BRAKE SIZING & SELECTION WORKSHEET INSTRUCTIONS

(After completion, you may wish to photocopy this page and fax it to us at (603) 332-3758

1. To select the proper brake size and number of cylinders required for a particular application, first complete the application data (at right) and perform the calculations below using the formulas given. Record your results in the spaces provided.

2. You will need to select a brake that has a torque capacity greater than that required by your application. Also, the brake you select must not exceed its maximum heat dissipation capability at the cooling speed of your application. Follow steps below.

3. Refer to the **Heat Dissipation vs. RPM** chart on the next page. Identify the brake series which have curves marked above the intersection of Heat (HP) dissipation capacity [calculation #3] versus Cooling Speed [calculation #6].

4. Refer to the **Torque Capacity** chart on the next page to identify brake size and pad options that have torque capacities which are slightly greater than your Torque(Max) [calculation #1].

5. From the **Torque Capacity** chart select a brake that has adequate torque capacity and heat dissipation for your Torque (Max) and Cooling Speed.

6. Check to ensure that the brake chosen has a greater torque capacity than your calculated E-stop torque [calculation #7]. It may be necessary to use a brake with higher torque capacity and operate some cylinders from a separate air supply to provide E-stop torque.

If your application has a low torque limit requirement, please check the **Performance Review** chart on page 16 to ensure the brake you've chosen has a minimum achievable torque below your requirement.

Note: If you are faced with several acceptable options, keep in mind that smaller brakes are less expensive, but a larger brake has greater heat dissipation at a given speed.

7. Refer to min. and max. brake shaft dimensions for the brake you have chosen (listed on each Series dimension page) to determine the acceptable bore dimension range. Using the **Standard Hub Bore and Key Dimensions** table and diagram, select a bore size (See Note). Specify keyway width only if non-standard is required.

8. **To Order:** Write the brake size, number of cylinders, bore diameter, key size, and options in the space provided below. Refer to the **Torque Capacity** chart for choice of friction pads. Turn to page 20 to properly specify your brake when ordering. List accessories separately.

9. Piping of cylinders will be configured in series unless otherwise specified. Specify piping and valving on separate **Brake Cylinder Piping Worksheet.**

NOTE: We recommend calling a DFE applications engineer at (603) 332-6150 for assistance in sizing a brake for your application.

APPLICATION DATA

1. Full Roll Diameter (D*max*) _____ inches

2. Core Diameter (D*min*) _____ inches

3. Web Speed, Max.(S*max*) _____ ft/min

   Min.(S*min*) _____ ft/min

4. Rotational Speed, Max. (N*max*) _____ rpm

   Min. (N*min*) _____ rpm

5. Web Tension, Max.(F*max*.) _____ lbs.

   Min.(F*min*.) _____ lbs.

6. Web Material _____

   Thickness _____ inches

   Width _____ inches

7. E-Stop Time (T) _____ sec.

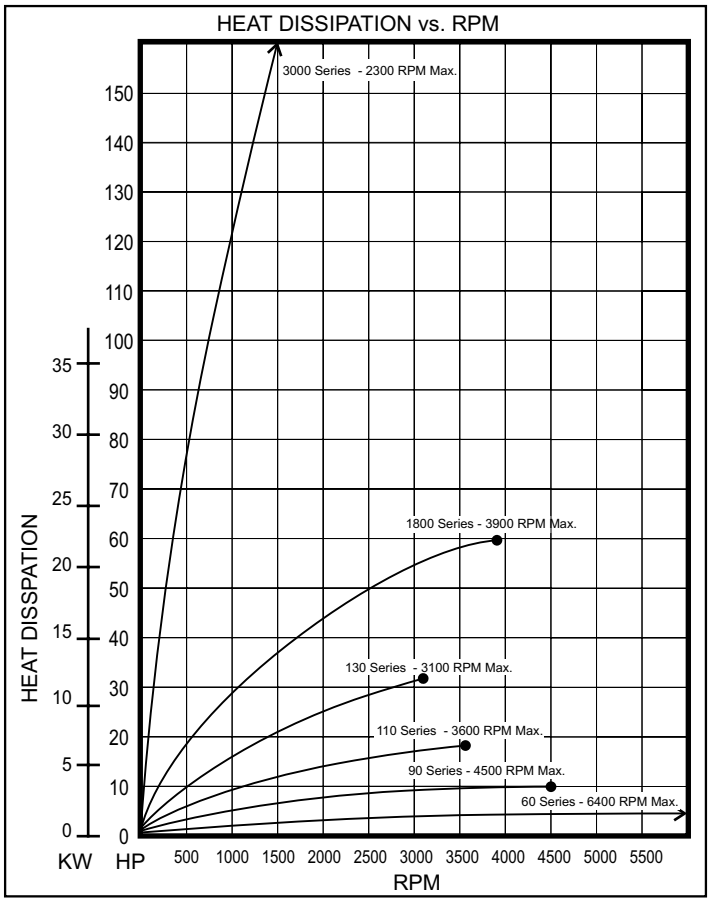
   Roll Weight (W) _____ lbs.

