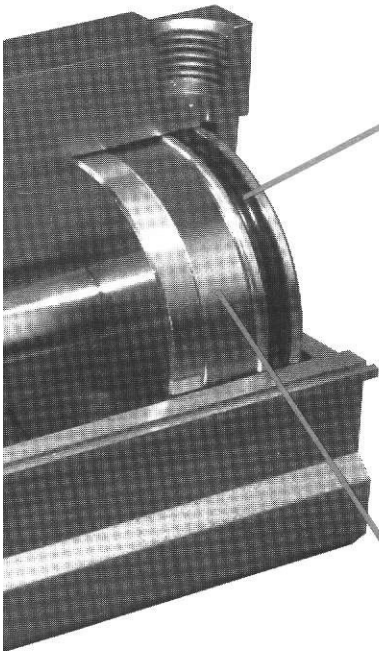
## Low profile "Compact" cylinder

The CDQ2 cylinder has a low profile design. The "High magnetic field" design due to its special magnet is slightly longer than the standard switch capable type although still more compact than conventional tie rod style cylinders.



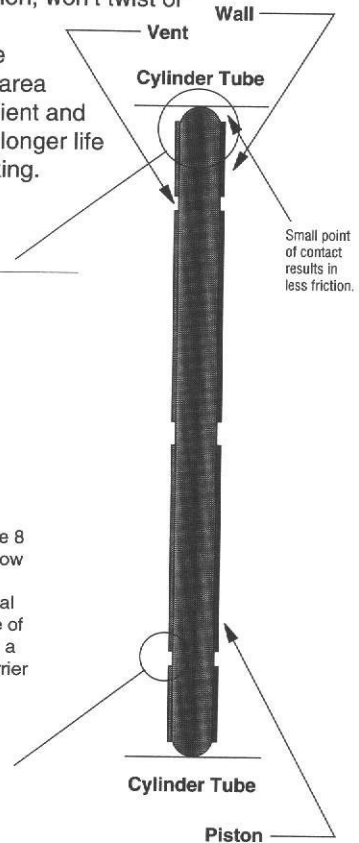
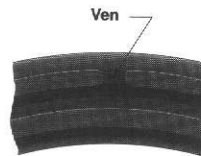
## Unique Figure 8 seal design

The figure 8 seal's unique shape conforms to the rectangular shape of the piston seal groove for a more precise fit. The figure 8 seal doesn't require lubrication; creates less friction; won't twist or collapse and requires low breakaway pressure. These features plus its small wear area make the figure-8 more efficient and guarantee that it will have a longer life than the "O" ring or "U" packing.



### The figure 8 seal vent

SMC Pneumatics' unique figure 8 seal incorporates vents that allow pressurized air to flow into an integrated cavity forcing the seal firmly against the opposite side of the piston seal groove creating a much tighter, more positive barrier against leakage.



## High magnetic field internal piston magnet

The Cylinder contains a specially designed internal magnet that will function properly when induced by a high magnetic field.

# Series CDQ2BP

## Compact Cylinder With High Magnetic Field Resistance Autoswitch

ø50, ø63, ø80,

### How To Order

CDQ2 **B** P 50-30 D M - P70 S

#### Mounting

<b>B</b>	Through hole (standard)
<b>A</b>	Both ends tapped
<b>L</b>	Foot mount
<b>F</b>	Rod side flange
<b>G</b>	Head side flange
<b>D</b>	Clevis mount

#### Bore Size

<b>50</b>	50mm
<b>63</b>	63mm
<b>80</b>	80mm

#### Cylinder Stroke

#### Acting

<b>D</b>	Dual Acting
----------	-------------

#### No. of Auto Switches

<b>-</b>	2 pcs.
<b>S</b>	1 pc.
<b>n</b>	n pcs.

#### Type of Auto Switch

<b>-</b>	No auto switch built in (high magnetic field resistance magnet)
<b>P70</b>	D-P70
<b>P74</b>	D-P74
<b>P75</b>	D-P75
<b>P80</b>	D-P8

\* Leadwire standard length: 0.5m  
Add L and Z at the end of part number for 3m and 5m, respectively.

\*\*Auto switch detail: see pgs. 10-11.

#### Rod End Configuration

<b>-</b>	Female thread
<b>M</b>	Male thread

### Seal Kit

Bore size	Part Number
50	CQ2B50-PS
63	CQ2B63-PS
80	CQ2B80-PS

### Mounting Bracket Part No.

Bore Size	Foot	Flange	Clevis Mount
50	CQ-L050	CQ-F050	CQ-D050
63	CQ-L063	CQ-F063	CQ-D063
80	CQ-L080	CQ-F080	CQ-D080

#### Notes:

If foot bracket is required, order 2 pcs/cylinder.

The accessories that come with the bracket are as follows:

Foot/Flange: Body Mounting Bolt

Clevis Mounting: Clevis Pin, C type Snap Ring used for Axis, Body Mounting Bolt.

### Standard Stroke

Bore Size (mm)	Standard Stroke (mm)
40	25, 30, 35, 40, 45, 50, 75, 100
50	25, 30, 35, 40, 45, 50, 75, 100
63	25, 30, 35, 40, 45, 50, 75, 100

#### \*How to make intermediate stroke.

Intermediate stroke between 50-100 (55, 60, 65 ...) : are obtained through the use of spacers (5, 10, 15, 20mm)  
(Example) CDQBP50-55 DM: SMC would install a 20mm width spacer in the CDQ2BP 50-75DM.

