

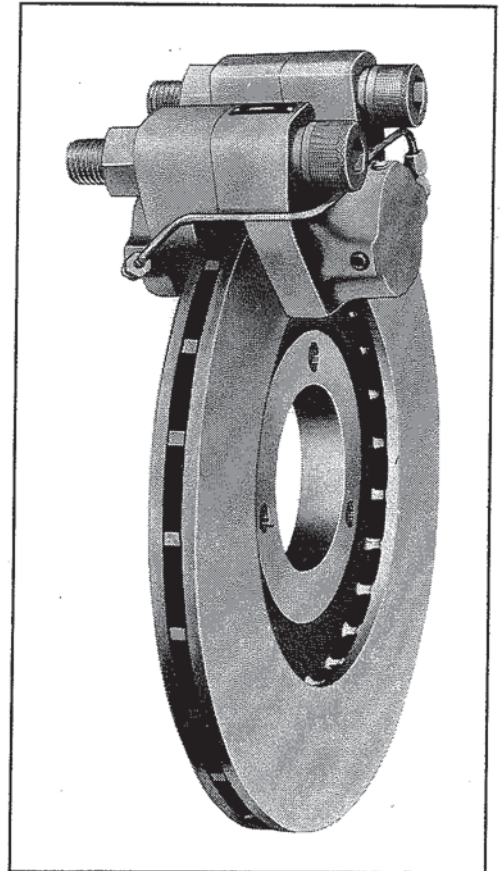
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Warning

Forward this manual to the person responsible for Installation, Operation and Maintenance of the product described herein. Without access to this information, faulty Installation, Operation or Maintenance may result in personal injury or equipment damage.

**Technical Application
and Maintenance
Information for Airflex®
Model 225DP100
Caliper Brakes**



Caution:

Use Only Genuine Airflex® Replacement Parts

The Airflex Division of Eaton Corporation recommends the use of genuine Airflex replacement parts. The use of non-genuine Airflex replacement parts could result in substandard product performance, and may void your Eaton warranty. For optimum performance, contact Airflex:

In the U.S.A. and Canada: (800) 233-5926

Outside the U.S.A. and Canada: (216) 281-2211

Authorized Distributor



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sales@midwestbrake.com
www.midwestbrake.com

Eaton® Airflex® Clutches & Brakes



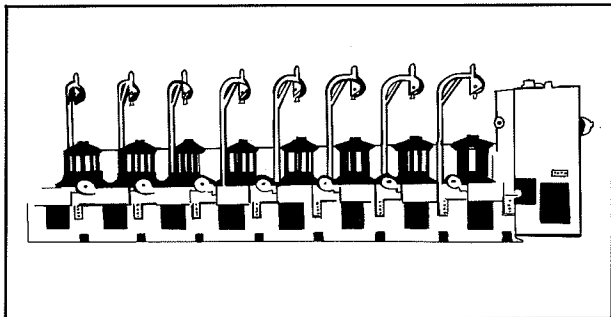
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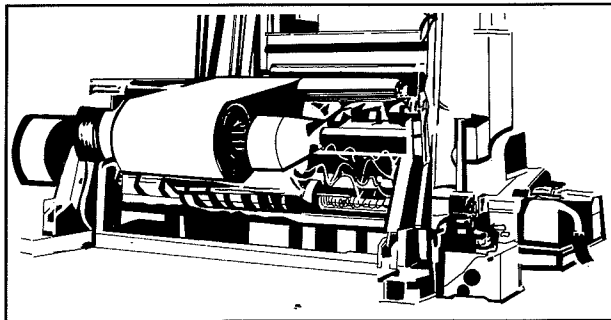
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TYPICAL APPLICATIONS



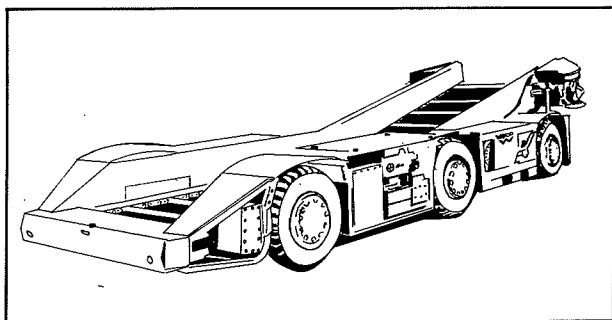
INDUSTRIAL USES

Airflex Caliper Brakes are used on wire drawing machinery, on presses as flywheel stopping brakes, on high inertia band saws as stopping brakes, and similar rugged heavy duty applications.



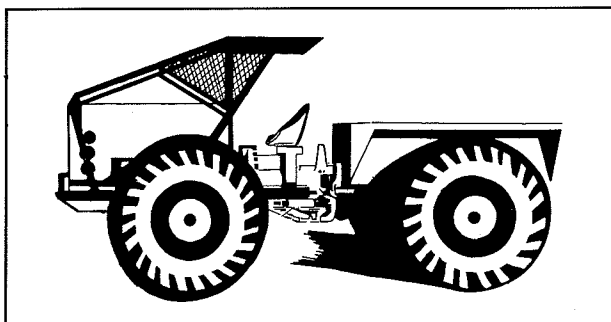
TENSION SYSTEMS

Airflex Caliper Brakes are used on un-wind stands and splicing machinery as tension brakes in the film, foil and metal-working industries.



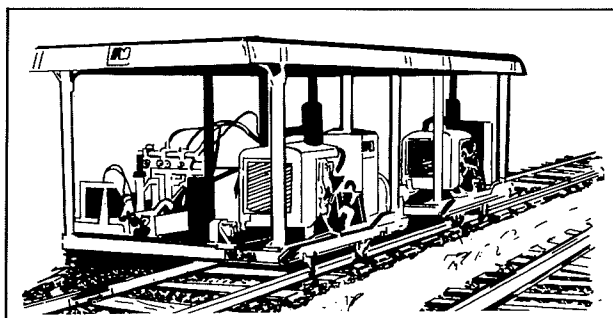
MINING EQUIPMENT

Airflex Caliper Brakes are used as general vehicle stopping brakes on underground mining equipment.



OFF-THE-ROAD VEHICLES

Airflex Caliper Brakes are used as stopping brakes on prop-shaft and wheel installations on heavy off-the-road equipment.

