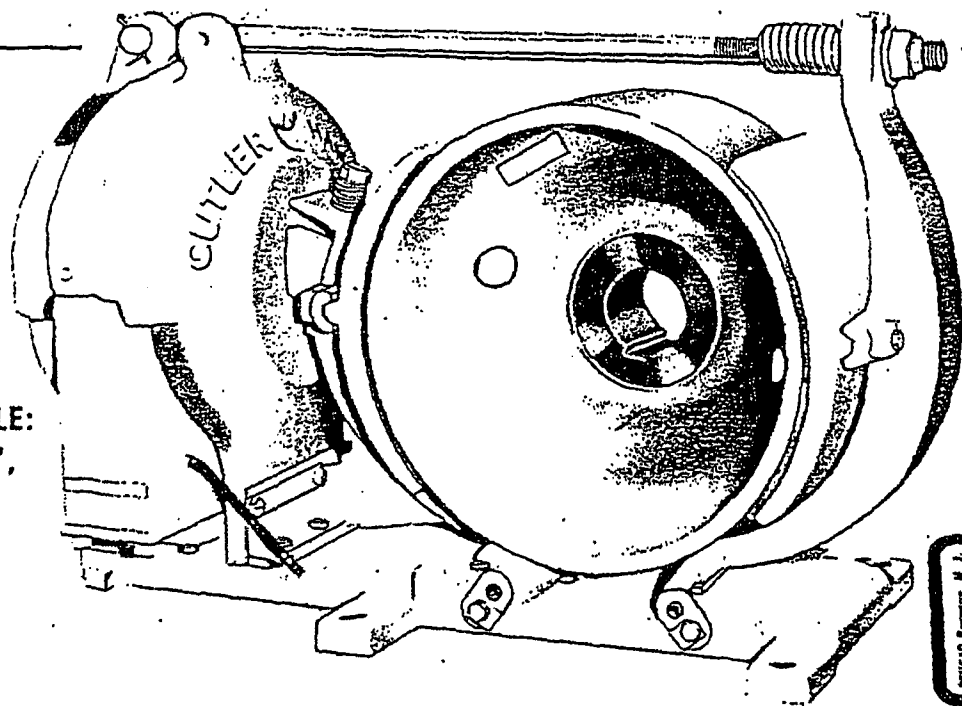
# 505 electro mechanical brakes *torque ranges available from 65 to 9000 lb. ft.*




**SEVEN WHEEL SIZES AVAILABLE: 8", 10", 13", 16", 19", 23" & 30"**



Cutler-Hammer electro mechanical, magnetic shoe brakes conform to NEMA-AISE standards and are designed for application on movable bridges, cranes, rolling mill drives, hoists, etc.

Wear and freezing are virtually non-existent on C-H brakes due to their design which eliminates all pivot pins but one (pull rod to armature). This single pin type pivot is maintained because it is doubly functional in that it also allows the pull rod to be easily swung out of the way if straight-up removal of the wheel is necessary.

The structural members of the 8" thru 23" brakes are made of ductile iron and their bases and armatures are made of cast steel. The 30" differs only in the base which is a steel weldment with laminated steel armatures.

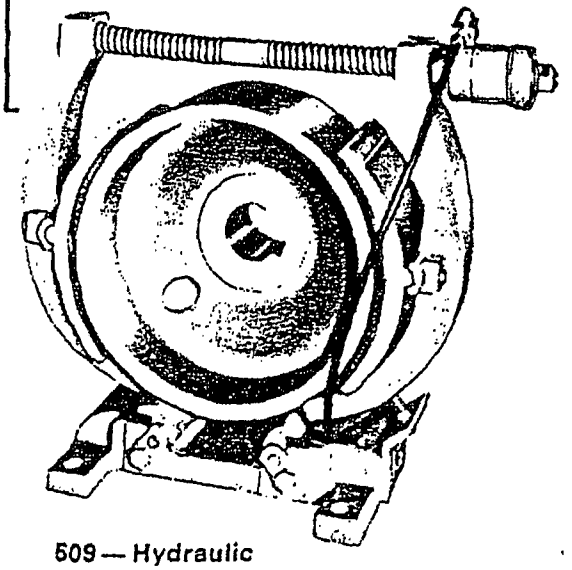
Three enclosures are available to protect the brake from severe environments: (1) Partial Wheel Cover — which goes over the top of the wheel and extends over the shoes; (2) NEMA 3 Lift Off — which covers everything but the coil and outer armature; and (3) NEMA 4-5 — which is watertight and dusttight.

