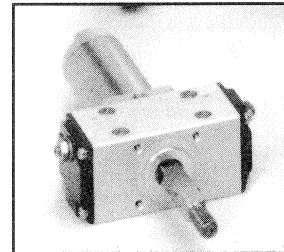
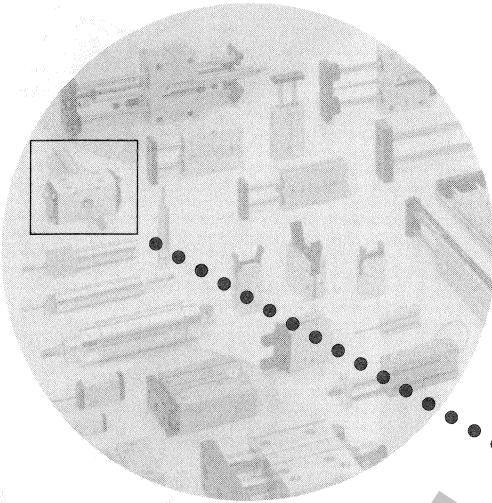


Swing Cylinders



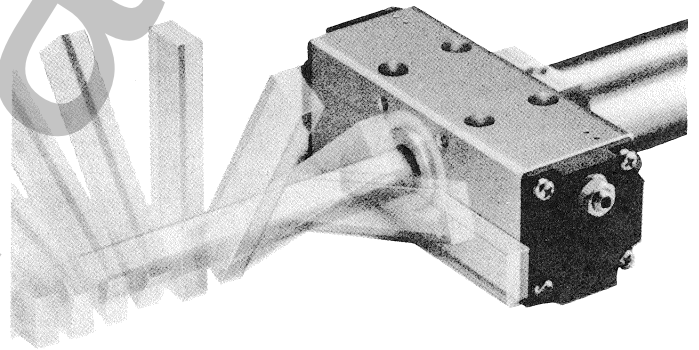
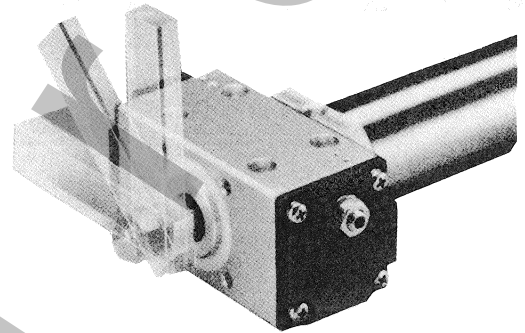
HUMPHREY SWING CYLINDERS

FEATURES

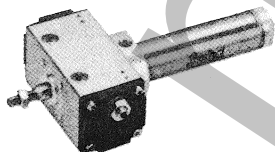
- Provides linear *and* rotary motion, either simultaneously or alternately.
- Simplifies design; one actuator does the work previously required by a cylinder and rotary actuator.
- Two bore sizes to choose from: 1-inch (25mm) and 1½-inch (40mm).
- Four different swing angles: 45°, 90°, 135° and 180°.

ADVANTAGES

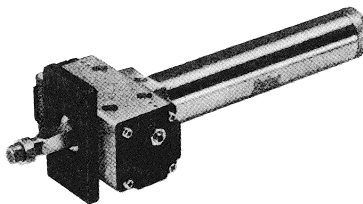
- Design simplicity. Reduces number of components required. Saves space, weight and cost.
- Built-in adjusting screw provides precise adjustment of swing angle.
- Spherical piston bushing provides fast, smooth rotary motion.
- Sensor switches can be applied to detect both linear and rotary functions.



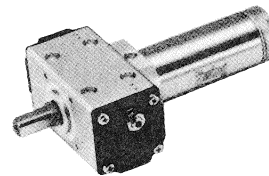
INFORMATION



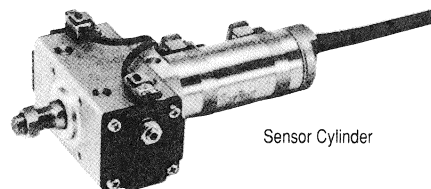
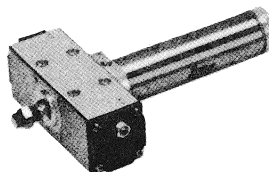
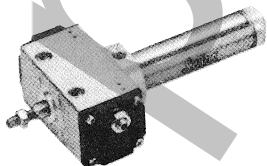
Standard type



