

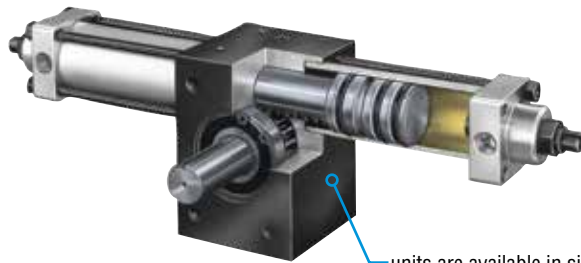
## 1000-8000

### Major Benefits

- Heavy duty
- Wide variety of options and accessories
- Versatile design
- High torque



OUTPUT TORQUES TO 31,800 in-lb [3595 Nm]



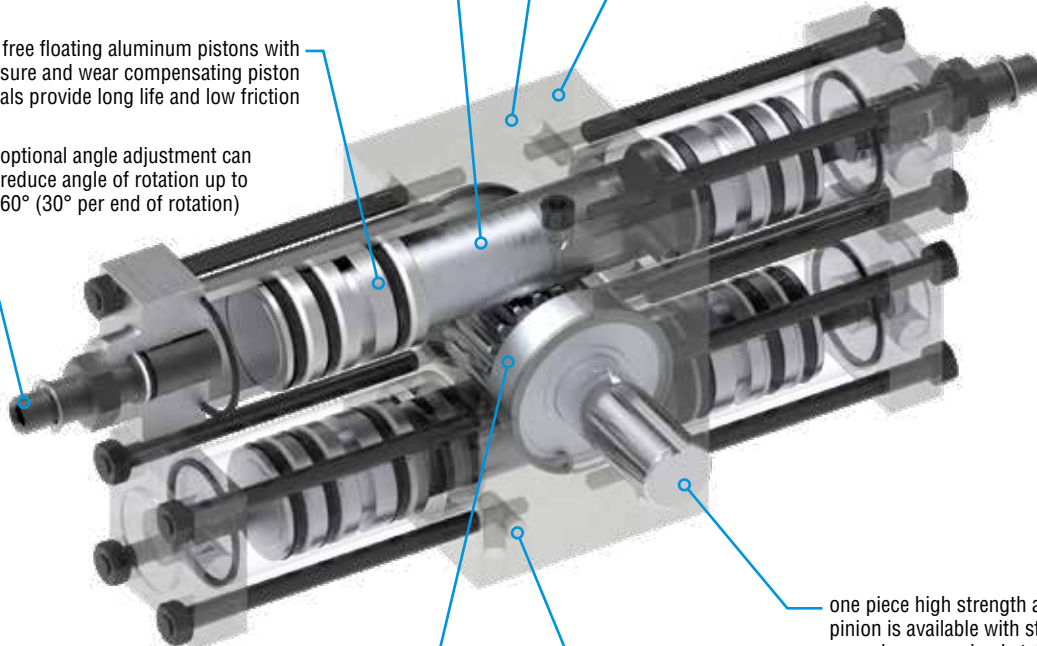
units are available in single or double rack configurations for increased torque capability and 0° backlash at end of rotation

high strength alloy steel racks and pinions ensure long life

free floating aluminum pistons with pressure and wear compensating piston seals provide long life and low friction

optional angle adjustment can reduce angle of rotation up to 60° (30° per end of rotation)

hardcoated aluminum body is impregnated with PTFE for wear resistance and lower friction



heavy duty sealed ball bearings ensure shaft stability under heavy and high impact loading

body has threaded mounting holes on front, back, and bottom for versatile mounting locations

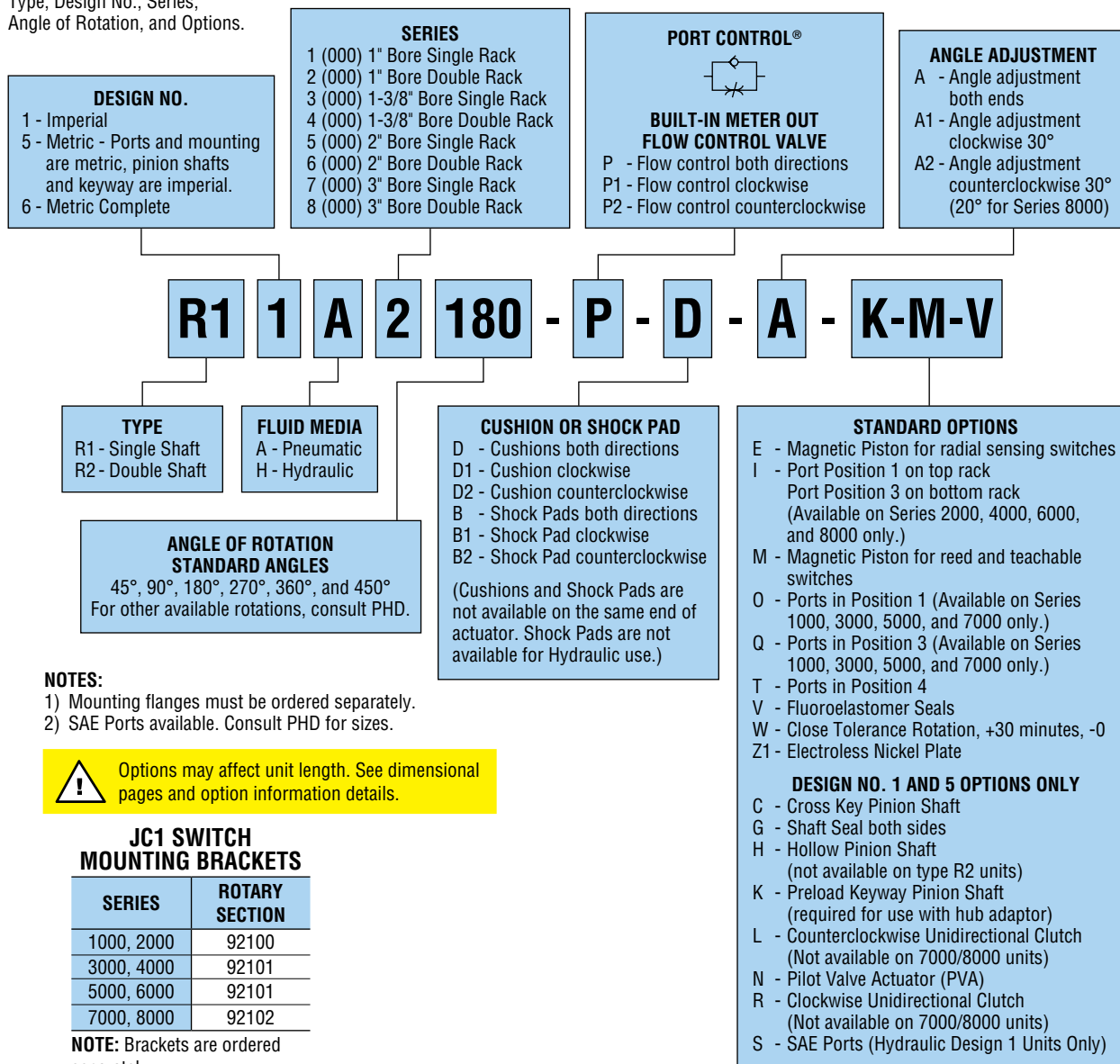
one piece high strength alloy steel pinion is available with standard keyed, cross key, or preload style pinion shafts

# ORDERING DATA: Series 1000-8000 Rotary Actuators

## UNITS WITH IMPERIAL SHAFTS AND KEYWAY

### TO ORDER SPECIFY:

Type, Design No., Series,  
Angle of Rotation, and Options.