### Auto Switch Mounting Bracket Part No.

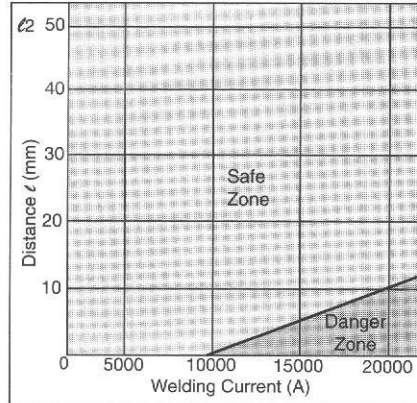
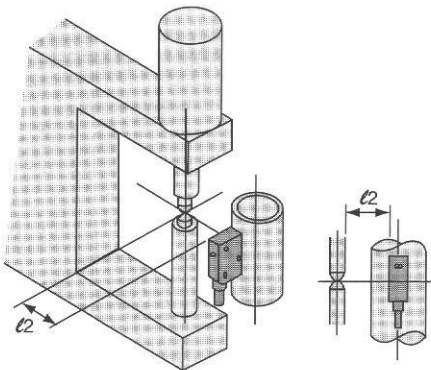
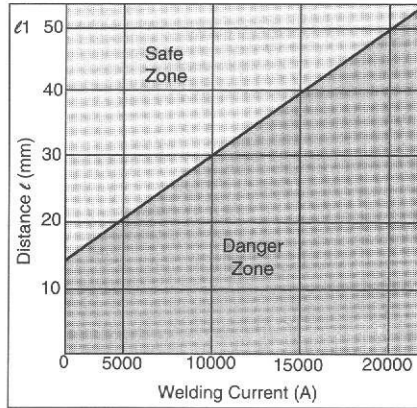
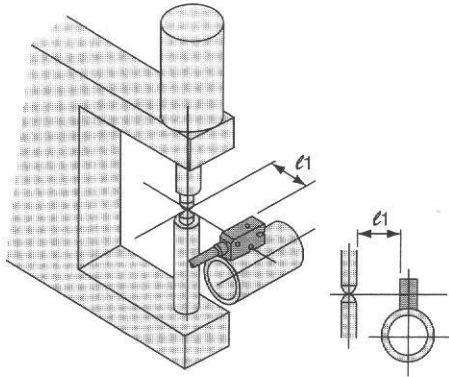
Auto-switch Model	Part No.	Notes
D-P7 D-P8	BQP1-050	<ul style="list-style-type: none"> <li>Switch mounting bracket: 1 pc.</li> <li>Switch mounting screw: 2 pcs. (M3x0.5x16L)</li> <li>Switch mounting bracket screw 2 pcs. (M3x0.5x14L)</li> <li>Switch mounting nut: 1 pc.</li> <li>Spring washer: 2 pcs. Nominal diameter: 3mm</li> </ul>

### Specifications

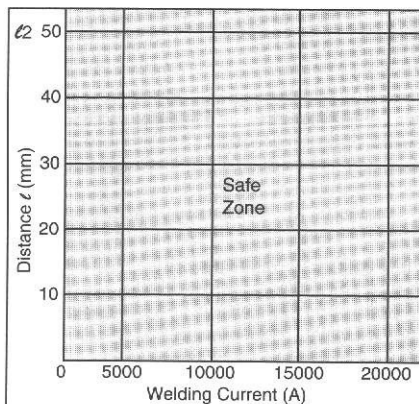
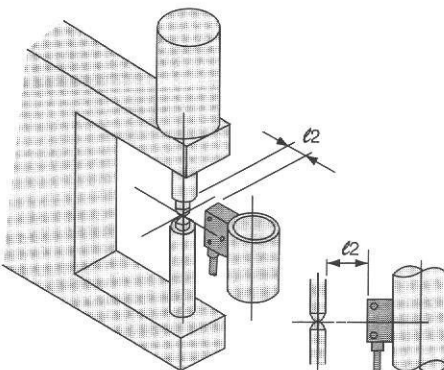
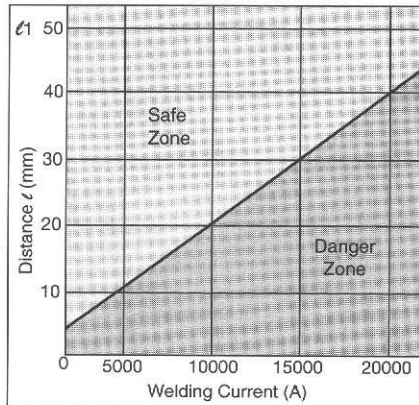
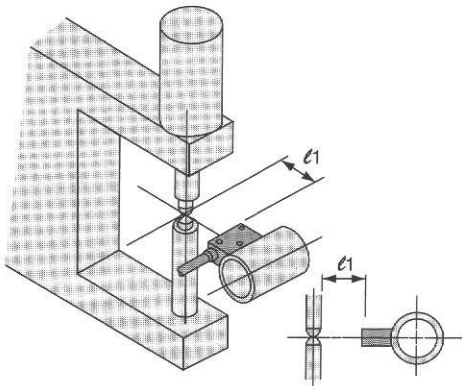
Fluid	Air
Proof pressure	217 psi (1.53kgf/cm <sup>2</sup> )
Maximum operating pressure	145 psi (10.2kgf/cm <sup>2</sup> )
Ambient and fluid temperature	41~140°F (5~60°C)
Lubrication	Non-lube
Cushion	Not available
Rod end thread	Male thread (std.)
Thread tolerance	JIS class 2
Stroke length tolerance (mm)	+1.0 0
Support type	Standard