## *optional manual release lever*

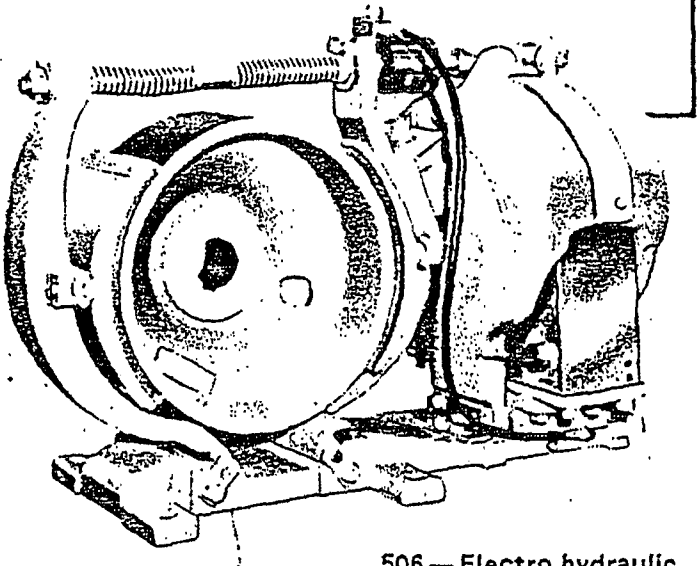
Quick acting, self resetting, this device permits simple, controlled torque release in the event of power failure. Operator merely raises the lever which cams the armatures together thus allowing controlled release of the brake holding force. There's no change in brake adjustment, no delay in resetting, and no downtime for re-adjustment. Available for 8" thru 23" brake sizes.

# 506 & 509
# hydraulic brakes

## *variable braking provides the ultimate in stopping control*



509 — Hydraulic



506 — Electro hydraulic

**FIVE WHEEL SIZES AVAILABLE: 8", 10", 13", 16" & 19"**

Hydraulic brakes give operators complete control of speed at which load is moving — thus increasing efficiency and improving safety. With the Type 506 Electro Hydraulic Brake the electrical system holds the brake released, and the pedal-operated hydraulic system enables controlled variable pressure braking for slowing and stopping functions. Type 509 is hydraulic only, depending on spring tension to hold the brake released. The hydraulic systems in both models operate the same as the braking system of an automobile — the more pressure applied to the pedal, the greater the braking torque. Both systems operate over the full range of speeds.

C-H hydraulic brakes comply with NEMA-AISE standards. Eight out of ten parts are interchangeable with mechanical brakes to considerably reduce parts inventory requirements for users of both mechanical and hydraulic systems.

### *optional power assist accessory*

This new device enables the use of hydraulic braking power on as many as four brakes simultaneously from a single control station. What's more, control may come from any remote source such as a footswitch, pendant station or radio control transmitter. The power assist greatly increases braking efficiency on many applications and reduces operator fatigue.

**CUTLER-HAMMER**

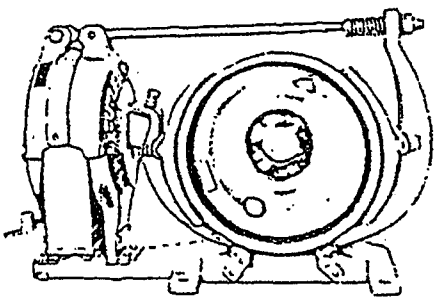
*INDUSTRIAL SYSTEMS DIVISION, Milwaukee, Wis. 53201*