### NOTES:

- 1) Mounting flanges must be ordered separately.
- 2) SAE Ports available. Consult PHD for sizes.



Options may affect unit length. See dimensional pages and option information details.

### JC1 SWITCH MOUNTING BRACKETS

SERIES	ROTARY SECTION
1000, 2000	92100
3000, 4000	92101
5000, 6000	92101
7000, 8000	92102

NOTE: Brackets are ordered separately.

### SERIES JC1xDx MAGNETIC SWITCHES

PART NO.	REQUIRED OPTION	DESCRIPTION
JC1RDU-5	-M	PNP or NPN DC Reed, 5 meter cable
JC1RDU-K	-M	PNP or NPN DC Reed, Quick Connect
JC1ADU-K	-M	AC Reed, Quick Connect (M12)
JC1HDP-5	-E	PNP (Source), 5 meter cable
JC1HDP-K	-E	PNP (Source), Quick Connect
JC1HDN-5	-E	NPN (Sink), 5 meter cable
JC1HDN-K	-E	NPN (Sink), Quick Connect

NOTE: Switches must be ordered separately.

### CORDSETS FOR SERIES JC1xDx SWITCHES

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 meter cable
63549-05	M8, 3 pin, Straight Female Connector, 5 meter cable
81284-1-010	M12, 4 pin, Straight Female Connector, 2 meter cable

NOTE: Cordsets are ordered separately.

### SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCHES (OPTION -M)

PART NO.	DESCRIPTION
JC1STP-2	PNP (Source), Solid State, 12-30 VDC, 2 meter cable
JC1STP-K	PNP (Source), Solid State, 12-30 VDC, Quick Connect

NOTE: Switches must be ordered separately.

### CORDSET FOR SERIES JC1ST SWITCHES

PART NO.	DESCRIPTION
81284-1-001	M8, 4 pin, Straight Female Connector, 5 meter cable

NOTE: Cordsets are ordered separately.

SPECIFICATIONS	SERIES 1000-8000
PNEUMATIC OPERATING PRESSURE	20 to 150 psi [1.4 to 10 bar]
HYDRAULIC OPERATING PRESSURE**	40 to 1500 psi [2.8 to 103 bar]
OPERATING TEMPERATURE	-20° to 180°F [-29° to 82°C]
ROTATIONAL TOLERANCE	Nominal rotation +10° to -0°
BACKLASH AT ANY MID-ROTATION POINT AND AT END OF ROTATION WITHOUT -A (DOUBLE RACK)	1° (2000), 0°30' (4000, 6000), 0°15' (8000)
BACKLASH AT END OF ROTATION WITH -A* (DOUBLE RACK)	0° (2000, 4000, 6000, 8000)
BACKLASH ON ALL SINGLE RACK UNITS (END AND ANY MID-ROTATION)	1° (1000), 0°30' (3000, 5000), 0°15' (7000)
LUBRICATION	Factory lubricated for rated life
MAINTENANCE	Field repairable

**NOTES:** \*-A angle adjustment screw must be engaged or adjusted to achieve 0° backlash.

\*\*All hydraulic ratings are based on non-shock hydraulic service.

SIZE	WEIGHT				BORE DIAMETER		DISPLACEMENT VOLUME/deg		THEORETICAL TORQUE OUTPUT		MAX AXIAL BEARING LOAD		MAX RADIAL BEARING LOAD		DISTANCE BETWEEN SHAFT BEARINGS	
	BASE		ADDER													
	lb	kg	lb/°	kg/°	in	mm	in³	mm³	in-lb/psi	Nm/bar	lb	N	lb	N	in	mm
1(000)	2.3	1.0	0.0022	0.0010	1.000	25.4	0.007	0.115	0.39	0.64	120	534	300	1334	1.375	34.9
2(000)	3.3	1.5	0.0043	0.0020	1.000	25.4	0.014	0.229	0.78	1.28						
3(000)	6.9	3.1	0.0064	0.0029	1.375	34.9	0.019	0.312	1.11	1.21	240	1068	600	2669	2.188	55.6
4(000)	9.7	4.4	0.0127	0.0058	1.375	34.9	0.038	0.623	2.22	3.64						
5(000)	10.7	4.8	0.0093	0.0042	2.000	50.8	0.041	0.672	2.36	3.87	370	1646	925	4114	2.235	56.8
6(000)	15.7	7.1	0.0185	0.0084	2.000	50.8	0.082	1.344	4.72	7.74						
7(000)	34.4	15.6	0.0289	0.0131	3.000	76.2	0.185	3.032	10.60	17.37	800	3558	2000	8896	3.750	95.3
8(000)	42.2	19.1	0.0578	0.0262	3.000	76.2	0.370	6.064	21.20	34.75						

HYD SERIES	OPTION psi [bar]			
	PLAIN	-P	-D	-E OR -M
1000	—	—	—	—
2000	1000 [69]	750 [52]	750 [52]	—
3000	—	—	—	—
4000	—	750 [52]	750 [52]	—
5000	—	—	—	750 [52]
6000	—	750 [52]	750 [52]	750 [52]
7000	—	—	—	500 [35]
8000	—	750 [52]	750 [52]	500 [35]

**NOTE:** All hydraulic ratings are based on non-shock hydraulic service.

## PRESSURE RATINGS FOR OPTIONS

All pneumatic rotary actuators have a maximum pressure rating of 150 psi [10 bar] air. Most hydraulic rotary actuators have a maximum pressure rating of 1500 psi [100 bar], except as noted in the chart.

Minimum factor of safety at maximum rated hydraulic pressure for output shaft is 2:1, and for hydraulic chambers is 3:1. Consult PHD for proof pressure data. Hydraulic ratings based on non-shock, hydraulic service.

## Application & Sizing Assistance

Use PHD's free online Product Sizing and Application at [www.phdinc.com/apps/sizing](http://www.phdinc.com/apps/sizing)

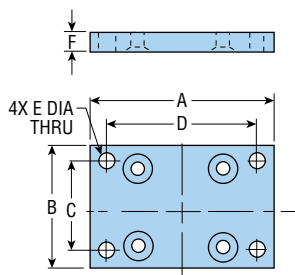
## WEIGHT TABLE - SINGLE SHAFT EXTENSION ACTUATORS