Flange option

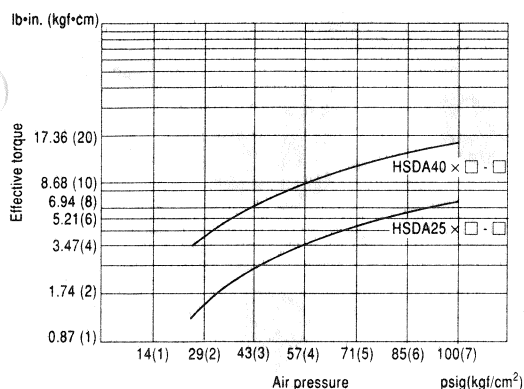


Square Rod End



Sensor Cylinder

EFFECTIVE TORQUE



lb·in. (kgf/cm)

Type	Air pressure – psig					
	29 (2)	43 (3)	57 (4)	71 (5)	85 (6)	100 (7)
HSDA25x□-□	1.5 (1.7)	2.6 (3.0)	3.7 (4.3)	4.9 (5.6)	5.9 (6.8)	7.0 (8.1)
HSDA40x□-□	4.1 (4.7)	6.5 (7.5)	8.9 (10.3)	11.5 (13.2)	13.8 (15.9)	16.2 (18.7)

CYLINDER THRUST FORCE

Force (F) is determined by piston area (A) and pressure (P), $F = A \times P$.

Select appropriate bore size by calculating the necessary force, considering loads and air pressure. Use the chart below to compute the “load rate” using the following formula:

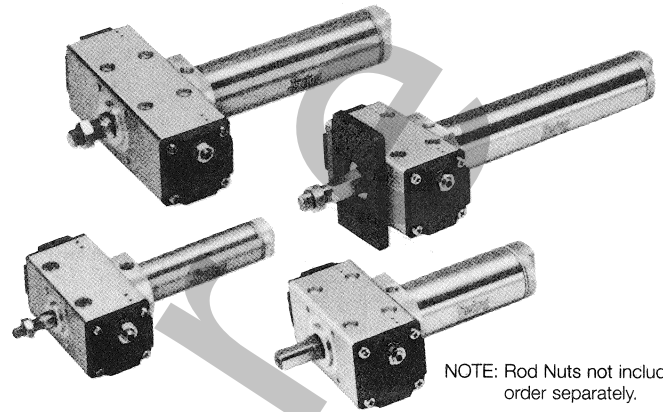
$$\text{Load rate} = \frac{\text{Load (weight)}}{\text{Calculation value (from charts below)}}$$

We recommend the “load rate” to be no more than 70%, and no more than 50% for high speed cycle rates.

lbs. (kgf)

Type	Piston rod width sq. in. (mm)	Action	Piston area in. ² (cm ²)	Air pressure – psig (kgf/cm ²)					
				29 (2)	43 (3)	57 (4)	71 (5)	85 (6)	100 (7)
HSDA25x□-□	0.291 (7.4)	Push	0.760 (4.90)	19.8 (9)	30.9 (14)	41.9 (19)	52.9 (24)	63.9 (29)	75.0 (34)
		Pull	0.676 (4.36)	17.6 (8)	28.7 (13)	37.5 (17)	46.3 (21)	57.3 (26)	66.2 (30)
HSDA40x□-□	0.512 (13)	Push	1.948 (12.5)	55.1 (25)	81.6 (37)	110.3 (50)	136.7 (62)	165.4 (75)	191.8 (87)
		Pull	1.686 (10.87)	46.3 (21)	70.6 (32)	94.8 (43)	119.1 (54)	143.3 (65)	167.6 (76)

SWING CYLINDERS



NOTE: Rod Nuts not included, order separately.