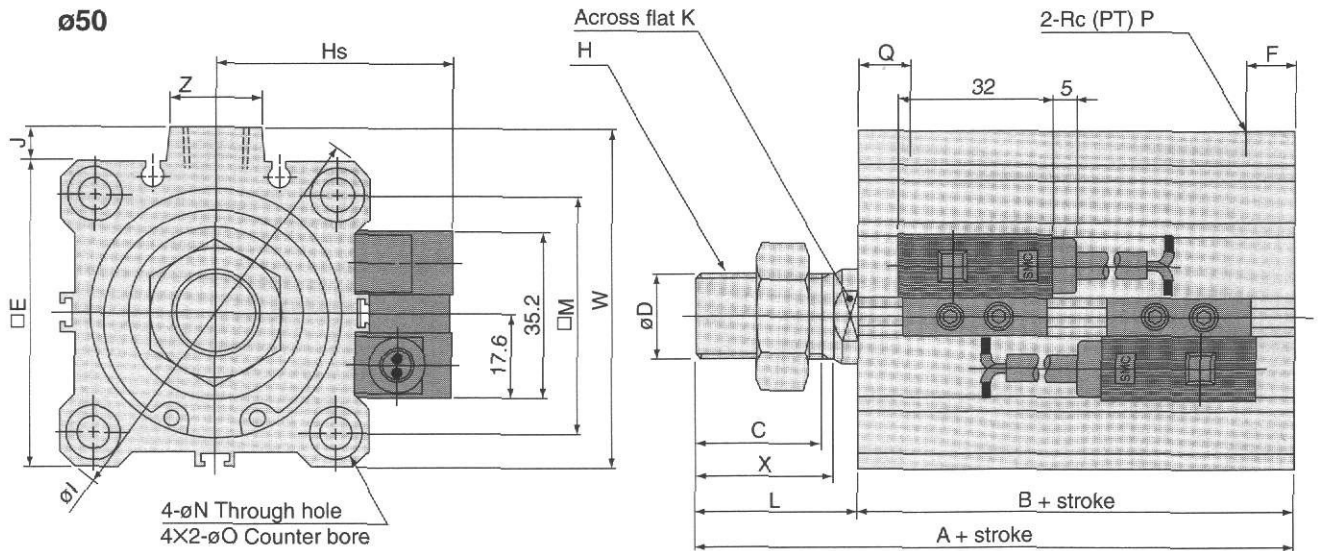
Distance From Auto Switch Side Face



Distance From Auto Switch Top Face



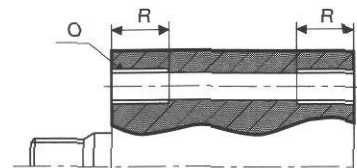
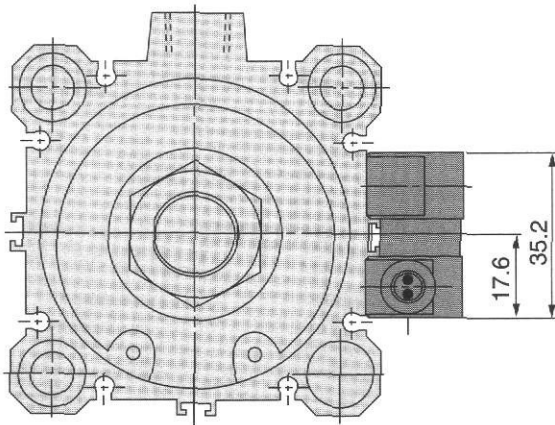
## Through Hole Mount: CDQ2BP - DM-



Note: Female thread and rod dimensions are the same as for clevis and head flange mounts.

## Both Ends Tapped: CDQ2AP - DM-

$\phi 63, \phi 80$



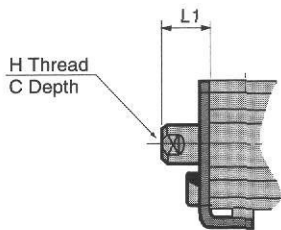
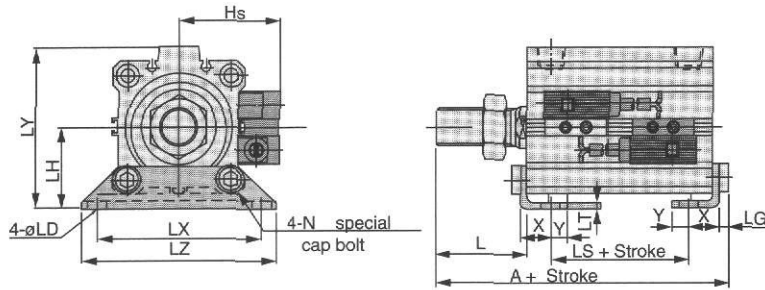
Bore size (mm)	O	R
50	M8x1.25	14
63	M10x1.5	18
80	M12x1.75	22

Note: Other dimensions are same as through hole type.