CALCULATIONS

1. Max. Torque (in-lb) = $\frac{D_{max} \times F_{max}}{2}$	
2. Min Torque (in-lb) = $\frac{D_{min} \times F_{min}}{2}$	
3. Heat (HP) = $\frac{F_{max} \times S_{max}}{33{,}000}$	
4. Brake N*max** (RPM) = 3.82 $\frac{S_{max}}{D_{min}}$ * *for max. cooling speed calculation*	
5. Brake N*min** (RPM) = 3.82 $\frac{S_{min}}{D_{max}}$ * for min cooling speed calculation	
6. Cooling Speed (RPM) = $\frac{2N_{min} + N_{max}}{3}$	
7. E-Stop Torque (in-lb) = $\frac{W \times D_{max} \times S_{max}}{7728 \times T}$	
SPECIAL REQUIREMENTS	
BRAKE SELECTED	BORE AND KEY

CHARTS FOR BRAKE SIZING AND PAD SELECTION

TORQUE CAPACITY, LB-IN (N-M) Torque Capacity at 75psi (5.17 bar)				
BRAKE SIZE		PAD COEFFICIENT OF FRICTION		
SERIES	# OF CYLINDERS	0.10 (#1) LB-IN (N-M)	0.20 (#2) LB-IN (N-M)	0.45 (#4) LB-IN (N-M)
60	1	40 (5)	80 (9)	170 (19)
	2	80 (9)	150 (17)	340 (38)
	3	110 (12)	230 (26)	500 (56)
	4	150 (17)	300 (34)	670 (76)
	5	190 (21)	380 (43)	840 (95)
	6	230 (26)	460 (52)	1010 (114)
90	1	170 (19)	340 (38)	750 (85)
	2	330 (37)	670 (76)	1500 (169)
	3	500 (56)	1000 (113)	2250 (254)
	4	660 (74)	1340 (151)	3000 (339)
110	1	230 (26)	460 (52)	1040 (117)
	2	460 (52)	920 (104)	2070 (234)
	3	690 (78)	1380 (156)	3110 (351)
	4	920 (104)	1840 (208)	4140 (468)
	5	1150 (130)	2300 (260)	5180 (585)
	6	1380 (156)	2760 (312)	6210 (702)
130	1	270 (30)	550 (62)	1230 (139)
	2	550 (62)	1090 (123)	2460 (278)
	3	820 (93)	1640 (185)	3690 (416)
	4	1090 (123)	2190 (247)	4920 (555)
	5	1370 (155)	2740 (310)	6150 (694)
	6	1640 (185)	3280 (371)	7380 (833)
	7	1910 (216)	3830 (432)	8610 (972)
	8	2190 (247)	4370 (493)	9840 (1111)
1800	1	400 (45)	790 (89)	1800 (203)
	2	800 (90)	1590 (180)	3600 (407)
	3	1200 (136)	2400 (271)	5400 (610)
	4	1600 (181)	3190 (360)	7200 (813)
	5	2000 (226)	3990 (451)	9000 (1017)
	6	2400 (271)	4800 (542)	10800 (1220)
	7	2800 (316)	5590 (632)	12590 (1422)
	8	3200 (361)	6390 (722)	14390 (1626)
	9	3600 (407)	7200 (813)	16190 (1829)
	10	3990 (451)	7990 (903)	17990 (2033)
3000	1	710 (80)	1420 (160)	3190 (360)
	2	1420 (160)	2840 321()	6380 (721)
	3	2120 (240)	4260 (482)	9540 (1078)
	4	2840 (321)	5670 (641)	12780 (1444)
	5	3550 (401)	7090 (801)	15930 (1800)
	6	4260 (481)	8510 (962)	19170 (2166)
	7	4960 (560)	9900 (1119)	22320 (2522)
	8	5670 (641)	11340 (1281)	25560 (2888)
	9	6380 (721)	12780 (1444)	28710 (3244)
	10	7090 (801)	14220 (1607)	31860 (3600)
	11	7790 (880)	15570 (1759	35100 (3966)
	12	8510 (962)	17010 (1922)	38250 (4321)
	13	9180 (1037)	18450 (2084)	41490 (4688)
	14	9900 (1119)	19890 (2247)	44640 (5043)
	15	10620 (1200)	21240 (2400)	47880 (5409)
	16	11340 (1281)	22680 (2562)	51030 (5765)