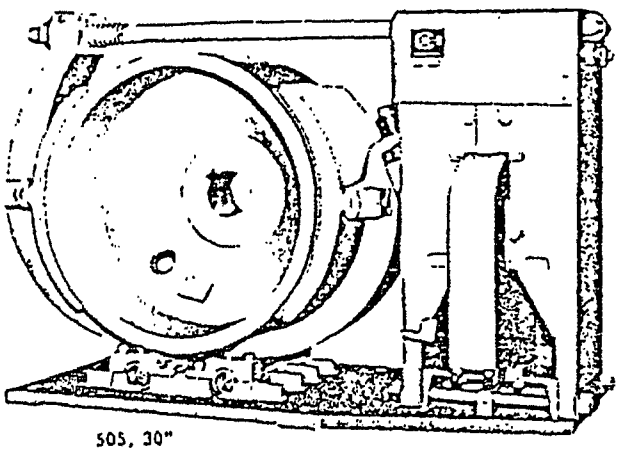
9-15-66

# HEAVY DUTY MAGNETIC BRAKES

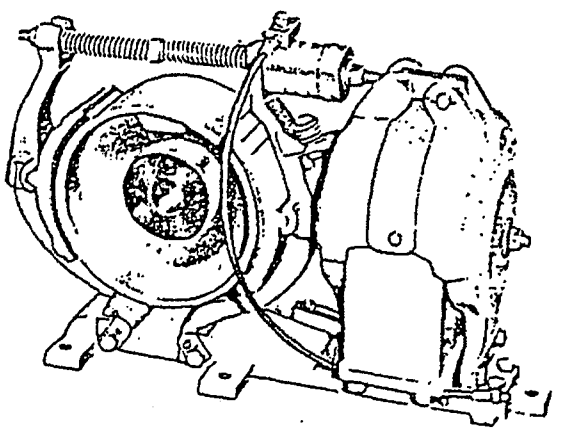
TECHNICAL INFORMATION PUBLICATION 505/506

## 505 Electro-Mechanical
## 506 Electro-Hydraulic

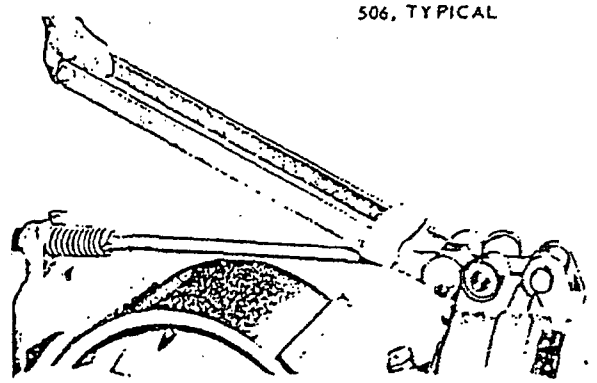




505, 30"



506, TYPICAL



505, OPTIONAL MANUAL RELEASE LEVER

### DESIGN CHARACTERISTICS

- GENERAL – D-c operated shoe brakes. Short-stroke magnet and armature structure. Electrically released and spring set. 506 has added hydraulic system independent of spring-set mechanisms.
- STANDARDS – AISE and NEMA ratings and dimensions. NEMA 1 mounting (base on horizontal surface).
- TORQUE RATINGS – 65 lb-ft through 9,000 lb-ft. Equal stopping and holding when spring-set. Equal torque for either direction of wheel rotation. Hydraulically applied torque infinitely variable.
- COILS – Series ½ or 1 hour. Shunt intermittent of continuous. Class B insulated. NEMA 3 enclosed. Leads (about 4" long) supplied with copper lugs. Revisible so that leads point toward or away from wheel. Separately supplied resistor for shunt brakes.
- LININGS – Asbestos with constant coefficient of friction under operating conditions. Pinned to brake shoes.
- WHEELS – Special cast ductile iron. Standard castings for most requirements. Tapered bore (with keyway), tolerance .005", tapers of 1.250" or 1.219" per foot on diameter. Straight bore (with keyway and setscrew), tolerance .001". Physical and metallurgical properties not affected by excessive temperatures.
- CONSTRUCTION – Structural members made of ductile iron, except 30" base which is plate steel. Laminated armatures in 30", cast steel armatures in 8" through 23".
- INSTALLATION – Magnet end can be to left or right. Adjustments and settings require only 1 cresent wrench. All adjustment points are readily accessible.