Bore Size (mm)	A	B	C	D	E	F	H	$\phi 1$	J	K	L	M	$\phi N$	O	P	Q	W	X	Z	Hs
50	89	55.5	26	20	64	10.5	M18x1.5	86	7	17	33.5	50	6.6	11 Depth 8	1/4	10.5	71	28.5	19	49
63	94.5	61	26	20	77	10.5	M18x1.5	103	7	17	33.5	60	90	14 Depth 10.5	1/4	15	84	28.5	19	55.5
80	112	68.5	32.5	25	98	12.5	M22x1.5	132	6	22	43.5	77	11	17.5 Depth 13.5	3/8	16	104	35.5	26	65.5



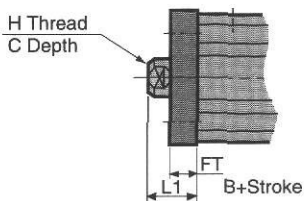
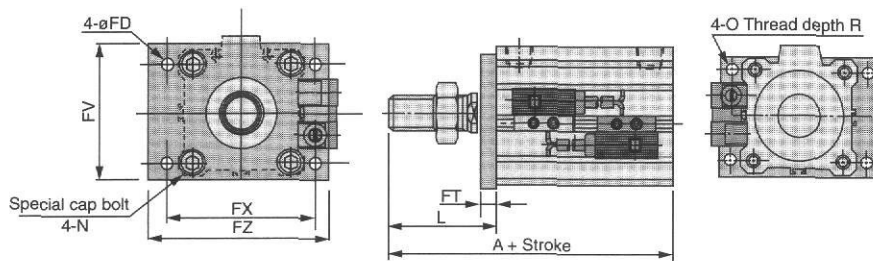
Foot Mount: CDQ2LP  -  DM-



(mm)

Bore size (mm)	A	L	O	R	N	X	Y	LD	LG	LH	L1	H	C
50s	107.2	43.5	M8x1.25	14	M8x1.25	14.7	8	9	5	39	18	M10X1.5	15
63	112.7	43.5	M10x1.5	18	M10x1.5	16.2	9	11	5	46	18	M10X1.5	15
80	133.5	53.5	M12x1.75	22	M12x1.75	19.5	11	13	7	59	20	M16X2.0	21

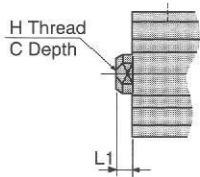
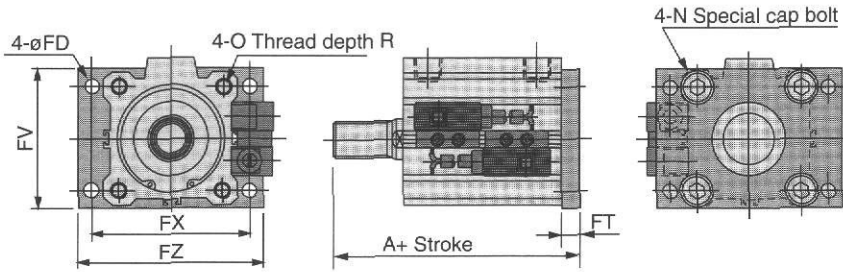
Rod Side Flange: CDQ2FP  -  DM-



(mm)

Bore size (mm)	A	L	O	R	N	FD	FT	FV	FX	FZ	L1	H	C
50	99	43.5	M8x1.25	14	M8x1.25	6.6	9	67	76	89	18	M10X1.5	15
63	104.5	43.5	M10x1.5	18	M10x1.5	9	9	80	92	108	18	M10X1.5	15
80	122	53.5	M12x1.75	22	M12x1.75	11	11	99	116	134	20	M16X2.0	21

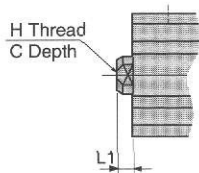
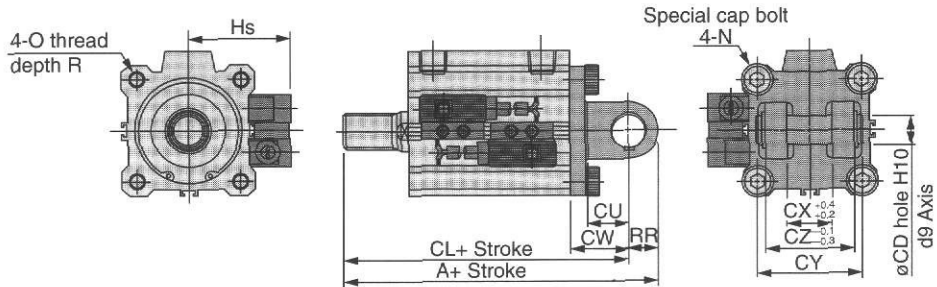
## Head Side Flange: CDQ2GP □-□ DM-□□



(mm)

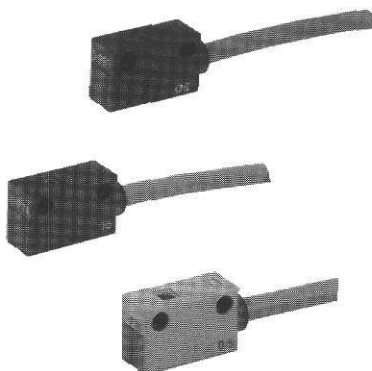
Bore size (mm)	A	O	R	N	FD	FT	FV	FX	FZ	L1	H	C
50	98.	M8x1.25	14	M8x1.25	6.6	9	67	76	89	8	M10X1.5	15
63	103.5	M10x1.5	18	M10x1.5	9	9	80	92	108	8	M10X1.5	15
80	123	M12x1.75	22	M12x1.75	11	11	99	116	134	10	M16X2.0	21

## Clevis Mount: CDQ2DP □-□ DM-□□



(mm)

