

# THE INNOVATORS IN OFF HIGHWAY BRAKES

## PRIDE IN PERFORMANCE:

Dependability, safety and performance have always been the dominant factors in the design and manufacture of Hayes Caliper Disc Brakes. Since 1946, first as H&H Products Company Inc., then as H&H Products Division of Kelsey-Hayes Company and beginning June of 1984 as Hayes Brake. Our disc brakes and brake systems have earned Hayes an enviable reputation as the "disc brake specialists". Many years of experience and development in this exclusive field have led to the comprehensive range of models and accessories that we offer today for motorcycles, recreational, construction, agricultural and military vehicles, as well as other types of mobile and stationary equipment.

Meeting your brake needs has always been Hayes' number one commitment. If your products are to perform with the highest efficiency and meet today's stringent safety standards, so must the brakes. Our experienced research, design and development team is well aware of today's rapidly changing technological advances. At Hayes, we're dedicated to producing the most up-to-date, highest quality braking systems—all for the best value. We'll help you find the right braking system for your needs, or custom design one for your special application. Then, we'll guarantee the quality and consistency of every piece you order. Because our braking systems are engineered for the world 's finest products—yours.

## PLEASE NOTE

Information contained in this catalog is for your general information and guidance only. It is not recommended or intended to be a substitute for competent professional assistance which is a prerequisite to any specific application.

Hayes Brake, LLC. makes **no express or implied warranty of any kind whatsoever** concerning the information contained herein and the applicability thereof to a specific use is solely the responsibility of the user. Nothing in this catalog is or shall be construed as a warranty of any kind by Hayes Brake, LLC.

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# SELECTING THE RIGHT BRAKE

## OPTIMUM PERFORMANCE FOR YOUR APPLICATION

To pick the brake and rotor combination that will provide the optimum performance for your particular application, three major factors must be considered—the braking torque required, which affects the choice of caliper unit; the maximum kinetic energy absorption required, which affects the choice of rotor; and the mechanical and environmental requirements, which affect the installation.

### TORQUE

Torque requirements are very often the primary consideration in selecting a design. Torque curves and torque ratings given for each caliper indicate the torque that can be expected under normal operating conditions. A simple torque formula is given for each brake based on the effective rotor radius and the applied braking effort.

In selecting an appropriate brake unit the following equations are useful for estimating torque requirements:

#### For Stopping a Rotating Mass

$$T = \frac{0.00326 \ln \times 12}{t} \quad \text{where } T = \text{required torque in lbs in.}$$

$I = \text{inertia of mass in lbs. ft}^2$   
 $n = \text{initial velocity of mass in rpm}$   
 $t = \text{time of stop in seconds}$

#### For constant Drag Applications

$$T = \frac{5252H \times 12}{n} \quad \text{where } T = \text{required torque in lbs in.}$$

$H = \text{Horsepower absorbed in hp}$   
 $n = \text{constant velocity in rpm}$

#### For Braking a Moving Vehicle

$$T = \frac{W a R \times 12}{g N} \quad \text{where } T = \text{required torque in lbs in.}$$

$W = \text{total vehicle weight in lbs.}$   
 $a = \text{rate of deceleration in ft./sec}^2$   
 $R = \text{effective rolling radius in ft.}$   
 $N = \text{number of brake wheels}$   
 $g = 32.2$

#### For Braking a Parked Vehicle

$$T = \frac{W \sin \Theta \times R}{Gr} \quad \text{where } T = \text{required torque in lbs in.}$$

$W = \text{total vehicle weight in lbs.}$   
 $\Theta = \text{angle in degrees}$   
 $R = \text{effective rolling radius in.}$   
 $Gr = \text{gear ratio to braked shaft}$

#### For Determining Deceleration Rates

$$a = \frac{1.076 V^2}{D_s} \quad \text{where } a = \text{deceleration in ft./sec}^2$$

$V = \text{velocity in miles per hour}$   
 $t_s = \text{stop time in seconds}$   
 $D_s = \text{distance to stop in ft.}$

$$a = \frac{1.467 V}{t_s}$$

**Note:** New pads and or brake disc must be burnished (worn in), before maximum torque can be achieved. The torque formula in this catalog provide torque values after burnishing, or wear-in.

### ENERGY ABSORPTION

Any moving object possesses kinetic energy and stopping that motion generates heat that must be dissipated. Disc brakes, by the very nature of their design, offer superior energy absorbing characteristics. The rotor acts as an excellent 'heat sink'. Since at any given time it is receiving heat through only a small fraction of its surface area, the rest of the rotor is available to dissipate heat to the surrounding air. Just as torque affects the caliper design, kinetic energy (or heat) absorption affects rotor design. Under normal conditions disc brakes are relatively fade free and can be operated successfully at far higher temperatures than a comparable drum or band type brake.

The ability of a disc brake to absorb and dissipate heat (kinetic energy) depends on several factors:

1. The effective rubbed area of the rotor
2. The effective rotor mass
3. Ambient temperature and additional forced cooling
4. Rotor design and material
5. Permissible maximum operating temperature

The following equations are useful for estimating kinetic energy requirements:

#### For a Rotating Mass

$$KE = 0.00017 \ln^2 \quad \text{where } KE = \text{kinetic energy in ft. lbs}$$

$I = \text{inertia of mass in lbs. ft}^2$   
 $n = \text{initial velocity in rpm}$

#### For Stopping a Moving Vehicle

$$KE = 0.0334 W V^2 \quad \text{where } KE = \text{kinetic energy in ft. lbs}$$

$W = \text{total weight of vehicle in lbs.}$   
 $V = \text{initial velocity in mph}$

#### For Total Energy Input Over a Specified Period

$$KE = \frac{2\pi N T}{12} \quad \text{where } KE = \text{kinetic energy in ft. lbs}$$

$N = \text{total number of rotor revolutions in that time}$   
 $T = \text{applied torque in lbs. in.}$   
 $\pi = 3.1416$

### MECHANICAL AND ENVIRONMENTAL

Although the basic specification of the brake may well be determined by the first two considerations, the actual design and configuration finally selected is often dictated by the operating environment and space restrictions imposed by the equipment. The physical layout may determine whether mechanical actuation is feasible or the more flexible hydraulic or pneumatic actuation is to be preferred. It may also determine the choice of fixed or floating mount configurations.

Operating environment and duty cycle are major factors in brake selection. Some models will work well in dirty environments, others will not. The result of comprehensive life cycle testing on your machine in its expected duty cycle and operating environment is the final brake decision factor.

# MECHANICAL BRAKE

## LIGHT DUTY, COMPACT & LIGHT WEIGHT

### 210M & 220M

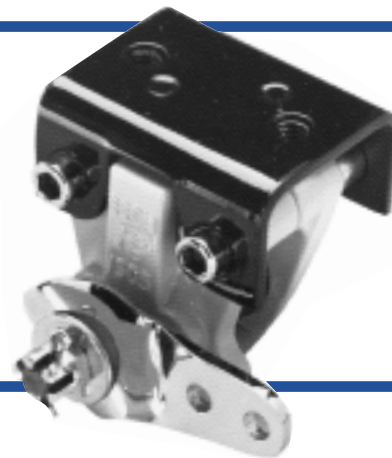
#### FEATURES:

- Capable of 300 lbs. of clamp force.
- Lightweight two piece die cast housing.
- Available with floating mount bracket, or can be fix mounted.
- Cable or push rod actuation.
- Available with either non asbestos organic or sintered metallic pads.
- Both CW and CCW lever actuation.

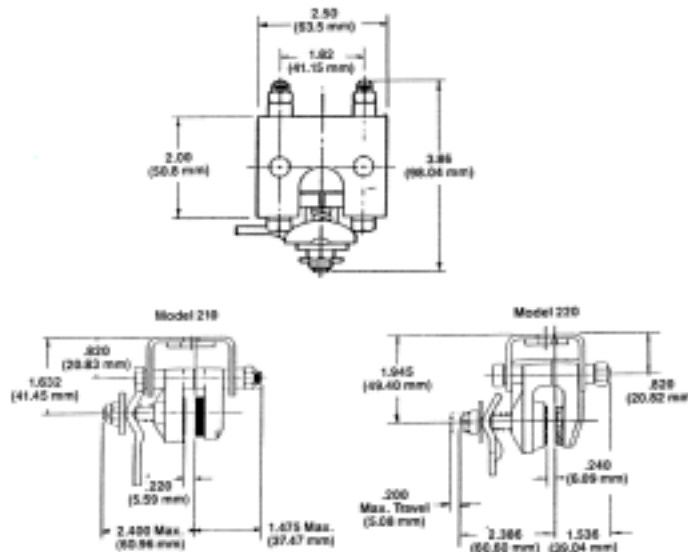
#### TYPICAL SPECIFICATIONS:

Series .....	210M & 220M
Rotor Diameter .....	4 in. and up
Rotor Thickness .....	0.120 to 0.195 inches
Maximum Lever Force @ 1.81" .....	75 lbs.
Lever Positions .....	45° increments
Lining Type .....	non asbestos organic or sintered
Total Lining Area.....	1.68 sq. in.
Usable Lining Thickness Per Pad .....	0.125 in. approx.
Mount .....	floating or fixed
Casting Material .....	aluminum
Weight With Bracket .....	1.1 lbs.

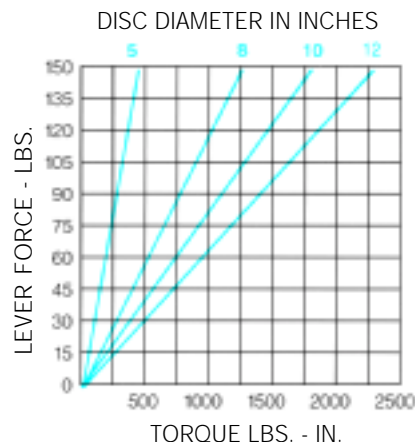
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 8 \mu F \left( \frac{\text{DIA}}{2} - 0.625 \right) \text{ for 1.81" Lever}$$

T = developed torque in lbs-in. DIA = diameter of rotor in inches  
 F = applied lever force in lbs. μ = friction coefficient, assume 0.35





# MECHANICAL BRAKE MEDIUM DUTY

## 1100M

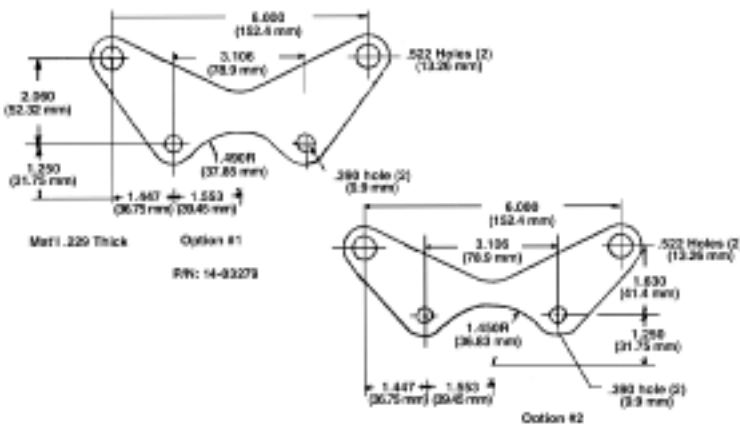
### FEATURES:

- Capable of 900 lbs. of clamp force.
- Economical heat treated stamped steel construction.
- Zinc finish resists rust and corrosion.
- Large friction area for extended pad life.
- Can be fixed or floating mounted.
- Mount bracket optional.
- Choice of CW and CCW lever actuation.