### OPTIONAL FEATURES

- COIL CIRCUIT FOR SHUNT BRAKES – Protective panel to obtain intermittent duty ratings on continuous duty applications. A-c rectifier panel which has coil protective circuit included for 8" through 23" brakes. A-c rectifier panel for 30" brakes but without coil protective feature. Increased or decreased release and/or set time, special voltages, etc.
- ENCLOSURE – Wheel protective cover on pull rod of 505 only. NEMA 3 weather resistant. NEMA 4-5 watertight and dusttight.
- WHEEL – Special offsets, bores, castings, etc. Safety flange, ¼" × ¼", on motor side, shoes retain wheel if wheel loosens or if motor shaft breaks.
- DUPLEX INSTALLATION, 506 ONLY – 1 brake operated from 2 master stations. 2 brakes operated from 1 or 2 master stations.
- MOUNTING – NEMA 2 mounting (base on vertical surface with magnet structure up).
- MANUAL OPERATION, 505 8" THROUGH 23" ONLY – Manual self-returning variable torque lever. Screw type non self-returning release.

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# HEAVY DUTY MAGNETIC BRAKES

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## 505 Electro-Mechanical
## 506 Electro-Hydraulic

### SCRIPTION

4 505 and 506 brakes are electro-mechanical D-c operated
)e brakes. They are elctrically released and spring set
l are therefore fail-safe under power failure. Torque due
spring-setting is fixed as adjusted. 506 brakes have
ded) hydraulic linkages which permit variable torque in-
)endent of spring-set torque.

th brakes are identical except for the pull rod and the
er shoe lever. 505 brakes shipped since January, 1962,
1 readily be converted to 506 brakes.

tailed descriptions of standard and optional features of
4 505 and 506 brakes start on this page immediately
er "Selection".

### 'ERATION

en the coil is energized, the armatures move together to
mpress the torque spring and move the shoes away from
: wheel to release the brake. De-energizing the coil
ows the torque spring to separate the armatures and press
: shoes against the wheel to set the brake. Torque is
1stant during stopping and holding.

5 brakes operate exactly as 505 brakes with the exception
1t the operator can impose hydraulically actuated torque
time. In normal (service) operation, the brake is
: ally released constantly, and braking is hydraulic.
ke is spring-set only to hold (park) the system.

a hydraulic system is used, options are available to oper-
: 1 or 2 brakes from 2 masters or from 1 master.

### :LECTION

)r most applications, the brake torque must simply equal
e full load motor torque as reflected to the wheel. The
rmula for this figure is:

$$T = \frac{5250 \times HP}{RPM_{wheel}}$$

th the torque requirement known, and the type and duty
cle established, the Selection Table on page 4 will
dicate a suitable brake either with or without optional
nels.

some applications it is common to use a different torque
:ing for the brake. A crane trolley is an example where
50% brake is typical. A crane hoist typically employs
125% or a 150% brake.

few applications require a thorough analysis of the brake
d the system. The items which must be considered,
gether with data and formulae, begin on page 11.

:tailed descriptions of standard and optional features
C-H 505 and 506 brakes follow.

### I' ND NEMA STANDARDS

:akes conform to AISE and NEMA standards for mill
:s. These standards prescribe items such as: wheel
ameters and widths, torque increments, height of wheel
:nterline, mounting dimensions, voltage and current values
r release and set, etc. For mill motors, these same
ndards also fix wheel offsets, bores, and mounting
:nterlines between the motor and the brake. Dimensions
1d drawings of standard brakes with respect to mill motors

### SIZE, TYPE AND DUTY CYCLE

Brakes are categorized by the factors of: 1) size, wheel diameter, 2) type, power supply to coil, and 3) duty cycle, coil time-on time-off. These are summarized in the "Selection Table" on page 4.

SIZE – See "Selection Table".

TYPE – Brakes are designated as series or shunt. Series brakes have their coils in the armature circuit of a D-c motor. Shunt brakes have their coils separately energized from a D-c source. The separate supply may be A-c if an optional rectifier panel is used. (page 3).

DUTY CYCLE – The time-on time-off of a brake coil determines its duty cycle. The duty cycle definitely affects the maximum torque rating of a brake, and the following will illustrate this.

Given a fixed volume for the coil, wattage dissipation limits the time the coil can be energized without overheating. This is analogous with mill motor ratings, and the duty cycle of brakes is purposely selected to coincide with mill motor standards.

