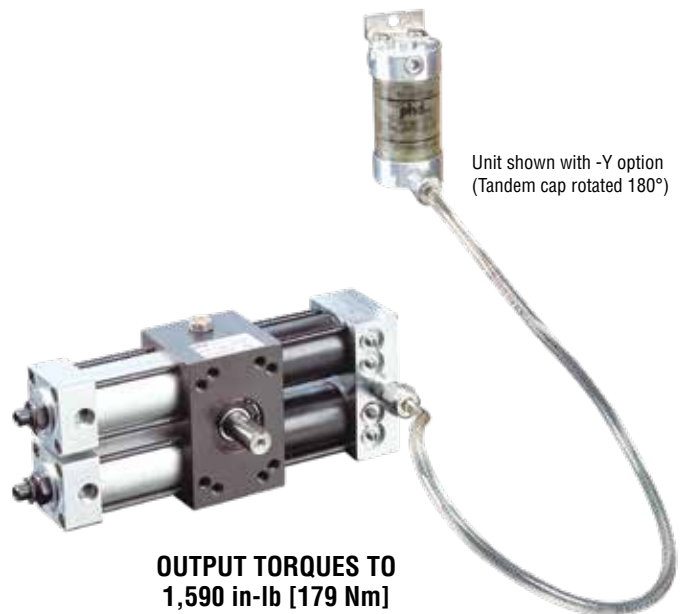


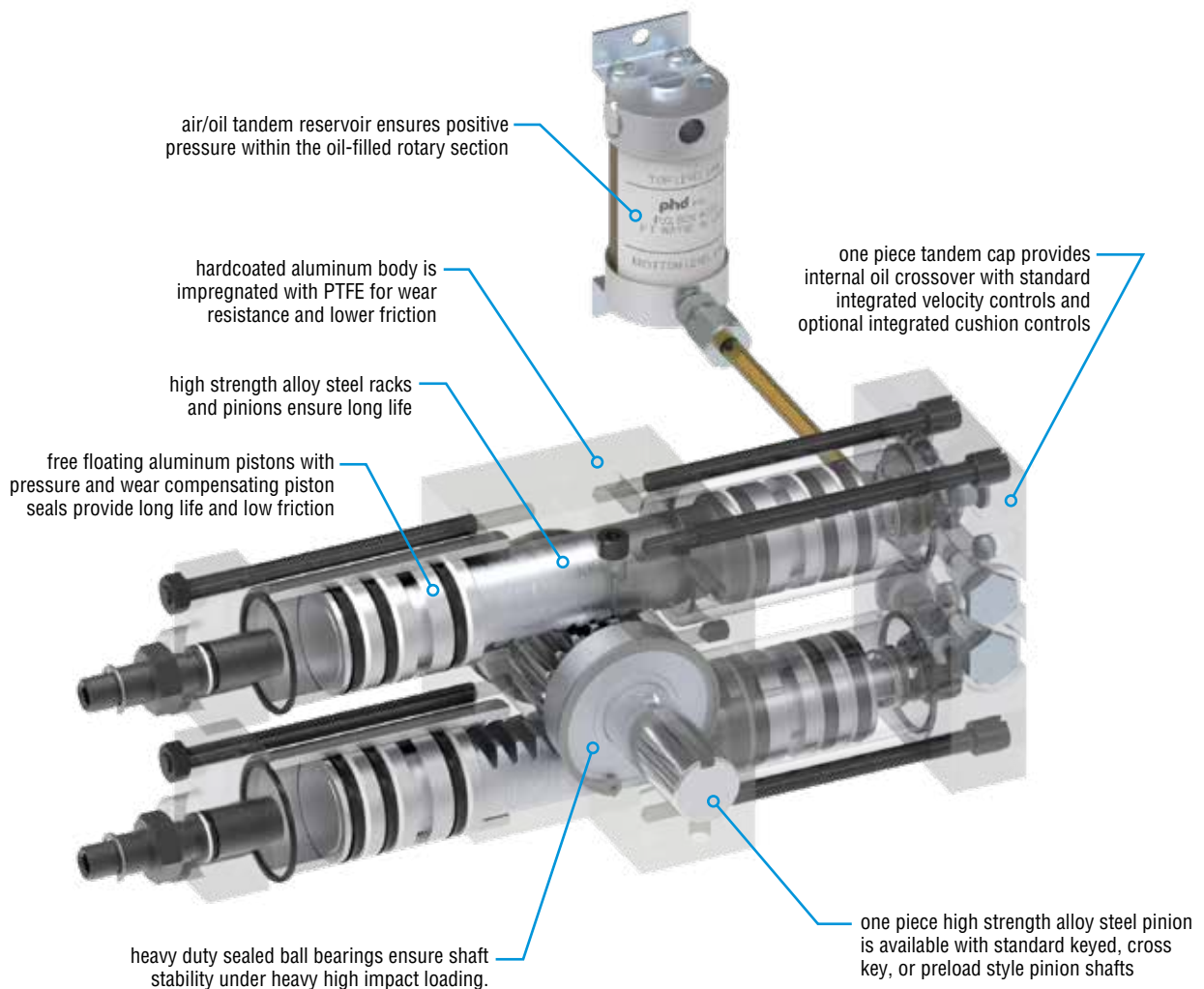
2000-8000

Major Benefits

- Smooth rotation throughout rotation
- Controlled velocity



**OUTPUT TORQUES TO
1,590 in-lb [179 Nm]**

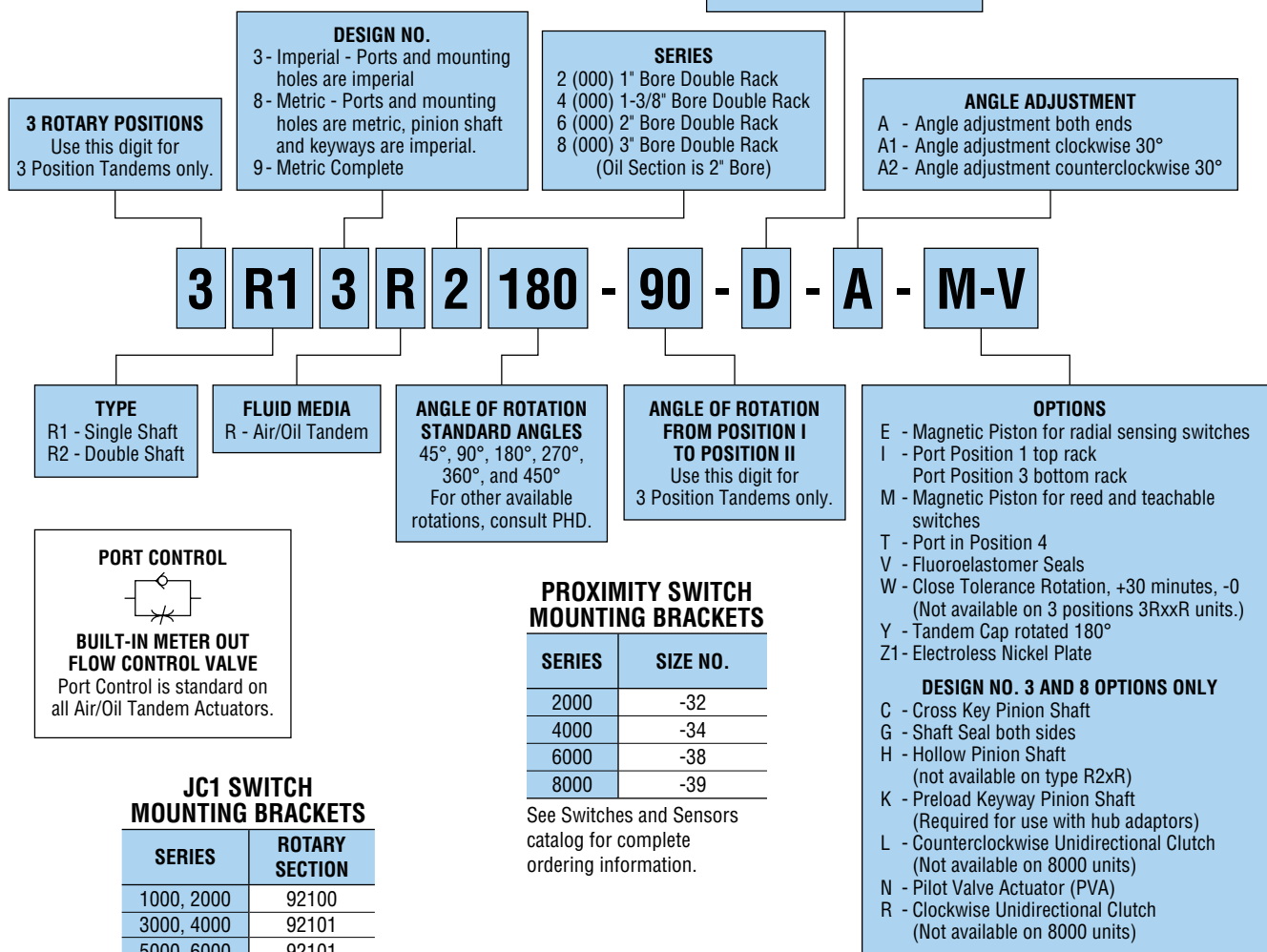


ORDERING DATA: Series 2000-8000 Rotary Actuators - Air/Oil Tandem

UNITS WITH IMPERIAL SHAFTS AND KEYWAY

TO ORDER SPECIFY:

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



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

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	TANDEM SERIES 2000-8000
PNEUMATIC OPERATING PRESSURE	20 to 150 psi [1.4 to 10 bar]
OPERATING TEMPERATURE	-20° to 180°F [-29° to 82°C]
FULL (TOTAL) ROTATIONAL TOLERANCE	Nominal rotation +10°/-0°
MID-ROTATIONAL TOLERANCES (3-POSITION UNIT)	(see chart below for mid-position tolerance)
BACKLASH AT ANY MID-ROTATION POINT AND AT END OF ROTATION WITHOUT -A OPTION	1° (2000), 0° 30' (4000, 6000), 0° 15' (8000)
BACKLASH AT END OF ROTATION WITH -A OPTION* (DOUBLE RACK)	0° (2000, 4000, 6000, 8000)
BACKLASH AT MID-POSITION LOCATION (3 POSITION UNIT)	(see chart below for mid-position backlash)
LUBRICATION	Factory lubricated for rated life
MAINTENANCE	Field repairable

NOTE: *Angle adjustment screw must be engaged or adjusted to achieve 0° backlash. (-A standard on 3-position units)

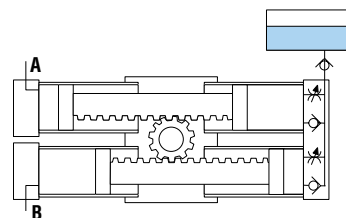
	WEIGHT				BORE DIAMETER		DISPLACEMENT VOLUME/deg		THEORETICAL TORQUE OUTPUT		MAX SPEED at 80 psi	MAX AXIAL BEARING LOAD		MAX RADIAL BEARING LOAD		DISTANCE BETWEEN SHAFT BEARINGS	
	BASE		ADDER														