PERFORMANCE REVIEW TABLE

BRAKE SERIES	MAX. # OF CYLINDERS	MIN. TORQUE CAPACITY lb-in. (N-M) at 5 psi w/ two #1 pads	MAX TORQUE CAPACITY lb-in. (N-M) at 75 psi w/ max. #4 pads	MAXIMUM RPM	MINIMUM BORE in (mm)	MAXIMUM BORE in (mm)
60	6	3 (0.3)	1010 (114)	6400	0.625 (13)	1.375 (35)
90	4	14 (1.5)	3000 (339)	4500	0.750 (19)	1.375 (35)
110	6	19 (2)	6210 (702)	3600	1.250 (32)	2.438 (62)
130	8	23 (2.6)	9840 (1111)	3100	1.375 (35)	2.750 (70)
1800	10	33 (4)	17990 (2033)	3900	2.000 (50)	4.000 (115)
3000	16	60 (7)	51030 (5765)	2300	3.75 (95)	5.50 (150)

TYPICAL TENSIONS FOR WEB MATERIALS

ACETATE: 0.5 lb. per mil per inch of width

FOIL:

Aluminum	0.5 lb. per mil per inch of width	
Copper	0.5 lb.	"

CELLOPHANE: 0.75 lb. per mil per inch of width

NYLON: 0.25 lb. per mil per inch of width

PAPER:

15 lb *	0.4 lb. per inch of width	
20 lb	0.5 lb.	"
30 lb	0.75 lb.	"
40 lb	1.25 lb.	"
60 lb	2.0 lb.	"
80 lb	3.0 lb.	"
100 lb	4.0 lb.	"

* based on 3000 sq. ft. ream

PAPERBOARD:

8pt	3.0 lb. per inch of width	
12pt	4.0 lb.	"
15pt	4.5 lb.	"
20pt	5.5 lb.	"
25pt	6.5 lb.	"
30pt	8.0 lb.	"

POLYETHYLENE: 0.12 lb. per mil per inch of width

POLYESTER (Mylar): 0.75 lb. per mil per inch of width

POLYPROPYLENE: 0.25 lb. per mil per inch of width

POLYSTYRENE: 1.0 lb. per mil per inch of width

RUBBER:

GAUGE	AT 25% STRETCH	AT 50% STRETCH
10 mil	1.75	3.68
12 mil	1.10	2.03
16.5 mil	4.09	8.17
26 mil	2.47	4.97

SARAN: .15 lb per mil per inch of width

STEEL:

GAUGE - INS	UNWIND-PSI	REWIND-PSI
.001 -.005	1000	4000
.006 -.025	850	3500
.026 -.040	750	3000
.041 -.055	650	2600
.058 -.070	550	2200
.071 -.090	450	1800
.091 -.120	450	1400
.121 -.140	400	1200
.141 -.165	400	1000
.166 -.200	400	900
.201 -.275	400	800
.276 -.380	300	700

VINYL: .05 lb. per mil per inch of width

** For laminated webs, sum the tension for the individual webs and add 0.1 lb per inch of width.

OPTIONS & ACCESSORIES

Mounting Adapter Assemblies. A plate with short bolts that connects adjacent actuator assemblies. Reduces the quantity of mounting bolts needed and provides an optional mounting bolt pattern. Mounting bolts included. Adapters are shown in the dimensional drawings for Models 110 through 3000.