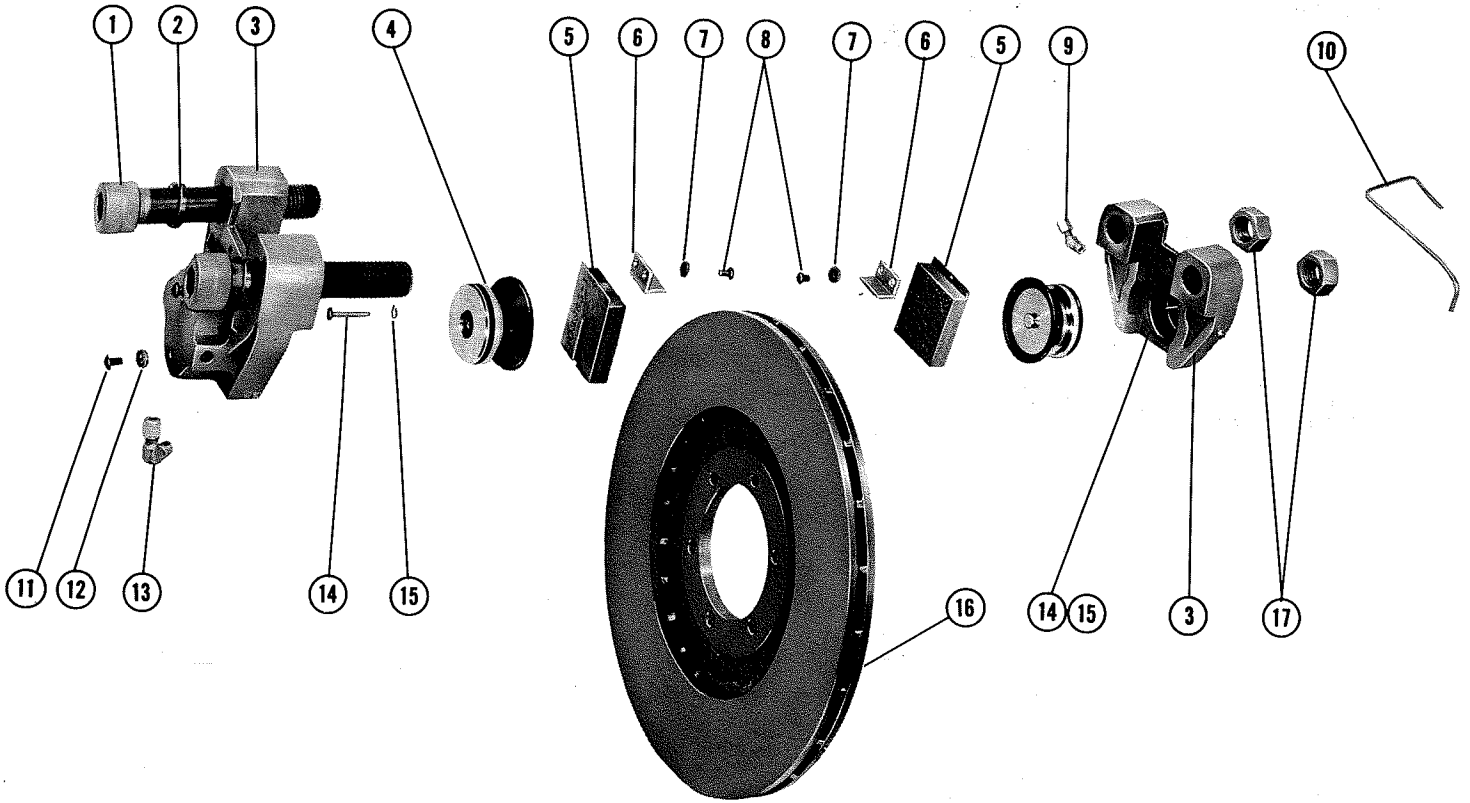


RAILROAD MAINTENANCE EQUIPMENT

Airflex Caliper Brakes are used as vehicle stopping brakes on track laying and maintenance equipment.

ILLUSTRATED PARTS LIST

AIRFLEX 225DP100 CALIPER BRAKE



ITEM	QUANTITY	PART NUMBER	DESCRIPTION
1	2	30x920	Socket Head Screw
2	2	31x7	Lockwasher
3	2	504813	Cylinder Block
4	2	See Page 7 for Details.	Piston Assembly
5	2	303865-1 303865-2	Friction Shoe (Std.) Friction Shoe (Slip)
6	2	202774	Shoe Retainer
7	4	153x309	Dyna Seal
8	4	153x323	Button Head Cap Screw
9	1	91x2	45° Elbow
10	1	407914-1	Bridge Pipe
11	4	153x323	Button Head Cap Screw
12	4	153x309	Dyna Seal
13	1	92x2	Elbow
14	2	202716	Pin
15	2	138x52	Snap Ring
16	1	407936	15" Ventilated Disc
17	2	45x4	Hex Nut

OPERATION, INSTALLATION & MAINTENANCE INSTRUCTIONS

FOR AIRFLEX 225DP CALIPER BRAKES

OPERATION

The Airflex[®] Caliper Disc Brake has been designed for industrial use in general stopping and tensioning applications. The opposed piston design provides balanced braking action and permits fixed mounting of the caliper and disc. Symmetrical split construction facilitates installation and allows mounting from either side or at the center between caliper halves. This split design permits the use of discs of different thicknesses and diameters.

Air or hydraulic pressure is introduced into the cylinder blocks at one of the two inlet openings. The bridge pipe connects the two cylinders, assuring equal pressure on both sides. Both pistons move simultane-

ously and squeeze the piston mounted friction shoe assemblies against the disc, causing braking action. When the actuating pressure is released to "0" psi, a spring powered, self-adjusting, release mechanism retracts the pistons and friction shoes, and assures running clearance between the friction shoe and the disc.

The shoe retraction and self-adjusting mechanism is contained inside of the caliper piston. In this way, the assembly is completely inside the caliper cylinder block and is not subject to tampering or contamination by foreign matter. The adjusting is done automatically and no maintenance is required throughout the life of the shoes.

INSTALLATION

There are two parallel machined surfaces on the Airflex 225DP Caliper Brake in the area of the mounting bolts; however, only one of these is intended to be used as a mounting surface. **DO NOT** mount the brake on the side where the Bridge Pipe, Item #10 on Page 4, would cause interference. The Caliper Brake unit is symmetrical, and to avoid the Bridge Pipe interference, the unit can be positioned for either direction of rotation. The brake mounting bracket should be fabricated to butt against the lip adjacent to the machined surface. This bracket must also be of sturdy construction and rigidly mounted to prevent deflection during operation. **LOCATION OF MOUNTING HOLES:** First install the disc, and then clamp the Caliper Brake to the disc with either air or hydraulic pressure. **CAUTION:** Before locating the holes for drilling, make sure the brake friction pads completely engage the disc so they do not overhang the outer

edge of the disc. The O.D. of the disc must not rub against the Cylinder Block, Item #3. It is very important that the mounting bracket be properly aligned with the mounting surface of the brake.

It is recommended that two tapped holes (1" 8NC-3 THREAD) be provided in the mounting bracket. **NOTE:** The Mounting Screws, Item #1 and Lockwashers, Item #2, are furnished with the brake, and should be tightened to 300 FT.-LBS. TORQUE MINIMUM. The Hex Nuts, Item #17, are furnished primarily for shipping purposes; however, they can be used for mounting where "thru holes" in the bracket are desired rather than tapped holes. With this arrangement, relocate the lockwasher to the hex nut end and tighten to the above specifications. The "thru holes" must not be oversize — use 1-1/32" diameter drill maximum.

OPERATION, INSTALLATION & MAINTENANCE INSTRUCTIONS

FOR AIRFLEX 225DP100 CALIPER BRAKE

MAINTENANCE

BLEEDING THE HYDRAULIC SYSTEM:

1. There are two bleed screws, a bridge pipe and a pipe plug on the cylinders. Select the ones which are located at the highest level on each cylinder.
2. Apply hydraulic pressure and hold it "ON". Gently loosen the selected components and allow the air and a small amount of fluid to escape. **CAUTION:** Re-tighten the component before releasing the applied pressure to avoid sucking more air back into the system.
3. Repeat Step No. 2 as many times as necessary to remove all the air bubbles from the system.
4. During this bleeding operation, make sure that an adequate supply of fluid is available to prevent air from entering the system.