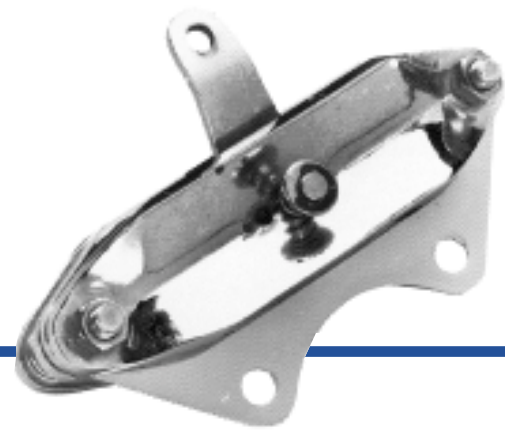
### TYPICAL SPECIFICATIONS:

Series .....	1100M
Rotor Diameter .....	5 to 8 in.
Rotor Thickness .....	0.156 to 0.188 in.
Maximum Lever Force @ 2.10" Hole .....	300 lbs.
Lever Position .....	0 or 180 degrees
Lining Type .....	non asbestos organic
Total Lining Area .....	11 sq.in.
Usable Lining Thickness Per Pad .....	0.130 in.
Weight Without Bracket .....	2.73 lbs.

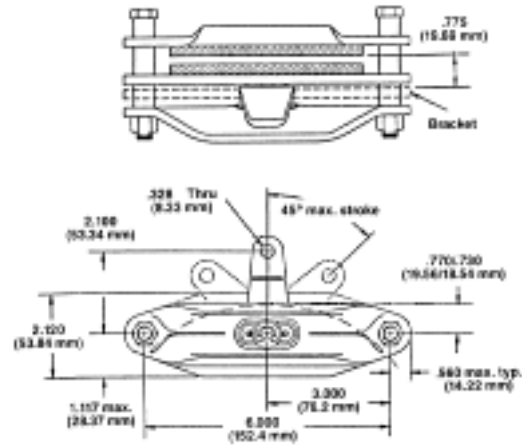
### AVAILABLE BRACKET CONFIGURATION:



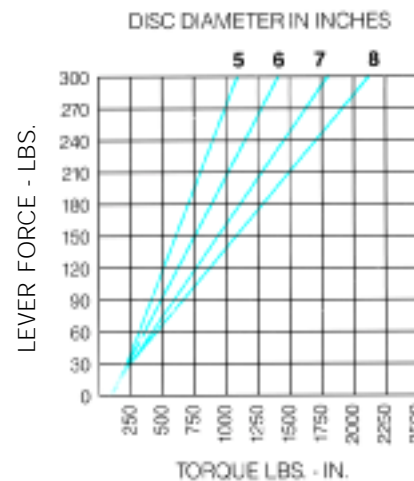
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



### REFERENCE DIMENSIONS:



### TORQUE INFORMATION:



$$\text{Formula: } T = 6 \mu F \left( \frac{\text{DIA}}{2} - 0.687 \right) \text{ for 2.100" Lever}$$

T = developed torque in lbs.-in. DIA = diameter of rotor in inches  
 F = applied lever force in lbs. μ = friction coefficient, assume 0.35



Hayes Brake LLC  
 5800 West Donges Bay Road  
 Mequon, Wisconsin 53092  
 Phone (262) 242-4300  
 Fax (262) 242-0524  
 www.hayesbrake.com



# MECHANICAL BRAKE MEDIUM DUTY

## 400M

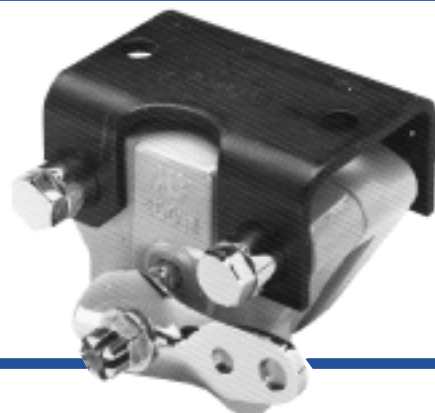
### FEATURES:

- Capable of 1,000 lbs. of clamp force.
- Constructed of lightweight die cast aluminum.
- Available with floating mount bracket or can be fix mounted.
- Wide range of levers/cams are available.
- Easily adapted to various rotor thicknesses.
- Both CW and CCW lever actuation.

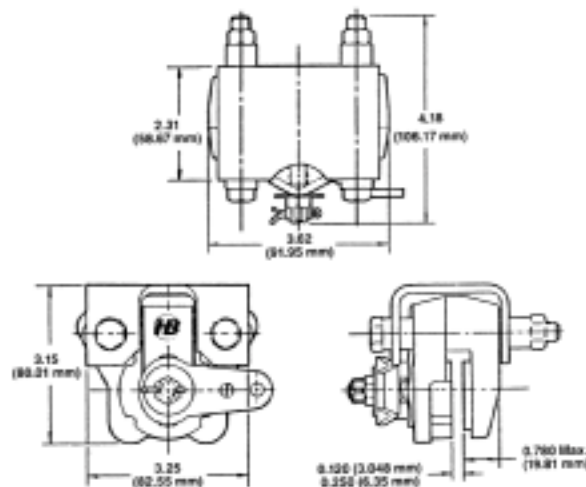
### TYPICAL SPECIFICATIONS:

Series.....	400M
Rotor Diameter .....	6 to 15 in.
Rotor Thickness .....	0.120 to .250 in.
Maximum Lever Force (22° cam with 1.81" Hole) .....	150 lbs.
Lining Type .....	non asbestos organic
Total Lining Area .....	3.5 sq. in.
Usable Lining Thickness Per Pad .....	0.14 in.
Lever Position .....	45 degree increments
Weight With Bracket .....	2 lbs.

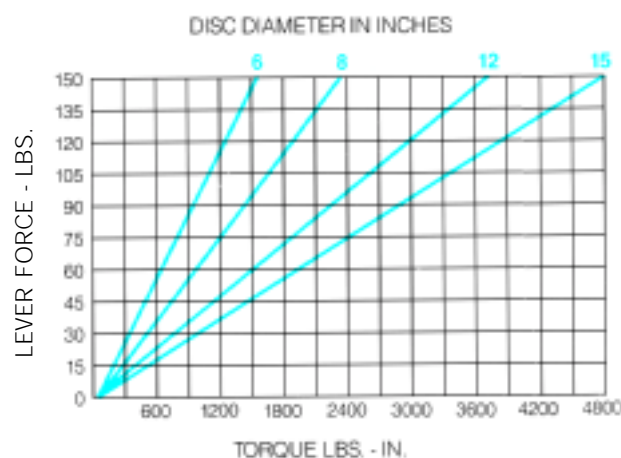
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



### REFERENCE DIMENSIONS:



### TORQUE INFORMATION:



$$\text{Formula: } T = 13.4 \mu F \left( \frac{\text{DIA}}{2} - 0.812 \right) \text{ for 1.81" Lever with 22° Cam}$$

T = developed torque in lbs.-in.  
F = applied lever force in lbs.

DIA = diameter of rotor in inches  
 $\mu$  = friction coefficient, assume 0.35



# MECH. BRAKE SYSTEM

## DESIGNED FOR HYDRAULIC WHEEL MOTORS

### M15 WM FOR 8 & 10 INCH WHEELS

#### FEATURES:

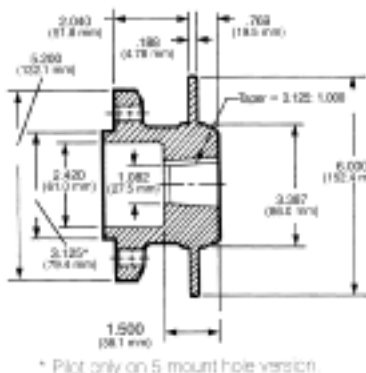
- Capable of 1,450 lbs. of clamp force.
- Maximum 2,500 lbs. - in. of torque.
- Designed to fit inside an 8" diameter wheel.
- Available as a complete system, Aluminum Caliper, Ductile Cast Iron Bracket & Hub/Disc
- Simple single piece caliper bridge design.
- Choice of CW or CCW lever actuation.
- Minimum moving parts to wear out.

#### TYPICAL SPECIFICATIONS:

Series .....	M15 WM
Rotor Diameter .....	6.00 inches
Rotor Thickness .....	0.188 in.
Maximum Stroke .....	50 degrees
Maximum Lever Force @ 2.25" Hole .....	240 lbs.
Lining Type .....	non asbestos organic
Total Lining Area .....	2.9 sq. in.
Usable Lining Thickness Per Pad .....	0.125 in.
Mount Design .....	floating
Casting Material .....	aluminum
Weight With Bracket .....	2.5 lbs.

#### WHEEL MOTOR HUB-DISC:

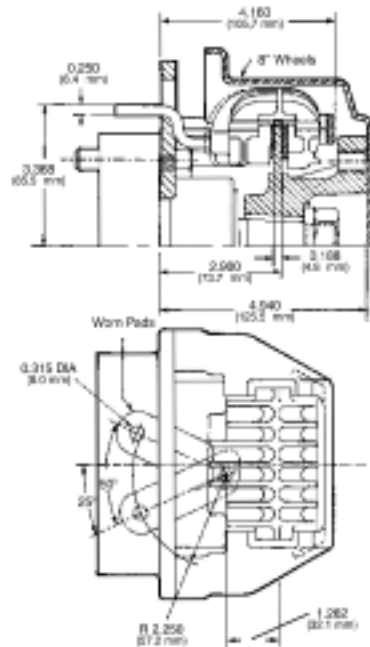
	4-Bolt Wheel on 4" Diameter
Bolts Size	1/2 - 20
	7/16 - 20
	M12 x 1.5
	5-Bolt Wheel on 4.5" Diameter
Bolts Size	1/2 - 20
	7/16 - 20
	M12 x 1.5



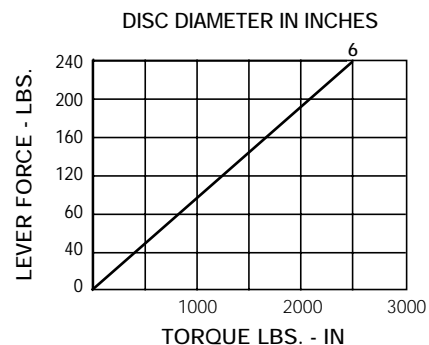
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 12.03 \mu F \left( \frac{\text{DIA}}{2} - 0.55 \right) \text{ for 2.25" Lever}$$

T = developed torque in lbs.-in. DIA = diameter of rotor in inches  
F = applied lever force in lbs.  $\mu$  = friction coefficient, assume 0.35





# MECHANICAL BRAKE

## MEDIUM DUTY SIDE LEVER ACTUATED

### 1110M

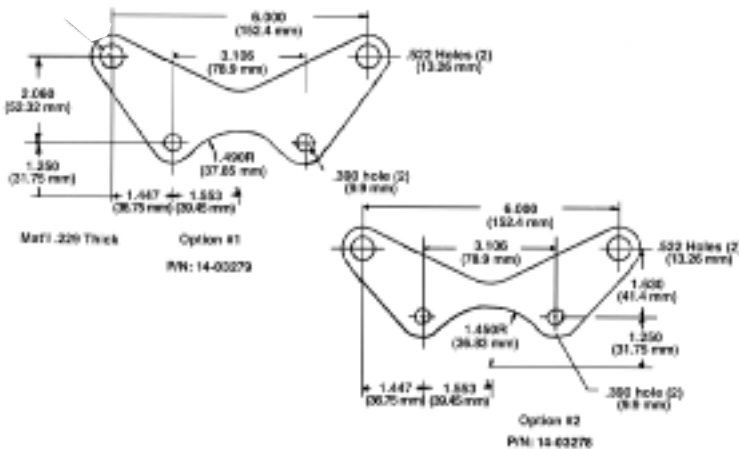
#### FEATURES:

- Capable of 1,600 lbs. of clamp force.
- Economical heat treated stamped steel construction
- Zinc finish resists rust and corrosion.
- Large friction area for extended pad life.
- Choice of CW or CCW lever actuation.
- May be fixed or float mount.
- Mount Bracket optional, consult Hayes for available options.