Bore size (mm)	A	O	R	N	CD	CL	CU	CW	CX	CY	CZ	RR	L1	H	C
50	131	M8x1.25	14	M8x1.25	14	117	20	28	22	50.6	44	14	8	M10X1.5	15
63	138.5	M10x1.5	18	M10x1.5	14	124.5	20	30	22	50.6	44	14	8	M10X1.5	15
80	168	M12x1.75	22	M12x1.75	18	150	27	38	28	64	56	18	10	M16X2.0	21



### Auto Switch Specifications With Indicator Light

Auto Switch No.	D-P70		D-P74		D-P75	
Lead Wire Entry	Grommet					
Application	Relay, Sequence Controller				Sequence Controller	
Load Voltage	AC100V	DC24V	AC100V	DC24V		
Max. Load Current and Load Current Range	20mA	5~40mA	5~20mA	40mA		
Contact Point Protection Circuit	Available				Not Available	
Internal Pressure Drop (Internal resistance)	(10Ω or less)	2.4 or less		(0)		
Leak Current	1.8mA	0		1.2mA		
Indicator/Amp	Red LED at Off	Red LED at On		RED LED at OFF		

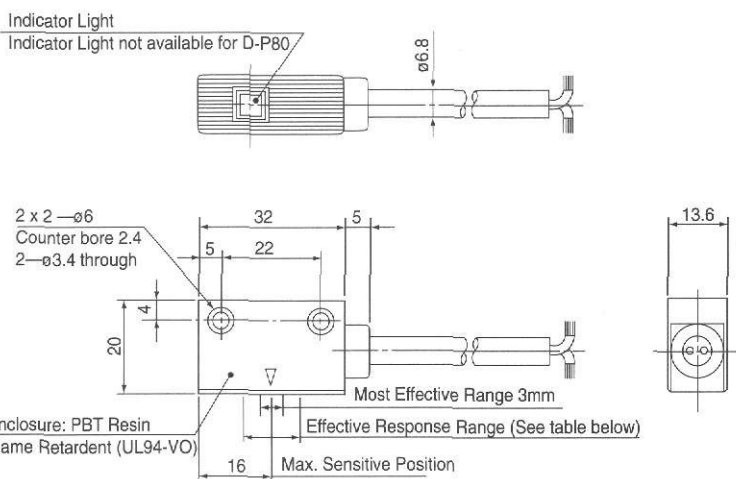
### Auto Switch Specifications Without Indicator Light

Part No.	D-P80		
Lead Wire Entry	Grommet		
Application	Relay, Sequence Controller		
Load Voltage	24V	48V	100V
Max. Load Current	50mA	40mA	20mA
Contact Point Protection Circuit	Not available		
Internal Resistance	1Ω or less		

Response time - 1.2ms  
 Lead wire - oil proof, flame retardant (VW-1), heavy insulated cable ø6.8, 0.75 mm<sup>2</sup>, 2 wire (white and black), 0.5m\*  
 Impact proof, 300m/s<sup>2</sup>\*\*  
 Insulation resistance • 50mΩ or above (among lead wire and enclosure) at DC500V mega.  
 Ambient temperature • 14~140°F (-10~60°C)  
 Protective construction • IEC standard, IP67, Immersion proof (JISCO920), oil proof construction

\*In case of 3m and 5m lead wire, add L and Z, respectively, at the end of part number.  
 \*\*Conversion to the conventional unit from SI unit: 1m/s<sup>2</sup> = 0.1019172G

### Auto Switch External Dimensions

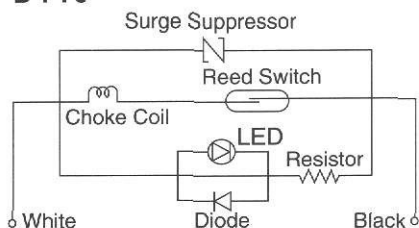


### Response Range (z dimension)

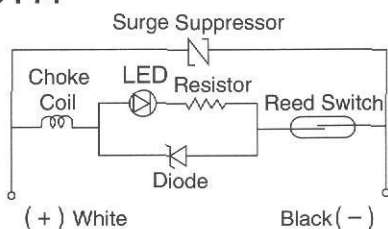
Cylinder Series	Applicable Tube Bore Size		
	50	63	80
CDQ2 P	9	9	10

\* Effective response range  
 Sufficiently magnetized range so that external magnetic field cannot interfere to cause error response when switch is on.  
 \*\* Response Range  
 The range where auto switch turns on.