MODEL	PART NUMBERS
110 SERIES - 115 & 116 only	613-1318
130 SERIES - 135 - 138 only	613-1191
1800 SERIES - Standard	613-1193
3000 SERIES - Standard	613-1195

Guard Mounting Blocks. Right angle block with 0.344 inch through hole to machine frame. Allows installation of the guard if a mounting plate is not used. Series 60 through 1800 require 4, Series 3000 require 6.

ALL SERIES	213-0310

External Shut-off Valve Assemblies. Controls air supply for actuators. Please specify valving configuration as shown on the following page when ordering a complete brake assembly. See diagram below for dimensions.

NUMBER OF VALVES	PART NUMBERS
One-Valve Assembly	613-0238
Two-Valve Assembly	613-0240
Three-Valve Assembly	613-0242
Four-Valve Assembly	613-0244
Replacement Slider Valve	119-0007

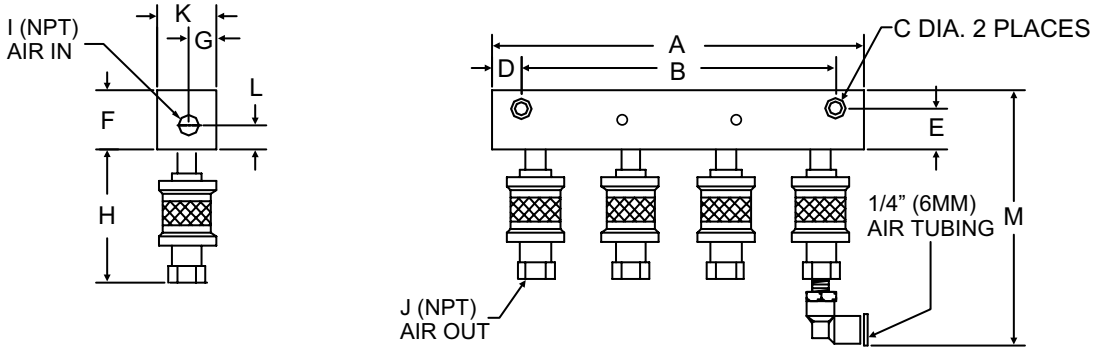
Mounting Plates. Flat plate for mounting the brake and guard if used. Mounting Plates are shown in the dimensional drawings for all models.

SERIES	MODELS	PART NUMBERS
60	ALL	213-0305
90	ALL	213-1364
110	NO ADAPTERS	213-1365
	with ADAPTERS	213-1366
130	NO ADAPTERS	213-1366
	with ADAPTERS	213-1367
1800	ALL	213-1367
3000	ALL	213-1695

Guard Assemblies. Safety device to prevent people or objects from touching brake when in use. Guards are shown in the dimensional drawings for all models.

SERIES	MODELS	PART NUMBERS
60	ALL	613-1311
90	ALL	613-1346
110	NO ADAPTERS	613-1316
	with ADAPTERS	613-1347
130	NO ADAPTERS	613-1347
	with ADAPTERS	613-1349
1800	ALL	613-1349
3000	ALL	613-1534