SERIES	POWER	45°		90°		180°		270°		360°		450°		PER 90°		ADDER FOR DOUBLE	
		lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
1000	Pneumatic	2.4	1.09	2.5	1.13	2.7	1.22	2.9	1.32	3.1	1.41	3.3	1.50	0.20	0.09	0.06	0.03
	Hydraulic	2.6	1.18	2.7	1.22	2.9	1.32	3.1	1.41	3.4	1.54	3.6	1.63	0.23	0.10	0.06	0.03
2000	Pneumatic	3.5	1.59	3.6	1.63	4	1.81	4.4	2.00	4.8	2.18	5.2	2.36	0.39	0.18	0.06	0.03
	Hydraulic	3.7	1.68	3.9	1.77	4.4	2.00	4.8	2.18	5.3	2.40	5.8	2.63	0.47	0.21	0.06	0.03
3000	Pneumatic	7.2	3.27	7.5	3.40	8.1	3.67	8.6	3.90	9.2	4.17	9.8	4.45	0.58	0.26	0.38	0.17
	Hydraulic	7.4	3.36	7.8	3.54	8.5	3.86	9.2	4.17	9.9	4.49	10.5	4.76	0.69	0.31	0.38	0.17
4000	Pneumatic	10.2	4.63	10.8	4.90	12	5.44	13.1	5.94	14.2	6.44	15.4	6.99	1.14	0.52	0.38	0.17
	Hydraulic	10.8	4.90	11.4	5.17	12.8	5.81	14.2	6.44	15.6	7.08	17	7.71	1.39	0.63	0.38	0.17
5000	Pneumatic	11.1	5.03	11.5	5.22	12.4	5.62	13.2	5.99	14	6.35	14.9	6.76	0.84	0.38	0.5	0.23
	Hydraulic	12.5	5.67	13.2	5.99	14.6	6.62	16.1	7.30	17.5	7.94	19	8.62	1.44	0.65	0.5	0.23
6000	Pneumatic	16.6	7.53	17.4	7.89	19.1	8.66	20.7	9.39	22.4	10.16	24.1	10.93	1.67	0.76	0.5	0.23
	Hydraulic	19.2	8.71	20.7	9.39	23.6	10.70	26.5	12.02	29.4	13.34	32.3	14.65	2.91	1.32	0.5	0.23
7000	Pneumatic	35.7	16.19	37	16.78	39.6	17.96	42.2	19.14	44.8	20.32	47.4	21.50	2.60	1.18	2.4	1.09
	Hydraulic	40	18.14	42.2	19.14	46.5	21.09	50.9	23.09	55.2	25.04	59.5	26.99	4.34	1.97	2.4	1.09
8000	Pneumatic	44.8	20.32	47.4	21.50	52.6	23.86	57.8	26.22	63	28.58	68.2	30.93	5.20	2.36	2.4	1.09
	Hydraulic	53.4	24.22t	57.8	26.22	66.4	30.12	75.1	34.06	83.7	37.97	92.4	41.91	8.66	3.93	2.4	1.09

## KINETIC ENERGY TABLE

UNIT	KE MAX. PLAIN UNIT		KE MAX. WITH SHOCK PAD		KE MAX. WITH CUSHION	
	in-lb	Nm	in-lb	Nm	in-lb	Nm
RxxA1	2.02	0.23	3.5	0.40	8.07	0.91
RxxA2	2.02	0.23	3.5	0.40	8.07	0.91
RxxA3	5.78	0.65	10	1.14	23.13	2.61
RxxA4	5.78	0.65	10	1.14	23.13	2.61
RxxA5	6.58	0.74	11.5	1.30	26.32	2.97
RxxA6	6.58	0.74	11.5	1.30	26.32	2.97
RxxA7	17.63	1.99	31	3.49	70.53	7.97
RxxA8	17.63	1.99	31	3.49	70.53	7.97

## MOUNTING FLANGE (HARDWARE INCLUDED)



### BOTTOM MOUNTING FLANGE

SERIES	KIT NO.		LETTER DIMENSION											
			A		B		C		D		E		F	
	Imperial	Metric	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1000 2000	13756	14320	3.250	82.6	2.000	51	1.500	38.1	2.625	66.7	0.281	7.1	0.250	6.3
3000 4000	13757	14321	4.500	114	3.000	76	2.375	60.3	3.875	98.4	0.406	10.3	0.437	11.1
5000 6000	13758	14322	4.500	114	4.000	102	3.375	85.7	3.875	98.4	0.406	10.3	0.437	11.1

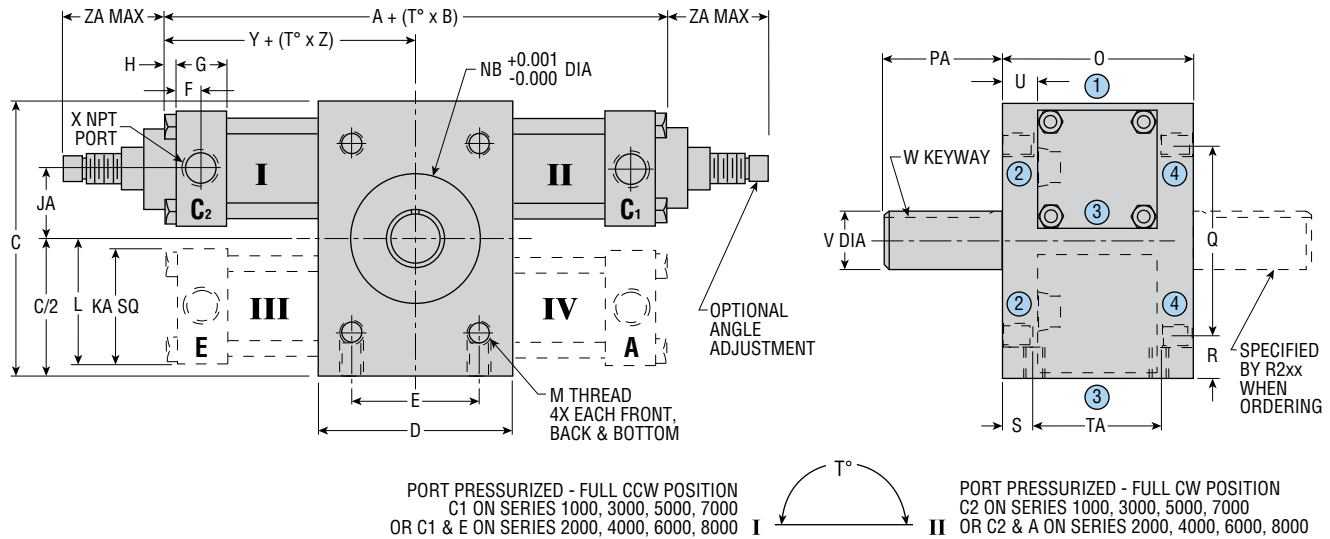
### SIDE MOUNTING FLANGE

SERIES	KIT NO.		LETTER DIMENSION													
			A		B		C		D		E		F		G	
	Imperial	Metric	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1000 2000	13759	14316	4.250	108	2.000	51	1.375	34.9	3.625	92.1	0.281	7.1	0.250	6.3	0.758	19.2
3000 4000	13760	14317	5.750	146	3.000	76	2.125	54.0	5.125	130.2	0.406	10.3	0.437	11.1	1.070	27.2
5000 6000	13761	14318	6.500	165	4.000	102	3.375	85.7	5.875	149.2	0.406	10.3	0.437	11.1	1.325	33.3
7000 8000	13762	14319	12.000	305	5.000	127	3.000	76.2	10.000	254.0	0.781	19.8	0.750	19.1	2.000	50.8

All dimensions are reference only unless specifically tolerated.