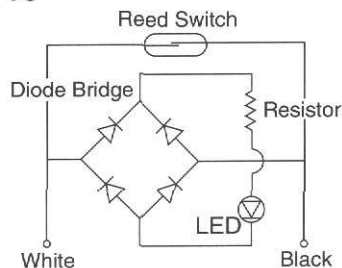
#### D-P70



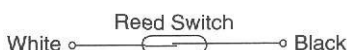
#### D-P74



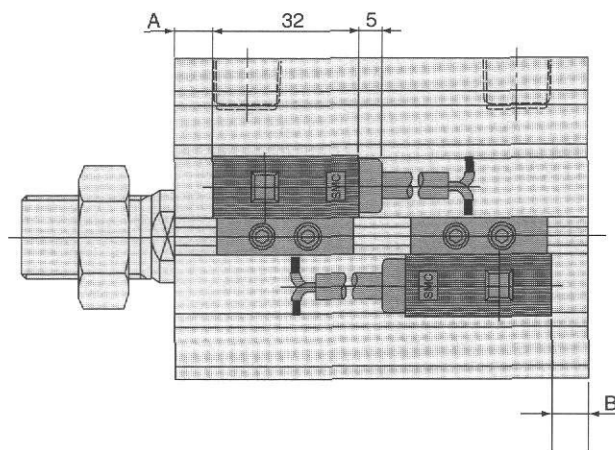
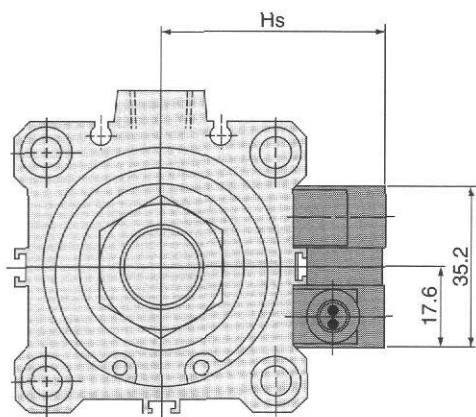
#### D-P75



#### D-P80



## D-P7 • P8



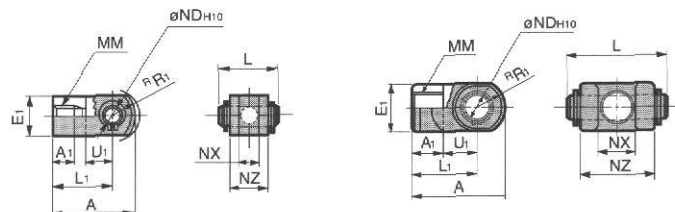
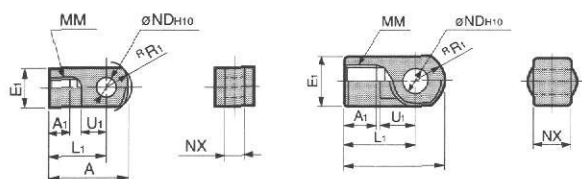
### Auto Switch Mounting Position

Symbol	Auto switch setup position		
	ø50	ø63	ø80
A	19	21	23.5
B	4.5	8	12.5
Hs	49	55.5	65.5

Set the stroke end within  $\pm 1.5$ mm or less of the above specified positioning order to maximize the high magnetic field resistability.

### Minimum Allowable Stroke

No. of Auto switches	Minimum stroke (mm)	
1 pc.	25	
2 pcs.	different side	25
	same side	30

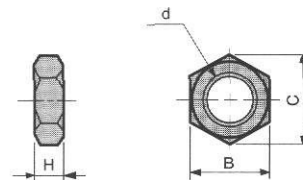
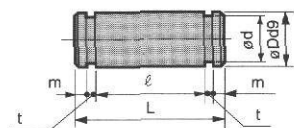


### CQ2 - Single Rod Clevis (mm)

Part No.	Applicable bore size	A	A <sub>1</sub>	E <sub>1</sub>	L <sub>1</sub>	MM	<sup>r</sup> R <sub>1</sub>	U <sub>1</sub>	NDH <sub>10</sub>	NX
I-G05	50,63	56	18	ø28	40	M18x1.5	16	20	14 <sup>+0.070</sup> <sub>0</sub>	22 <sup>-0.3</sup> <sub>-0.5</sub>
I-G08	80	71	21	ø38	50	M22x1.5	21	27	18 <sup>+0.070</sup> <sub>0</sub>	28 <sup>-0.3</sup> <sub>-0.5</sub>

### CQ2 - Double Rod Clevis (mm)

Part No.	Applicable bore size	A	A <sub>1</sub>	E <sub>1</sub>	L <sub>1</sub>	MM	<sup>r</sup> R <sub>1</sub>	U <sub>1</sub>	NDH <sub>10</sub>	NX	NZ	L	PIN part no.
Y-G05	50,63	56	20	ø28	40	M18x1.5	16	20	14 <sup>+0.070</sup> <sub>0</sub>	22 <sup>-0.3</sup> <sub>-0.5</sub>	44	50.6	IY-G05
Y-G08	80	71	23	ø38	50	M22x1.5	21	27	18 <sup>+0.070</sup> <sub>0</sub>	28 <sup>-0.3</sup> <sub>-0.5</sub>	56	64	IY-G08



### CQ2 - Double Rod Clevis Pin (mm)

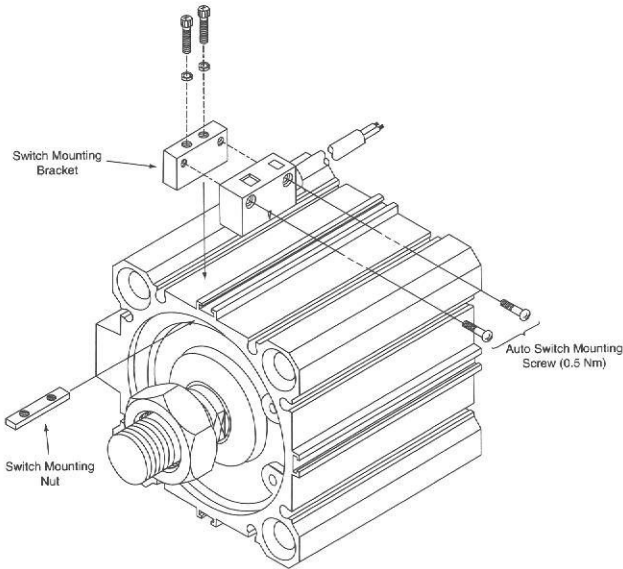
Part No.	Applicable bore size	Dd9	L	d	l	m	t	Snap ring
IY-G05	50,63	14 <sup>-0.050</sup> <sub>-0.083</sub>	50.6	13.4	44.2	2.05	1.15	Axial C style 14
IY-G08	80	18 <sup>-0.050</sup> <sub>-0.093</sub>	64	17	56.2	2.55	1.35	Axial C style 18