A coil energized for a short period can carry relatively high currents and compress a "stiff" torque spring. With this spring as a reference, the torque rating is established as the practical maximum for this cycle. Standards are: series ½ hour, and shunt intermittent. For longer cycles, the coil can carry less current, compress a "less-stiff" spring, and brake torque must be reduced. Series 1 hour ratings are reduced to 65% of ½ hour brakes, and shunt continuous ratings are reduced to 75% of intermittent brakes. Shunt applications which use an auxiliary protecting panel (either A-c or D-c) can have intermittent ratings for all applications if these panels incorporate a forcing and protecting circuit. See page 3. From these considerations, standard duty cycles are listed below.

1. Series. D-c motor only. 505 only.
   a. ½ hour duty, or crane duty. The coil carries 100% of full load armature current for ½ hour without overheating. This corresponds to 1 minute on, 2 minutes off, or ⅓ time duty.
   b. 1 hour duty, or mill duty. The coil carries 100% of full load armature current for 1 hour without overheating. This corresponds to 1 minute on, 1 minute off, or ½ time duty.
   c. C-H and NEMA standards are that series brakes will release at 40% and set at 10% of full load armature current.
2. Shunt, D-c supply, A-c or D-c motor.
   a. Intermittent, or 1 hour shunt. The coil and its permanent series resistance are across 100% of line voltage for 1 hour without overheating.
   b. Continuous, or 8 hour shunt. The coil and its permanent series resistance are across 100% of line voltage for 8 hours (considered to be continuously) without overheating.
   c. With optional coil protective panel. (See page 3): The coil circuit is across 100% of line voltage continuously without overheating. Torque rating is the same as intermittent duty brakes.
   d. C-H and NEMA standards are that shunt brakes will

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# HEAVY DUTY MAGNETIC BRAKES

## 505 Electro-Mechanical
## 506 Electro-Hydraulic

TECHNICAL INFORMATION PUBLICATION 505/506

### SIZE, TYPE AND DUTY CYCLE (Continued)

3. Shunt, A-c supply, A-c or D-c motor, A-c rectifier panel.

   a. Panel for 8" through 23" brakes. See below. The optional panel for these sizes includes the protecting circuit and a rectifier. The panel and the coil circuit can be continuously energized at 100% of A-c supply voltage without overheating. Torque rating is the same as for intermittent duty.

   b. Panel for 30" brakes. See below. This provides D-c from an A-c supply, but without the protecting feature. Therefore brakes are rated either intermittent or continuous. The panel and the coil circuit, at 100% of the A-c supply voltage, can be energized without overheating, for 1 hour for intermittent duty, or continuously for continuous duty.

   c. C-H and NEMA standards are that brakes will operate at 85% of the A-c supply voltage.

### WHEELS

C-H brake wheels are made of specially formulated ductile iron. This has friction characteristics similar to cast iron, and shock and strength characteristics like steel. Because C-H wheels are not heat treated or carburized, they retain their physical and metallurgical properties at temperatures where wheels made of other materials undergo significant changes in their microstructure. C-H wheels wear evenly and smoothly in the form of fine flakes. For this reason, wheel scoring and lining erosion are significantly reduced.

### LININGS

C-H brake linings are made of high grade impregnated asbestos fibers. They are technically called "folded and compressed" linings. The materials used in C-H linings result in a lining which has a constant coefficient of friction under operating conditions as well as long life.

### COILS

Coils are made with Class B insulation, and they are NEMA 3 enclosed in stainless steel. Coils have 2 leads (about 4" long), and each lead is supplied with a suitable lug. Coils are reversible so that the leads can point toward or away from the wheel.

### MOUNTING

505 and 506 brakes are designed for NEMA 1 mounting (base on horizontal surface). Optionally they are available for NEMA 2 mounting (base on vertical surface, magnet end up). Dimensions are the same for either mounting.

### CONSTRUCTION

Structural members are made of ductile iron, except the 30" base, which is a steel weldment. Armatures in 8"-23" brakes are cast steel; 30" armatures are made of laminated steel.

C-H brakes have only 1 true pivot pin (pull rod to armature). By using hardened sockets wherever possible, wear and sticking at pivot points is negligible.