FRICTION SHOE REPLACEMENT:

A visual inspection is all that is required to determine when the friction shoes should be replaced. Actual new lining thickness is $21/32''$ (not including the steel backing plate). When the lining thickness is worn to approximately $9/32''$, or within $1/8''$ of the mounting slot in the lining, new friction shoes should be installed. Damage to the piston will result if the lining is allowed to wear beyond this point.

REPLACEMENT OF THE FRICTION SHOES is a simple task and requires only a few minutes of time. Refer to the Illustrated Parts List on page 4. First, WITH PRESSURE OFF, remove four (4) But-

ton Head Socket Cap Screws, Item #8, along with the four (4) Dyna Seals, Item #7. This will release the two (2) Friction Shoe Retainers, Item #6, and permit removal of the two Friction Shoe Assemblies, Item #5. **IMPORTANT:** Before inserting the new Friction Shoe Assemblies, it is necessary to force the pistons all the way back in the cylinders. If there is any residual pressure remaining in the cylinders, it may be necessary to loosen one of the bleed screws on each Cylinder, Item #3, to bleed off the pressure. Once the pistons are fully retracted, the new Friction Shoe Assemblies can be easily installed and secured with the retainers.

SHOE RETRACTION:

The operation of the retractor mechanism can be described by using the Illustration on Page 7. Pin (2) is fixed to cylinder block (1) by snap ring (3). Piston (5) is positioned by retaining rings (8) which slide along pin (2). Spring (10) is retained in the piston by washer (11) and snap ring (12). The force required to slide the retaining rings along the pin is greater than the force developed by the spring.

When pressure is applied, the piston moves outward, compressing the spring until washer (11) bottoms against spring guide (9). The pressure, acting on the piston diameter, forces the retaining rings outward along the pin. When pressure is removed, the retaining rings maintain their new position on the pin. The spring then retracts the piston until the spring guide (9) bottoms against the piston. The gap between the spring guide and washer is equal to the clearance between the disc and friction pad.

PISTON REPLACEMENT

AIRFLEX 225DP CALIPER BRAKES

First remove old piston and dust boot assembly. Clean cylinder area and dust boot groove. Keep dust boot groove free of oil!

Note: Pin, Item #2, and snap ring, Item #3 are not included in the kit and should be left in the cylinder block when removing the old piston assemblies or replaced after cleaning.

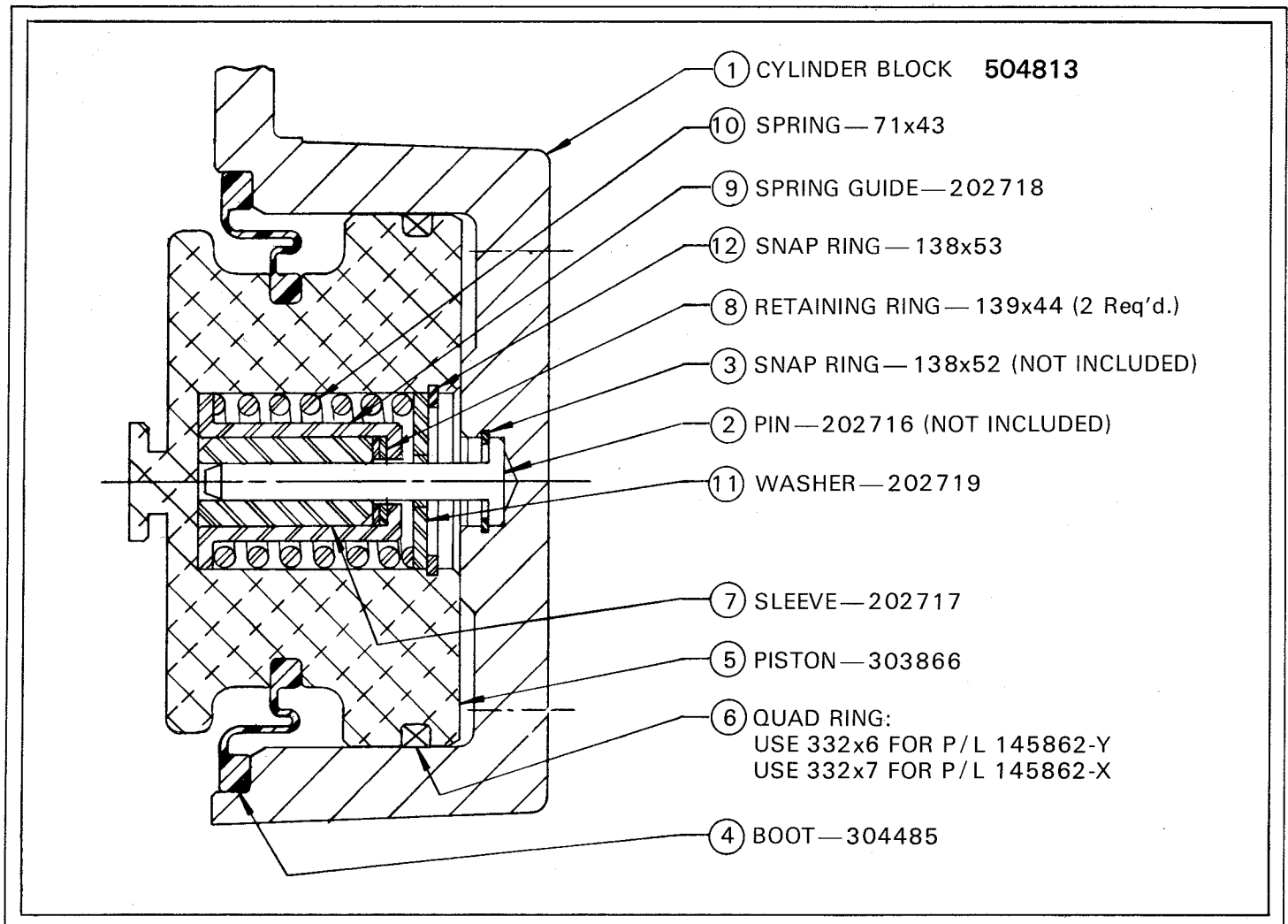
Dust Boot (item #4), Quad Ring (Item #6), and self-adjustment mechanism (Items #7, #8, #9, #10, #11 and #12) are assembled to Piston (Item #5) at the factory. **IMPORTANT** – Quad Ring (4) must match the particular actuating medium to be used. Kit 145862X

is for air or mineral base fluid; Kit 145862Y is for vegetable base fluid.

Make sure Quad Ring (6) is properly seated in its groove. Coat this ring and piston wall with compatible type of oil. Insert carefully in cylinder bore and over Pin (Item #2) retained in Cylinder Block (Item #1) from previous usage. **CAUTION!** Do not damage lips of Quad Ring.