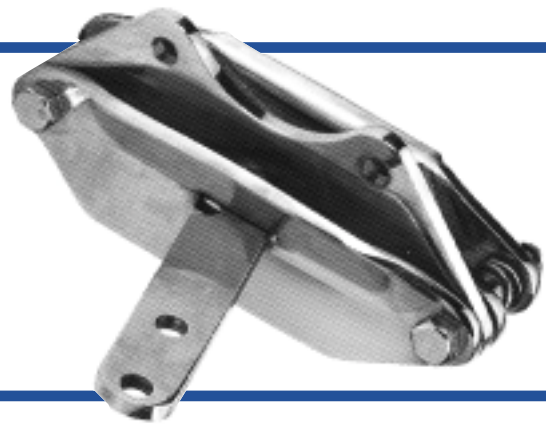
#### TYPICAL SPECIFICATIONS:

Series ..... 1110M  
 Rotor Diameter ..... 5.00 to 8.50 in.  
 Rotor Thickness ..... 0.156 to 0.375 in.  
 Maximum Lever Force @ 4.00" Hole ..... 200 lbs.  
 Lining Type ..... non asbestos organic  
 Total Lining Area ..... 11 sq. in.  
 Usable Lining Thickness Per Pad ..... 0.130 inch  
 Weight Without Bracket ..... 2.8 lb.

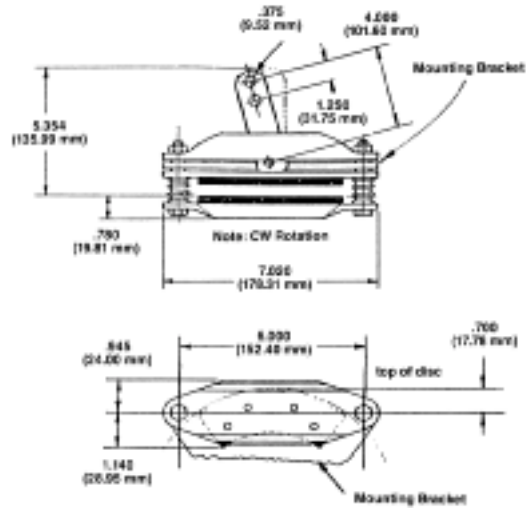
#### AVAILABLE BRACKET OPTIONS:



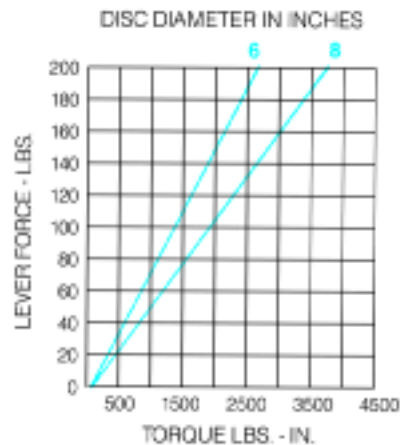
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 16\mu F \left( \frac{\text{DIA}}{2} - 0.687 \right) \text{ for 4.0" Lever}$$

T = developed torque in lbs.-in. DIA = diameter of rotor in inches  
 F = applied lever force in lbs.  $\mu$  = friction coefficient, assume 0.35



# MECHANICAL BRAKE

## FOR HYDRAULIC WHEEL MOTORS OR SECONDARY STOP, PARK

### M50

#### FEATURES:

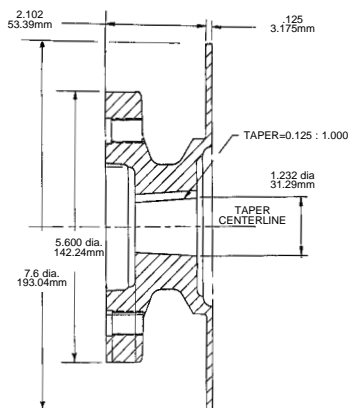
- Capable of 5,000 lbs. of clamp force.
- One piece cast iron housing.
- Efficient ball ramp actuation.
- Sealed actuation mechanism
- Designed to mount in a 10 inch wheel.
- Easy Bolt to plate caliper mounting
- Choice of CW or CCW lever actuation.
- Patented centering design maximizes pad life.

#### TYPICAL SPECIFICATIONS:

Series .....	M50
Rotor Diameter .....	7.00 to 8.00 in.
Rotor Thickness .....	0.125 or 0.188 in.
Maximum Lever Force @ 3.46 inch Hole .....	216 lbs.
Maximum Lever Stroke .....	120 degrees
Lining Type .....	non asbestos organic
Total Lining Area .....	5.52 sq. in.
Usable Lining Thickness Per Pad .....	0.090 inch
Weight .....	4.25 lb.

#### WHEEL MOTOR HUB-DISC NUMBERS

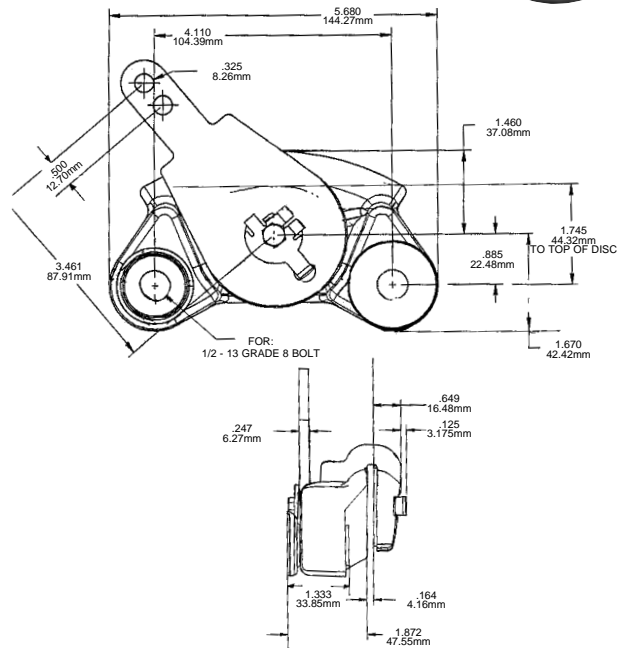
Bolts Size	4-Bolt Wheel on 4" Diameter
	1/2 - 20
	7/16 - 20
Bolts Size	5-Bolt Wheel on 4.5" Diameter
	1/2 - 20
	7/16 - 20
	M12 x 1.5



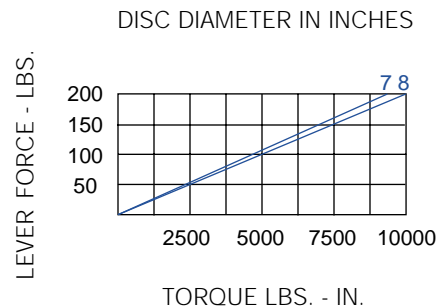
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 46.17\mu F \left( \frac{\text{DIA}}{2} - 0.86 \right) \text{ for 3.46" Lever}$$

T = developed torque in lbs.-in. DIA = diameter of rotor in inches  
F = applied lever force in lbs.  $\mu$  = friction coefficient, assume 0.35



Hayes Brake LLC  
5800 West Donges Bay Road  
Mequon, Wisconsin 53092  
Phone (262) 242-4300  
Fax (262) 242-0524  
www.hayesbrake.com





# MECHANICAL BRAKE

## SECONDARY STOP OR PARK

### M90

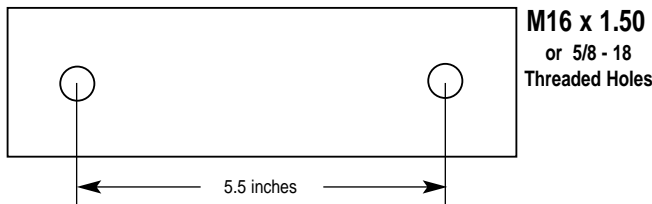
#### FEATURES:

- Capable of 9,000 lbs. of clamp force.
- One piece cast iron housing.
- Efficient ball ramp actuation.
- Sealed actuation mechanism.
- High coefficient friction material.
- Durable, low cost mount with sealed bushings.
- Pads changed by removing one mount bolt.
- Capable of parking a wide range of vehicles.
- Choice of CW or CCW lever actuation.

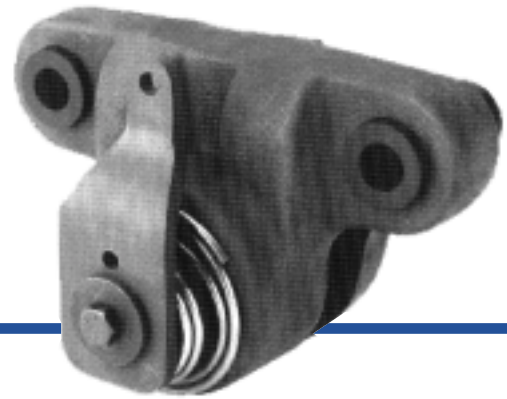
#### TYPICAL SPECIFICATIONS:

Series .....	M90
Rotor Diameter .....	10 to 18 in.
Rotor Thickness .....	0.375 to 1.00 in.
Maxium Lever Force @ 4" Hole .....	500 lbs.
@ 3.325" Hole .....	600 lbs.
Maximum Lever Stroke .....	120 degrees
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	9 sq. in.
Usable lining Thickness per pad .....	0.125 in.
Lever Positions .....	30 degree increments
Weight .....	13 lbs.

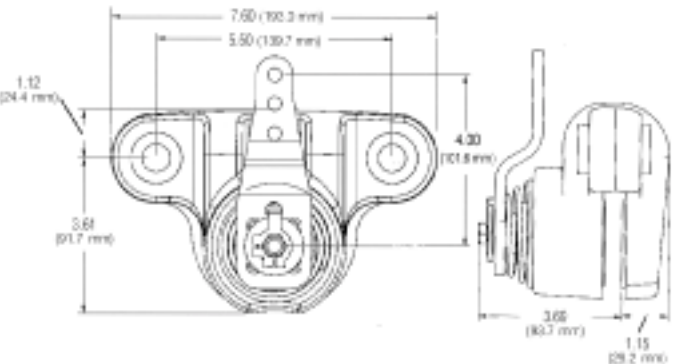
#### MOUNT PLATE CONFIGURATION:



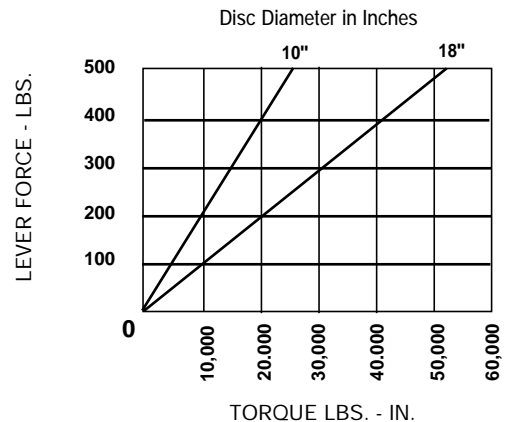
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula } T = 36.0 \mu F \left( \frac{\text{DIA}}{2} - 1.0 \right) \text{ for 4.0" Lever}$$

T = developed torque in lbs.-in.      DIA = diameter of rotor in inches  
F = applied lever force in lbs.      μ = friction coefficient, assume 0.35







# MECHANICAL BRAKE

## SPRING APPLIED AIR OR HYDRAULIC RELEASED

### M100SA

#### FEATURES:

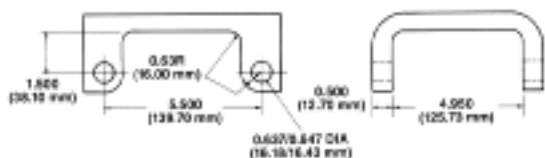
- Capable of 10,000 lbs. of clamp force.
- Self adjusting for friction pad wear.
- Fully sealed internal ball ramp mechanism.
- Fully assembled, with air chamber mounted for either CW or CCW operation.
- Quick change pads, retained by mount pins.
- Fast response-capable of 100 milliseconds.
- Chamber can be positioned in 90 degree increments.
- Mechanical release using a wrench.