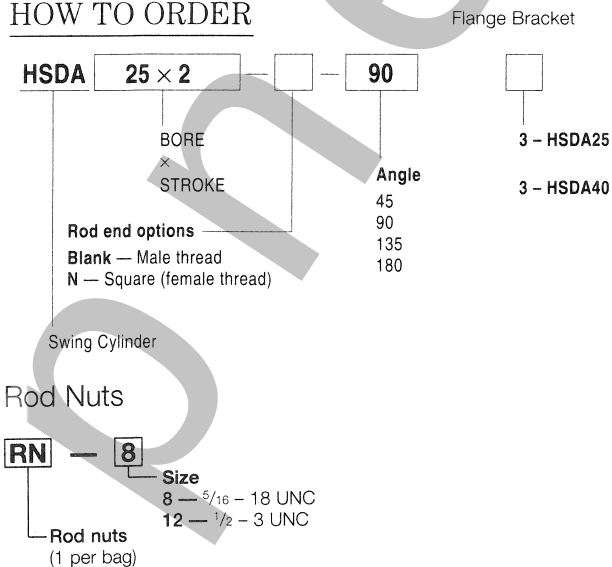
SPECIFICATIONS

Item		Standard type							
		HSDA 25 x ☐				HSDA 40 x ☐			
		Angle specifications							
		-45	-90	-135	-180	-45	-90	-135	-180
Media		Air							
Operating pressure – psig (kgf/cm ²)		30 ~ 100 (2 ~ 7)							
Operating temperature – °F (°C)		32 ~ 140 (0 ~ 60)							
Lubrication		None required							
Cylinder section	Operation	Double acting							
	Max. speed – in/s (mm/s)	20 (500)							
	Cushion	Buna bumpers on both sides of piston							
	Port size	1/8" NPT							
	Stroke tolerance – in. (mm)	+0.039 (+1) – 0 – (0)							
Swing section	Movement	Multiple movement piston with angle adjuster (rack and pinion)							
	Effective torque (at 71 psig) – lb.·in (kgf·cm)	4.86 (5.6)				11.46 (13.2)			
	Swing angle range	20° ~ 105°	45° ~ 105°	100° ~ 195°	135° ~ 195°	20° ~ 100°	80° ~ 100°	100° ~ 190°	170° ~ 190°
	Backlash	3.5°				2.5°			
	Swing time – sec. ^{NOTE 1} 71 psig (5 kgf/cm ²) w/o load	0.2 ~ 0.5	0.2 ~ 0.5	0.4 ~ 0.8	0.4 ~ 1.0	0.2 ~ 1.0	0.2 ~ 1.2	0.4 ~ 1.8	0.4 ~ 2.5
	Cushion	None							
	Cylinder bore x stroke – mm	16 x 6.3	16 x 12.6	16 x 18.9	16 x 25.2	20 x 9.4	20 x 18.8	20 x 28.3	20 x 37.7
	Force – lb.·in (kgf·cm) ^{NOTE 2}	0.017 (0.02) [0.052 (0.06)]				0.052 (0.06) [0.174 (0.2)]			
	Port size	1/8" NPT							

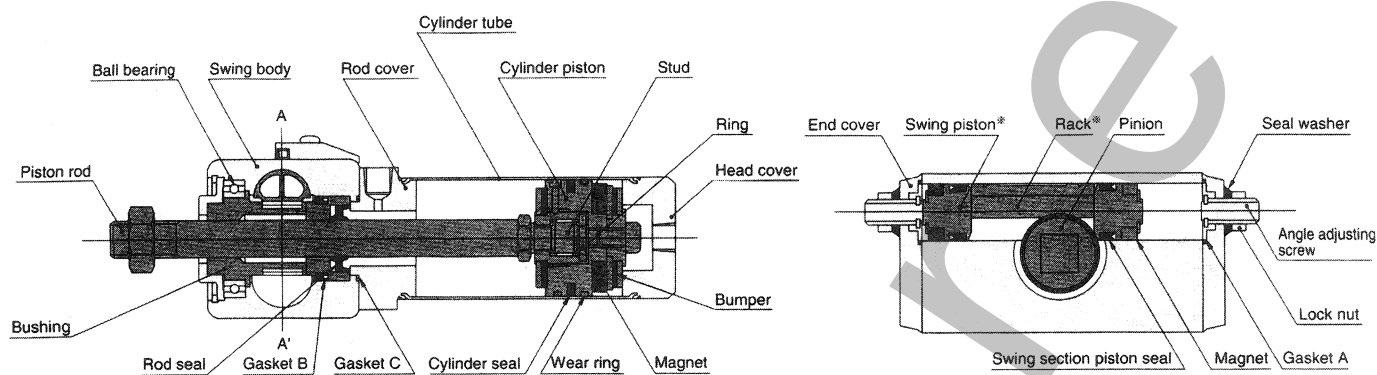
NOTE 1: Using specified angle.

NOTE 2: Value in [] is for square rod end.