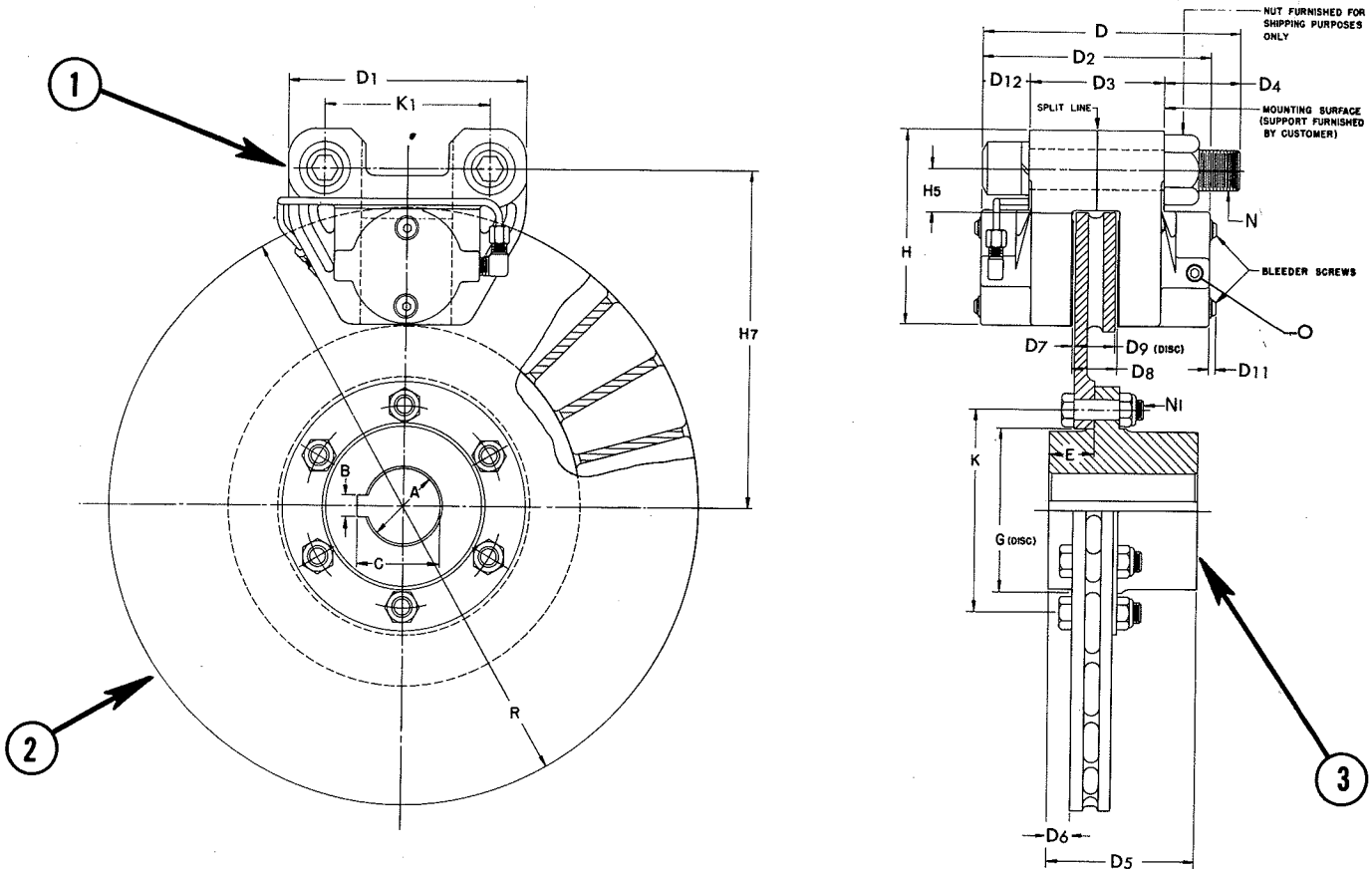
Bond Dust Boot (4) to Cylinder Block (1) as shown in sketch herewith using a good grade of rubber-to-iron adhesive, such as Eastman 910 or Goodyear Plybond.

NOTE: TWO REPAIR KITS REQUIRED TO REPAIR ONE BRAKE



DIMENSIONAL INFORMATION

AIRFLEX 225DP100 CALIPER BRAKES



SIZE	TORQUE** RATING (lb.-ins.) At 1000 psi	DIMENSIONS IN INCHES																											
		BORE		D	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	D ₈	D ₉	D ₁₀	D ₁₁	D ₁₂	E	G	H	H ₅	H ₇	K	K ₁	N		N ₁		R	O
		Min.	Max.																					No.	Size	No.	Size		
225DP100	15,000 [†]	1½	2½	6½	6½	5¾	3¾	1¾	3¾	¾	¾	1½	1	¼	1¾	1¾	1½	4¾	4¾	1	8½	5¾	4¼	2	1-8NC	6	½-13NC	15	½ P.T.

**Maximum operating pressure, 1000 psi.
[†] Consult factory for other Disc Thicknesses.

ITEM	DESCRIPTION	PART NUMBER
1	Caliper Assembly – Std. Linings (Veg. Seals)	145862H
	Caliper Assembly – Std. Linings (Min. Seals)	145862J
	Caliper Assembly – Slip Linings (Min. Seals)	145862C
	Caliper Assembly – Slip Linings (Veg. Seals)	145862W
2	Ventilated Disc 15" Dia. 1" Thick	407936
3	Reversible Hub Tapped Holes (Std.)	402262
	Reversible Hub Clearance Holes	404351

NOTE: When ordering, itemize the desired parts. Caliper discs available for use with Type "E" "QD" bushings, please consult Factory. Bore range with Type "E" bushing is 7/8" to 3-7/16".

AIRFLEX 225DP100 CALIPER SPECIFICATIONS

Maximum Pressure: 1000 PSI
Minimum Pressure: 8–13 PSI with release spring
Caliper Weight: 17 Lbs.

Caliper Mounting: Two 1-8NC3 socket head screws with lock washers and nuts.

Materials:

Cylinder Block	Ductile Iron
Pistons	Aluminum
Piston Seals	Quad-type rings suitable for air and mineral-base oil, or vegetable-base oil. (Customer to specify)
Friction Material	Molded asbestos composition.
Ventilated Disc	Cast Iron, 55,000 to 65,000 PSI tensile strength and 220 to 240 Brinell hardness.

Piston Specifications:

Diameter	2-1/4 inches
Area (each)	3.98 square inches
Stroke	1/16 inch (self-adjusting for wear)
Stroke Retract	1/16 inch
Maximum Recommended Travel Displacement	1/2 inch
	.25 in. ³ per piston

Friction Lining Specs.:

Area	12.5 square inches (total) in two 2-5/8" x 2-3/8" pads
Thickness (new)	21/32 inch
Allowable Wear	3/8 inch
Replacement Thickness	9/32 inch lining thickness

Ventilated Disc Specs.:

Thickness	1 inch
Allowable Wear	1/16 inch per side
Replacement Thickness	7/8 inch minimum
Friction Surface Finish	125 Micro
Weight (15" ventilated type)	24 lbs.
WK ² for same	5.6 Lbs.-Ft. ²
Maximum Recommended RPM for same	1800
Disc Swept Area	226 Sq. In.

Parasitic Loss: 8 PSI (new lining) to 13 PSI (fully worn lining).

Actuating Media: Air or fluids.