#### TYPICAL SPECIFICATIONS:

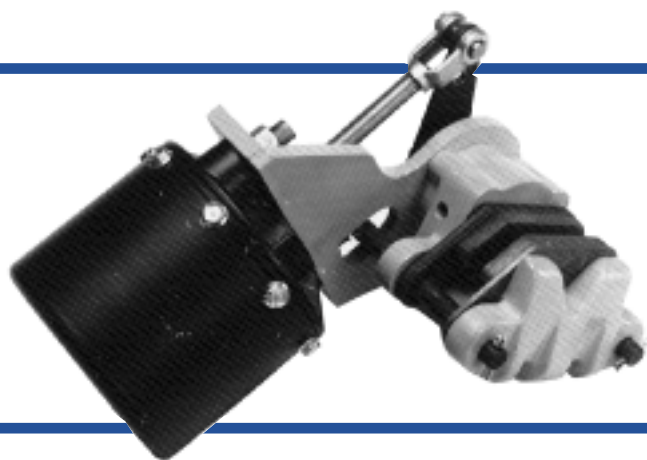
Series .....	M100SA
Rotor Diameter .....	10 in. and up
Rotor Thickness .....	0.500 to 0.750 in.
Brake Hold Off .....	40 PSI of air or hyd.
Maximum Chamber Rating .....	125 PSI of air or hyd.
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	14.8 sq. in.
Lining Thickness Per Pad .....	0.470 in.
Chamber Mounting .....	90 degree increments
Housing .....	nodular iron
Weight .....	36.5 lbs.

**Note:** Consult Hayes about alternate chamber orientations.

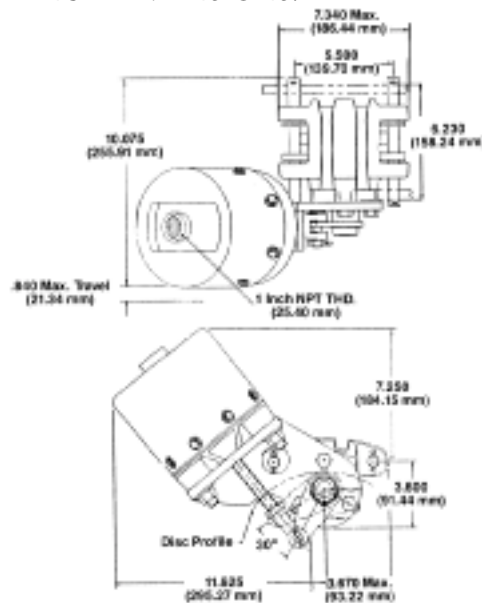
#### TYPICAL BRACKET CONFIGURATION:



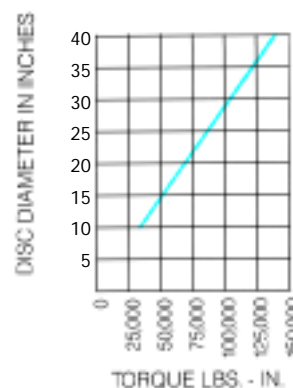
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 2 \mu F \left( \frac{\text{DIA}}{2} - 1.0 \right)$$

T = developed torque in lbs.-in.  
F = 10,000 lbs. of clamp force

DIA = diameter of rotor in inches  
 $\mu$  = friction coefficient, assume 0.35



# MECHANICAL BRAKE

## SPRING APPLIED HYDRAULIC RELEASE

### M100SH

#### FEATURES:

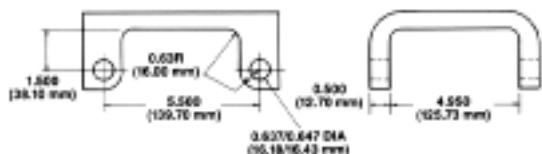
- Capable of 10,000 lbs. of clamp force.
- Self adjusts for friction pad wear.
- Fully assembled with spring chamber capable of being rotated in 90 degree increments.
- Quick change pads, retained by mount pins.
- Fully sealed internal ball ramp mechanism.
- Capable of a 40 millisecond response time.
- Spring will have less than 2% creep in normal applications.
- Mechanical released using a wrench on chamber pull rod.

#### TYPICAL SPECIFICATIONS:

Series .....	M100SH
Rotor Diameter .....	10 in. and up
Rotor Thickness .....	0.500, 0.625, and 0.750 in.
Brake Hold Off .....	995 psi hyd.
Max Hydraulic Pressure .....	3,675 psi hyd.
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	14.8 sq. in.
Usable Lining Thickness Per Pad .....	0.47 in.
Chamber Mounting .....	90 deg. increments
Housing .....	nodular iron
Weight .....	48 lbs.

**Note:** Consult Hayes about other chamber to caliper orientations.

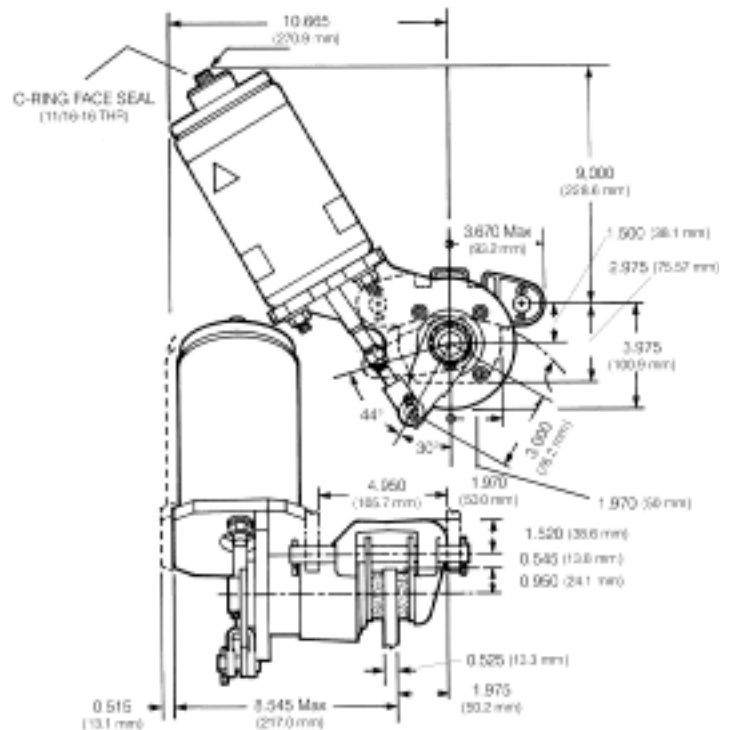
#### TYPICAL BRACKET CONFIGURATION:



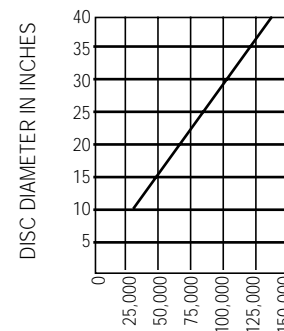
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula } T = 2 \mu F \left( \frac{\text{DIA}}{2} - 1.0 \right)$$

T = developed torque in lbs.-in. DIA = diameter of rotor in inches  
 F = 10,000 pound clamp force  $\mu$  = friction coefficient, assume 0.35



Hayes Brake LLC  
 5800 West Donges Bay Road  
 Mequon, Wisconsin 53092  
 Phone (262) 242-4300  
 Fax (262) 242-0524  
 www.hayesbrake.com

# HYDRAULIC BRAKE FOR 8 INCH IN WHEEL MOUNTING

## 1-35-1S

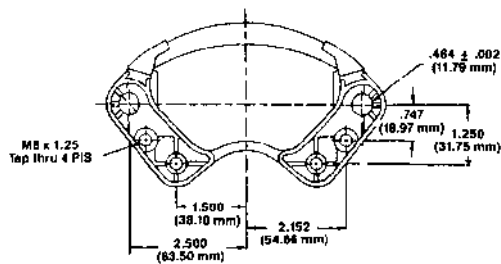
### FEATURES:

- Capable of 2,200 lbs. of clamp force.
- Can be mounted in most currently available 8" wheels.
- Right or left hand inlet locations.
- Patented rubber vibration dampening pad on floating rail.
- Mounts on flat plate parallel to disc with 6 holes - two for torque take out and 4 for mount bolts.
- Four bleeder or inlet locations.

### TYPICAL SPECIFICATIONS:

Series .....	1-35-1S
Rotor Diameter .....	6 to 10 in.
Rotor Thickness .....	0.187 to 0.250 in.
Piston Diameter .....	1.372 in.
Maximum Hydraulic Pressure .....	1500 psi
Fluid Displacement @ 1500 PSI .....	0.033 cu. in.
Fluid Type .....	Brake Fluid DOT 3 or DOT 5
Inlet .....	3/8 - 24 thread with 3/16" inverted flare
Lining Type .....	non asbestos organic
Total Lining Area .....	5.5 sq. in.
Usable Lining Thickness Per Pad .....	0.125 in.
Weight .....	3.1 lbs.

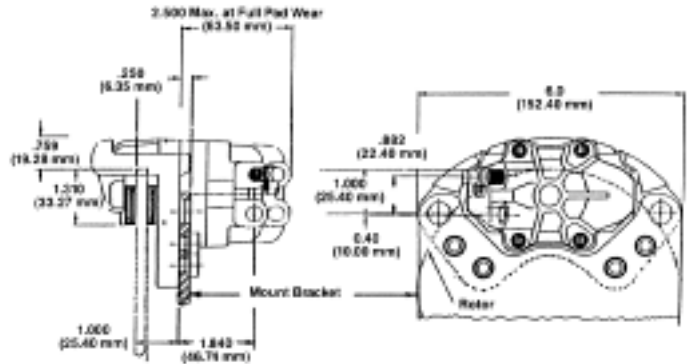
### STANDARD DIE CAST MOUNT BRACKET:



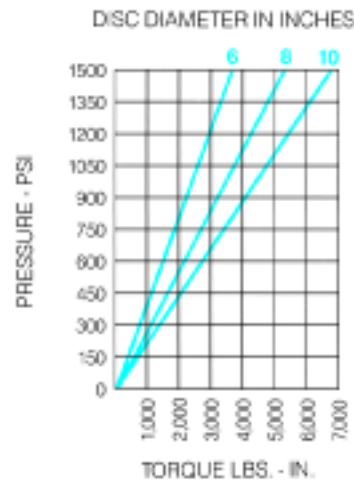
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



### REFERENCE DIMENSIONS:



### TORQUE INFORMATION:



$$\text{Formula: } T = 2.96 \mu P \left( \frac{\text{DIA}}{2} - 0.625 \right)$$

T = developed torque in lbs-in. DIA = diameter of rotor in inches  
P = applied line pressure in psi. μ = friction coefficient. assume 0.35



# HYDRAULIC BRAKE MEDIUM DUTY COMPACT

## 1-41-1S

### FEATURES:

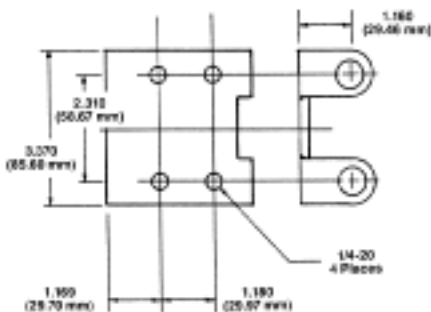
- Capable of 3,100 lbs of clamp force.
- Economically constructed with die cast aluminum housing.
- Square seal piston retraction for constant running clearance.
- Three bleeder and inlet options for mount flexibility.
- Available for either hydraulic or brake fluid application.
- Various brackets available.