# DIMENSIONS: Series 1000-8000 Rotary Actuators

## IMPERIAL



SHAFT KEYWAY: SHOWN AT MID-ROTATION

PORT POSITION: INDICATED BY CIRCLED NUMBERS

-O & -Q AVAILABLE ON SERIES 1000, 3000, 5000, & 7000 ONLY

TUBES III & IV: INCLUDED ON SERIES 2000, 4000, 6000, & 8000 UNITS ONLY

MTG. HOLES: CENTERED ON CENTERLINE OF ACTUATOR BODY

CUSHIONS: SERIES 1000 & 2000 ACTUATORS

ADD 13 mm TO RESPECTIVE "A" AND "Y" DIMENSIONS FOR EACH CUSHION

CAP STYLE	SERIES	LETTER DIMENSION												
		A	B	C	D	E	F	G	H	JA	KA	L	M	NB
PLAIN	1000 & 2000	5.698	0.0174	3.000	2.000	1.500	0.250	0.500	0.00	0.750	1.375	1.437	1/4-20 x 0.312 DP	1.125 x 0.056 DP
-A	1000 & 2000	6.198	0.0174	3.000	2.000	1.500	0.500	0.750	0.00	0.750	1.375	1.437	1/4-20 x 0.312 DP	1.125 x 0.056 DP
BOTH	3000 & 4000	7.906	0.026	4.250	3.000	2.000	0.344	0.688	0.250	1.156	1.875	2.094	5/16-18 x 0.500 DP	2.000 x 0.039 DP
BOTH	5000 & 6000	9.126	0.026	5.000	4.000	2.500	0.375	0.750	0.203	1.156	2.250	2.281	3/8-16 x 0.625 DP	2.1654 x 0.052 DP
BOTH	7000 & 8000	12.160	0.052	8.000	5.000	3.000	0.469	1.062	0.437	1.875	3.500	3.625	3/4-10 x 1.250 DP	3.3465 x 0.120 DP

CAP STYLE	SERIES	LETTER DIMENSION													
		O	PA	Q	R	S	TA	U	V	W	X	Y	Z	ZA	
PLAIN	1000 & 2000	2.000	0.875	2.000	0.500	0.250	1.500	0.312	0.4998/0.5003	1/8 x 1/16 x 0.625	1/8	2.849	0.0087	0.00	
-A	1000 & 2000	2.000	0.875	2.000	0.500	0.250	1.500	0.312	0.4998/0.5003	1/8 x 1/16 x 0.625	1/8	3.099	0.0087	1.125	
BOTH	3000 & 4000	3.000	1.875	3.000	0.625	0.500	2.000	0.562	0.8748/0.8753	3/16 x 3/32 x 1.500	1/4	3.953	0.013	1.500	
BOTH	5000 & 6000	3.000	1.875	3.500	0.750	0.500	2.000	0.375	1.124/1.125	1/4 x 1/8 x 1.500	1/4	4.563	0.013	1.875	
BOTH	7000 & 8000	5.000	3.500	5.000	1.500	1.250	2.500	0.750	1.749/1.750	3/8 x 3/16 x 3.000	3/8	6.080	0.026	2.875	

## OPTION LOCATION REFERENCE

ACTUATOR TYPE	LETTER OPTION REFERENCED BY TUBE NUMBER											PORT & NEEDLE LOCATIONS REFERENCED BY CIRCLED NUMBERS														
	-A		-B		-D		-P		-M	-E	-N	STANDARD			-O			-Q			-T			-I		
	-A1	-A2	-B1	-B2	-D1	-D2	-P1	-P2				PORT	-P	-D	PORT	-P	-D	PORT	-P	-D	PORT	-P	-D	PORT	-P	-D
R1xA & R2xA	II	I	II	I	II	I	II	I	I, II	I, II	I, II	2	1	1	1	2	2	3	2	2	4	1	1	1, 3	4	4
R1xH & R2xH	II	I	N/A	N/A	II	I	II	I	I, II	I, II	N/A	2	1	1	1	2	2	3	2	2	4	1	1	1, 3	4	4

## QUICK REFERENCE FOR: A + (T° x B)

SERIES	DEGREE OF ROTATION					
	45	90	180	270	360	450
*1000 & 2000	6.481	7.264	8.830	10.396	11.962	13.528
3000 & 4000	9.076	10.246	12.586	14.926	17.266	19.606
5000 & 6000	10.296	11.466	13.806	16.146	18.486	20.826
7000 & 8000	14.500	16.840	21.520	26.200	30.880	35.560

\*Dimensions calculated using plain cap style. Add 0.250 to dimension for each -A style cap used on Series 1000/2000 only.

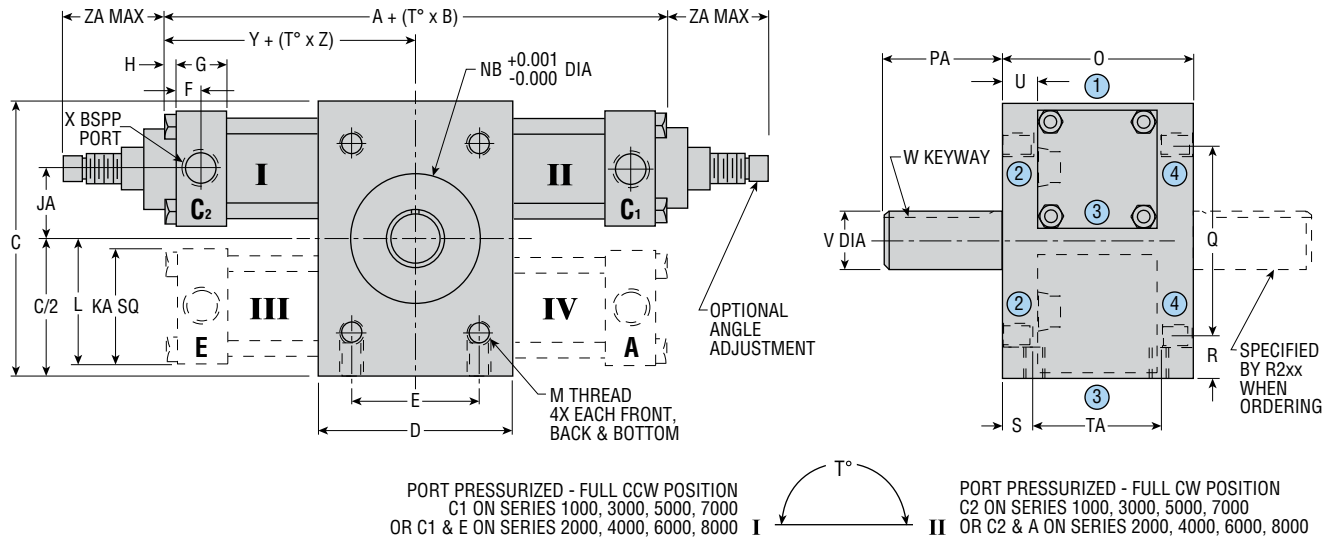
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## CAD & Sizing Assistance

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# DIMENSIONS: Series 1000-8000 Rotary Actuators

## METRIC



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CUSHIONS: SERIES 1000 & 2000 ACTUATORS

ADD 13 mm TO RESPECTIVE "A" AND "Y" DIMENSIONS FOR EACH CUSHION

CAP STYLE	SERIES	LETTER DIMENSION																
		A	B	C	D	E	F	G	H	JA	KA	L	M	NB	O	PA	Q	R
PLAIN	1000 & 2000	145	0.44	76	51	38.1	6	13	0	19	35	36	M6 x 1.0 x 8 DP	28.58 x 1.4 DP	50.8	22	50.8	13
-A	1000 & 2000	157	0.44	76	51	38.1	13	19	0	19	35	36	M6 x 1.0 x 8 DP	28.58 x 1.4 DP	50.8	22	50.8	13
BOTH	3000 & 4000	201	0.66	108	76	50.8	9	17	6	29	48	53	M8 x 1.25 x 13 DP	50.80 x 1.0 DP	76.2	48	76.2	16
BOTH	5000 & 6000	232	0.66	127	102	63.5	10	19	5	29	57	58	M10 x 1.5 x 16 DP	55.00 x 1.3 DP	76.2	48	88.9	19
BOTH	7000 & 8000	309	1.33	203	127	76.2	12	27	11	48	89	92	M20 x 2.5 x 32 DP	85.00 x 3.0 DP	127.0	89	127.0	38