SIZE	lb	kg	lb/°	kg/°	in	mm	in³	mm³	in-lb/psi	Nm/bar	deg/sec	lb	N	lb	N	in	mm
2(000)	4.5	2.0	0.0059	0.0027	1.000	25.4	0.007	0.115	0.39	0.64	366°	120	534	300	1334	1.375	34.9
4(000)	11.5	5.2	0.0161	0.0073	1.375	34.9	0.019	0.312	1.11	1.82	348°	240	1068	600	2669	2.188	55.6
6(000)	18.1	8.2	0.0244	0.0111	2.000	50.8	0.041	0.672	2.36	3.87	216°	370	1646	925	4114	2.235	56.8
8(000)	41.0	18.6	0.0581	0.0264	3.000	76.2	0.185	3.032	10.60	17.37	156°	800	3558	2000	8896	3.750	95.3

OPERATING PRINCIPLE

This feature is available on Series 2000, 4000, 6000, and 8000. One end functions as a control member only, reducing the effective output torque to match 1000, 3000, 5000, and 7000 respectively.

The illustration shows a tandem actuator with built-in Port Controls®, crossover manifold and oil reservoir. The latter serves as an accumulator to compensate for oil volume changes due to temperature variation.

NOTE: The reservoir should have 20 psi [1.4 bar] pressure at all times to ensure the system remains purged.



3-POSITION MID-POSITION TOLERANCES & BACKLASH

SERIES	TOLERANCE	BACKLASH
2000	±1°	±1° 30'
4000 & 6000	±0° 30'	±1° 15'
8000	±0° 15'	1°

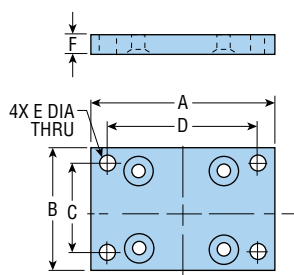
WEIGHT TABLE - SINGLE SHAFT EXTENSION ACTUATORS

SERIES	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
2000	4.7	2.13	5	2.27	5.5	2.49	6.1	2.77	6.6	2.99	7.1	3.22	0.53	0.24	0.06	0.03
4000	12.2	5.53	12.9	5.85	14.4	6.53	15.8	7.17	17.3	7.85	18.7	8.48	1.45	0.66	0.38	0.17
6000	19.2	8.71	20.3	9.21	22.5	10.21	24.7	11.20	26.9	12.20	29.1	13.20	2.20	1.00	0.5	0.23
8000	44.7	20.28	47.3	21.45	52.5	23.81	57.8	26.22	63	28.58	68.2	30.93	5.23	2.37	2.4	1.09