### TYPICAL SPECIFICATIONS:

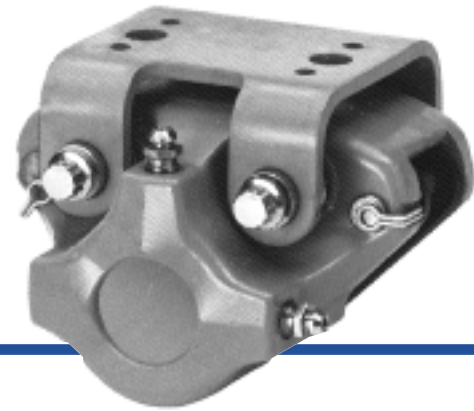
Series .....	1-41-1S
Rotor Diameter .....	6 to 20 in.
Rotor Thickness .....	0.100 to 0.375 in.
Piston Diameter .....	1.622 in.
Maximum Hydraulic Pressure .....	1500 psi
Fluid Displacement @ 1500 PSI .....	0.081 cu. in.
Fluid Type .....	Brake Fluid DOT 3 & 5 or Hydraulic Oil
Fluid Inlet .....	3/8-24 thread with 3/16" inverted flare
Bleeder (either side) .....	3:00, 9:00 or 12:00
Lining Type .....	non-asbestos organic or sintered
Total Lining Area .....	7.30 sq. in.
Usable Lining Thickness Per Pad .....	0.175 in.
Weight With Bracket .....	4 lbs.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified.

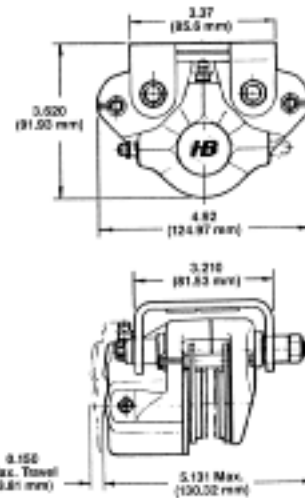
### STANDARD MOUNT BRACKET:



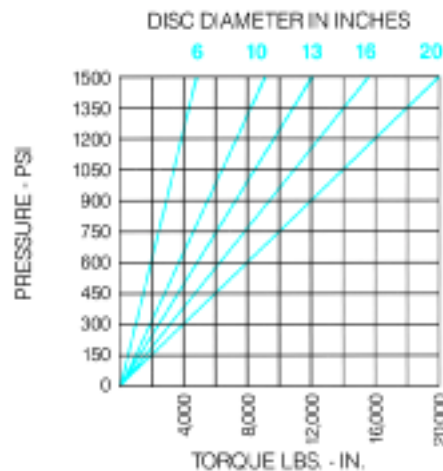
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



### REFERENCE DIMENSIONS:



### TORQUE INFORMATION:



$$\text{Formula: } T = 4.14 \mu P \left( \frac{\text{DIA}}{2} - 0.95 \right)$$

T = developed torque in lbs-in.  
P = applied line pressure in psi.

DIA = diameter of rotor in inches  
 $\mu$  = friction coefficient. assume 0.35



# HYDRAULIC BRAKE

## TWO PISTONS OPPOSED MEDIUM DUTY

### 2-41-1S

#### FEATURES:

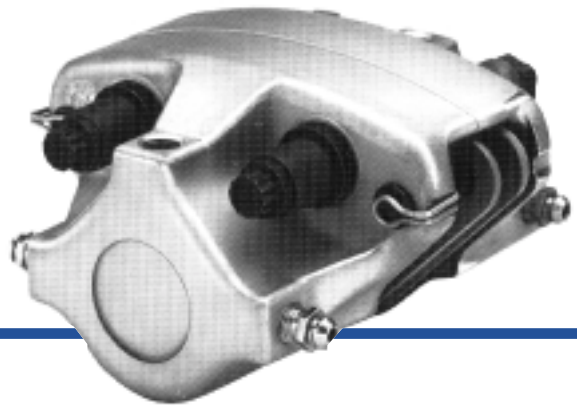
- Capable of 3,100 lbs. of clamp force.
- Economically constructed with die cast aluminum housing.
- Choice of side fix mount lugs or top mount bracket.
- Utilizes internal transfer port with o-ring seal.
- Square seal piston retraction for constant running clearance.
- Three bleeder and inlet location options.
- Available for either hydraulic or brake fluid application.

#### TYPICAL SPECIFICATIONS:

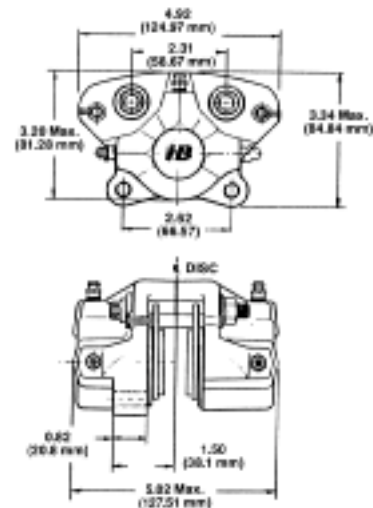
Series .....	2-41-1S
Rotor Diameter .....	6 to 20 in.
Rotor Thickness .....	0.100 to 0.375 in.
Piston Diameter .....	1.622 in.
Maximum Hydraulic Pressure .....	1500 psi
Fluid Displacement @ 1500 PSI .....	0.161 cu. in.
Fluid Type .....	Brake Fluid DOT 3 & 5 or Hydraulic Oil
Fluid Inlet .....	3/8 -24 thread with 3/16" inverted flare
Bleeder (either side) .....	3:00, 9:00 or 12:00
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	7.30 sq. in.
Usable Lining Thickness Per Pad .....	0.175 in.
Weight .....	4 lbs.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified.

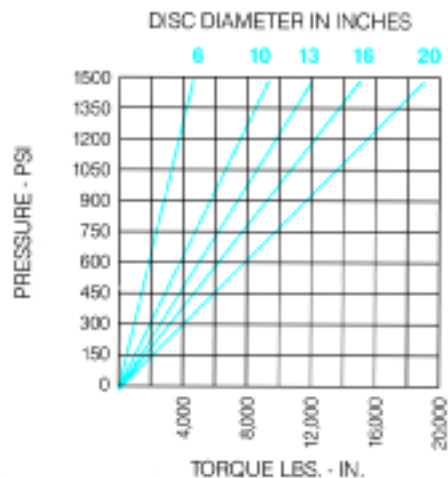
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 4.14 \mu P \left( \frac{\text{DIA}}{2} - 0.95 \right)$$

T = developed torque in lbs-in.      DIA = diameter of rotor in inches  
P = applied line pressure in psi       $\mu$  = friction coefficient. assume 0.35



# HYDRAULIC BRAKE

## HEAVY DUTY FIXED MOUNT

### 2-57-1S

#### FEATURES:

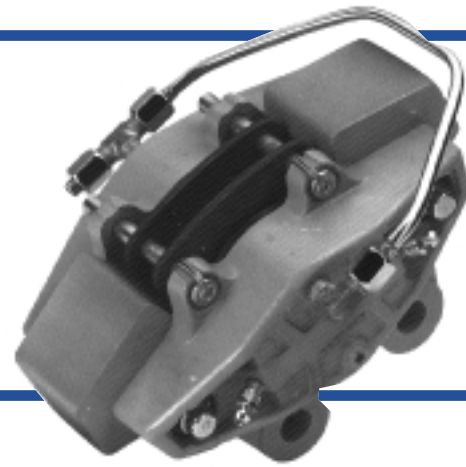
- Capable of 7,960 lbs. of clamp force.
- Die cast aluminum housing for lightweight and heat dissipation.
- Square seal piston retraction for constant running clearance.
- Large area (volume) pads for durability and low maintenance.
- Either above or below rotor mount holes available.
- Right or left hand assemblies for in wheel mounting.
- Adaptable to either brake or hydraulic fluid.

#### TYPICAL SPECIFICATIONS:

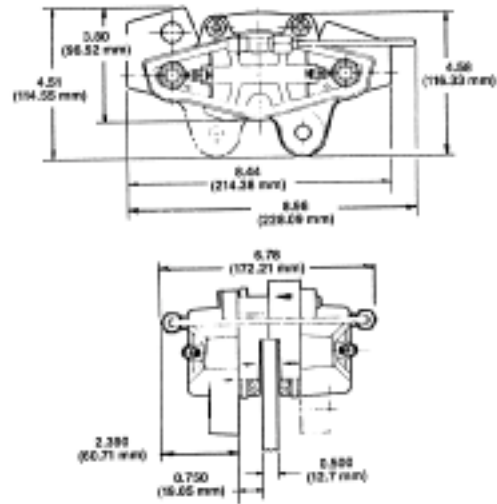
Series .....	2-57-1S
Rotor .....	10 to 24 in.
Rotor Thickness .....	0.375 to 1.20 in.
Piston Diameter .....	2.25 in.
Maximum Hydraulic Pressure .....	2000 psi
Fluid Displacement @ 2000 PSI .....	0.31 cu. in.
Fluid Type .....	Brake Fluid DOT 3 & 5 or Hydraulic Oil
Fluid Inlet .....	1/8 -27 NPT
Bleeder Options .....	3:00, 9:00 or 12:00
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	15 sq. in.
Usable Lining Thickness Per Pad .....	0.30 in.
Weight .....	10.5 lbs.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified

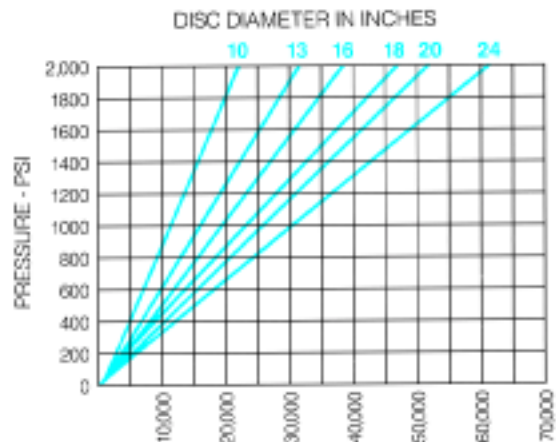
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 7.96 \mu P \left( \frac{\text{DIA}}{2} - 1.1 \right)$$

T = developed torque in lbs-in.    DIA = diameter of rotor in inches  
 P = applied line pressure in psi     $\mu$  = friction coefficient. assume 0.35



# HYDRAULIC BRAKE IN WHEEL SERVICE OR DRIVE LINE

## 1-663-1S

### FEATURES:

- Capable of 10,000 lbs. of clamp force.
- Ideal for mount on driveline or in the wheel.
- One piece nodular iron housing.
- Square seal piston retraction for constant running clearance.
- Supplied with mount bolts and sealed and lubricated slider pins.
- Variety of inlet and bleeder options for mounting flexibility.
- Quick change pads with 14.5 sq. in. of pad area.

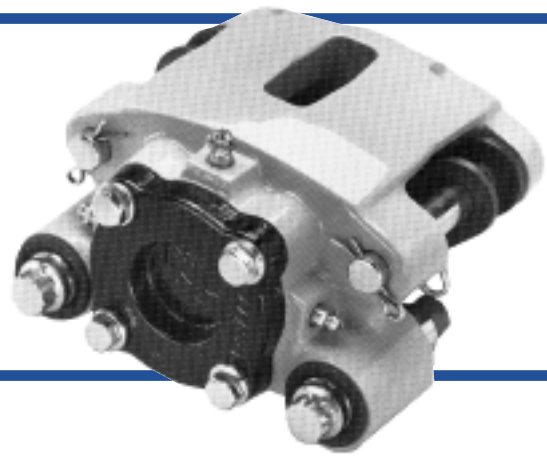
### TYPICAL SPECIFICATIONS:

Series .....	1-663-1S
Rotor Diameter .....	10 to 20 in.
Rotor Thickness .....	0.75 to 1.0 in.
Piston Diameter .....	2.6 in.
Max. Hydraulic Pressure .....	2000 psi
Fluid Displacement @ 2000 PSI .....	0.20 cu. in.
Fluid Type .....	Brake DOT Fluid 3 & 5 or Hydraulic Oil
Fluid Inlet* .....	3/8-24 thread, w/ 3/16" inverted flare
Bleeder* .....	3:00, 9:00, & 12:00
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	14.5 sq. in.
Usable Lining Thickness Per Pad .....	0.328 in.
Weight .....	18 lbs.