CAP STYLE	SERIES	LETTER DIMENSION										
		S	TA	U	V		W		X	Y	Z	ZA
					IMPERIAL SHAFTS*	METRIC SHAFTS*	IMPERIAL SHAFTS*	METRIC SHAFTS*				
PLAIN	1000 & 2000	6	38.1	8	12.69/12.71	12.00/11.97	3.15 x 1.59 x 16	4 x 2.5 x 15	1/8	72	0.22	0
-A	1000 & 2000	6	38.1	8	12.69/12.71	12.00/11.97	3.15 x 1.59 x 16	4 x 2.5 x 15	1/8	78	0.22	29
BOTH	3000 & 4000	13	50.8	14	22.22/22.23	22.00/21.96	4.75 x 2.36 x 38	6 x 3.5 x 32	1/4	100	0.33	38
BOTH	5000 & 6000	13	50.8	10	28.55/28.58	28.00/27.96	6.35 x 3.18 x 38	8 x 5 x 40	1/4	116	0.33	48
BOTH	7000 & 8000	32	63.5	19	44.42/44.45	44.00/43.96	9.53 x 2.36 x 78	12 x 5 x 56	3/8	154	0.66	73

\*Both imperial and metric shaft options available on metric body (imperial shaft = Design 5, metric shaft = Design 1). Numbers are for metric units and are in mm.

## OPTION LOCATION REFERENCE

ACTUATOR TYPE	LETTER OPTION REFERENCED BY TUBE NUMBER											PORT & NEEDLE LOCATIONS REFERENCED BY CIRCLED NUMBERS														
	-A		-B		-D		-P		-M	-E	-N	STANDARD			-O			-Q			-T			-I		
	-A1	-A2	-B1	-B2	-D1	-D2	-P1	-P2				PORT	-P	-D	PORT	-P	-D	PORT	-P	-D	PORT	-P	-D	PORT	-P	-D
R1xA & R2xA	II	I	II	I	II	I	II	I	I, II	I, II	I, II	2	1	1	1	2	2	3	2	2	4	1	1	1, 3	4	4
R1xH & R2xH	II	I	N/A	N/A	II	I	II	I	I, II	I, II	N/A	2	1	1	1	2	2	3	2	2	4	1	1	1, 3	4	4

## QUICK REFERENCE FOR: A + (T° x B)

SERIES	DEGREE OF ROTATION					
	45	90	180	270	360	450
*1000 & 2000	164.6	184.5	224.3	264.1	303.8	343.6
3000 & 4000	230.5	260.2	319.7	379.1	438.6	498.0
5000 & 6000	261.5	291.1	351.4	410.1	469.5	529.0
7000 & 8000	368.3	427.7	548.0	665.5	784.4	903.2

\*Dimensions calculated using plain cap style. Add 6.3 to dimension for each -A style cap used on Series 1000/2000 only.

## CAD & Sizing Assistance

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**P**

## PORT CONTROL® BOTH DIRECTIONS

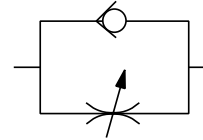
**P1**

## PORT CONTROL® CLOCKWISE

**P2**

## PORT CONTROL® COUNTERCLOCKWISE

The exclusive PHD Port Control®, “built-in” speed control valve based on the “meter-out” principle, features an adjustable needle and a separate ball check. Both are built into the rotary actuator end cap and are used to control the speed of the actuator over its entire rotation.



The self-locking needle has micrometer threads and is adjustable under pressure. It determines the orifice size which controls the exhaust volume only of the actuator proper. The separate ball check is closed while fluid is exhausting from the actuator, but opens to permit full flow of incoming fluids. The PHD Port Control® provides the optimum in speed control for rotary actuators. It saves space and eliminates the cost of fittings and installation for external flow control valves.

**D**

## ADJUSTABLE CUSHIONS BOTH DIRECTIONS

**D1**

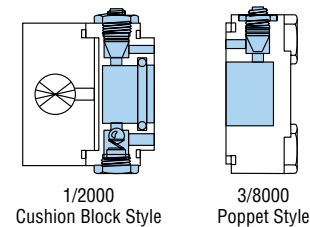
## ADJUSTABLE CUSHIONS CLOCKWISE

**D2**

## ADJUSTABLE CUSHIONS COUNTERCLOCKWISE

PHD Cushions are designed for smooth deceleration at the end of rotation. When the cushion is activated, the remaining volume in the cylinder must exhaust past an adjustable needle which controls the amount of deceleration. Effective cushion length is approximately 30° of rotation.

Cushions on Series 2000, 4000, 6000, and 8000 are furnished on one of two racks only.



**A**

## ANGLE ADJUSTMENT BOTH DIRECTIONS

**A1**

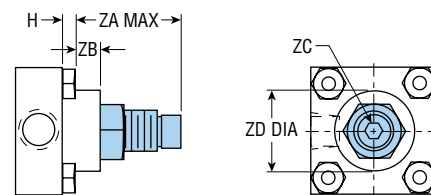
## ANGLE ADJUSTMENT CLOCKWISE

**A2**

## ANGLE ADJUSTMENT COUNTERCLOCKWISE

Adjusting screw(s) for reducing angle of rotation in either or both directions for use where exact degree of desired rotation cannot be predetermined or where requirements may vary during operation. Standard adjusting screw will reduce angle of rotation up to 30°. Available in conjunction with all other optional features.

Cushions are normally engaged over the last 30° of angle. The use of angle adjusting screws to reduce angle of rotation has a direct effect on the length of cushion engagement. Example: 10° angle reduction will reduce cushion engagement by 10°.



SERIES	LETTER DIMENSION				
	H	ZA	ZB	ZC	ZD
1000 & 2000	0.00 [0]	1.125 [29]	0.312 [8]	3/16 HEX —	0.875 [22]
3000 & 4000	0.250 [6]	1.500 [38]	0.375 [10]	1/4 HEX —	1.250 [32]
5000 & 6000	0.203 [5]	1.875 [48]	0.750 [19]	1/4 HEX —	1.250 [32]
7000 & 8000	0.437 [11]	2.875 [73]	0.937 [24]	3/4 FLAT [19 mm]	1.750 [45]

Numbers in [ ] are for metric units and are in mm.

All dimensions are reference only unless specifically toleranced.

**B**

## SHOCK PADS BOTH DIRECTIONS

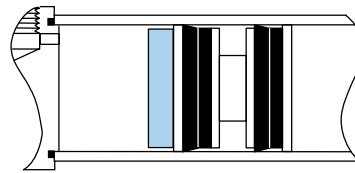
**B1**

## SHOCK PADS CLOCKWISE

**B2**

## SHOCK PADS COUNTERCLOCKWISE

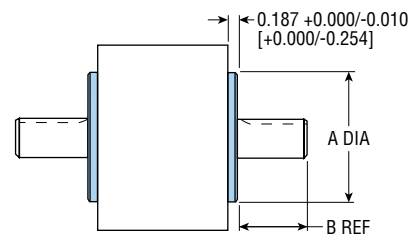
Polyurethane pads for absorption of shock and noise are available on each end of Series 1000-8000 Rotary Actuators. Reducing shock permits higher piston velocities for shorter cycle times. Reducing noise levels provides improved environment for increased productivity. Pads eliminate metal-to-metal contact between piston and end caps. **NOTE:** Air application only.