HOW TO ORDER



INNER CONSTRUCTION AND MAJOR PARTS



MATERIALS OF MAJOR PARTS

Cylinder section

Parts	Materials
Cylinder tube	Stainless steel
Cylinder piston	Anodized aluminum
Piston rod	Hard steel (hard chrome plated)
Rod cover	Anodized aluminum
Head cover	Anodized aluminum
Bushing	Oil permeated bronze
Stud	Hard steel (nickel plated)
Ring	Special steel (HSDA25 is plastic)
Wear ring	Plastic
Packing	Buna
Bumper	Buna
Magnet	Resin magnet

Swing section

Parts	Materials
Swing main body	Anodized aluminum
End cover	Anodized aluminum
Pinion	Plastic
Rack	Plastic
Ball bearing	Bushing steel
Packing	Buna
Magnet	Sintered magnet

BORE SIZE AND STROKE in. (mm)

Type	Standard strokes – in.	Max. stroke – in.
HSDA25 x □ - □	3/4, 1, 2	2
HSDA40 x □ - □	3/4, 1, 2, 3, 4	4

WEIGHT oz. (kgf)

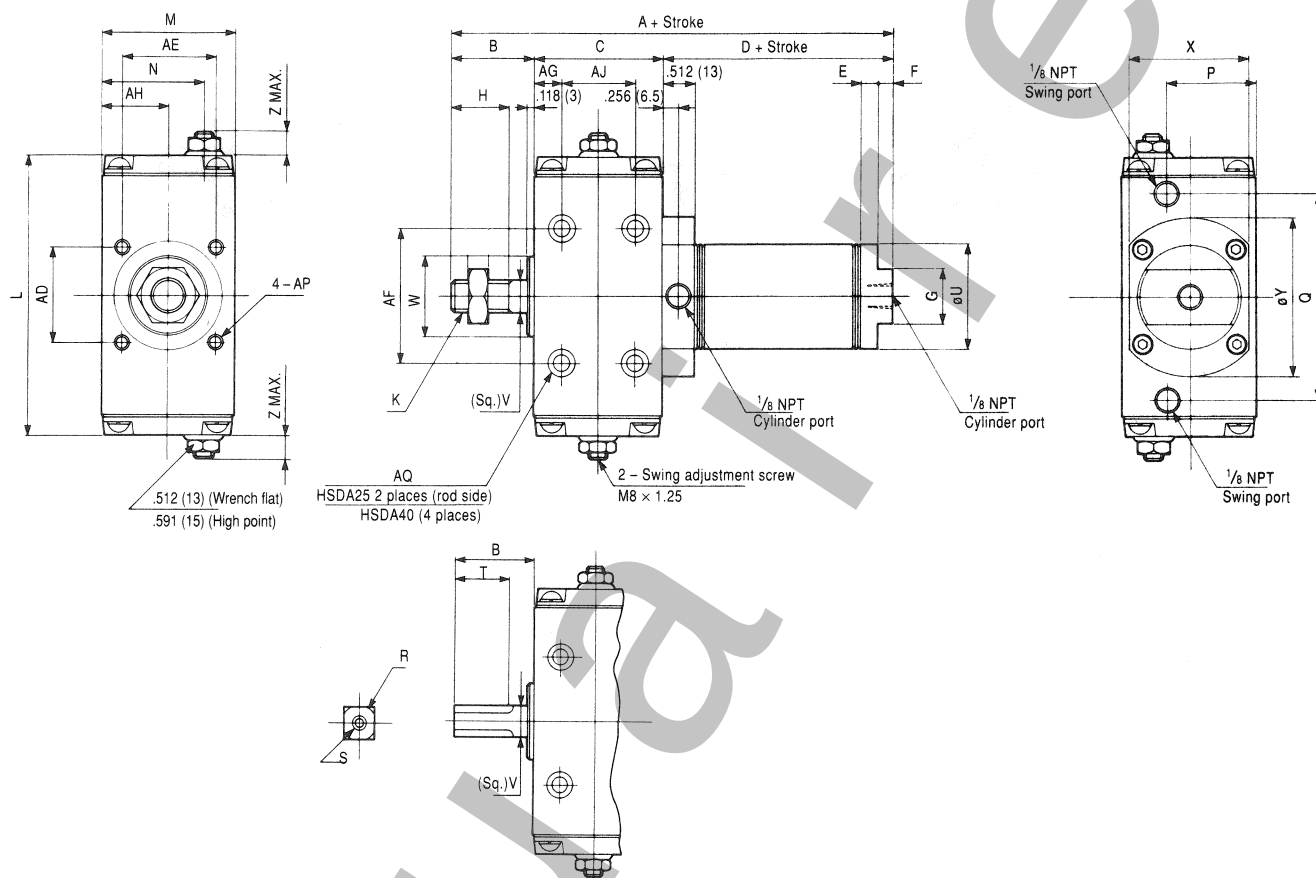
Item		Type			
		HSDA25x□ - 45, 90	HSDA25x□ - 135, 180	HSDA40x□ - 45, 90	HSDA40x□ - 135, 180
Zero stroke		22.6 (0.64)	26.8 (0.76)	44.1 (1.25)	54.0 (1.53)
Additional weight per 1 inch stroke		0.75 (0.0009)		1.8 (0.0021)	
Flange weight		6.0 (0.17)		8.1 (0.23)	
Cylinder Sensor switch weight	ZG553	0.70 (0.02)			
	CS4M				
Swing Sensor switch weight	ZC153	0.70 (0.02)			
	CS5T CS11T				