CAD & Sizing Assistance

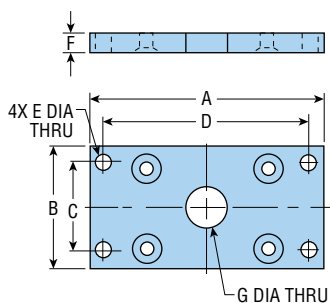
Use PHD's free online Product Sizing and CAD Configurator at phdinc.com/myphd

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
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
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
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

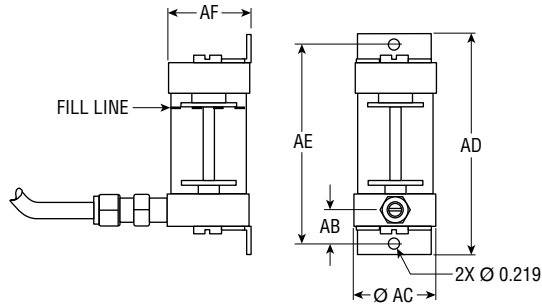
SERIES	KIT NO.		LETTER DIMENSION													
			A		B		C		D		E		F		G	
	Imperial	Metric	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
2000	13759	14316	4.250	108	2.000	51	1.375	34.9	3.625	92.1	0.281	7.1	0.250	6.3	0.758	19.2
4000	13760	14317	5.750	146	3.000	76	2.125	54.0	5.125	130.2	0.406	10.3	0.437	11.1	1.070	27.2
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
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 toleranced.

DIMENSIONS: Series 2000-8000 Rotary Actuators - Air/Oil Tandem

IMPERIAL

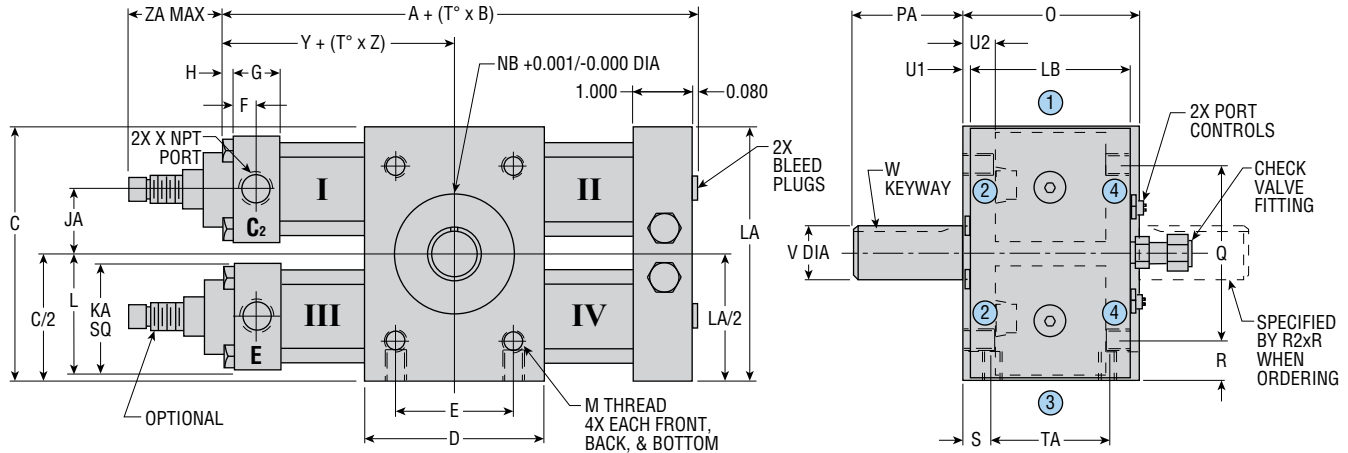
TANK DIMENSIONS



RESERVOIR PART NO.	AB	AC	AD	AE	AF
13459-02-2	0.647	2.500	5.500	5.125	2.531
13459-03-2	0.545	1.500	3.875	3.500	1.531

RESERVOIR ASSEMBLY IS INCLUDED WITH UNIT.
SERIES 2000, 4000, & 6000 UNITS USE PART NO. 13459-03-2.
SERIES 8000 UNITS USE PART NO. 13459-02-2.

NOTE: THE RESERVOIR SHOULD HAVE 20 psi PRESSURE AT ALL TIMES TO ENSURE THE SYSTEM REMAINS PURGED.



CAP STYLE	SERIES	LETTER DIMENSION														NB
		A	B	C	D	E	F	G	H	JA	KA	L	LA	LB	M	
PLAIN	2000	6.215	0.0174	3.000	2.000	1.500	0.250	0.500	0.00	0.750	1.375	1.437	2.875	1.750	1/4-20 x 0.312 DP	1.125 x 0.056 DP
-A	2000	6.465	0.0174	3.000	2.000	1.500	0.500	0.750	0.00	0.750	1.375	1.437	2.875	1.750	1/4-20 x 0.312 DP	1.125 x 0.056 DP
BOTH	4000	7.986	0.026	4.250	3.000	2.000	0.344	0.688	0.250	1.156	1.875	2.094	4.187	2.750	5/16-18 x 0.500 DP	2.000 x 0.039 DP
BOTH	6000	9.190	0.026	5.000	4.000	2.500	0.375	0.750	0.203	1.156	2.250	2.281	4.687	2.750	3/8-16 x 0.625 DP	2.1654 x 0.052 DP
BOTH	8000	11.128	0.052	8.000	5.000	3.000	0.469	1.062	0.437	1.875	3.500	3.625	6.125	3.000	3/4-10 x 1.250 DP	3.3465 x 0.120 DP

CAP STYLE	SERIES	LETTER DIMENSION													
		O	PA	Q	R	S	TA	U1	U2	V	W	X	Y	Z	ZA
PLAIN	2000	2.000	0.875	2.000	0.500	0.250	1.500	0.125	0.312	0.4998/0.5003	1/8 x 1/16 x 0.625	1/8	2.849	0.0087	0
-A	2000	2.000	0.875	2.000	0.500	0.250	1.500	0.125	0.312	0.4998/0.5003	1/8 x 1/16 x 0.625	1/8	3.099	0.0087	1.125
BOTH	4000	3.000	1.875	3.000	0.625	0.500	2.000	0.125	0.562	0.8748/0.8753	3/16 x 3/32 x 1.500	1/4	3.953	0.013	1.500
BOTH	6000	3.000	1.875	3.500	0.750	0.500	2.000	0.125	0.375	1.124/1.125	1/4 x 1/8 x 1.500	1/4	4.563	0.013	1.875
BOTH	8000	5.000	3.500	5.000	1.500	1.250	2.500	1.000	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