**G**

## SHAFT SEAL COVERS

Not available on Rx6x models

Fits all PHD Series 1000-8000, except when ordering hollow shafts. Isolates internal or external pressures. Maximum pressure differential is 500 psi [34.4 bar]. Furnished installed on actuator only (both sides). Covers are made of hard anodized aluminum. Not to be used as a pilot.



SERIES	LETTER DIMENSION	
	A	B
2000	1.875 [47.63]	0.688 [17.5]
4000	3.000 [76.20]	1.688 [42.9]
6000	3.250 [82.55]	1.688 [42.9]
8000	4.480 [113.79]	3.312 [84.1]

Numbers in [ ] are for metric units and are in mm.

**V**

## FLUOROELASTOMER SEALS

Fluoroelastomer seals are available to achieve seal compatibility with certain fluids. Seal compatibility should be checked with the fluid manufacturer for proper application.

**W**

## CLOSE TOLERANCE ROTATION

Not available on 3 position 3RxxR units

This option may be specified when a precise rotation is required and angle adjustment (see previous page) is not acceptable. By specifying this option, rotation will be within a tolerance of +30, -0 minutes. Standard tolerance is -0°, +10° of rotation.

**Z1**

## ELECTROLESS NICKEL PLATING

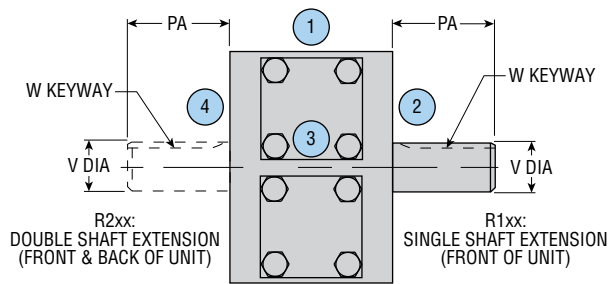
Electroless nickel plating is done on all externally exposed ferrous parts except the pinion shaft. This optional plating treatment gives an alternative method of protecting the unit from severe environments.

**NOTE:** Standard plating is Zinc and Black Oxide.

All dimensions are reference only unless specifically toleranced.



## BASIC SHAFT DIMENSIONS: R1xx and R2xx



SERIES	LETTER DIMENSION				
	PA	IMPERIAL *		METRIC **	
		V	W	V	W
1000 & 2000	0.875 [22]	0.4998/0.5003 [12.69/12.71]	1/8 x 1/16 x 0.625 [3.18 x 1.56 x 16]	—	—
3000 & 4000	1.875 [48]	0.8748/0.8753 [22.22/22.23]	3/16 x 3/32 x 1.500 [4.75 x 2.36 x 38]	—	—
5000 & 6000	1.875 [48]	1.124/1.125 [28.55/28.58]	1/4 x 1/8 x 1.500 [6.35 x 3.18 x 38]	—	—
7000 & 8000	3.500 [89]	1.749/1.750 [44.42/44.45]	3/8 x 3/16 x 3.000 [9.53 x 2.36 x 76]	—	—

### NOTES:

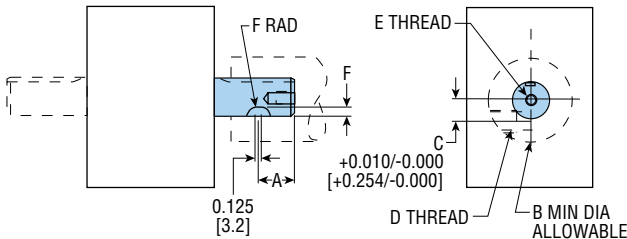
- 1) **SHAFT KEYWAY:** SHOWN AT MID-ROTATION
- 2) \*IMPERIAL SHAFT UNITS (Rx1x, Rx5x)
- 3) \*\*METRIC SHAFT UNITS (Rx6x)

## K

### PRELOADED KEYWAY SHAFT

Not available on Rx6x

Required when use with hub adaptor is desired.



SERIES	LETTER DIMENSION					
	A	B	C	D	E	F
1000 & 2000	0.375 [9.5]	1.500 [38.1]	0.250 [6.35]	3/8-24 [M10]	10-32 x 0.312 DP [M5 x 8]	0.156 [4]
3000 & 4000	0.812 [20.6]	2.000 [50.8]	0.437 [11.11]	1/2-20 [M12]	5/16-24 x 0.440 DP [M8 x 11]	0.220 [6]
5000 & 6000	0.812 [20.6]	3.000 [76.2]	0.563 [14.28]	5/8-11 [M16]	3/8-24 x 0.560 DP [M10 x 14]	0.251 [6]
7000 & 8000	1.500 [38.1]	4.000 [101.6]	0.875 [22.22]	1-8 [M24]	1/2-20 x 0.687 DP [M12 x 17.5]	0.438 [11]

**SHAFT KEYWAY:** SHOWN AT MID-ROTATION

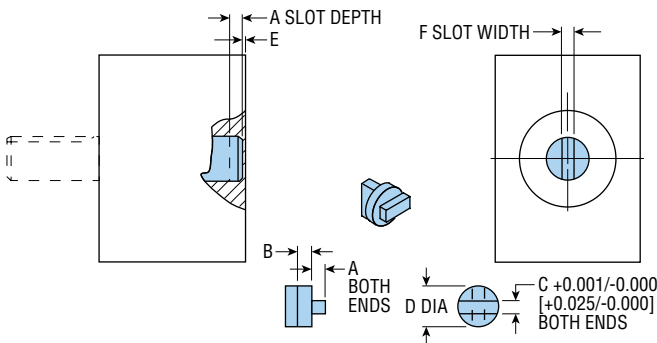
**R2xx UNITS:** WHEN ORDERING SPECIFY -K-K FOR PRELOAD ON BOTH SHAFT EXTENSIONS. PRELOAD WILL BE ON OPPOSITE SIDES OF SHAFT.

**SCREW SET:** INCLUDED WITH UNIT

## C

### CROSS KEY SHAFT

Not available on Rx6x



SERIES	LETTER DIMENSION					
	A	B	C	D	E	F
1000 & 2000	0.250 [6.4]	0.215 [5.5]	0.230 [5.8]	0.500 [12.7]	0.118 [3]	0.250 [6.3]
3000 & 4000	0.250 [6.4]	0.265 [6.7]	0.248 [6.3]	0.875 [22.2]	0.120 [3]	0.248 [6.3]
5000 & 6000	0.437 [11]	0.485 [12.3]	0.500 [12.7]	1.125 [28.6]	0.150 [3.8]	0.5002 [12.7]
7000 & 8000	0.437 [11]	0.805 [20.4]	0.875 [22.2]	1.750 [44.5]	0.245 [6.2]	0.8752 [22.2]

**SHAFT KEYWAY:** SHOWN AT MID-ROTATION

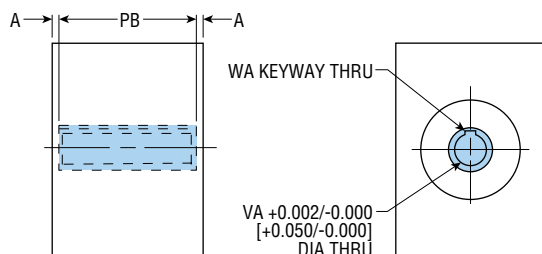
**R2xx UNITS:** WHEN ORDERING SPECIFY -C-C FOR CROSSKEY ON BOTH SHAFT EXTENSIONS

**CROSSKEY:** INCLUDED WITH UNIT

## H

### HOLLOW SHAFT

Not available on Rx6x



SERIES	LETTER DIMENSION			
	A	PB	VA	WA
1000 & 2000	0.042 [1.1]	1.920 [48.76]	0.250 [6.35]	—
3000 & 4000	0.042 [1.1]	2.917 [74.09]	0.500 [12.7]	1/8 x 1/16 [3.18 x 1.58]
5000 & 6000	0.135 [3.4]	2.730 [69.34]	0.687 [17.46]	3/16 x 3/32 [4.76 x 2.38]
7000 & 8000	0.240 [6.1]	4.520 [114.80]	1.125 [28.57]	1/4 x 1/8 [6.35 x 3.18]

**SHAFT KEYWAY:** SHOWN AT MID-ROTATION

All dimensions are reference only unless specifically tolerated.