### D-c PROTECTIVE PANEL, SHUNT ONLY

In some continuous applications, the required torque is between the intermittent and the continuous rating for a brake. Normally, a larger brake would be selected. As an option, a protective panel which permits using the smaller brake is available. The scheme utilized is below.

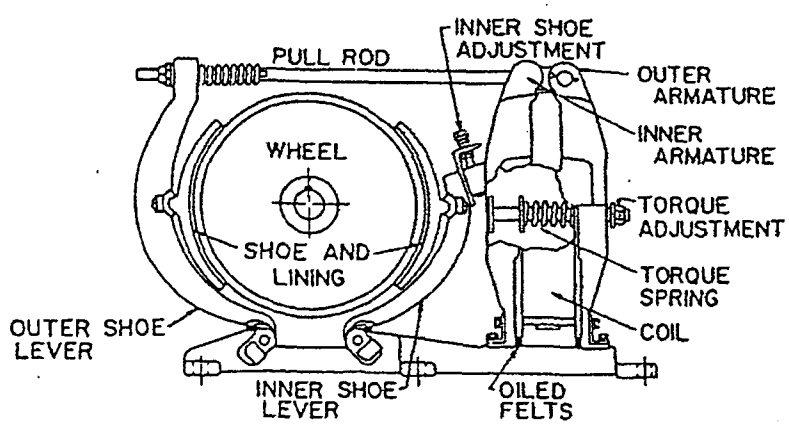
The panel uses a forcing circuit to release the brake and a timer and switch to insert resistance into the coil circuit. This keeps the coil temperature in bounds, and intermittent torque ratings are possible on continuously energized brakes. This same forcing and protecting scheme is used in A-c rectifier panels for 8"-23" brakes.

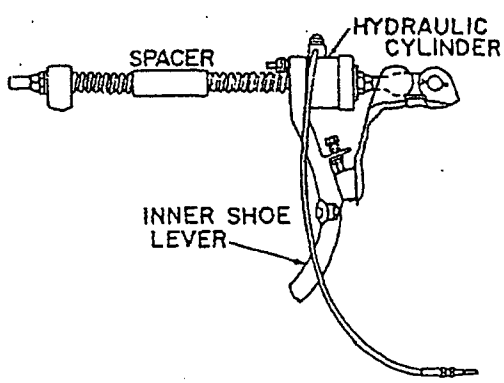
### A-C RECTIFIER PANEL, SHUNT, 8"-23" ONLY

For A-c applications similar to the above, the protective panel is enlarged to include a suitable rectifier. This allows intermittent ratings for continuous applications from an A-c source. D-c voltage is 81% of A-c voltage.

### A-c RECTIFIER PANEL, SHUNT, 30" ONLY

This optional panel does not include the forcing/protecting circuit. It only makes it possible to use 30" brakes from an A-c source. Separate series resistance is included, as is an integral 3 phase transformer. D-c voltage is 230 V.



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# HEAVY DUTY MAGNETIC BRAKES

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## 505 Electro-Mechanical
## 506 Electro-Hydraulic

### ICLOSURES

ndard brakes are open type, but they function successly in moist or dusty environments. For extreme conditions, nclosures are available. They are:

Partial wheel cover. This is a partial cover over the top of the wheel and extends over the shoes. It is mounted on the pull rod, and is not available for 506.

NEMA 3. This is a lift-off enclosure which covers everything but the coil and the outer armature. The centerline height of the wheel is unaffected, and the shaft cut-out is included.

NEMA 4-5 watertight and dusttight. This is a split-case gasketed enclosure without cutouts. The height of the wheel centerline is increased. As an option, a shaft hole, gasket or shaft seal and retainer can be provided. Holes, bolt holes, and gaskets for mounting directly to other machinery are not available.

### MANUAL RELEASE, 505 ONLY, 8"-23" ONLY.

Two mechanisms are available. They are:

1. A cam-action lever which is self-returning to the set position. Due to the cam action, a set brake can be released and re-set as desired.
2. A screw-type release, non-self returning. This is a wrench-operated release and must be released and re-set with a wrench.

### BRAKE ADJUSTMENT

In any application, torque should be adjusted for best performance rather than maximum. The permissible range of adjustment is:

ALL series brakes: 100% to 50% of ½ HOUR RATING.