SERIES	LETTER OPTION REFERENCED BY TUBE NUMBER								PORT & NEEDLE LOCATIONS REFERENCED BY CIRCLED NUMBERS							
	-A				-D				-P				STANDARD			
	-A1 -A2 -D1 -D2 -P1 -P2				-M -E				PORT -P -D				-T -I			
	III	I	II	IV	Standard	I & III	I & III		2	4	4	4	4	4	1, 3	4

SHAFT KEYWAY: SHOWN AT MID-ROTATION

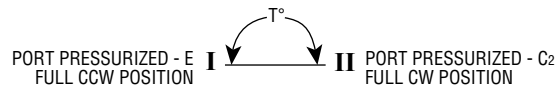
PORT POSITION: INDICATED BY CIRCLED NUMBERS

MTG. HOLES: CENTERED ON CENTERLINE OF ACTUATOR BODY

QUICK REFERENCE FOR: A + (T° x B)

SERIES	DEGREE OF ROTATION					
	45	90	180	270	360	450
*2000	6.998	7.781	9.347	10.913	12.479	14.045
4000	9.156	10.326	12.666	15.006	17.346	19.686
6000	10.360	11.530	13.870	16.210	18.550	20.890
8000	13.468	15.808	20.488	25.168	29.848	34.528

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

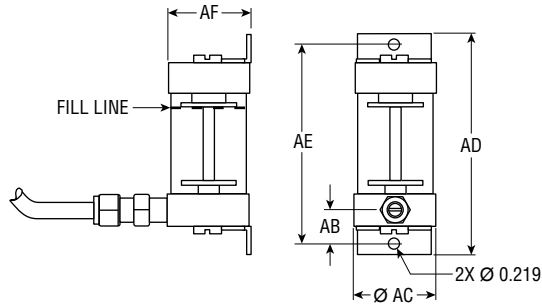


All dimensions are reference only unless specifically tolerated.

DIMENSIONS: Series 2000-8000 Rotary Actuators - Air/Oil Tandem

METRIC

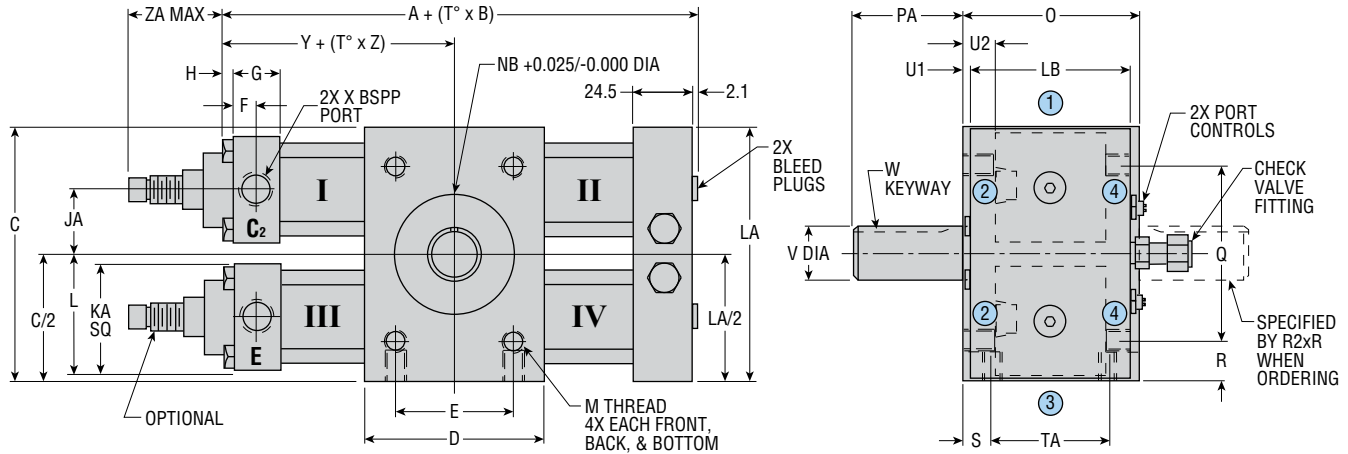
TANK DIMENSIONS



RESERVOIR PART NO.	AB	AC	AD	AE	AF
13459-02-2	16.4	63.5	139.7	130.2	64.3
13459-03-2	13.8	38.1	98.4	88.9	38.9

RESERVOIR ASSEMBLY IS INCLUDED WITH UNIT.
SERIES 2000, 4000, & 6000 UNITS USE PART NO. 68397-03-2.
SERIES 8000 UNITS USE PART NO. 68397-02-2.

NOTE: THE RESERVOIR SHOULD HAVE 1.4 bar PRESSURE AT ALL TIMES TO ENSURE THE SYSTEM REMAINS PURGED.



CAP STYLE	SERIES	LETTER DIMENSION																	
		A	B	C	D	E	F	G	H	JA	KA	L	LA	LB	M	NB	O	PA	Q
PLAIN	2000	158	0.44	76	51	38.1	6	13	0	19	35	36	73	44	M6 x 1.0 x 8 DP	28.58 x 1.4 DP	50.8	22	50.8
-A	2000	165	0.44	76	51	38.1	13	19	0	19	35	36	73	44	M6 x 1.0 x 8 DP	28.58 x 1.4 DP	50.8	22	50.8
BOTH	4000	203	0.66	108	76	50.8	9	17	6	29	48	53	106	70	M8 x 1.25 x 13 DP	50.80 x 1.0 DP	76.2	48	76.2
BOTH	6000	233	0.66	127	102	63.5	10	19	5	29	57	58	119	70	M10 x 1.5 x 16 DP	55.00 x 1.3 DP	76.2	48	88.9
BOTH	8000	283	1.32	203	127	76.2	12	27	11	48	89	92	156	76	M20 x 2.5 x 32 DP	85.00 x 3.0 DP	127.0	89	127

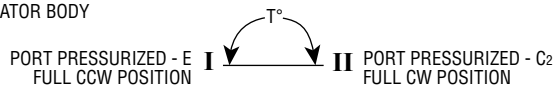
CAP STYLE	SERIES	LETTER DIMENSION													
		R	S	TA	IMPERIAL SHAFTS*		METRIC SHAFTS*		U1	U2	X	Y	Z	ZA	
					V	W	V	W							
PLAIN	2000	13	6	38.1	12.69/12.71	3.15 x 1.59 x 16	12.00/11.97	4 x 2.5 x 15	3	8	1/8	72	0.22	0	
-A	2000	13	6	38.1	12.69/12.71	3.15 x 1.59 x 16	12.00/11.97	4 x 2.5 x 15	3	8	1/8	78	0.22	29	
BOTH	4000	16	13	50.8	22.22/22.23	4.75 x 2.36 x 38	22.00/21.96	6 x 3.5 x 32	3	14	1/4	100	0.33	38	
BOTH	6000	19	13	50.8	28.55/28.58	6.35 x 3.18 x 38	28.00/27.96	8 x 5 x 40	3	10	1/4	116	0.33	48	
BOTH	8000	38	32	63.5	44.42/44.45	9.53 x 2.36 x 78	44.00/43.96	12 x 5 x 56	25	19	3/8	154	0.66	73	

*BOTH IMPERIAL AND METRIC SHAFT OPTIONS AVAILABLE ON METRIC BODY (IMPERIAL SHAFT = DESIGN 8, METRIC SHAFT = DESIGN 9).
NUMBERS FOR METRIC UNITS AND ARE IN mm.