## MAGNETIC PISTON FOR USE WITH PHD SWITCHES

See engineering data page for Hydraulic Pressure Ratings with these options. See ordering data for magnetic piston ordering information. Switches and brackets must be ordered separately. **See Switches and Sensors catalog for complete switch information.**

**E**

### MAGNETIC PISTON FOR SERIES JC1 RADIAL SENSING SWITCHES

Series 1000-8000 Rotary Actuators may be equipped with a magnetic band (specify -E) on the pistons which activates externally mounted radial sensing switches. These switches allow the interfacing of the PHD Actuators to various logic systems. This option is for use with the following switches.

PART NO.	DESCRIPTION
JC1HDP-5	PNP (Source), 5 meter cable
JC1HDP-K	PNP (Source), Quick Connect
JC1HDN-5	NPN (Sink), 5 meter cable
JC1HDN-K	NPN (Sink), Quick Connect

**NOTE:** Switches must be ordered separately.

### CORDSETS FOR SERIES JC1xDx SWITCHES

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 meter cable
63549-05	M8, 3 pin, Straight Female Connector, 5 meter cable
81284-1-010	M12, 4 pin, Straight Female Connector, 2 meter cable

**NOTE:** Cordsets are ordered separately.

**M**

### MAGNETIC PISTON FOR SERIES JC1 REED & TEACHABLE SWITCHES

The PHD Series JC1 Reed Switches may be used in situations where the (-E) switches are not applicable. Actuators are equipped with a magnetic band (specify -M) on the pistons which activates externally mounted axial sensing JC1 Reed switches. The JC1 switches may be used to signal a programmable controller, sequencer, relay, or in some cases, a valve solenoid. This option to be used with the following switches.

PART NO.	DESCRIPTION
JC1RDU-5	PNP or NPN DC Reed, 5 meter cable
JC1RDU-K	PNP or NPN DC Reed, Quick Connect
JC1ADU-K	AC Reed, Quick Connect (M12)

**NOTE:** Switches must be ordered separately.

### CORDSETS FOR SERIES JC1xDx SWITCHES

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 meter cable
63549-05	M8, 3 pin, Straight Female Connector, 5 meter cable
81284-1-010	M12, 4 pin, Straight Female Connector, 2 meter cable

**NOTE:** Cordsets are ordered separately.

The PHD Series JC1 Teachable switch provides the ability to identify two separately programmable positions with a single switch. Programmable capability means no "fine tuning." With switch located centrally to the desired sensing positions, move actuator to desired positions and program. Recommended for use only when the two sensing positions are less than 1.375" [35 mm] apart. Solid state technology provides a highly reliable switch. Includes LED indicators on control module for positioning and programming.

PART NO.	DESCRIPTION
JC1STP-2	PNP (Source), Solid State, 12-30 VDC, 2 meter cable
JC1STP-K	PNP (Source), Solid State, 12-30 VDC, Quick Connect

**NOTE:** Switches must be ordered separately.

### CORDSET FOR SERIES JC1ST SWITCHES

PART NO.	DESCRIPTION
81284-1-001	M8, 4 pin, Straight Female Connector, 5 meter cable

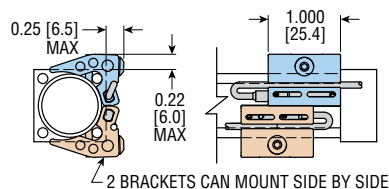
**NOTE:** Cordsets are ordered separately.

### JC1 SWITCH MOUNTING BRACKETS

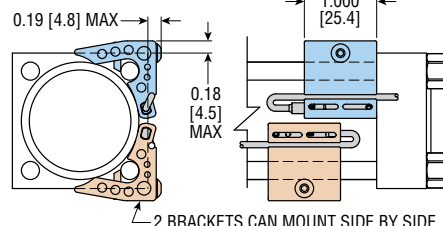
SERIES	ROTARY SECTION
1000, 2000	92100
3000, 4000	92101
5000, 6000	92101
7000, 8000	92102

**NOTE:** Brackets are ordered separately.

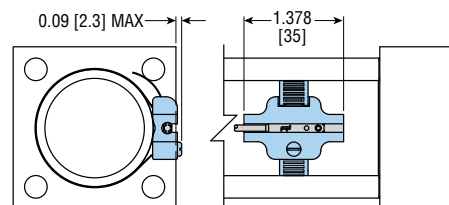
#### SWITCH BRACKET 92100



#### SWITCH BRACKET 92101



#### SWITCH BRACKET 92102



All dimensions are reference only unless specifically tolerated.

# OPTIONS: Series 1000-8000 Rotary Actuators

**L**

## COUNTERCLOCKWISE UNIDIRECTIONAL CLUTCH

Not available on Rx6x or 7/8000 units.  
Output hub will only rotate in counterclockwise direction at specific rotation ordered.

Output hub rotates in one direction only. It remains motionless while rack and pinion reverse. Clutch repeats within  $\pm 1/2^\circ$ .

Assembly features a Torrington roller clutch. Spring loaded brake shoes limit output shaft free wheeling, but are not intended for stopping external loads.

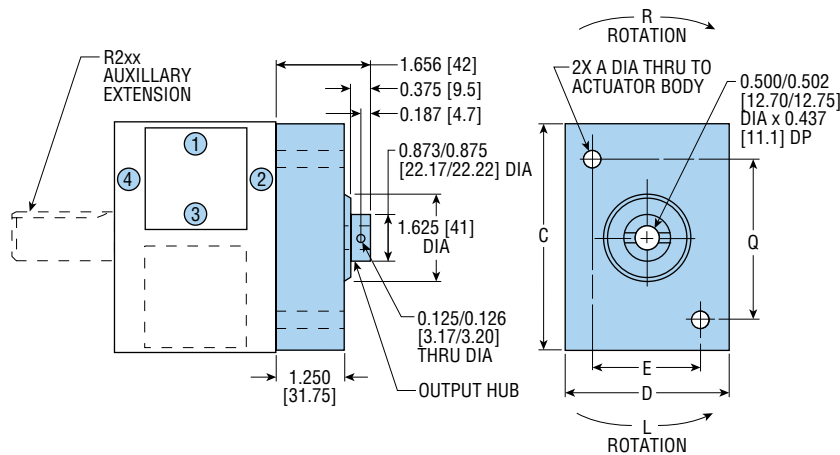
**R**

## CLOCKWISE UNIDIRECTIONAL CLUTCH

Not available on Rx6x or 7/8000 units.  
Output hub will only rotate in clockwise direction at specific rotation ordered.