VALVE DIMENSIONS

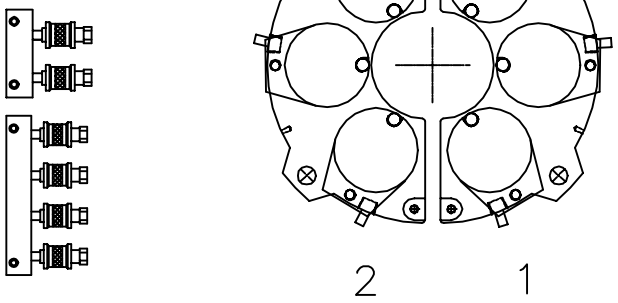


SIZE		A	B	C	D	E	F	G	H	I	J	K	L	M
1 0R 2 VALVE	in	3.12	2.125	0.22	0.50	0.80	1.00	0.45	2.37	1/8 NPT	1/8 NPT	1.00	0.40	4.50
	mm	79.25	53.98	5.59	12.7	20.32	25.4	11.43	60.2	1/8 NPT	1/8 NPT	25.4	10.16	114.30
3 0R 4 VALVE	in	6.38	5.38	0.22	0.50	0.80	1.00	0.45	2.37	1/8 NPT	1/8 NPT	1.00	0.40	4.50
	mm	162.05	136.65	5.59	12.7	20.32	25.4	11.43	60.2	1/8 NPT	1/8 NPT	25.4	10.16	114.30

BRAKE CYLINDER PIPING WORKSHEET

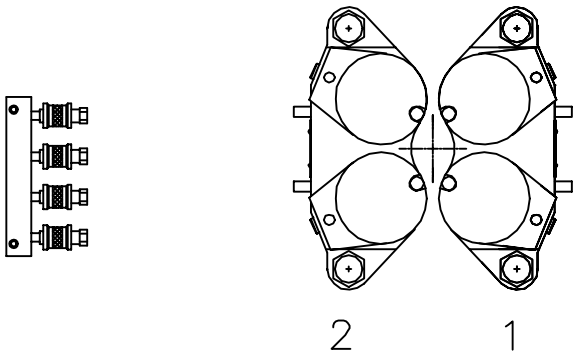
The diagrams below represent the axial views of complete actuator assemblies for each of DFE's Heavy Duty Brakes. Identify your brake size by the first two digits appearing above each brake. Draw your piping from each actuator or pad to the valve required. Piping of cylinders will be completed in series unless otherwise specified.