OPTION LOCATION REFERENCE

SERIES	LETTER OPTION REFERENCED BY TUBE NUMBER							PORT & NEEDLE LOCATIONS REFERENCED BY CIRCLED NUMBERS							
								STANDARD				-T			
	-A1	-A2	-D1	-D2	-P1	-P2	-M	PORT	-P	-D	PORT	-P	-D	PORT	-P
R1xR & R2xR	III	I	II	IV	Standard		I & III	2	4	4	4	4	4	1, 3	4

SHAFT KEYWAY: SHOWN AT MID-ROTATION
PORT POSITION: INDICATED BY CIRCLED NUMBERS
MTG. HOLES: CENTERED ON CENTERLINE OF ACTUATOR BODY



All dimensions are reference only unless specifically tolerated.

QUICK REFERENCE FOR: A + (T° x B)

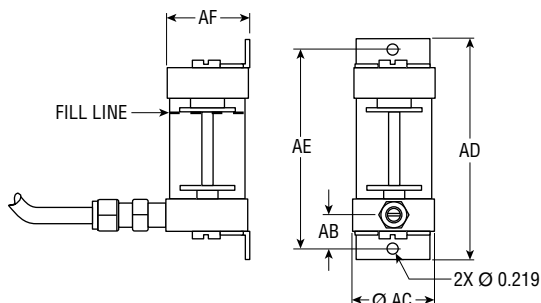
SERIES	DEGREE OF ROTATION					
	45	90	180	270	360	450
*2000	177.7	197.6	237.4	277.2	317.0	356.7
4000	232.6	262.2	321.7	381.2	440.6	500.0
6000	263.1	292.9	352.3	411.7	471.2	530.9
8000	342.1	401.5	520.4	639.3	758.1	877.0

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

DIMENSIONS: Series 2000-8000 Rotary Actuators - 3-Position Air/Oil Tandem

IMPERIAL

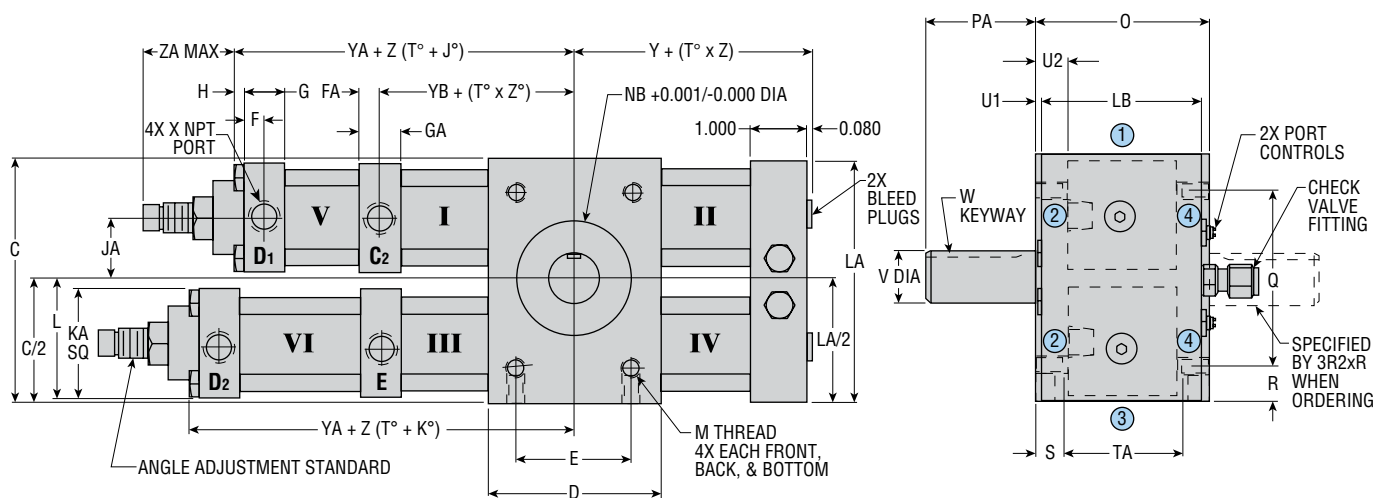
TANK DIMENSIONS



RESERVOIR PART NO.	AB	AC	AD	AE	AF
13459-02-2	0.647	2.500	5.500	5.125	2.531
13459-03-2	0.545	1.500	3.875	3.500	1.531

RESERVOIR ASSEMBLY IS INCLUDED WITH UNIT.
SERIES 2000, 4000, & 6000 UNITS USE PART NO. 13459-03-2.
SERIES 8000 UNITS USE PART NO. 13459-02-2.

NOTE: THE RESERVOIR SHOULD HAVE 20 psi PRESSURE AT ALL TIMES TO ENSURE THE SYSTEM REMAINS PURGED.



SERIES	LETTER DIMENSION															
	C	D	E	F	FA	G	GA	H	JA	KA	L	LA	LB	M	NB	O
2000	3.000	2.000	1.500	0.500	0.500	0.750	0.750	0.00	0.750	1.375	1.437	2.875	1.750	1/4-20 x 0.312 DP	1.125 x 0.056 DP	2.000
4000	4.250	3.000	2.000	0.344	0.375	0.688	0.719	0.250	1.156	1.875	2.094	4.187	2.750	5/16-18 x 0.500 DP	2.000 x 0.039 DP	3.000
6000	5.000	4.000	2.500	0.375	0.344	0.750	0.719	0.203	1.156	2.250	2.281	4.687	2.750	3/8-16 x 0.625 DP	2.1654 x 0.052 DP	3.000
8000	8.000	5.000	3.000	0.469	0.469	1.062	1.062	0.437	1.875	3.500	3.625	6.125	3.000	3/4-10 x 1.250 DP	3.3465 x 0.120 DP	5.000