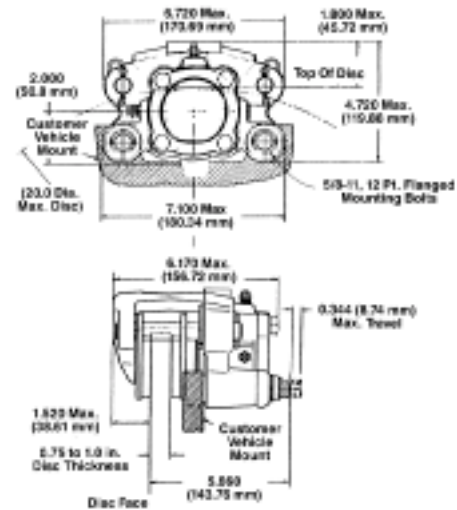
\*Bleeder and Inlet locations are interchangeable.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified.

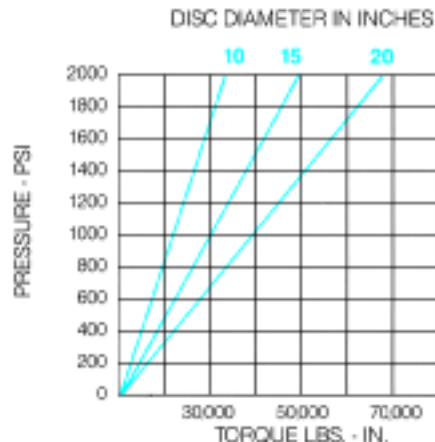
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



### REFERENCE DIMENSIONS:



### TORQUE INFORMATION:



$$\text{Formula: } T = 10.6\mu P \left( \frac{\text{DIA}}{2} - .875 \right)$$

T = developed torque in lbs.-in.  
P = applied line pressure in psi.

DIA = diameter of rotor in inches  
 $\mu$  = friction coefficient. assume 0.35



# HYDRAULIC BRAKE

## SERVICE & PARK BRAKE

### HEAVY DUTY

# 1-663-1SA

#### FEATURES:

- Capable of 10,000 lbs. of service clamp force, and 10,000 lbs. of mechanical clamp force.
- Ideal for mount on driveline or in the wheel.
- One piece nodular iron housing.
- Square seal piston retraction for constant running clearance.
- Integral secondary/park brake self adjusts for pad wear.
- Choice of CW or CCW lever actuation.
- Variety of inlet and bleeder options for mounting flexibility.
- Supplied with mount bolts and sealed and lubricated slider pins.
- Quick change pads with 14.5 sq. in. of pad area.

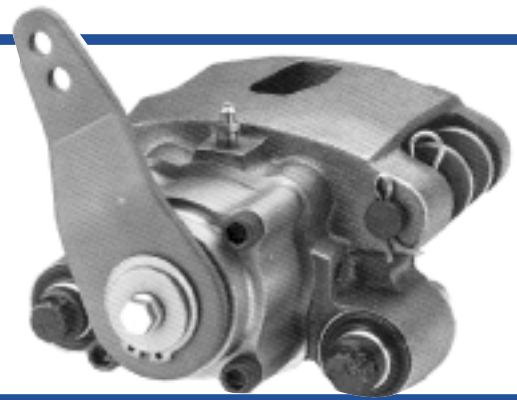
#### TYPICAL SPECIFICATIONS:

Series .....	1-663-1SA
Rotor Diameter .....	10 to 20 in.
Rotor Thickness .....	0.75 to 1.0 in.
Lining Type .....	non-asbestos organic or sintered
Total Lining Area .....	14.5 sq. in.
Usable Lining Thickness Per Pad .....	0.328 in.
Weight .....	21 lbs.
Hydraulic Service Information:	
Piston Diameter .....	2.6 in.
Max. Hydraulic Pressure .....	2000 psi
Fluid Displacement @ 2000 PSI.....	0.20 cu. in.
Fluid Type .....	Brake Fluid DOT 3 & 5 or Hydraulic Oil
Fluid Inlet* .....	3/8-24 thread with 3/16" inverted flare
Bleeder* .....	3:00, 9:00, & 12:00
Mechanical Park Brake Information:	
Max. Lever Force @ 4.375 in. ....	450 lbs.
Lever Stroke for 10,000 lbs. of clamp .....	27 deg.
Lever Positions .....	30 deg. increments

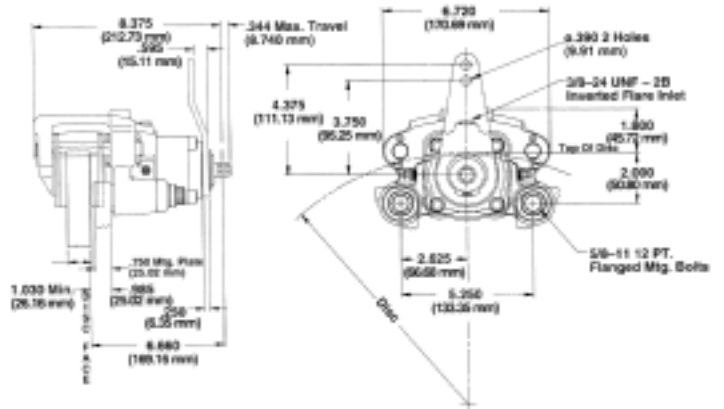
\*Bleeder and Inlet locations are interchangeable.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified.

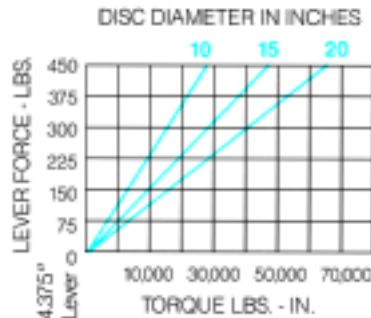
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



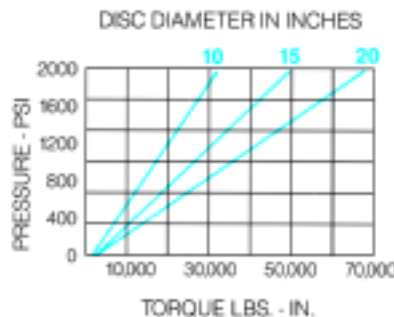
#### SECONDARY/PARK BRAKE TORQUE INFORMATION:



Formula:  

$$T = 44.4 \mu F \left( \frac{DIA}{2} - 0.875 \right)$$
 for 4.375" Lever

#### HYDRAULIC SERVICE TORQUE INFORMATION:



Formula:  

$$T = 10.6 \mu P \left( \frac{DIA}{2} - 0.875 \right)$$

T = developed torque in lbs.-in.    DIA = diameter of rotor in inches  
 P = applied line pressure in psi     $\mu$  = friction coefficient. assume 0.35  
 F = applied lever force in lbs.



# HYDRAULIC BRAKE

## FIXED MOUNT HEAVY DUTY

### 2-660-1S

#### FEATURES:

- Capable of 10,000 lbs. of clamp force.
- Ideal for mount on driveline or in the wheel.
- One piece nodular iron housing.
- Square seal piston retraction for constant running clearance.
- Variety of inlet and bleeder options for mounting flexibility.
- Quick change pads with 24 sq. in. of pad area.

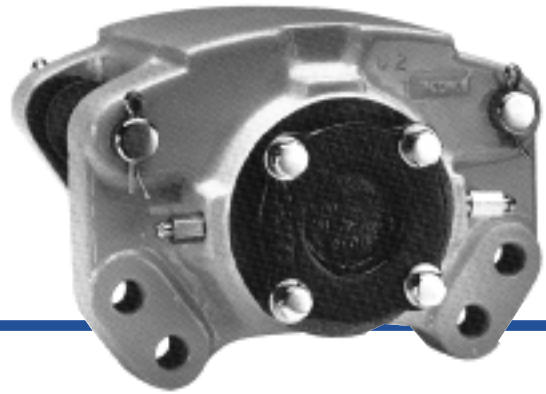
#### TYPICAL SPECIFICATIONS:

Series .....	2-660 -1S
Rotor Diameter .....	12 to 20 in.
Rotor Thickness .....	0.500 to .940 in.
Piston Diameter .....	2.6 in.
Maximum Hydraulic Pressure .....	1800 PSI
Fluid Displacement @ 1800 PSI .....	0.40 cu. in.
Fluid Type .....	Brake Fluid DOT 3 & 5 or Hydraulic Oil
Fluid Inlet* .....	7/16-24 thread, with 1/4 in. inverted flare
Bleeder Each Side*.....	3:00, 9:00, & 12:00
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	24 sq. in.
Usable Lining Thickness Per Pad .....	0.50 in.
Weight .....	39 lbs.

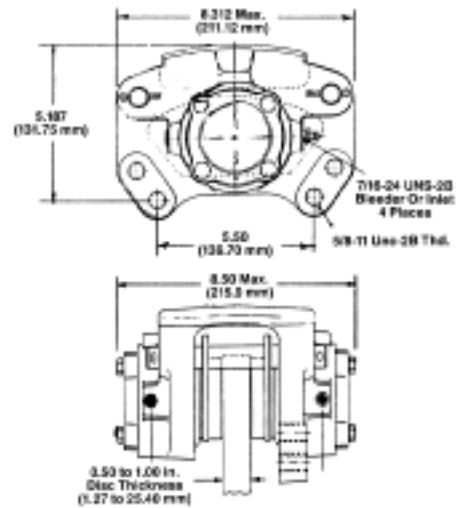
\*Bleeder and Inlet locations are interchangeable.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified.

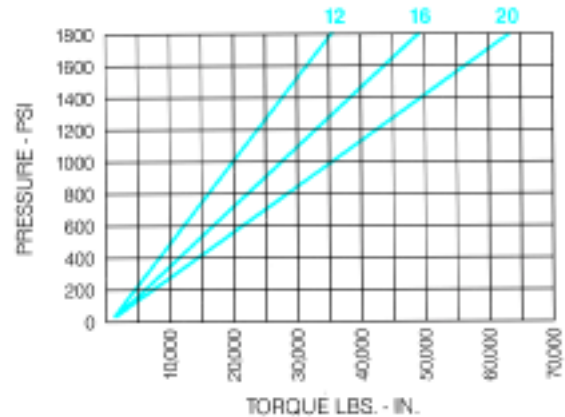
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



#### TORQUE INFORMATION:



$$\text{Formula: } T = 10.6 \mu P \left( \frac{\text{DIA}}{2} - 0.875 \right)$$

T = developed torque in lbs-in.      DIA = diameter of rotor in inches  
P = applied line pressure in psi.      μ = friction coefficient. assume 0.35



# HYDRAULIC BRAKE

## SERVICE & PARK HEAVY DUTY

### 2-660-1SA

#### FEATURES:

- Capable of 10,000 lbs. of service clamp force, and 10,000 lbs. of mechanical clamp force.
- Ideal for fixed mount on driveline.
- One piece nodular iron housing.
- Square seal piston retraction for constant running clearance.
- Integral secondary/park brake self adjusts for pad wear.
- CW or CCW park brake lever actuation.
- Variety of inlet and bleeder options for mounting flexibility.
- Quick change pads with 24 sq. in. of pad area.