ALL shunt brakes: 100% to 50% of INTERMITTENT.

The importance of proper installation and adjustments cannot be overemphasized. Check the nameplate on the brake for the 100% torque setting.

### ELECTION TABLE, 505 AND 506 BRAKES

| Brake Size | RATED TORQUE, Lb-Ft ① Sprg. (spring set) or Hyd. (hydraulically set) | | | | | | | WR² of Wheel | Wheel RPM, Max. | WEIGHTS, Lb. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D-c | | | | | | A-c ② | | | | | | |
| | Series (505 Only) | | Shunt, 515, 230 or 550 V. | | | | Shunt | | | Wheel Only | | Brake and Wheel | |
| | ½ Hour or Crane | 1 Hour or Mill | Intermittent or 1 Hour Shunt | Continuous or 8 Hour Shunt | | Continuous with Coil Protective Panel | Continuous with A-c Rectifier Panel | | | | | | |
| | Sprg. | Sprg. | Sprg. or Hyd. | Sprg. | Hyd. | Sprg. or Hyd. | Sprg. or Hyd. | Lb × Ft² | RPM | Ship. | Net | Ship. | Net |
| 8" | 100 | 65 | 100 | 75 | 100 | 100 | 100 | 1.1 | 5,000 | 18 | 12 | 178 | 150 |
| 10" | 200 | 130 | 200 | 150 | 200 | 200 | 200 | 3 | 4,000 | 35 | 25 | 263 | 240 |
| 13" | 550 | 365 | 550 | 400 | 550 | 550 | 550 | 12 | 3,180 | 75 | 59 | 510 | 465 |
| 16" | 1,000 | 650 | 1,000 | 750 | 1,000 | 1,000 | 1,000 | 36 | 2,500 | 120 | 102 | 700 | 645 |
| 19" | 2,000 | 1,300 | 2,000 | 1,500 | 2,000 | 2,000 | 2,000 | 70 | 2,110 | 185 | 160 | 1,220 | 1,150 |
| 23" 05 only | 4,000 | 2,600 | 4,000 | 3,000 | – | 4,000 | 4,000 | 210 | 1,740 | 315 | 290 | 1,830 | 1,735 |
| 30" 05 only | 9,000 | 6,000 | 9,000 | 6,750 | – | 9,000 | 9,000 int. 6,750 cont. | 880 | 1,340 | 1,180 | 1,100 | 4,100 | 3,920 |

Actual hydraulically applied torque is dependent only on force on pedal. See page 6.

208-240/1/60 or 440-480/1/60 for 8"-23". Same voltages except 3 phase for 30".

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# HEAVY DUTY MAGNETIC BRAKES

## 505 Electro-Mechanical
## 506 Electro-Hydraulic

TECHNICAL INFORMATION PUBLICATION 505/506

### POWER FOR SHUNT BRAKES

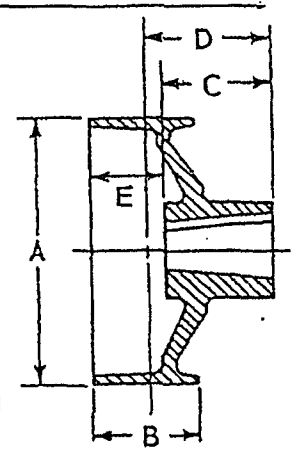
| Brake Size | D-c Operated 115, 230, or 550 V. | | | | | | From A-c Rectifier Panel, 208-240 V. 60 Cycle or 440-480 V. 60 Cycle | | | | From D-c Protective Panel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intermittent | | | Continuous | | | Separate Permanent Series Resistance | Power, KVA. | | | |
| | Separate ① Permanent Series Resistance | | Power, | Separate ① Permanent Series Resistance | | Power, | | Inrush | Sealed | $\phi$ | |
| | Quan. | Type | KW. | Quan. | Type | KW. | | | | | |
| 8" | 1 | H | .44 | 1 | H | .26 | – | 1.75 | .25 | 1 | Refer To Cutler-Hammer |
| 10" | 1 | H | .50 | 1 | H | .28 | – | 1.85 | .25 | 1 | |
| 13" | 1 | H | .66 | 1 | H | .43 | – | 2.60 | .26 | 1 | |
| 16" | 1 | H | .82 | 1 | H | .49 | – | 2.82 | .26 | 1 | |
| 19" | 1 | H | 1.24 | 1 | H | .60 | – | 3.22 | .41 | 1 | |
| 23" | 2 | H | 1.92 | 1 | H | .79 | – | 4.17 | .51 | 1 | |
| 30" | 1 | WS | 4.50 | 2 | WS | 2.95 | Int. 1 – WS Box | 3.5 | 3.5 | 3 | |
| | | | | | | | Cont. 2 – WS Box | | | | |