**CAUTION:** Any angular error will accumulate; therefore, shot pins or similar locators are necessary on index applications. Maintain shot pin location during reversal of Rotary Actuator to guarantee that clutch shaft does not move due to external forces or slight internal friction in clutch.

Overrun clutch for intermittent unidirectional shaft output, available for Series 1000 through 6000.



SERIES	LETTER DIMENSION				
	A	C	D	E	Q
1000 & 2000	0.281 [7.2]	2.938 [74.6]	2.000 [51]	1.500 [38]	2.000 [50.8]
3000 & 4000	0.344 [8.7]	4.188 [106.3]	3.000 [76]	2.000 [50.8]	3.000 [76.2]
5000 & 6000	0.406 [10.3]	4.938 [125.4]	4.000 [102]	2.500 [63.5]	3.500 [88.9]

SERIES	LIMITING FACTORS			
	MAX. INLET PRESSURE (psi) [bar]	MAX. RADIAL OR AXIAL LOAD (lb) [N]		
1000	1052 [72]	5	[22]	
2000	526 [36]	5	[22]	
3000	372 [25]	10	[44]	
4000	186 [13]	10	[44]	
5000	174 [12]	15	[66]	
6000	87 [6]	15	[66]	

ABOVE INLET PRESSURES PROVIDE A MAXIMUM TORQUE OF 414 in-lb [46.8 Nm] ALLOWED BY THE CLUTCH

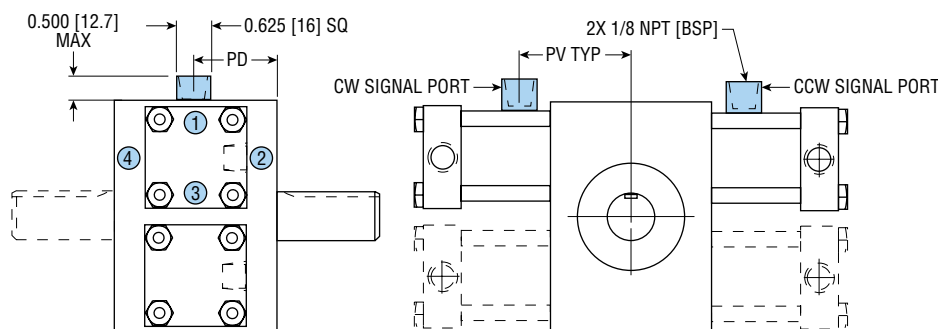
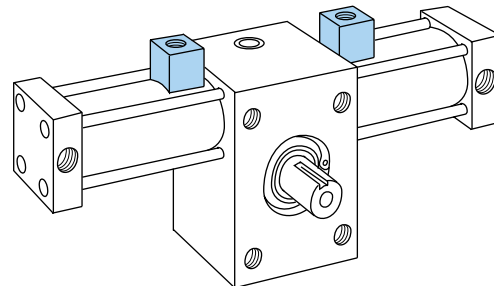
**N**

## PILOT VALVE ACTUATOR

The PVA functions as a built-in pneumatic limit switch. An air pressure signal is provided at the end-of-piston travel as the piston seal uncovers an orifice in the block. Upon reversal of piston travel, the pilot pressure is shut off and the pilot line is vented through the rotary actuator housing.

Air pilot signal is provided approximately 0.03 inch [1 mm] prior to end of piston travel (or 10 to 15 degrees prior to end of rotation). For pneumatic use only.

PVA ports are located in position 1 unless otherwise specified. Not available in conjunction with angle adjustment -A option.



SERIES	LETTER DIMENSION		
	PD	PV	
		STANDARD	W/-B
1000 & 2000	1.000 [25.4]	2.191 [55.7]	1.848 [46.9]
3000 & 4000	1.500 [38.1]	2.847 [72.3]	2.410 [61.2]
5000 & 6000	1.500 [38.1]	3.436 [87.3]	2.978 [75.6]
7000 & 8000	2.500 [63.5]	4.409 [112]	3.770 [95.8]

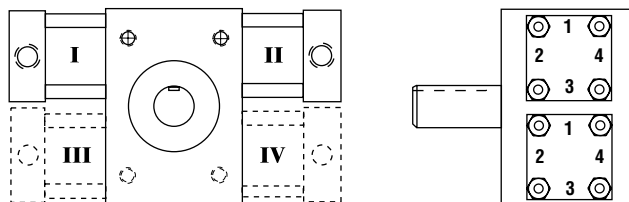
PVA UNITS WILL REQUIRE A MINIMUM ROTATION OF 45°

All dimensions are reference only unless specifically tolerated.

## PORT & PORT CONTROL® LOCATIONS

Standard port location on all Series 1000-8000 Actuators is position 2. Standard PVA (-N) Locations are tubes I and II in position 1. Standard Port Control® and cushion adjustment needles are located in end caps I and II in position 1. Other port and adjusting needle locations are available as specified.

Needles may not be located in same position as ports.



**I**

### PORT POSITION 1 TOP RACK PORT POSITION 3 BOTTOM RACK

This option positions the ports in position 1 on tubes I and II and in position 3 on tubes III and IV. This allows access to the ports on the "Top" and "Bottom" sides of the actuator.

**Q**

### PORTS POSITION 3 (N/A on 2, 4, 6, and 8000 units)

This option positions the ports in position 3 on tubes I and II.

**O**

### PORTS POSITION 1 (N/A on 2, 4, 6, and 8000 units)

This option positions the ports in position 1.

**T**

### PORTS POSITION 4

This option positions the ports in position 4. This allows access to ports from the back.

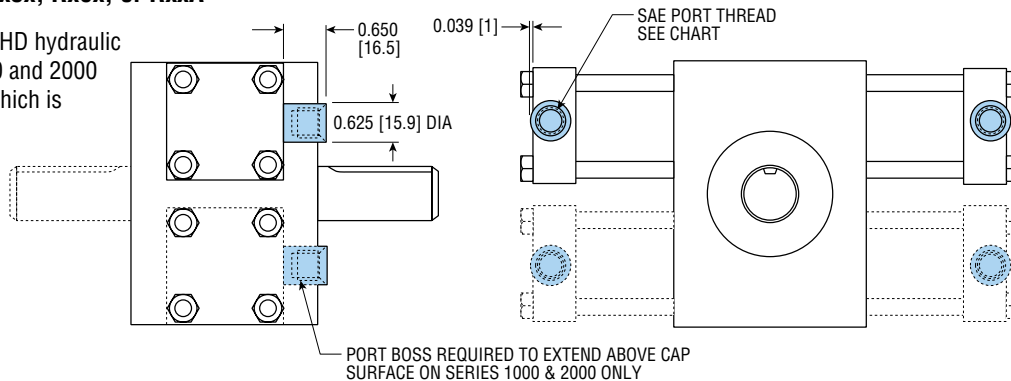
**S**

### SAE PORTS FOR HYDRAULIC FLUID Not available on Rx5x, Rx6x, or RxxA

SAE Ports are available on most PHD hydraulic Rotary Actuators. The Series 1000 and 2000 Rotary Actuators require a boss which is brazed to the caps.

Dimensions for this boss are shown. Consult PHD for optional port position or units with Port Controls.

SERIES	PORT SIZE
1000 & 2000	7/16 - 20 SAE
3000 & 4000	7/16 - 20 SAE
5000 & 6000	9/16 - 18 SAE
7000 & 8000	3/4 - 16 SAE



All dimensions are reference only unless specifically toleranced.