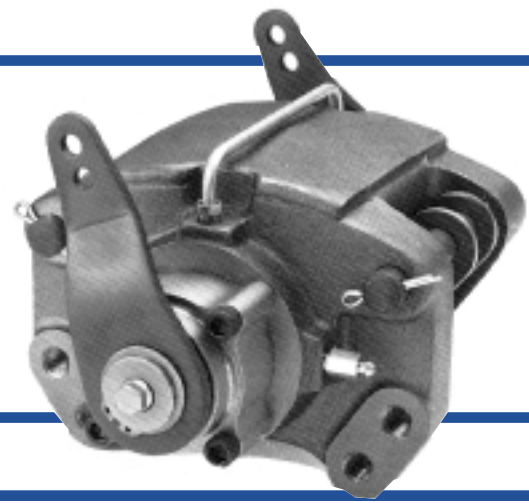
#### TYPICAL SPECIFICATIONS:

Series .....	2-660-1SA
Rotor Diameter .....	12 to 20 in.
Rotor Thickness .....	0.500 to 0.940 in.
Lining Type .....	non asbestos organic or sintered
Total Lining Area .....	24 sq. in.
Usable Lining Thickness Per Pad .....	0.50 in.
Weight .....	46 lbs.
Hydraulic Service Information	
Piston Diameter .....	2.6 in.
Max. Hydraulic Pressure .....	2000 psi
Fluid Displacement @ 2000 PSI .....	0.40 cu. in.
Fluid Type .....	Brake Fluid DOT 3 & 5 or Hydraulic Oil
Fluid Inlet* .....	7/16 -24 thread, with 1/4 inverted flare
Bleeder Each Side* .....	3:00, 9:00, & 12:00
Mechanical Park Brake Information	
Max. Lever Force @ 4.375 in. ....	450 lbs.
Lever Stroke for 10,000 lbs. of clamp .....	27 deg.
Lever Positions .....	30 deg. increments

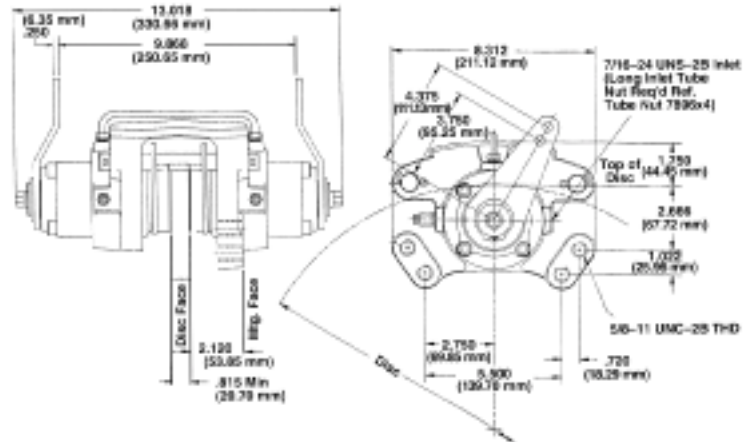
\*Bleeder and Inlet locations are interchangeable.

**Note:** The same seals cannot be used for both Brake and Hydraulic fluid. Either Brake or Hydraulic fluid must be specified.

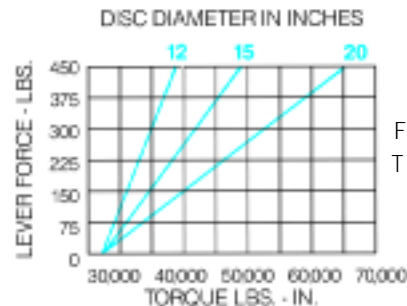
Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



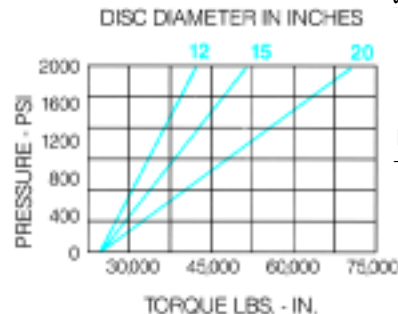
#### SECONDARY/PARK BRAKE TORQUE INFORMATION:



Formula:  

$$T = 44.4 \mu F \left( \frac{DIA}{2} - 0.875 \right)$$
 for 4.375" Lever

#### HYDRAULIC SERVICE TORQUE INFORMATION:



Formula:  

$$T = 10.6 \mu P \left( \frac{DIA}{2} - 0.875 \right)$$

T = developed torque in lbs-in.    DIA = diameter of rotor in inches  
 P = applied line pressure in psi    μ = friction coefficient. assume 0.35  
 F = applied lever force in lbs.



Hayes Brake LLC  
 5800 West Donges Bay Road  
 Mequon, Wisconsin 53092  
 Phone (262) 242-4300  
 Fax (262) 242-0524  
 www.hayesbrake.com

# SPRING APPLIED HYDRAULIC RELEASE CHAMBER

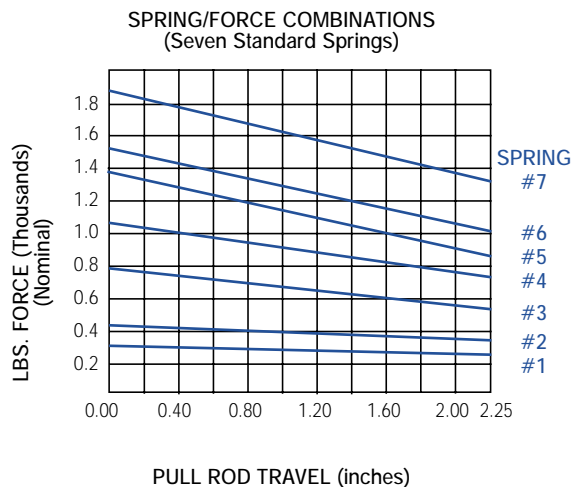
## SPRING CHAMBER - HIGH PRESSURE

### FEATURES:

- Springs are permanently and safely sealed in corrosion resistant chamber.
- Only 2.76 cubic inches of fluid required for hold off.
- Designed for continuous system pressures up to 3,675PSI.
- Spring designed for less than 2% creep in normal applications.
- Minimal variation in spring force over entire 2.25 inch stroke.
- SAE J1453-6 O-ring face seal inlet.\*
- Sealed chamber prevents actuator and spring contamination.
- Ball socket push rod end minimizes binding and allows easy rotation for length adjustment and back off.
- Optional threaded rod or rod with clevis end available.
- For use with petroleum and synthetic hydraulic fluids.\*
- Weight is 13 lbs.

\* Consult Hayes for other options.

### TYPICAL SPECIFICATIONS:

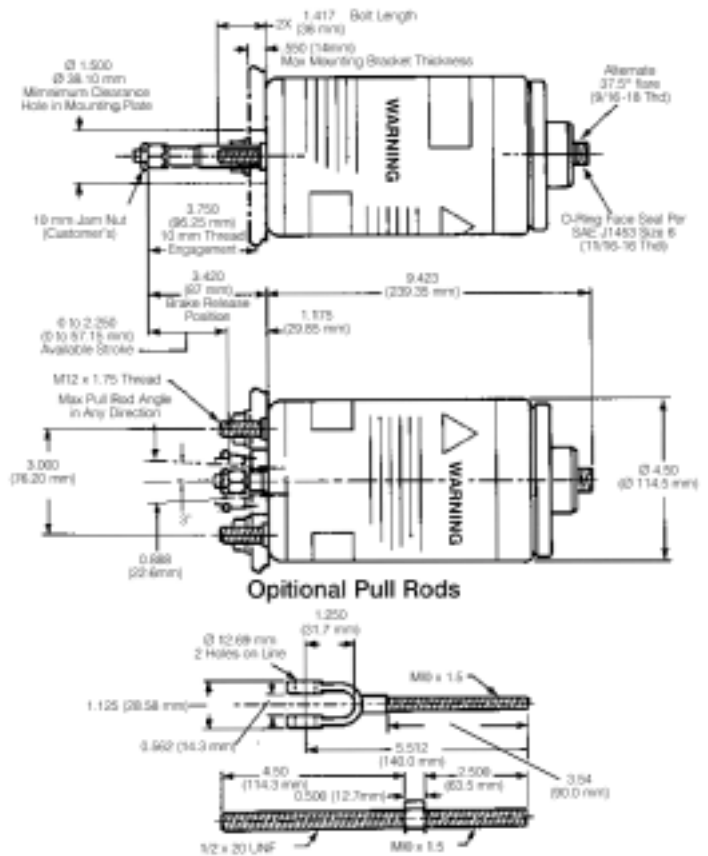


Note: Consult Factory about alternative hold off forces and maximum pressures.

Specifications are guide lines only and subject to change. Consult Hayes for specific model and part number and assembly drawing.



### REFERENCE DIMENSIONS:



Spring no.	Force (lbs.) 0.00" Stroke	Force (lbs.) 1.00" Stroke	Force (lbs.) 2.25" Stroke	PSI* Hold Off	Max PSI
1	300	285	255	270	3675
2	415	387	330	375	3675
3	750	660	515	665	3675
4	1110	984	750	995	3675
5	1395	1195	830	1280	3675
6	1487	1300	1070	1330	3675
7	1865	1670	1310	1670	3675

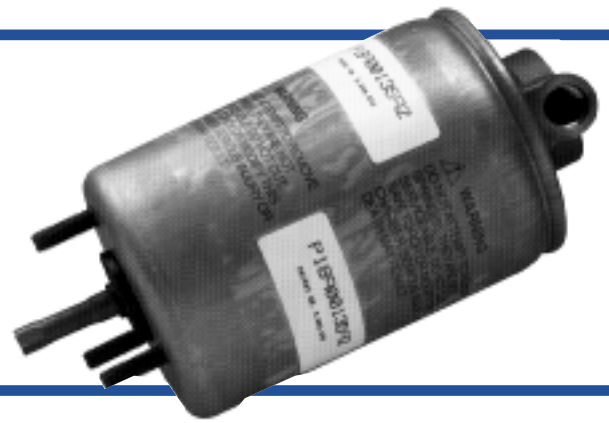
\*Note: 1 Fluid @ 70° of PSI  
2 Hold off and actuate PSI are not the same.



Hayes Brake LLC  
5800 West Donges Bay Road  
Mequon, Wisconsin 53092  
Phone (262) 242-4300  
Fax (262) 242-0524  
www.hayesbrake.com

# SPRING APPLIED HYDRAULIC RELEASE CHAMBER

## SPRING CHAMBER - LOW PRESSURE

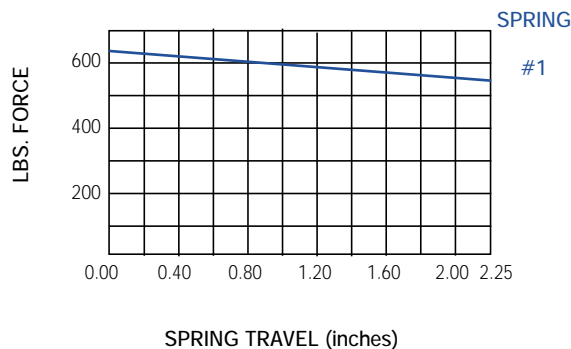


### FEATURES:

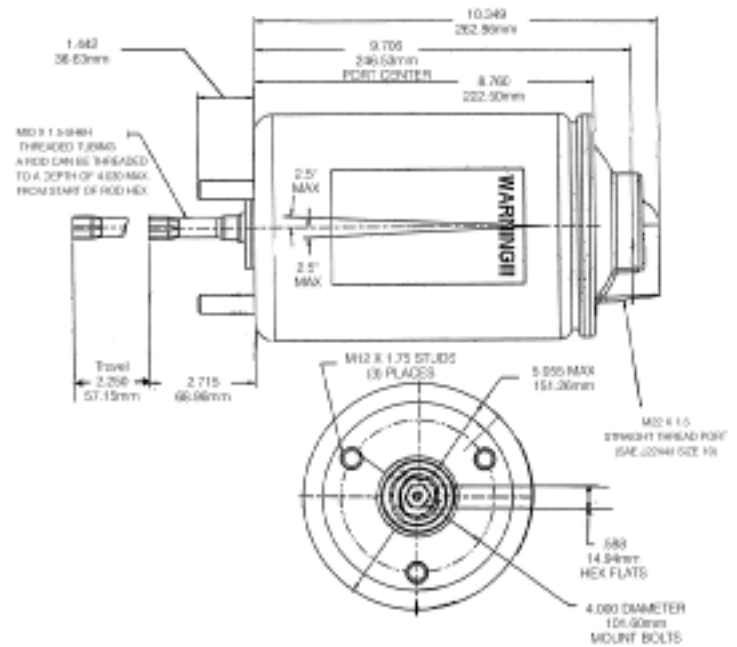
- Designed for use at the hydraulic pressure available from most transmissions.
- Springs are permanently and safely sealed in a corrosion resistant chamber.
- Needs 15.9 cubic inches of fluid for hold off.
- Hold off pressure and maximum pressure dependent on selected spring, typical 125 psi hold off and 300 psi maximum.
- Spring designed for less than 2% creep in normal applications.
- Minimal variation in spring force over entire 2.25 pull rod travel.
- Sealed chamber prevents actuator and spring contamination.
- Ball socket pull allows easy rotation for length adjustment and back off.
- Optional threaded rod or rod with clevis end available.
- For use with petroleum and synthetic hydraulic fluids.
- Approximate weight, 20 lbs.