### CQ2 - Jam Nut (mm)

Part No.	Applicable bore size	d	H	B	C
NT-05	50,63	M18x1.5	11	27	31.2
NT-08	80	M22x1.5	13	32	37.0

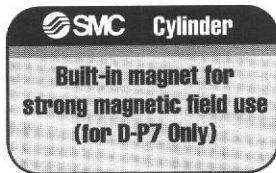
## How to secure the auto switch position

1. Insert mounting screws into the switch body, then secure it with the mounting bracket.
2. Insert the switch screw (nut) into the cylinder tube groove, insert the mounting screw into the mounting nut from the top of the bracket, secure the position.
3. The screw mounting torque is specified in parenthesis.



## Specification Label

The D-P7 and D-P8 auto switches are specified for high magnetic field resistance cylinders. Thus, they are not compatible with cylinders that utilize standard type switches. Cylinders designed for use in a high magnetic field are labeled as follows:



## General Caution

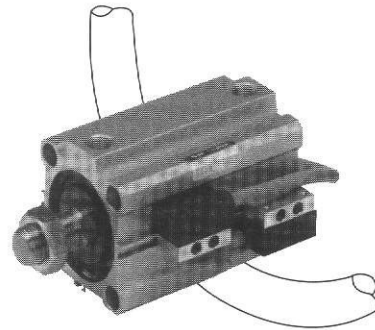
1. Verify cylinder and switch specifications prior to use.
2. Do not exceed the auto switches specified load above the maximum contact capacity. If load is used for a relay, use an appropriate relay to maximize the life.
3. Exceeding specifications for load current, voltage, temperature, impact, etc. could result in malfunction and operational failure. Please be sure to read the specifications thoroughly before use.

## Handling precautions

1. Flush away the dust and cutting particles in the cylinder tube thoroughly before mounting.
2. Mount the cylinder so that any load applied to the piston rod is always applied in the axial orientation
  - Ensure concentricity (proper alignment) when mounting the cylinder.
  - Use guide or equivalent when cylinder is used as a stopper so that no direct side load is applied to the piston rod
3. Do not damage or dent the piston rod sliding area. This may cause air leakage to occur due to rod seal damage
4. When disassembling, remove C type snap ring using snap ring pliers (tool with C type snap ring)

## How to install / Mounting and Adjustment

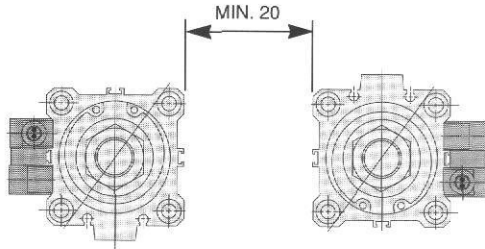
1. The minimum stroke required for high magnetic field resistance auto switch is 25mm.
2. Please adhere to the precautions listed below in order to maximize the high magnetic field resistance of the auto switch.
  - 1) avoid generation of the high magnetic field during cylinder piston transition or movement
  - 2) switches must be kept 25mm or more apart if 2 or more switches are required for one cylinder
  - 3) if cylinder is used close to the welding cable and/or welding gun electrode, change the switch position using a graph shown on p.3 illustrating the safety zone or keep the welding cable away from the cylinder
  - 4) do not use the cylinder if the welding cable is surrounding the cylinder as shown in the figure below
  - 5) please contact SMC if the welding cable or welding gun electrode (energizing secondary current) are used in close proximity of multiple switches.



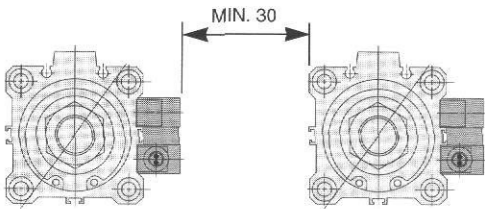
3. Use protective tube to cover the switch wires when wires are directly exposed to the weld spatter.

- Do not drop, dent, or allow excessive impact to cylinder during handling.
- Keep at least 20mm away from each other when 2 or more cylinders with high magnetic field resistance auto switch are mounted in parallel.

Distance between cylinder tubes: 20mm or more



Distance between cylinder tubes: 30mm or more



- Do not wire to allow any repetitive bending stress and tension to switch wire during operation.
- Please contact SMC if used in environments resulting in exposure to splashing water or coolant.
- Be sure to use the specified torque when mounting the auto switch.
- Place the switch in the middle of the specified response range when mounting to cylinder for best results. Mounting switch at the edge of response range could result in an unstable response.

### Wiring/current and voltage

- Ensure that the load is connected before connecting the power source.
- Use as short a wire as possible. Using a long wire to reach the load could increase the inrush current when the switch is on and consequently shorten the switch life.
- Use a contact protection box for auto switches without a contact protection circuit or that have induction loads with 5 meters or more length lead wires. Lack of contact protection may cause a reduction in switch service life.
- D-P74 auto switch is polarized when DC24V is used: white lead wire is positive and black lead wire is negative. If connected in reverse the LED will not light

- up, although the auto switch will function. Do not exceed specified current or the LED might be damaged and not function.
- The indicator light is lit when switch is off for D-P70 and D-P75. Thus, leak current is EXPECTED (D-P70 .. Max. 1.8 mA, D-P75.. Max. 1.2 mA). This leak current could interfere the micro current control circuit.