Available with two types of seals for vegetable or mineral base hydraulic fluids. For air actuation the mineral base type is recommended.

TORQUE & ENERGY VALUES

AIRFLEX 225DP100 CALIPER

FOR CYCLIC APPLICATIONS OR CRASH STOPS

TORQUE VALUES

Operating Pressure Range (PSI)
0 to 100 100 to 1000

Torque Value for 15" diameter disc	See Std. Lining Curves on Graph GR-1.	See Std. Lining Curves on Graph GR-2.
Torque Value for other than 15" diameter disc	Torque value from Graph GR-1 as above multiplied by <u>Disc OD-3.4</u>	Torque value from Graph GR-2 as above multiplied by <u>Disc OD-3.4</u>
	11.75	11.75

Multiple Calipers on One Disc Multiply above single caliper torque values by number of calipers.

Minimum possible disc is 9-5/8" diameter (with integral hub).

Holding force at 1000 PSI = 2500 pounds (rail applications).

ENERGY CAPACITY (Single caliper per disc)

- (1) The energy capacity is determined by the operating speed of the ventilated disc.
- (2) Cyclic service (*)..... See Graph GR-3
- (3) Crash stopping Maximum recommended energy per stop is
(Disc must cool to room temp between stops) 1.7×10^6 Ft.-Lbs.

(*) With standard 15" ventilated disc. For other sizes of disc (non-ventilated) 1" thick.
Multiply values in (2) above by $\frac{(\text{Disc OD})^2}{300}$

300

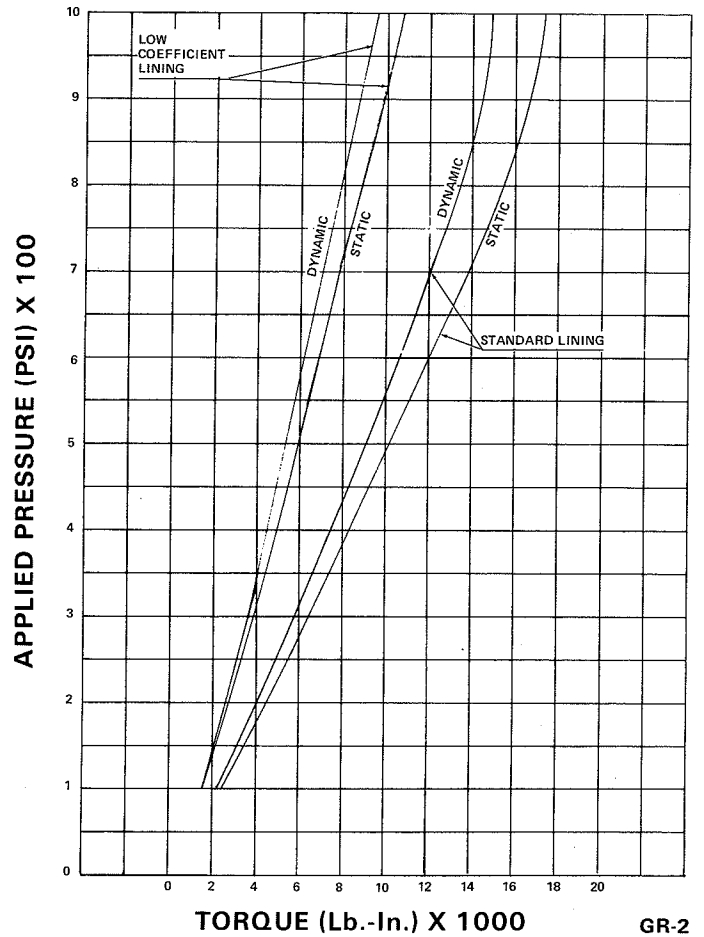
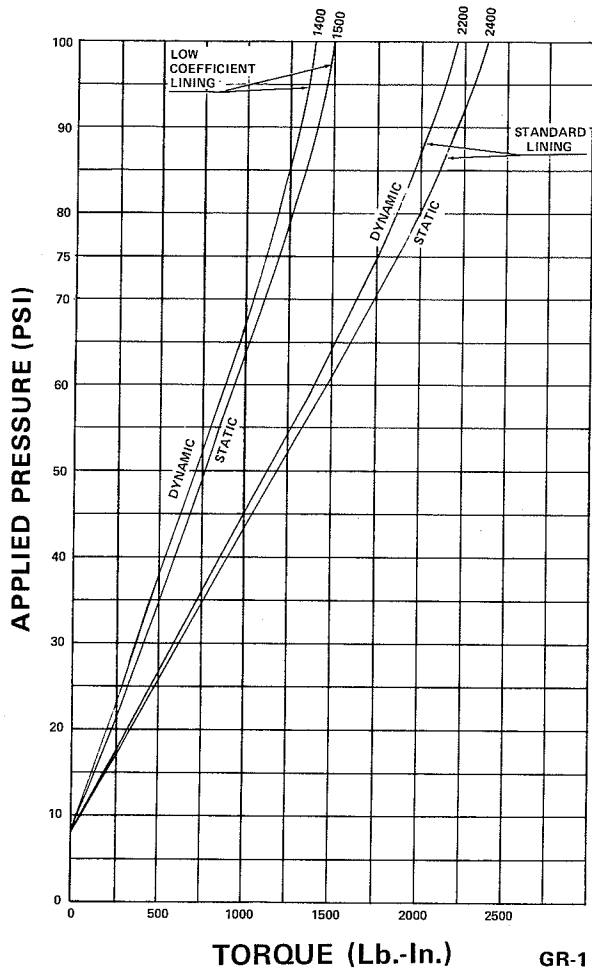
Energy Values for Multiple Calipers on One Disc in Cyclic Duty

With (2) Calipers on 1 Disc the energy capacity is reduced by 5%

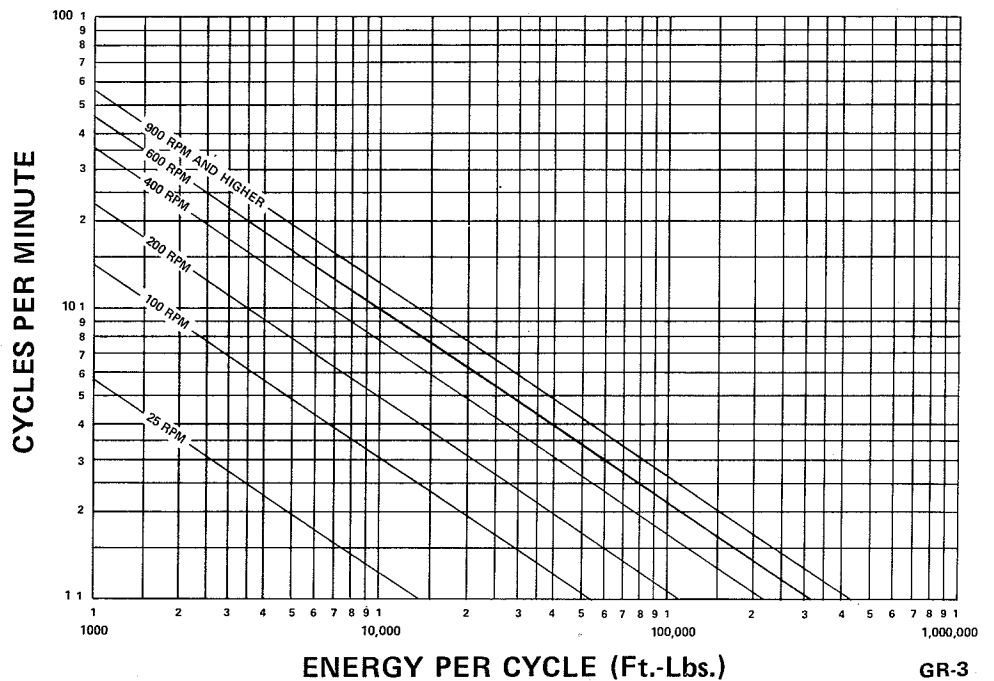
With (3) Calipers on 1 Disc the energy capacity is reduced by 10%