EXAMPLE: Weight for HSDA25x2 -90 with flange bracket, and two sensor switches is $22.6 + (0.75 \times 2) + 6.0 + (0.70 \times 2) = 31.5$ oz. (852 kgf).

DIMENSION DIAGRAMS

in. (mm)

Standard type



Type	Code - in. (mm)										
	A	B	C	D	E	F	G	H	K	L	M
HSDA25x□ -45, HSDA25x□ -90	5.236 (133)	1.142 (29)	1.732 (44)	2.362 (60)	0.157 (4)	0.197 (5)	0.748 (19)	0.709 (18)	5/16-18 UNC	3.543 (90)	1.732 (44)
HSDA25x□ -135, HSDA25x□ -180	5.236 (133)	1.142 (29)	1.732 (44)	2.362 (60)	0.157 (4)	0.197 (5)	0.748 (19)	0.709 (18)	5/16-18 UNC	4.528 (115)	1.732 (44)
HSDA40x□ -45, HSDA40x□ -90	6.063 (154)	1.339 (34)	2.047 (52)	2.677 (68)	0.236 (6)	0.236 (6)	0.866 (22)	0.906 (23)	1/2-13 UNC	4.409 (112)	2.126 (54)
HSDA40x□ -135, HSDA40x□ -180	6.063 (154)	1.339 (34)	2.047 (52)	2.677 (68)	0.236 (6)	0.236 (6)	0.866 (22)	0.906 (23)	1/2-13 UNC	5.906 (150)	2.126 (54)

Type	Code - in. (mm)									
	N	P	Q	R NOTE 1	S	T	U	V	W	X
HSDA25x□ -45, HSDA25x□ -90	1.339 (34)	1.181 (30)	2.480 (63)	0.315 (8)	8-32 UNC, depth 0.236 (6)	0.709 (18)	1.039 (26.4)	0.291 (7.4)	0.787 (20)	1.496 (38)
HSDA25x□ -135, HSDA25x□ -180	1.339 (34)	1.181 (30)	3.465 (88)	0.315 (8)	8-32 UNC, depth 0.236 (6)	0.709 (18)	1.039 (26.4)	0.291 (7.4)	0.787 (20)	1.496 (38)
HSDA40x□ -45, HSDA40x□ -90	1.634 (41.5)	1.417 (36)	3.268 (83)	0.591 (15)	1/4-20 UNC, depth 0.236 (6)	0.984 (25)	1.638 (41.6)	0.512 (13)	1.260 (32)	1.890 (48)
HSDA40x□ -135, HSDA40x□ -180	1.634 (41.5)	1.417 (36)	4.764 (121)	0.591 (15)	1/4-20 UNC, depth 0.236 (6)	0.984 (25)	1.638 (41.6)	0.512 (13)	1.260 (32)	1.890 (48)

Type	Code - in. (mm)							
	Y	Z NOTE 2	AD	AE	AF	AG	AH	AJ
HSDA25x□ -45, HSDA25x□ -90	1.772 (45)	0.457 (11.6) [0.732 (18.6)]	0.984 (25)	0.984 (25)	1.654 (42)	0.315 (8)	0.866 (22)	-
HSDA25x□ -135, HSDA25x□ -180	1.772 (45)	0.457 (11.6) [0.732 (18.6)]	0.984 (25)	0.984 (25)	1.654 (42)	0.315 (8)	0.866 (22)	-
HSDA40x□ -45, HSDA40x□ -90	2.520 (64)	0.441 (11.2) [0.717 (18.2)]	1.496 (38)	1.496 (38)	2.126 (54)	0.433 (11)	1.063 (27)	1.181 (30)
HSDA40x□ -135, HSDA40x□ -180	2.520 (64)	0.441 (11.2) [0.717 (18.2)]	1.496 (38)	1.496 (38)	2.126 (54)	0.433 (11)	1.063 (27)	1.181 (30)