SERIES	LETTER DIMENSION															
	PA	Q	R	S	TA	U1	U2	V	W	X	Y	YA	YB	Z	ZA	
2000	0.875	2.000	0.500	0.250	1.500	0.125	0.312	0.4998/0.5003	1/8 x 1/16 x 0.625	1/8	3.366	5.983	2.599	0.0087	1.125	
4000	1.875	3.000	0.625	0.500	2.000	0.125	0.562	0.8748/0.8753	3/16 x 3/32 x 1.500	1/4	4.033	6.721	3.360	0.013	1.500	
6000	1.875	3.500	0.750	0.500	2.000	0.125	0.375	1.124/1.125	1/4 x 1/8 x 1.500	1/4	4.627	7.325	3.980	0.013	1.875	
8000	3.500	5.000	1.500	1.250	2.500	1.000	0.750	1.749/1.750	3/8 x 3/16 x 3.000	3/8	5.048	9.865	5.236	0.026	2.875	

OPTION LOCATION REFERENCE

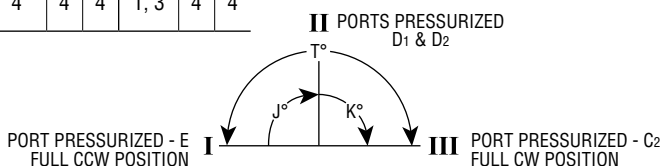
SERIES	LETTER OPTION REFERENCED BY TUBE NUMBER						PORT & NEEDLE LOCATIONS REFERENCED BY CIRCLED NUMBERS									
	-A	-D		-P		-M	-E	STANDARD			-T			-I		
		-D1	-D2	-P1	-P2			PORT	-P	-D	PORT	-P	-D	PORT	-P	-D
3R1xR & 3R2xR	Standard	II	IV	Standard	I & III V & VI	I & III V & VI	2	4	4	4	4	4	1, 3	4	4	

SHAFT KEYWAY: SHOWN AT MID-ROTATION

PORT POSITIONS: INDICATED BY CIRCLED NUMBERS

MTG. HOLES: CENTERED ON CENTERLINE OF ACTUATOR BODY

PLUMBING SCHEMATIC: LOCATED IN ENGINEERING DATA SECTION

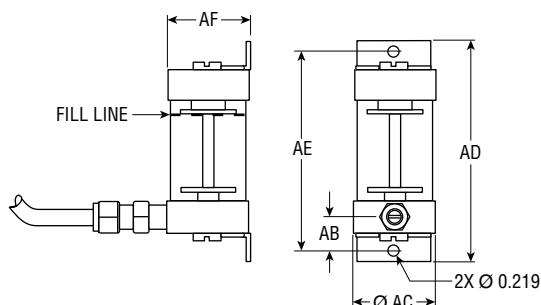


All dimensions are reference only unless specifically tolerated.

DIMENSIONS: Series 2000-8000 Rotary Actuators - 3-Position Air/Oil Tandem

METRIC

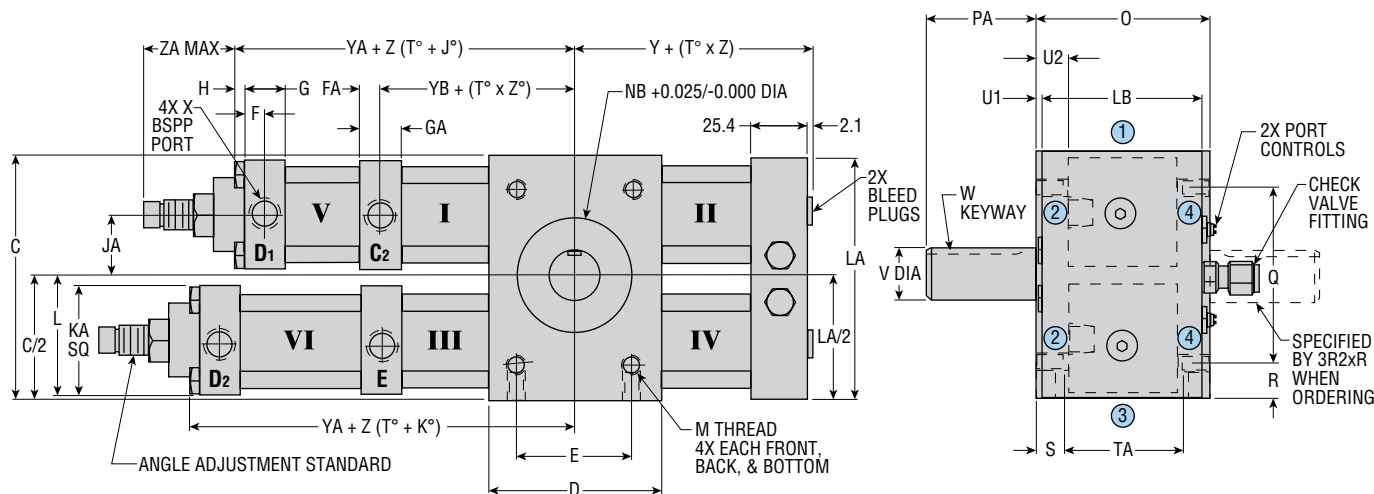
TANK DIMENSIONS



RESERVOIR PART NO.	AB	AC	AD	AE	AF
13459-02-2	16.4	63.5	139.7	130.2	64.3
13459-03-2	13.8	38.1	98.4	88.9	38.9

RESERVOIR ASSEMBLY IS INCLUDED WITH UNIT.
SERIES 2000, 4000, & 6000 UNITS USE PART NO. 68397-03-2.
SERIES 8000 UNITS USE PART NO. 68397-02-2.

NOTE: THE RESERVOIR SHOULD HAVE 1.4 bar PRESSURE AT ALL TIMES TO ENSURE THE SYSTEM REMAINS PURGED.



SERIES	LETTER DIMENSION																	
	C	D	E	F	FA	G	GA	H	JA	KA	L	LA	LB	M	NB	O	PA	Q
2000	76	51	38.1	13	13	19	19	0	19	35	36	73.0	44.5	M6 x 1.0 x 8 DP	28.58 x 1.4 DP	50.8	22	50.8
4000	108	76	50.8	9	10	17	18	6	29	48	53	106.4	69.9	M8 x 1.25 x 13 DP	50.80 x 1.0 DP	76.2	48	76.2
6000	127	102	63.5	10	9	19	18	5	29	57	58	119.1	69.9	M10 x 1.5 x 16 DP	55.00 x 1.3 DP	76.2	48	88.9
8000	203	127	76.2	12	12	27	27	11	48	89	92	155.6	76.2	M20 x 2.5 x 32 DP	85.00 x 3.0 DP	127.0	89	127.0

SERIES	LETTER DIMENSION														
	R	S	TA	U1	U2	IMPERIAL SHAFTS*		METRIC SHAFTS*		X	Y	YA	YB	Z	ZA
						V	W	V	W						
2000	13	6	38.1	3	8	12.69/12.71	3.15 x 1.59 x 16	12.00/11.97	4 x 2.5 x 15	1/8	85	152	66	0.22	29
4000	16	13	50.8	3	14	22.22/22.23	4.75 x 2.36 x 38	22.00/21.96	6 x 3.5 x 32	1/4	102	171	85	0.33	38
6000	19	13	50.8	3	10	28.55/28.58	6.35 x 3.18 x 38	28.00/27.96	8 x 5 x 40	1/4	118	186	101	0.33	48
8000	38	32	63.5	25	19	44.42/44.45	9.53 x 2.36 x 78	44.00/43.96	12 x 5 x 56	3/8	128	251	133	0.66	73

*BOTH IMPERIAL AND METRIC SHAFT OPTIONS AVAILABLE ON METRIC BODY (IMPERIAL SHAFT = DESIGN 8, METRIC SHAFT = DESIGN 9).
NUMBERS FOR METRIC UNITS AND ARE IN mm.