TORQUE & ENERGY VALUES AIRFLEX 225DP100 CALIPER BRAKES

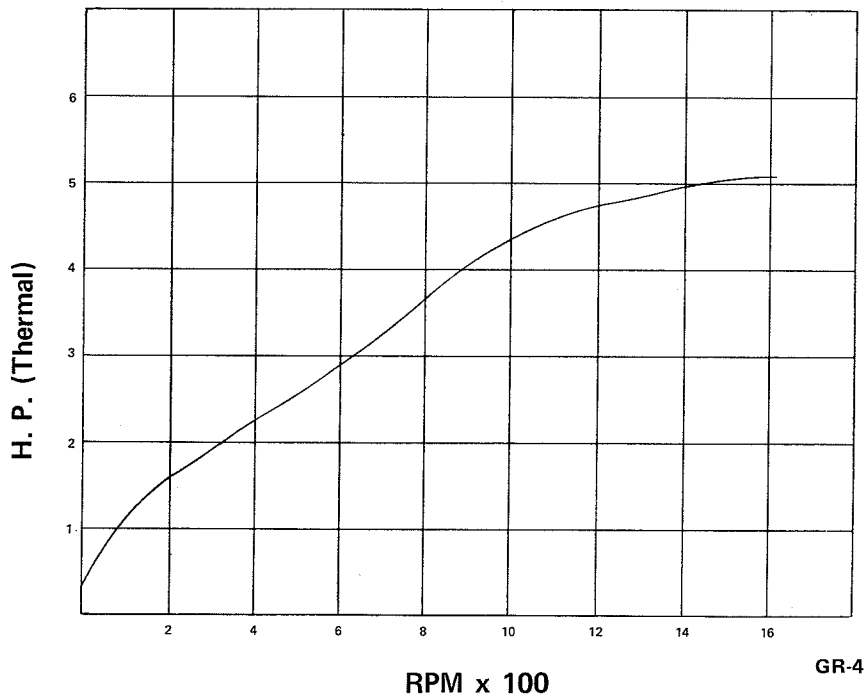
TORQUE VS. PRESSURE WITH 15" DIAMETER DISC



**MAXIMUM
ENERGY CAPACITY
FOR CYCLIC DUTY
WITH 15"
DIAMETER
VENTILATED DISC**



ENERGY CAPACITY CONTINUOUS SLIP



FOR TENSION BRAKE SERVICE (Continuous Slip)

TORQUE VALUES

One Caliper per Disc

Torque for 15" O.D. Disc — See Graph GR-1 (Slip Lining — Dynamic)

Torque for other than 15" O.D. Disc — Torque value from Graph GR-1 as above multiplied by $\frac{\text{Disc OD}-3.4}{11.75}$

ENERGY CAPACITY (Horsepower Absorption)

- (1) For one caliper on standard 15" disc. See Graph GR-4 for maximum values.
- (2) For one caliper on other disc diameters (non-ventilated and 1" thick)

$$HP = \left(\frac{\text{Disc O.D.}}{15} \right)^2 \times \frac{\text{RPM}}{375} \text{ (Fan cooling will improve values)}$$

- (3) For multiple calipers on one disc, multiply values from (1) or (2) just above by .95 for two calipers on one disc, or by 0.9 for three calipers on one disc.

SELECTION GUIDE

CYCLE APPLICATIONS – ROTATING SYSTEMS

Step 1 – Determine inertia, RPM, desired stopping time and cyclic rate for the load.

Step 2 – Calculate the torque required to stop in the allotted time.

$$T \text{ (Lb.-In.)} = \frac{WK^2 \text{ (Lb.-Ft. Sq.)} \times \text{RPM Change}}{25.7 \times \text{Time (seconds)}}$$

Step 3 – Determine operating pressure required from GR-1 or GR-2.

Step 4 – Determine energy per stop.

$$\text{(Rotating body)} \quad E \text{ (Lb.-Ft.)} = 1.7 \times WK^2 \left(\frac{\text{RPM}}{100} \right)^2$$

$$\text{(Linear)} \quad E \text{ (Lb.-Ft.)} = \frac{\text{Wgt. in Lbs. (Ft./Sec.)}^2}{64.4}$$

Step 5 – Find the energy per cycle on GR-3. Move vertically until the RPM Line is intersected, then read the maximum cycles per minute from the Cycle per Minute Column on the left.

Step 6 – If the torque in Step 2 or the energy in Step 4 and 5 is beyond the capability of a single caliper and disc, investigate multiple caliper or multiple disc assemblies. The energy rating is based on the capacity of the disc.

EXAMPLE

Step 1 – What is the braking system required to stop a 100 lb.-ft.² rotating inertia from 1800 RPM in 3 seconds at the cyclic rate of 1 CPM?

$$\text{Step 2 – } T = \frac{100 \times 1800}{25.7 \times 3} = 2330 \text{ Lb.-In.}$$

Step 3 – From GR-2, Minimum operating pressure required = 110 PSI.

$$\text{Step 4 – } E = 1.7 \times 100 \left(\frac{1800}{100} \right)^2 = 55,000 \text{ Ft.-Lbs. per cycle.}$$

Step 5 – From GR-3, maximum cyclic rate = 1 CPM.

Step 6 – One caliper @ 110 PSI operating pressure would meet the requirements.

SELECTION GUIDE

CONTINUOUS SLIP-UNWIND APPLICATION – CONSTANT HORSEPOWER

Step 1 – Determine maximum and minimum torque requirements. Maximum torque is at lowest speed. $T = \text{Tension} \times \text{Radius}$.

Step 2 – Find necessary operating pressures from GR-1 or GR-2, using the slip lining curves. Pressure range should be considered and for the best results, should not overlap. 0-100 PSI air or 100-1000 PSI hydraulic.

Step 3 – Determine minimum and maximum RPM for constant horsepower drive.

$$\text{RPM} = \frac{\text{Strip Speed (Ft./Min.)}}{2\pi R \text{ (Ft./Rev.)}}$$

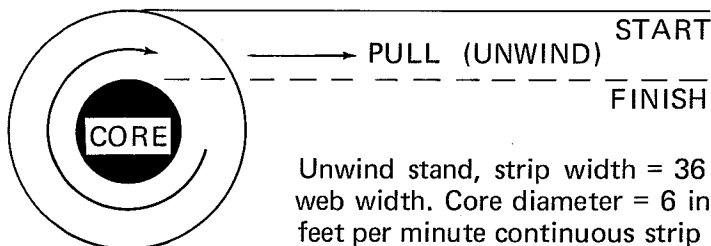
Step 4 – Determine the horsepower by the conditions at maximum torque and minimum speed. (This is the worst case for the ventilated disc).

$$\text{Dissipation HP} = \frac{\text{Torque (Lb.-In.)} \times \text{RPM}}{63,000} \quad \text{or} \quad \frac{\text{Tension(Lb.)} \times \text{Strip Speed (FT/min)}}{33,000}$$

Step 5 – Determine horsepower capability of caliper brake at minimum speed from GR-4.