6 _

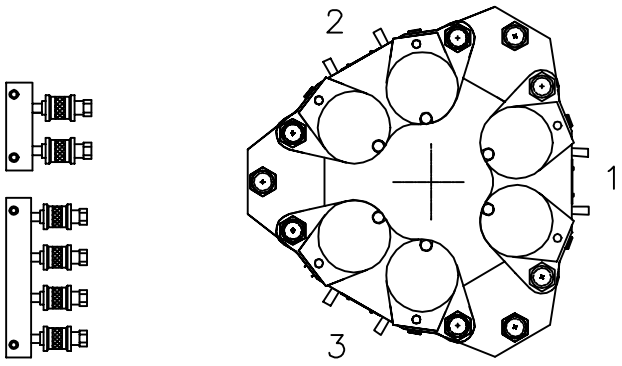


9 _

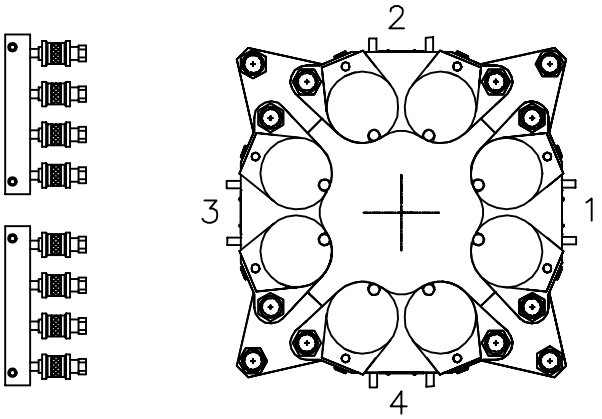
For: 111 113
112 114



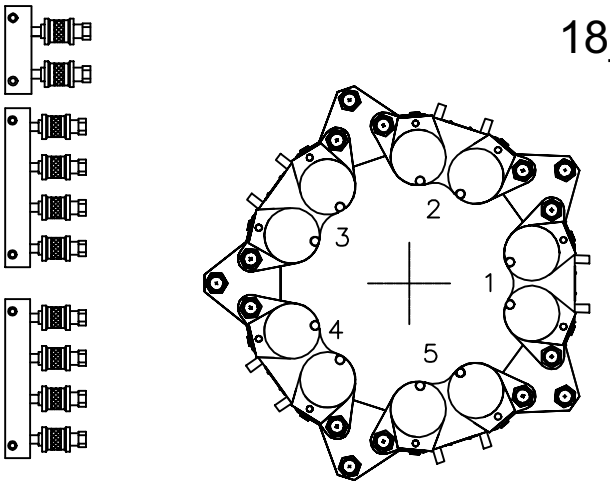
For: 115
116



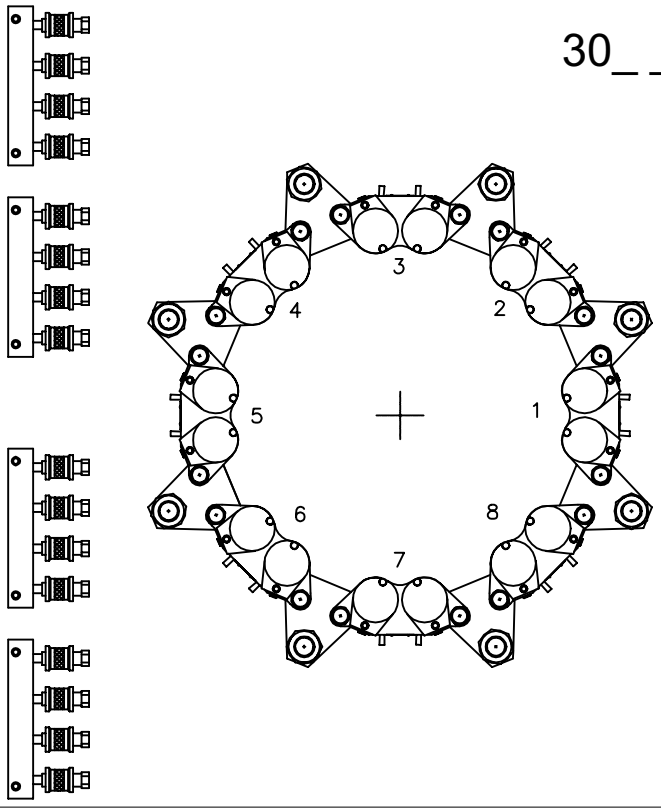
13_



18_ _



30_ _



REPLACEMENT PARTS

Actuator Assemblies. May be purchased as replacement parts, or to increase torque as add-ons, space provided. Specify friction pads and mounting bolt kit separately. Note: Addition of a second actuator to a 60 Series Brake requires Strap Kit 610-0018

CYLINDERS	60 SERIES	90 - 3000 SERIES
1 Cylinder	613-0188	613-0007
2 Cylinders	613-0190	613-0005
3 Cylinders	613-0192	n/a

Mounting Bolt Kits. Used to mount brakes to machine. For additional actuator assemblies or replacement part. Metric sizes available. Kit contains bolt, washers, and spacer.

UNIT	60 SERIES	90-130 SERIES	1800 SERIES	3000 SERIES
inch	613-0009	613-1216	613-1217	613-1337
metric	613-1306	613-1310	613-1309	613-1338

Friction Pads. Available in three coefficients. #4 (0.45) is standard on DFE brakes.

COEFFICIENT	60 SERIES	90-3000 SERIES
#1 (.10)	613-1221	613-1303
#2 (.20)	613-1222	613-1297
#4 (.45)	613-1224	613-1298

Cylinder Kit. Addition or replacement of cylinders can be done with the following kits. Friction pads and mounting bolt kit not included.

60 SERIES	613-1305
90-3000 SERIES	613-1317

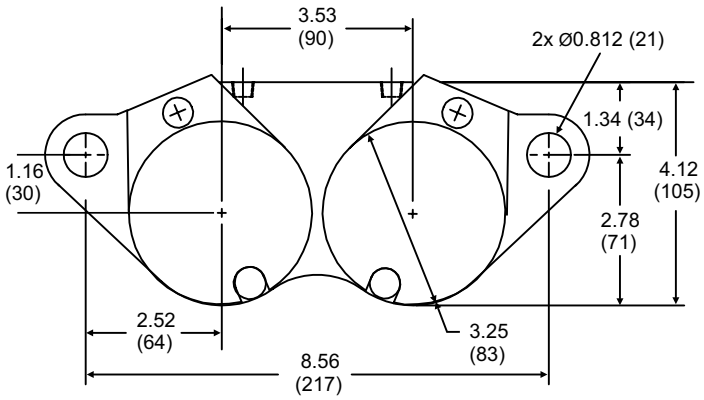
Reduced Area Piston Kit. For 90 Series brakes and up. Reduces torque produced to 31% of normal.