#### 4. Serial connection

The serial connection of the switch, as shown in figure below, could result in the following:

- D-P74: A large voltage drop (2.4V) could occur due to LED resistance.
- D-P70 and D-P75: the switch operation should be normal, however, indicator light may appear to be dim. (the serial connection is limited to 2 pcs.)
- use switch D-P8 (without indicator light) if LED resistance causes problem.



[ n pcs. of connection will result in n times of voltage drop ]

#### Piston speed limitation for intermediate stroke position

Do not exceed max. piston speed when auto switch is at the intermediate stroke and a load is applied to the piston while traveling. Auto switch response time may be shortened due to insufficient loading operation as a result. The maximum detectable speed is:

$$V(\text{m/s}) = \frac{\text{Auto switch response range (mm)} \times 1000}{\text{Loading time (ms)}}$$



# Conversion Chart

## Metric to English

(Multiply \_\_\_\_\_ by \_\_\_\_\_ To Obtain \_\_\_\_\_)

<b>Length</b>		<b>Torque</b>	
mm	0.0394	mils	N • m
mm	0.0394	in	kg • m
cm	0.3937	in	0.7375
m	3.2810	ft	7.2330
<b>Area</b>		<b>Pressure</b>	
mm <sup>2</sup>	0.0016	in <sup>2</sup>	mm(H <sub>2</sub> O)
cm <sup>2</sup>	0.1550	in <sup>2</sup>	mm(Hg)
m <sup>2</sup>	10.765	ft <sup>2</sup>	torr
			kPa
			bar
			kg cm <sup>2</sup>
			atm
<b>Volume</b>		<b>Energy</b>	
mm <sup>3</sup>	6.10 x 10 <sup>-5</sup>	in <sup>3</sup>	N • m
cm <sup>3</sup> (cc)	0.0610	in <sup>3</sup>	J
m <sup>3</sup>	35.320	ft <sup>3</sup>	MJ
-	0.0353	ft <sup>3</sup>	
-	0.2642	gal (U.S.)	
<b>Weight</b>		<b>Power</b>	
g	0.0353	oz	W
kg	2.2046	lb	kW
<b>Force</b>		<b>Temperature</b>	
gf	2.205 x 10 <sup>-3</sup>	lbf	°F=(1.8 x °C) + 32
kgf	2.2046	lbf	
N	0.2248	lbf	
<b>Flow rate</b>			
		NI/min x 0.035 = SCFM	

## Key

µm = micron (micrometer)  
 mm = millimeter  
 cm = centimeter  
 m = meter  
 mils = 0.001 inch  
 n = inch  
 ft = foot  
 cc = cubic centimeter  
 L = liter  
 gal (U.S.) = U.S. gallon  
 g = gram  
 kg = kilogram  
 oz = ounce  
 lb = pound

gf = gram - force  
 kgf = kilogram - force  
 N = newton  
 lbf = pound - force  
 N • m = newton - meter  
 kg • m = kilogram - meter  
 ft • lb = foot - pound  
 mm (H<sub>2</sub>O) = millimeter water column  
 in (H<sub>2</sub>O) = inches water column  
 mm (Hg) = millimeter mercury column  
 in (Hg) = inches mercury column

## English to Metric

(Multiply \_\_\_\_\_ by \_\_\_\_\_ To Obtain \_\_\_\_\_)

<b>Length</b>		<b>Torque</b>	
mils	2.54	mm	ft • lb
in	25.4	mm	ft • lb
in	2.54	cm	1.3559
ft	0.3048	m	0.1383
<b>Area</b>		<b>Pressure</b>	
in <sup>2</sup>	645.16	mm <sup>2</sup>	in(H <sub>2</sub> O)
in <sup>2</sup>	6.4516	cm <sup>2</sup>	in(Hg)
ft <sup>2</sup>	0.0929	m <sup>2</sup>	psi
			psi
			psi
			psi
			psi
			psi
<b>Volume</b>		<b>Energy</b>	
in <sup>3</sup>	16387	mm <sup>3</sup>	ft • lb
in <sup>3</sup>	16.387	cm <sup>3</sup> (cc)	ft • lb
ft <sup>3</sup>	0.0283	m <sup>3</sup>	kWh
ft <sup>3</sup>	28.329	L	
gal(U.S.)	3.785	L	
<b>Weight</b>		<b>Power</b>	
oz	28.329	g	ft • lb/s
lb	0.4536	kg	hp
<b>Force</b>		<b>Temperature</b>	
lbf	453.6	gf	°C = 5/9(°F-32)
lbf	0.4536	kgf	
lbf	4.4482	N	
<b>Flow rate</b>			
		SCFM x 28.57 = NI/min	
		Cv1.0 = Kv 0.856	

psi = pounds per square inch  
 kPa = kilopascals  
 atm = atmospheres  
 J = joule  
 MJ = megajoule  
 W = watt  
 kW = kilowatt  
 kWh = kilowatt-hour  
 hp = horsepower  
 °C = degrees Centigrade  
 °F = degrees Fahrenheit  
 s = seconds  
 NI/min = Normal liters per minute

SCFM = Std. cubic feet per minute

## Basic Formulas

Circle circumference = πD = 2πr  
 Circle area = πr<sup>2</sup>  
 Force = Pressure x Area  
 Cylinder Volume (rod side) = (piston area - rod cross-section area) x stroke  
 Cylinder Volume (head end) = piston area x stroke  
 Torque = force x perpendicular distance from shaft

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