Step 6 – If torque and/or energy is beyond the capability of one caliper, investigate multiple calipers or discs. The energy capacity is determined by the disc.

EXAMPLE:



Unwind stand, strip width = 36 inches. Tension is two pounds per inch of web width. Core diameter = 6 inches, full roll = 18 inches. Running at 500 feet per minute continuous strip speed.

Step 1 – $T \text{ min.} = 36 \times 2 \times 3 = 216 \text{ Lb.-In.}$
 $T \text{ max.} = 36 \times 2 \times 9 = 648 \text{ Lb.-In.}$

Step 2 – From GR-1 Operating Press Min. = 20 PSI --- Max. = 45 PSI.

Step 3 – $\text{Min. RPM} = \frac{500}{2\pi \times .75} = 107 \text{ RPM}$

$\text{Max. RPM} = \frac{500}{2\pi \times .25} = 320 \text{ RPM}$

Step 4 – $\frac{648 \times 107}{63,000} = 1.1 \text{ Horsepower}$ or $\frac{36 \times 2 \times 500}{33,000} = 1.1 \text{ HP}$

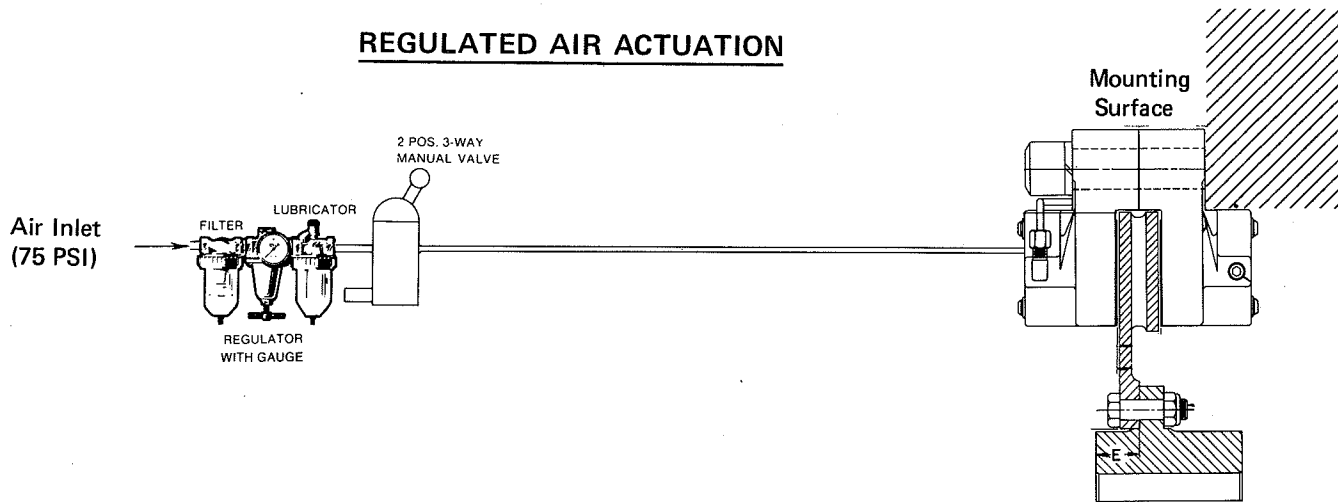
Step 5 – @ 107 RPM, maximum thermal capacity = 1.125 horsepower (per GR-4).

Step 6 – One caliper and one disc operating on air pressure will meet the requirements.