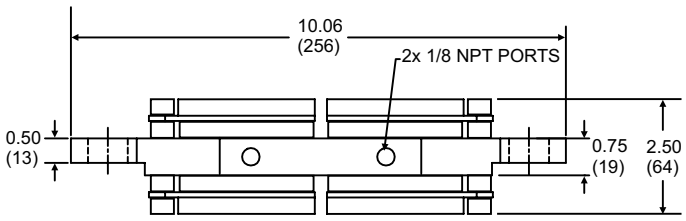
90-3000 SERIES	613-0252

UNIVERSAL ACTUATOR

- Backed by our **No-Squeal Warranty.**
- No disassembly required when changing brake pads.
- No-Fail cylinder. Return spring can't puncture the diaphragm.
- Replace worn brake pads in seconds, without tools.
- Limited travel piston prevents disk scoring and blown diaphragms.
- Deactivate any cylinder or piston simply by removing the brake pad. Takes only seconds. No extra parts to buy, install or remove.
- A range of brake pads having friction coefficients of 0.10 (#1), 0.20 (#2), and 0.45 (#4)
- Retrofit kits available for dual disk brakes of other manufacturers.

INCHES (mm)





INSTALLATION CHECKLIST FOR DUAL DISK BRAKES

In order to obtain the best brake performance and ensure trouble-free operation, you must ensure that the installation environment and related machinery comply with the following conditions. Compliance with these requirements is necessary to validate the 5 Year Warranty and No-Squeal Warranty.

1. The brake mounting surface must be rigid and strong enough so it doesn't deflect when loaded by brake torque.
2. The shaft must be straight. (Bent shafts cause disk run-out, resulting in vibration and noise)
3. The shaft must not have noticeable end play.
4. The shaft bearing must be in good condition, with no noticeable free-play or noise.
5. The shaft diameter must be properly matched to the brake bore. (A loose fit can cause balance problems and disk run-out)
6. The shaft must be perpendicular to the brake mounting surface to within 0.040" (1 mm), measured at the end of the shaft.
7. The set screws must be tight so the disk assembly does not move on the shaft.
8. The actuator plates must be centered between the disks and be parallel to the brake mounting surface.
9. All mounting bolts and set screws must be tight.
10. The friction surfaces of the disks and friction pads must be clean and free of oil or any other lubricant or substance.
11. The friction pads must be installed with the friction surface against the disk, and the steel back plate against the air cylinder.
12. Actuator plates must be parallel to the disks. (Cocked actuators cause uneven wear and noise.)

HOW TO ORDER

Specify your brake using the Dual Disk product code below.

1. Specify which series brake and how many cylinders you require .
2. Specify bore (standard key is assumed).
3. Specify any options.
4. Assume all pads are 0.45 (standard). Describe any variations.

Example: 2D115-1.500-MA, 2cyls w 0.20 pads.

2D X X - XXX - OPTIONS, # cyls with .## pads

DUAL DISK BRAKE

SERIES	# OF CYLINDERS	BORE	OPTION(S) separate with commas	VARIATIONS
6 = 60 Series 9 = 90 Series 11 = 110 Series 13 = 130 Series 18 = 1800 Series 30 = 3000 Series	1-6 for 60 Series 1-4 for 90 Series 1-6 for 110 Series 1-8 for 130 Series 01-10 for 1800 Series 01-16 for 3000 Series	See Bore & Key Charts on Brake pages	MA = Mounting Adapters (110 Series and up) MMB= Metric Mounting Bolts NSK = Nonstandard Key RA = Reduced Area Piston Z = Specials	This brake will have two cylinders with 0.20 frictions pads. Remaining three will be std. 0.45 pads.

Your brake:_____

Refer to Brake Sizing and Selection Worksheet in the following pages for selection of your brake.