OPTION LOCATION REFERENCE

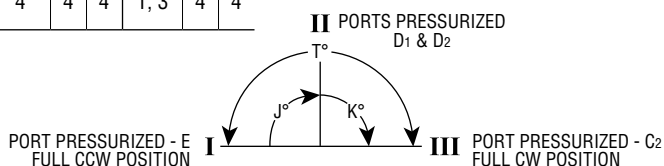
SERIES	LETTER OPTION REFERENCED BY TUBE NUMBER						PORT & NEEDLE LOCATIONS REFERENCED BY CIRCLED NUMBERS									
	-A	-D		-P		-M	-E	STANDARD			-T			-I		
		-D1	-D2	-P1	-P2			PORT	-P	-D	PORT	-P	-D	PORT	-P	-D
3R1xR & 3R2xR	Standard	II	IV	Standard	I & III V & VI	I & III V & VI	2	4	4	4	4	4	1, 3	4	4	

SHAFT KEYWAY: SHOWN AT MID-ROTATION

PORT POSITIONS: INDICATED BY CIRCLED NUMBERS

MTG. HOLES: CENTERED ON CENTERLINE OF ACTUATOR BODY

PLUMBING SCHEMATIC: LOCATED IN ENGINEERING DATA SECTION



All dimensions are reference only unless specifically tolerated.

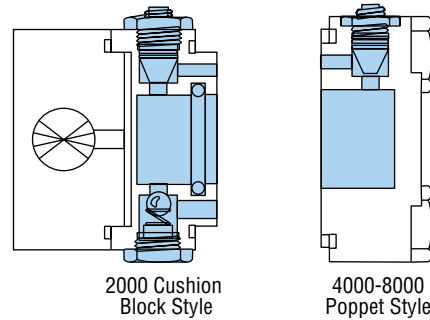
D ADJUSTABLE CUSHIONS BOTH DIRECTIONS

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, except on the 8000 Tandem which has 20° of cushion length.

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



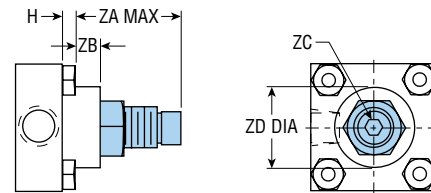
A ANGLE ADJUSTMENT BOTH DIRECTIONS (Standard on 3-position units)

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°.

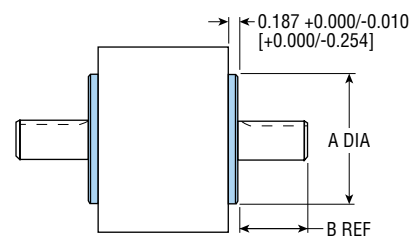


SERIES	LETTER DIMENSION				
	H	ZA	ZB	ZC	ZD
2000	0.00 [0]	1.125 [29]	0.312 [8]	3/16 HEX —	0.875 [22]
4000	0.250 [6]	1.500 [38]	0.375 [10]	1/4 HEX —	1.250 [32]
6000	0.203 [5]	1.875 [48]	0.750 [19]	1/4 HEX —	1.250 [32]
8000	0.437 [11]	2.875 [73]	0.937 [24]	3/4 FLAT [19 mm]	1.750 [45]

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

G SHAFT SEAL COVERS Not available on Rx9R

Fits all PHD Series 2000-8000, 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.

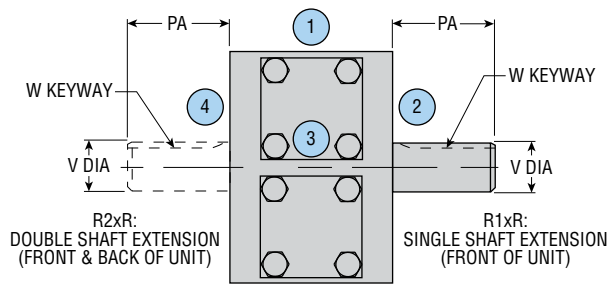


SERIES	LETTER DIMENSION	
	A	B
2000	1.875 [47.63]	0.688 [17.5]
4000	3.000 [76.20]	1.688 [42.9]
6000	3.250 [82.55]	1.688 [42.9]
8000	4.480 [113.79]	3.312 [84.1]

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

All dimensions are reference only unless specifically toleranced.

BASIC SHAFT DIMENSIONS: R1xR and R2xR



SERIES	LETTER DIMENSION				
	PA	IMPERIAL *		METRIC **	
		V	W	V	W
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]	—	—
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]	—	—
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]	—	—
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:

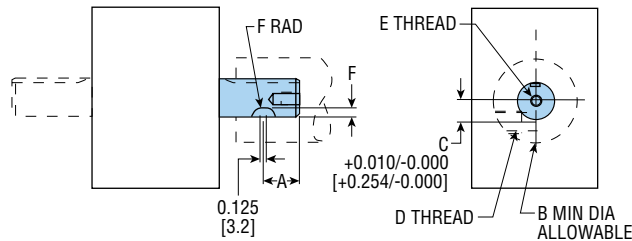
- 1) SHAFT KEYWAY: SHOWN AT MID-ROTATION
- 2) *IMPERIAL SHAFT UNITS (Rx3R, Rx8R)
- 3) **METRIC SHAFT UNITS (Rx9R)

K

PRELOADED KEYWAY SHAFT

Not available on Rx9R

Required when use of hub adaptor is desired.



SERIES	LETTER DIMENSION					
	A	B	C	D	E	F
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]
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]
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]
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

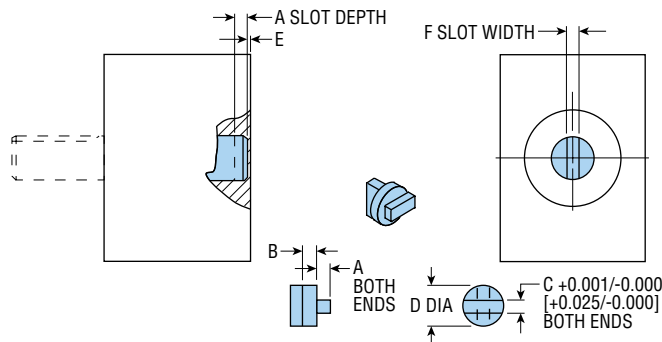
R2xx UNITS: WHEN ORDERING SPECIFY -K-K FOR PRELOAD ON BOTH SHAFT EXTENSIONS. PRELOAD WILL BE ON OPPOSITE SIDES OF SHAFT.