① Resistance data for 230 V. Refer to C-H for other voltages.

### SHUNT BRAKES, MAXIMUM SPEEDS OF OPERATION

| Brake Size | STANDARD Intermittent or Continuous Partial Voltage Coil and Separate Resistance | | OPTIONAL Intermittent Duty Coil Protective Panel ① or A-c Rectifier Panel ① | |
|---|---|---|---|---|
| | RELEASE, Sec. | SET, Sec. | RELEASE, Sec. | SET, Sec. |
| 8" | .25 | .25 | .22 | .15 |
| 10" | .30 | .30 | .25 | .20 |
| 13" | .35 | .40 | .30 | .22 |
| 16" | .45 | .45 | .40 | .25 |
| 19" | .50 | .50 | .45 | .30 |
| 23" | .55 | .55 | .50 | .32 |
| 30" | .55 | .10 | .55 | .10 |

①Use of either on all but A-c operated 30" brake allows intermittent duty rating on continuously energized coil circuits. The A-c operated 30" brake is rated either 6,750 lb-ft continuous or 9,000 lb-ft intermittent.




### STANDARD WHEEL CASTINGS

| Dimensions, Inches | | | | | | | | | | WR2 | Weight Lb. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C Max.① | D Max.① | D Min. | E Min.① | E Max. | Min. Bore Tapered | Min. Bore Straight | Max. Bore | Lb x Ft² | Ship | Net |
| 8 | 3¼ | 3 | 4 | 2⅛ | 2⅛ | 2⅞ | 1 | 1 | 2 | 1.1 | 18 | 12 |
| | | 4 | 3 | | ⅝ | | | | | | | |
| 10 | 3¼ | 3½ | 4¼ | 3⅜ | 2⅝ | 4 | 1 | 1 | 2 | 3 | 35 | 25 |
| | | | 3⅞ | | 2¼ | | | | | | | |
| 13 | 5¼ | 4½ | 5¾ | 3¼ | 3½ | 4⅞ | 1 | 1 | 3¼ | 12 | 75 | 59 |
| | | 4¾ | 3⅞ | | 2 | | | | | | | |
| | | 4½ | 6 | | 4⅛ | | | | | | | |
| | | 4½ | 4⅛ | | 2½ | | | | | | | |
| | | 4½ | 3⅜ | | 1⅞ | | | | | | | |
| 16 | 6¼ | 4½ | 6½ | 3⅝ | 5⅜ | 5⅞ | 3 | 2½ | 3¾ | 36 | 120 | 102 |
| | | 5⅛ | 6½ | | 4½ | | | | 4 | | | |
| | | 5 | 7¼ | | 5⅛ | | | | 3¾ | | | |
| | | 5 | 5 | | 3⅜ | | | | 3¾ | | | |
| | | 5 | 4⅛ | | 2½ | | | | 3¾ | | | |
| 19 | 8¼ | 5 | 7½ | 5⅜ | 6⅛ | 7¼ | 3½ | 3 | 4⅛ | 70 | 185 | 160 |
| | | 5½ | 8 | | | | | | | | | |
| 23 | 11¼ | 6 | 8¾ | 5 15/16 | 8⅛ | 9 3/16 | 4⅛ | 4 | 5 | 210 | 315 | 290 |
| 30 | 14¼ | 9¼ | 12¾ | 10¼ | 10⅜ | 10⅝ | 5⅛ | 5 | 7 | 880 | 1,180 | 1,100 |

① Standard castings have hub dimensions of C Max., D Max., and E Min. Refer to C-H for wheels from special castings.