Type	Code - in. (mm)	
	AP	AQ
HSDA25x□ -45, HSDA25x□ -90	10-32 UNF, depth 0.394 (10)	ø 0.280 (7.1), spot facing ø 0.433 (11) depth 0.248 (6.3)
HSDA25x□ -135, HSDA25x□ -180	10-32 UNF, depth 0.394 (10)	ø 0.280 (7.1), spot facing ø 0.433 (11) depth 0.248 (6.3)
HSDA40x□ -45, HSDA40x□ -90	1/4-20 UNC, depth 0.394 (10)	ø 0.280 (7.1), spot facing ø 0.433 (11) depth 0.248 (6.3)
HSDA40x□ -135, HSDA40x□ -180	1/4-20 UNC, depth 0.394 (10)	ø 0.280 (7.1), spot facing ø 0.433 (11) depth 0.248 (6.3)

NOTE 1: 0.315 in. (8mm) = $\begin{smallmatrix} 0 \\ -0.0009 \end{smallmatrix} \begin{smallmatrix} 0 \\ -0.022 \end{smallmatrix}$

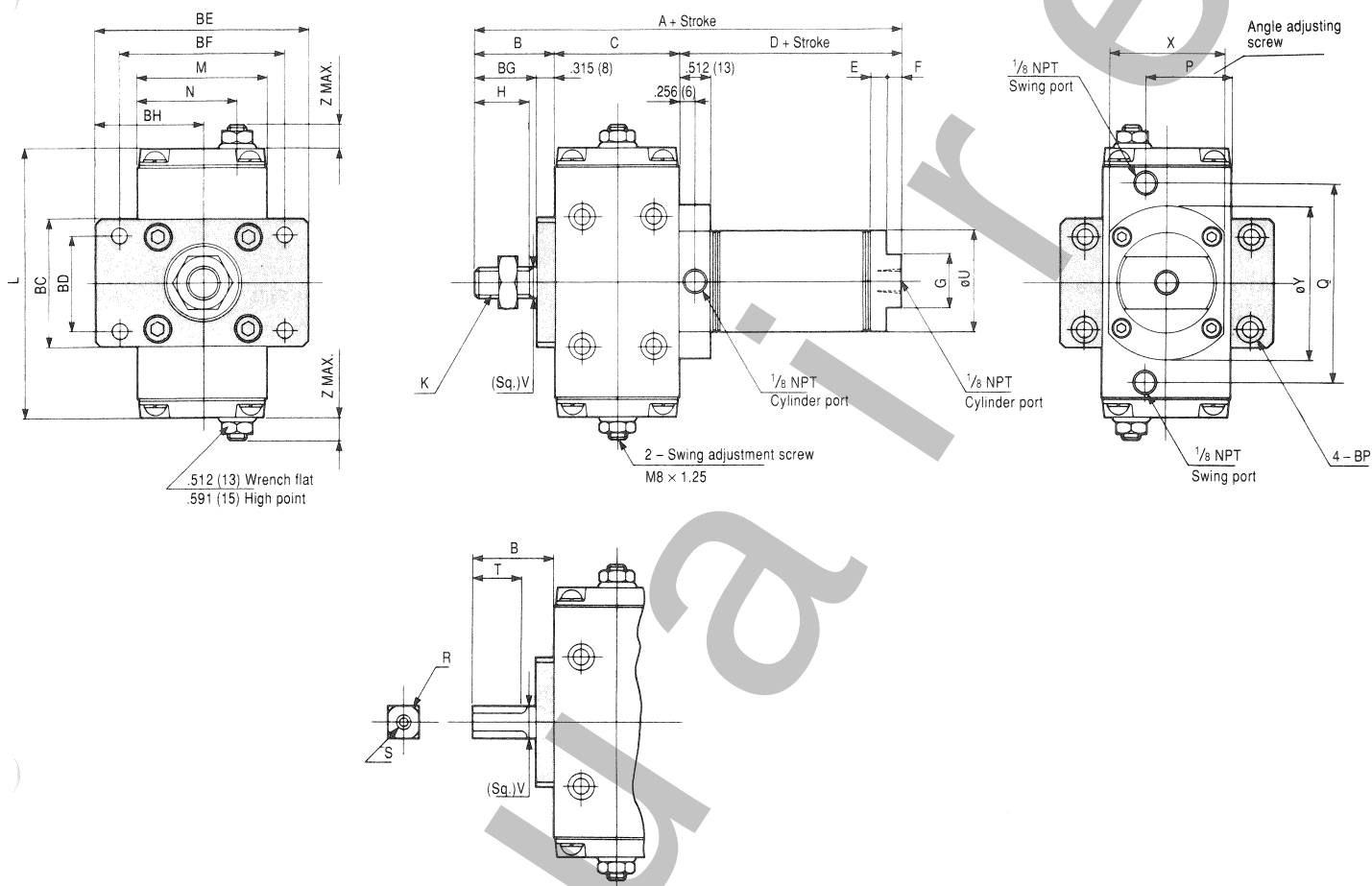
0.591 in. (15mm) = $\begin{smallmatrix} 0 \\ -0.0010 \end{smallmatrix} \begin{smallmatrix} 0 \\ -0.027 \end{smallmatrix}$