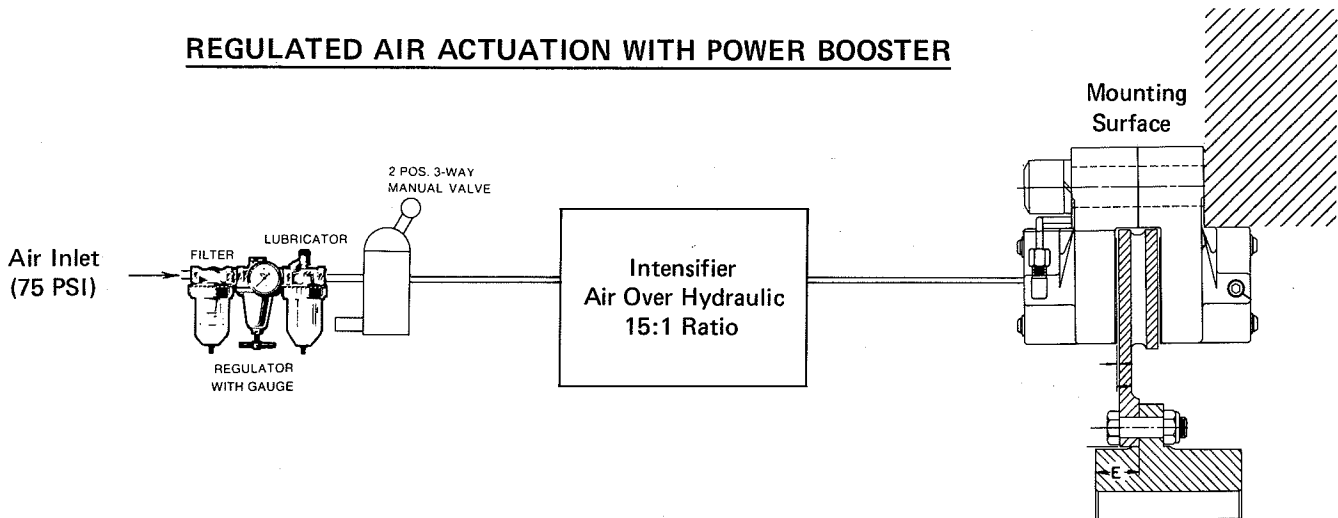
TYPICAL INSTALLATIONS

AIRFLEX 225DP100 CALIPER BRAKES

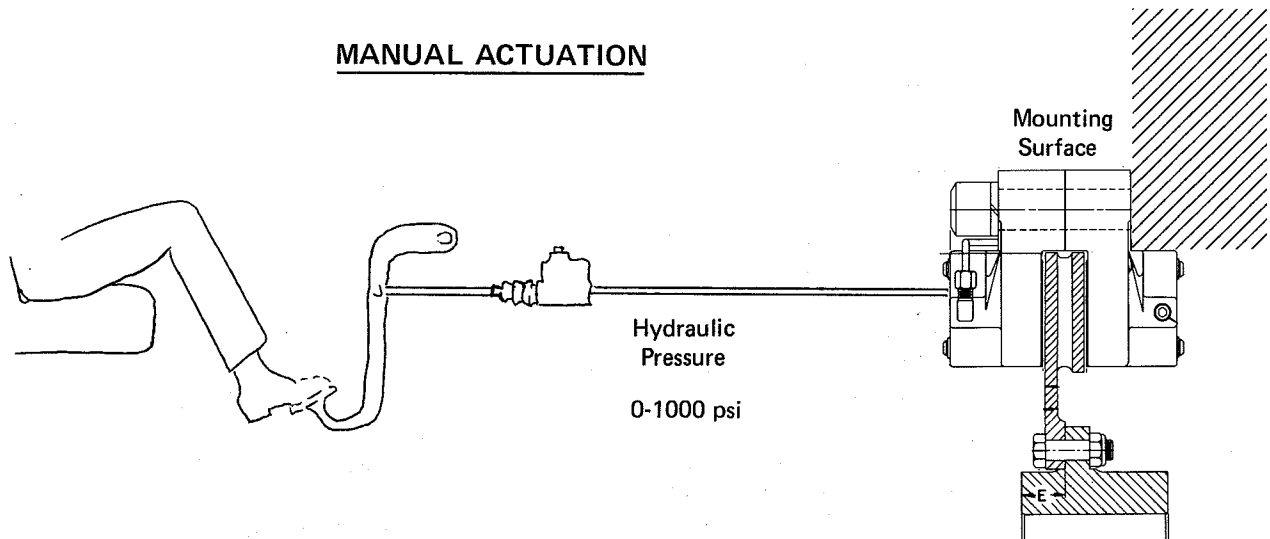
REGULATED AIR ACTUATION



REGULATED AIR ACTUATION WITH POWER BOOSTER



MANUAL ACTUATION



CALIPER ACCESSORIES

AIR OVER HYDRAULIC INTENSIFIER

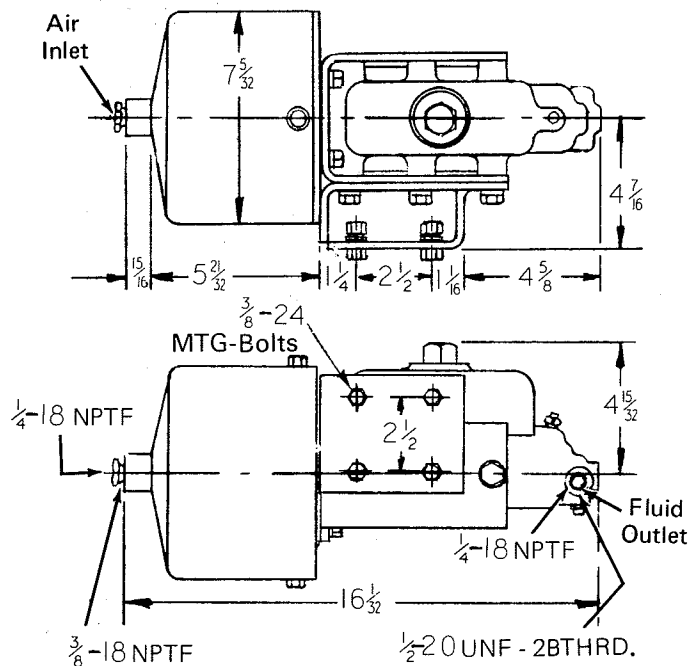
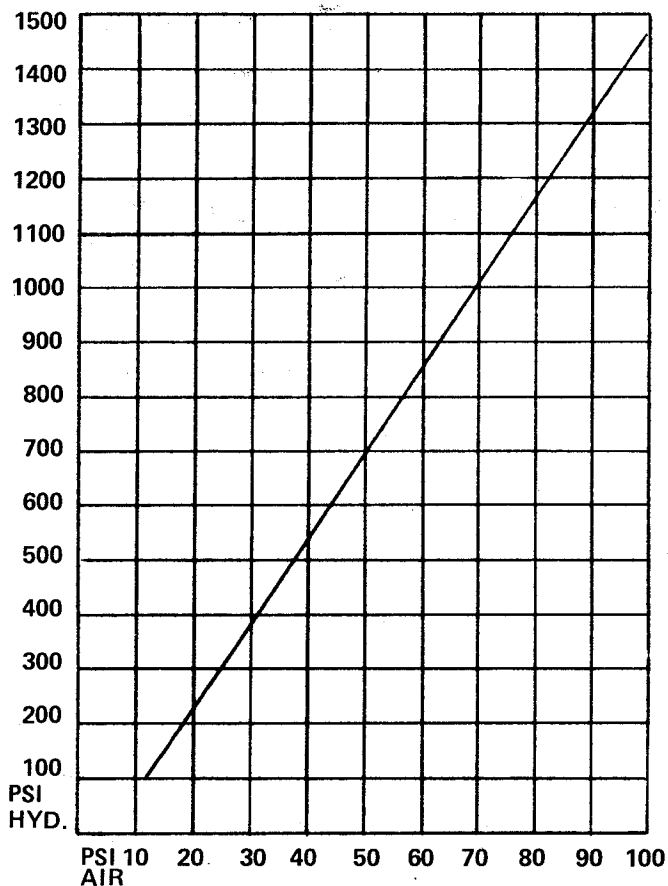
The unit is designed to multiply standard shop air pressure to a higher hydraulic pressure output. Designed for industrial disc brake use and similar systems, which require very low initial hydraulic displacement prior to full pressure application, and requires zero or near zero residual system pressure.

FEATURES

- (1) Approximately 15:1 pressure ratio.
- (2) Can accommodate 4.7 cu. in. system displacement.
- (3) Designed for use with Wagner® 21B Heavy Duty Brake Fluid.
- (4) Designed primarily for single stop and low cyclic duty.

AIRFLEX PART NUMBER – 000153x0772

HYDRAULIC LINE PRESSURE
VS APPLIED AIR PRESSURE



IMPORTANT NOTE: Caliper brakes used with intensifier must have vegetable base seals. Part number 145862H or 145862W. (See page # 8)

EATON PRODUCT WARRANTY

Subject to the conditions stated herein, Eaton Corporation warrants to the Purchaser that each new Airflex Product manufactured by Eaton will be free from failures caused by defects in material and workmanship, and will deliver its rated capacity, for a period of twelve (12) months from the date of shipment to Purchaser, provided such Product is properly installed, properly maintained, operated under normal conditions and with competent supervision. Warranty claims shall be made in writing and the part or parts shall, if requested by Airflex Division, be returned prepaid to the Airflex Division for inspection. Upon a determination that a defect exists, Eaton shall thereupon correct any defect, at its option either by repairing any defective part or parts or by making available at Eaton's plant a repaired or replacement part. This warranty does not extend to normal wear parts or components of the Product, such as friction material and friction surfaces.

LIMITATION OF WARRANTY

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL OR IMPLIED. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE SPECIFICALLY EXCLUDED.

In no event shall Eaton be liable for special, incidental or consequential damages. Eaton's liability arising out of the supplying of such Product, or its use, whether in warranty, contract or otherwise, shall in no case exceed the cost of correcting defects in the Products as herein provided. Upon expiration of the twelve (12) month period, all such liability shall terminate. THE FOREGOING SHALL CONSTITUTE THE SOLE REMEDY OF PURCHASER AND THE SOLE LIABILITY OF EATON.