SCREW SET: INCLUDED WITH UNIT

C

CROSS KEY SHAFT

Not available on Rx9R



SERIES	LETTER DIMENSION					
	A	B	C	D	E	F
2000	0.250 [6.4]	0.215 [5.5]	0.230 [5.8]	0.500 [12.7]	0.118 [3]	0.250 [6.3]
4000	0.250 [6.4]	0.265 [6.7]	0.248 [6.3]	0.875 [22.2]	0.120 [3]	0.248 [6.3]
6000	0.437 [11]	0.485 [12.3]	0.500 [12.7]	1.125 [28.6]	0.150 [3.8]	0.5002 [12.7]
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

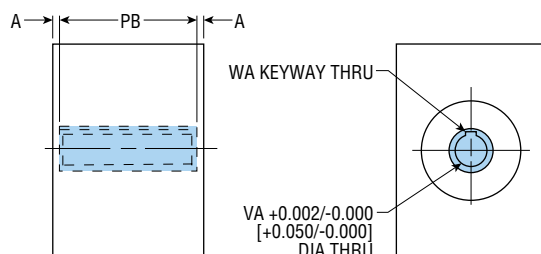
R2xx UNITS: WHEN ORDERING SPECIFY -C-C FOR CROSSKEY ON BOTH SHAFT EXTENSIONS

CROSSKEY: INCLUDED WITH UNIT

H

HOLLOW SHAFT

Not available on Rx9R



SERIES	LETTER DIMENSION			
	A	PB	VA	WA
2000	0.042 [1.1]	1.920 [48.76]	0.250 [6.35]	—
4000	0.042 [1.1]	2.917 [74.09]	0.500 [12.7]	1/8 x 1/16 [3.18 x 1.58]
6000	0.135 [3.4]	2.730 [69.34]	0.687 [17.46]	3/16 x 3/32 [4.76 x 2.38]
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

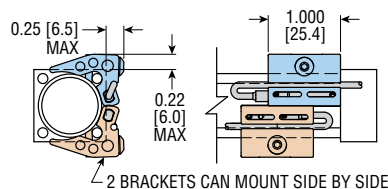
NOTE: Cordsets are ordered separately.

JC1 SWITCH MOUNTING BRACKETS

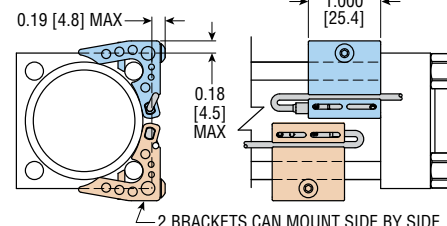
SERIES	ROTARY SECTION
1000, 2000	92100
3000, 4000	92101
5000, 6000	92101
7000, 8000	92102

NOTE: Brackets are ordered separately.

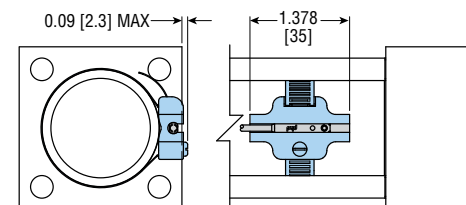
SWITCH BRACKET 92100



SWITCH BRACKET 92101



SWITCH BRACKET 92102



All dimensions are reference only unless specifically tolerated.

OPTIONS: Series 2000-8000 Rotary Actuators - Air/Oil Tandem

L

COUNTERCLOCKWISE UNIDIRECTIONAL CLUTCH

Not available on Rx9R or 7/8000

Output hub will only rotate in counterclockwise direction at specific rotation ordered.

R

CLOCKWISE UNIDIRECTIONAL CLUTCH

Not available on Rx9R or 7/8000

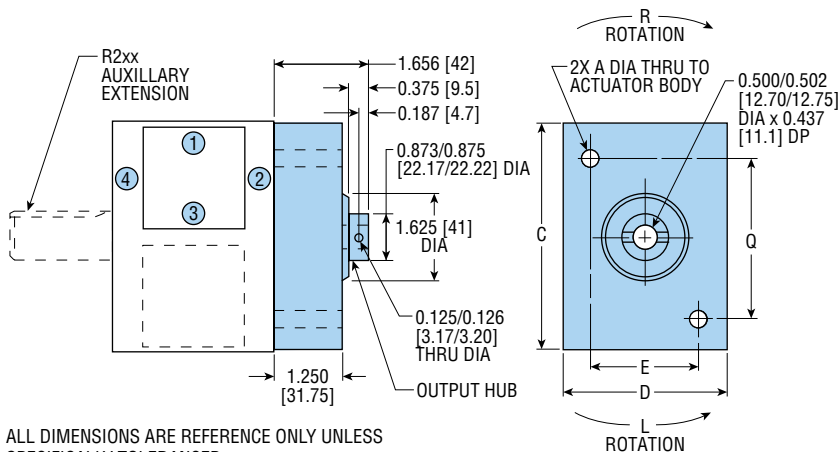
Output hub will only rotate in clockwise direction at specific rotation ordered.

Overrun clutch for intermittent unidirectional shaft output, available for Series 2000 through 6000.

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.

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.



ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED.

SERIES	LETTER DIMENSION				
	A	C	D	E	Q
2000	0.281 [7.2]	2.938 [74.6]	2.000 [51]	1.500 [38]	2.000 [50.8]
4000	0.344 [8.7]	4.188 [106.3]	3.000 [76]	2.000 [50.8]	3.000 [76.2]
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]
2000	526 [36]	5 [22]
4000	186 [13]	10 [44]
6000	87 [6]	15 [66]

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

PORT & PORT CONTROL® LOCATIONS

Standard port location on all Series 2000-8000 Actuators is position 2. Standard Port Control® and cushion adjustment needles are located in position 4.

I

PORT POSITION 1 TOP RACK PORT POSITION 3 BOTTOM RACK

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

T

PORT POSITION 4

This option positions the ports in position 4 on tubes I and III.

V

FLUROELASTOMER SEALS

W

CLOSE TOLERANCE ROTATION

Not available on 3 position 3RxxR units

Z1

ELECTROLESS NICKEL PLATING

Y

TANDEM CAP ROTATED 180°

This option rotates the cap of an Air/Oil Tandem Rotary Actuator 180°. This places the Port Control® (and Cushion) needles and the Tandem fitting in position 2. Standard position for these is position 4.