NOTE 2: Numbers in [] are for -45 and -135 models.

DIMENSION DIAGRAMS

in. (mm)

Flange type



Type	Code – in. (mm)										
	A	B	C	D	E	F	G	H	K	L	M
HSDA25x□-45, HSDA25x□-90	5.236 (133)	1.142 (29)	1.732 (44)	2.362 (60)	0.157 (4)	0.197 (5)	0.748 (19)	0.709 (18)	5/16-18 UNC	3.543 (90)	1.732 (44)
HSDA25x□-135, HSDA25x□-180	5.236 (133)	1.142 (29)	1.732 (44)	2.362 (60)	0.157 (4)	0.197 (5)	0.748 (19)	0.709 (18)	5/16-18 UNC	4.528 (115)	1.732 (44)
HSDA40x□-45, HSDA40x□-90	6.063 (154)	1.339 (34)	2.047 (52)	2.677 (68)	0.236 (6)	0.236 (6)	0.866 (22)	0.906 (23)	1/2-13 UNC	4.409 (112)	2.126 (54)
HSDA40x□-135, HSDA40x□-180	6.063 (154)	1.339 (34)	2.047 (52)	2.677 (68)	0.236 (6)	0.236 (6)	0.866 (22)	0.906 (23)	1/2-13 UNC	5.906 (150)	2.126 (54)

Type	Code – in. (mm)									
	N	P	Q	R ^{NOTE 1}	S	T	U	V	X	Y
HSDA25x□-45, HSDA25x□-90	1.339 (34)	1.181 (30)	2.480 (63)	0.315 (8)	8-32 UNC, depth 0.236 (6)	0.709 (18)	1.039 (26.4)	0.291 (7.4)	1.496 (38)	1.772 (45)
HSDA25x□-135, HSDA25x□-180	1.339 (34)	1.181 (30)	3.465 (88)	0.315 (8)	8-32 UNC, depth 0.236 (6)	0.709 (18)	1.039 (26.4)	0.291 (7.4)	1.496 (38)	1.772 (45)
HSDA40x□-45, HSDA40x□-90	1.634 (41.5)	1.417 (36)	3.268 (83)	0.591 (15)	1/4-20 UNC, depth 0.236 (6)	0.984 (25)	1.638 (41.6)	0.512 (13)	1.890 (48)	2.520 (64)
HSDA40x□-135, HSDA40x□-180	1.634 (41.5)	1.417 (36)	4.764 (121)	0.591 (15)	1/4-20 UNC, depth 0.236 (6)	0.984 (25)	1.638 (41.6)	0.512 (13)	1.890 (48)	2.520 (64)

Type	Code – in. (mm)							
	Z ^{NOTE 2}	BC	BD	BE	BF	BG	BH	BP
HSDA25x□-45, HSDA25x□-90	0.457 (11.6) [0.732 (18.6)]	1.732 (44)	1.181 (30)	2.953 (75)	2.362 (60)	0.827 (21)	1.476 (37.5)	ø 0.217 (5.5), spot facing ø 0.374 (9.5) depth 0.213 (5.4)
HSDA25x□-135, HSDA25x□-180	0.457 (11.6) [0.732 (18.6)]	1.732 (44)	1.181 (30)	2.953 (75)	2.362 (60)	0.827 (21)	1.476 (37.5)	ø 0.217 (5.5), spot facing ø 0.374 (9.5) depth 0.213 (5.4)
HSDA40x□-45, HSDA40x□-90	0.441 (11.2) [0.717 (18.2)]	2.126 (54)	1.575 (40)	3.543 (90)	2.756 (70)	1.024 (26)	1.772 (45)	ø 0.280 (7.1), spot facing ø 0.433 (11) depth 0.256 (6.3)
HSDA40x□-135, HSDA40x□-180	0.441 (11.2) [0.717 (18.2)]	2.126 (54)	1.575 (40)	3.543 (90)	2.756 (70)	1.024 (26)	1.772 (45)	ø 0.280 (7.1), spot facing ø 0.433 (11) depth 0.256 (6.3)