### TYPICAL SPECIFICATIONS:

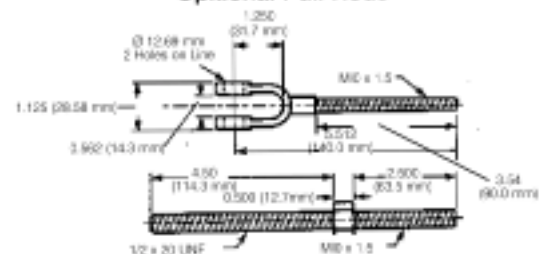
SPRING/FORCE COMBINATIONS



### REFERENCE DIMENSIONS:



### Optional Pull Rods



Spring no.	Force (lbs.) 0.00" Stroke	Force (lbs.) 1.00" Stroke	Force (lbs.) 2.25" Stroke	PSI* Hold Off	Max PSI
1	660	605	550	125	300

\*Note: 1 Fluid @ 70° of PSI  
2 Hold off and actuate PSI are not the same.

Note: Consult Factory about alternative hold off forces and maximum pressures.

Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



# MASTER CYLINDER

## COMPACT, LIGHTWEIGHT FOR FLANGE MOUNT

### 1710MC

#### FEATURES:

- Flange mount in .780 square hole with 3/4-16 nut.
- Compatible with any actuator rod which can be screwed into the 5/16-24 push rod.
- Piston housing made of porosity free extruded aluminum.
- Requires horizontal mounting.
- Built in pedal return spring under reservoir for compact size.
- Plastic reservoir has sight glass for checking fluid level.
- Designed for banjo style seals or unrestricted flare.

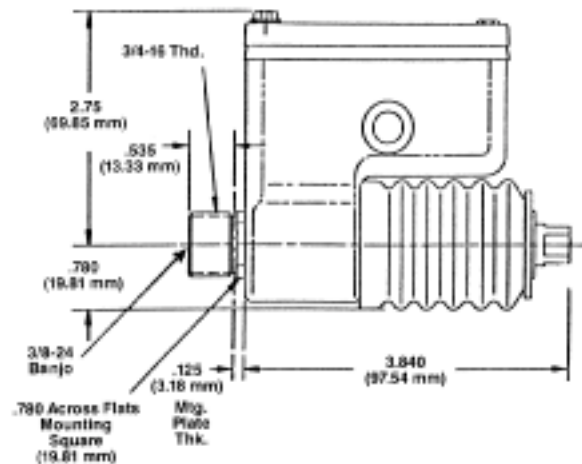
#### TYPICAL SPECIFICATIONS:

Series .....	1710MC
Actuation .....	push rod
Piston Bore .....	0.687 inches
Piston Stroke .....	0.558 in.
Displacement After Port Timing Hole Closure .....	0.184 cu. in.
Max Input Force .....	400 lbs.
Max PSI Output .....	900 psi
Return Spring Force .....	25 lbs.
Fluid .....	Brake Fluid DOT 3 or 5
Reservoir Volume .....	4.0 cu. in.

Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



#### REFERENCE DIMENSIONS:



# MASTER CYLINDER REMOTE RESERVOIR

## 179 MC

### FEATURES:

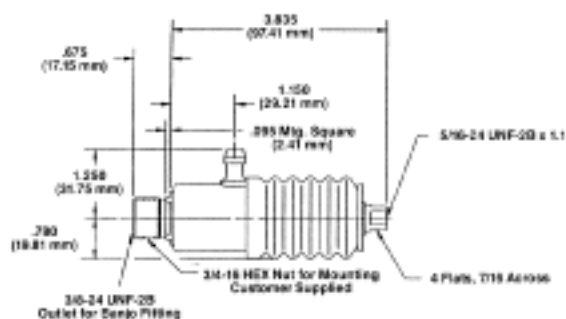
- Flange mount in .780 square hole with 3/4-16 nut.
- Compatible with any actuator rod which can be screwed into the 5/16-24 push rod.
- Piston housing made of porosity free extruded aluminum.
- Can be flange mounted vertically or horizontally.
- Built in pedal return spring.
- Optional remote plastic reservoir available.
- Inlet can be a banjo style or inverted flare.

### TYPICAL SPECIFICATIONS:

Series .....	1710MC
Actuation .....	push rod
Piston Bore .....	0.687 inches
Piston Stroke .....	0.558 in.
Displacement After Port Timing Hole Closure ...	0.184 cu. in.
Max Input Force .....	400 lbs.
Max PSI Output .....	900 psi
Return Spring Force .....	25 lbs.
Fluid .....	Brake Fluid DOT 3 or 5
Reservoir Volume .....	4.0 cu. in.



### REFERENCE DIMENSIONS:



Specifications are guidelines only and subject to change. Consult Hayes for specific model, part number and assembly drawings.



# BRAKE ANALYSIS AND PROPOSAL: VEHICLES

Customer Company Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
 Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-Mail: \_\_\_\_\_  
 Person Requesting Analysis: \_\_\_\_\_ Title: \_\_\_\_\_  
 Application (Model # and description or function): \_\_\_\_\_  
 If an existing brake is being used, model #: \_\_\_\_\_ Mfg'r: \_\_\_\_\_  
 Expected Sales Volume. 1<sup>st</sup> Year \_\_\_\_\_ 2<sup>nd</sup> Year \_\_\_\_\_ 3<sup>rd</sup> Year \_\_\_\_\_

HAYES BRAKE has an interest in making your product a success. Our contribution is dependent upon the information that you provide. We ask that you complete this Brake Analysis and Proposal (BAP) form as well as possible. The information will remain *confidential*. To summarize our intentions:

**WE WILL:**

- Perform an engineering analysis of your particular requirement.
- Make a recommendation based on the data provided to us.
- Ship quality products to you that are consistently the same as you tested.

**IF YOU WILL:**

- Define the application requirements.
- Keep us informed of application changes.
- Test and evaluate to your satisfaction Hayes' product in your unique duty cycle and operating environment, before production tested.

**VEHICLE INFORMATION:**

Weights and Dimensions

Vehicle	Unloaded	Loaded
Total Weight..... (WT)	_____ lbs	_____ lbs
Front Wheel Weight ..... (WF)	_____ lbs	_____ lbs
Rear Wheel Weight ..... (WR)	_____ lbs	_____ lbs
Center of Gravity-Height..... (CG)	_____ lbs	_____ lbs
Wheel Base..... (WB)		_____ in.
Tire Rolling Radius ..... (RR)		_____ in.
Total # of Vehicle Wheels.....		
# of Braked Wheels ..... Front	_____	Rear _____
Gear Ratio: Wheel to Brake:.... in Wheel Brake:	_____	or Drive Line Brake: _____
Expected Stop Surface	_____	
Description of Worst Case Environment	_____	

**DISC INFORMATION:**

Front Brake Disc: Dia \_\_\_\_\_ in., Thick's \_\_\_\_\_ in., Mat'l \_\_\_\_\_,  
 Rear Brake Disc: Dia. \_\_\_\_\_ in., Thick's \_\_\_\_\_ in., Mat'l \_\_\_\_\_,  
 Duty Cycle: Max Stops/Hour @ \_\_\_\_\_ MPH \_\_\_\_\_ Stops/Year \_\_\_\_\_

**DESIRED BRAKING PERFORMANCE OF VEHICLE:**

Type of Application: Service Brake \_\_\_\_\_ Park Brake Only \_\_\_\_\_  
 Emergency Stop \_\_\_\_\_ Emergency Stop on Grade \_\_\_\_\_ Other \_\_\_\_\_  
 Maximum Vehicle Speed: Unloaded \_\_\_\_\_ MPH, Stp. Dist \_\_\_\_\_ Ft or Decel \_\_\_\_\_ Ft Sec<sup>2</sup>  
 Maximum Vehicle Speed: Loaded \_\_\_\_\_ MPH, Stp. Dist \_\_\_\_\_ Ft or Decel \_\_\_\_\_ Ft Sec<sup>2</sup>  
 Park Brake Requirements: Forward Grade \_\_\_\_%/ \_\_\_\_ Deg Reverse Grade \_\_\_\_% \_\_\_\_ Deg  
 Drive Through Required: Y, N  
 Specific Standards that Apply to this Application: \_\_\_\_\_



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Customer \_\_\_\_\_ Model \_\_\_\_\_ Date \_\_\_\_\_ Number \_\_\_\_\_ Analysis By: \_\_\_\_\_

# BRAKE ANALYSIS AND PROPOSAL: SPECIAL APPLICATION

Customer Company Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-Mail \_\_\_\_\_  
Person Requesting Analysis: \_\_\_\_\_  
Application (Model number and description or function): \_\_\_\_\_  
If an existing brake is being used, model number: \_\_\_\_\_ Mfg'r: \_\_\_\_\_  
Expected Sales Volume. 1<sup>st</sup> Year \_\_\_\_\_ 2<sup>nd</sup> Year \_\_\_\_\_ 3<sup>rd</sup> Year \_\_\_\_\_

HAYES BRAKE has an interest in making your product a success. Our contribution is dependent upon the information that you provide. Thus we ask that you complete, as well as possible, this Brake Analysis and Proposal (BAP) Form. The information will remain *Confidential*. To summarize our intentions:

## WE WILL:

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- Ship products to you that are consistently the same as you tested.

## IF YOU WILL:

- Define the application requirements
- Keep us informed of application changes.
- Test and evaluate to your satisfaction Hayes' product in your unique duty cycle and operating environment, before production release.

## ADDITIONAL HYDRAULIC BRAKE INFORMATION:

Type of Fluid to be used: Brake Fluid Dot: \_\_\_\_\_ or Hydraulic Fluid: \_\_\_\_\_  
Master Cylinder (if used): Model No: \_\_\_\_\_ Mfg'd by: \_\_\_\_\_  
Bore Diameter: \_\_\_\_\_ Stroke: \_\_\_\_\_  
Reservoir Capacity: \_\_\_\_\_  
Max. Push Rod or Pedal with Ratio Force: \_\_\_\_\_ Max Pressure psi: \_\_\_\_\_

## ROTATING MASS DRAG BRAKING:

(Kinetic Energy Calculations for Stopping or Drag)

Weight (Mass) to be Braked: \_\_\_\_\_ lbs  
Or Horsepower: \_\_\_\_\_ hp  
Or Inertia of the Mass: \_\_\_\_\_ lbs. ft<sup>2</sup>  
Velocity: \_\_\_\_\_ mph  
Or RPM of the Mass: \_\_\_\_\_ rpm  
For Rotating Mass: Stop Time: \_\_\_\_\_ seconds  
Or Stop Torque: \_\_\_\_\_ lbs in

## SPRING CHAMBER INFORMATION:

Type of Function: \_\_\_\_\_ "Push" or "Pull" \_\_\_\_\_  
Spring Force Required: \_\_\_\_\_ lbs @ \_\_\_\_\_ inches of travel  
Allowable Spring Force at Full Stroke: \_\_\_\_\_ lbs  
Maximum Travel Required: \_\_\_\_\_ inches, max travel allowed \_\_\_\_\_ in  
Maximum System (Includes Spikes): \_\_\_\_\_ psi, minimum system \_\_\_\_\_ psi  
Required Apply Time: \_\_\_\_\_ sec, cycles per day \_\_\_\_\_

## SPECIAL APPLICATION INFORMATION:

Description of Application: \_\_\_\_\_