NOTE 1: 0.315 in. (8mm) = $\begin{smallmatrix} 0 \\ -0.0009 \end{smallmatrix}$ ($\begin{smallmatrix} 0 \\ -0.022 \end{smallmatrix}$)

0.591 in. (15mm) = $\begin{smallmatrix} 0 \\ -0.0010 \end{smallmatrix}$ ($\begin{smallmatrix} 0 \\ -0.027 \end{smallmatrix}$)

NOTE 2: Numbers in [] are for -45 and -135 models.

HANDLING TIPS AND POINTS TO BE CONSIDERED

CYLINDER SELECTION AND SWING ANGLE

SELECTION

1. Select a model so that the effective torque-to-load ratio is less than 80 percent (less than 50 percent when load is variable). With heavy loads and/or high speeds, use a shock absorber to dampen inertial forces on cylinder.
2. Swing cylinder angles are 45°, 90°, 135° and 180°. Angle adjustment range is shown in the chart below.

Type	Angle range
HSDA25x□-45	20° ~ 105°
HSDA25x□-90	45° ~ 105°
HSDA25x□-135	100° ~ 195°
HSDA25x□-180	135° ~ 195°
HSDA40x□-45	20° ~ 100°
HSDA40x□-90	80° ~ 100°
HSDA40x□-135	100° ~ 190°
HSDA40x□-180	170° ~ 190°

NOTE: The cylinder will be damaged when used under excessive load (kinetic energy).

INSTALLATION

1. Mount cylinders in any direction; however, the mounting surface must be flat. If there is bending or twisting of the cylinder during mounting, cycle life may be diminished, the cylinder may leak, or it may not operate properly.
2. Ensure that no damage occurs to the mounting surface, as this may adversely affect surface flatness.

Note chart below for maximum cylinder rod side load factors.

MAX. ALLOWABLE SIDE LOAD

oz. (kgf)

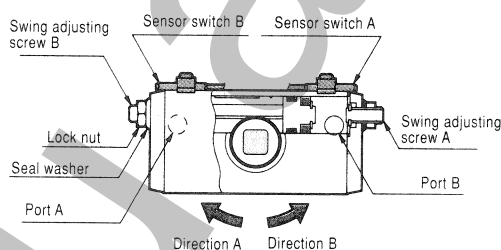
Type	Stroke				
	3/4	1	2	3	4
HSDA25	24.7 (0.7)	21.2 (0.6)	17.6 (0.5)	—	—
HSDA40	60.0 (1.7)	56.4 (1.6)	49.4 (1.4)	42.3 (1.2)	35.3 (1.0)

SWING ANGLE ADJUSTMENT

1. To adjust swing angle, loosen lock nut and turn adjusting screw to the right (clockwise) for lesser swing angle, turn to the left (counter clockwise) for greater angle. Do not protrude adjusting screw head from swing end surface over the dimension specified below.

in. (mm)

Type	Angle	
	45, 135	90, 180
HSDA25	0.73 (18.6)	0.46 (11.6)
HSDA40	0.71 (18.2)	0.44 (11.2)



When air is supplied to Port A, swing direction is to A. When air is supplied to Port B, swing direction is to B.

SWING TIME

1. See chart below for swing time (time from the start of swing to reach maximum angle).

Type	Swing angle – seconds			
	45°	90°	135°	180°
HSDA25	0.2 ~ 0.6	0.2 ~ 0.5	0.4 ~ 0.8	0.4 ~ 1.0
HSDA40	0.2 ~ 1.0	0.2 ~ 1.2	0.4 ~ 1.8	0.4 ~ 2.5

NOTES

1. Use external stopper for precise swing setting. HSDA25 has 3.5° (max.) and HSDA40 has 2.5° (max.) backlash.
2. Recommended tightening torque of lock nut is 34 lb. • in. (40 kgf • cm). Use 13mm standard metric wrench and avoid the use of adjustable wrench. Overtightening may damage the end cover.
3. Reed switch type sensor may malfunction in slow cycling applications. Hall effect type sensor switch is recommended for slow cycling applications.

APPLICATION EXAMPLES

