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MAGPOWR DESIGNER'S NOTEBOOK: Web Tension and Torque Control Products

12th Edition

MAXCESS®

MAGPOWR

Tension and Torque Control On-Site Seminar

Gain a thorough understanding of web tension and torque control methods and MAGPOWR products in an intense 3-day seminar including classroom presentations, hands-on demonstrations and application activities.

SEMINAR TOPICS
Basics of Web Control
Magnetic Particle Phenomenon
Magnetic Particle Brakes & Clutches
Magnetic Particle Brake & Clutch Sizing
Pneumatic Brakes
Pneumatic Brake Sizing
Basics of Control Theory
Manual Systems
Open Loop Systems
Closed Loop Systems
Tension Sensors / Load Cells
Tension Sensor / Load Cell Sizing
Tension Readouts
Tension Sensor Control Systems
Dancer Control Theory
Dancer Control Systems
Hands-on Setup Demonstrations

The seminar is offered annually, visit magpowr.com for a complete schedule

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Engineering Application and Web Tension Information

Torque:

A force that produces or tends to produce rotation. It is measured by multiplying the amount of force applied by its perpendicular distance from the axis of rotation (lever arm).

Torque (TQ) = Force (F) x Radius (R)

TQ = F x R

Typical units of measure for torque are pound-inch, pound-feet, newton-meters, and kilogram-meters.

Example:

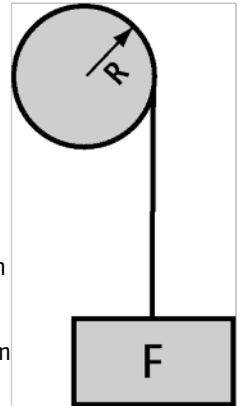A cable is wound around a drum of 30.5 cm (12 inch) radius (R) and is supporting a weight (F) of 22.7 kg (50 lbs).

What torque is being applied to the drum?

Solution:

TQ = F x R = 22.7 kg x .305 m = 6.9 kg-m

or

TQ = F x R = 50 lb x 12 inches = 600 lb-in

Power:

The rate at which work is done or energy is transmitted. Typical units of measure for power are watts or horsepower. One horsepower is equivalent to the amount of work required to lift 33,000 lbs one foot in one minute.

Relating Power to Torque:

Torque and speed of rotation are directly related to force and velocity in the following equations by radius. Therefore, the horsepower formula can be expressed as follows:

$$HP = \frac{\text{Force (lb) x Velocity (fpm)}}{33,000}$$

or

$$1HP = 745.7 \text{ Watts}$$

TQ = F x R

$$F = \frac{TQ}{R}$$

$$RPM = \frac{V}{2\pi R}$$

$$V = RPM \times 2\pi R$$

$$HP = \frac{F \times V}{33,000}$$

$$HP = \frac{\text{Torque (lb-ft) x RPM}}{5252}$$

$$TQ = \frac{HP \times 5252}{RPM}$$
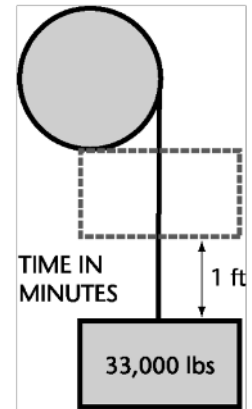
Slip Heat:

The heat generated when more horsepower is put into a clutch or brake than is taken out. Expressed in slip watts (SW).

If horsepower is being transmitted through the unit on a one-to-one basis (or lock-up condition), ignore slip heat calculations.

Magnetic particle units, however, are generally used in a slipping or controlled torque condition, and slip heat becomes a factor in selecting a unit. To determine the slip heat or the "slip watts" the unit must dissipate, use the following formula:

$$\text{Slip Heat} = \frac{\text{Torque (RPM in - RPM out)}}{7}$$

This formula may look unusual, but is the familiar horsepower formula from above,

$$HP = \frac{\text{Torque (lb-ft) x RPM}}{5252}$$

that substituted slip RPM for RPM and converts 1HP to 746 watts.

Slip heat must be calculated for each application. The curves in the catalog showing heat dissipation capacity of the individual brake or clutch are based upon continuous duty, and no "de-rating" or "service" factors need be applied. The unit can be applied up to or on the curve for all normal applications. If applied over the curve, life of the unit will be greatly reduced.

Heat dissipation of the unit is dependent on the cooling effect of the outer rotating member. This outer member is labeled or can be determined by rotating both shafts. The shaft that turns the fins is the outer rotating member and should normally be driven at the higher RPM.

Inertia:

The tendency of matter to remain at rest or continue at a fixed velocity, unless it is affected by an outside force. The velocity can be linear or rotational.

Inertia = (WK^2), where W = weight of object

K = distance from the axis of rotation

Some inertia are:

A. SOLID DISK (WK^2) = $\frac{1}{2}$W X R^2 where R is Radius in feet

B. CLUTCH GEARED TO LOAD

$$(WK^2)_{(at\ clutch)} = (WK^2)_{(at\ load)} \left[\frac{RPM\ (load)}{RPM\ (clutch)} \right]^2$$

C. W = Conveyor load in pounds
V = Velocity in ft/min
RPM = measured at clutch

$$WK^2_{(conveyor)} = W \left[\frac{V}{2\pi RPM} \right]^2$$

Relating Inertia to Torque:

To determine the torque required to start or stop a load in a specified amount of time:

$$Torque = \frac{(WK^2)RPM}{308t}$$

(WK^2) = Inertia in lb-ft^2

t = time in seconds

Useful Conversions:

GENERAL
1 meter = 100 centimeters = 1,000 millimeters
1 micron = 0.001 millimeter
1 kilogram = 1,000 grams
1 foot = 12 inches
1 mil = 0.001 inches
1 pound = 16 ounces

LENGTH
1 foot = 0.3048 meters
1 inch = 2.54 centimeters

FORCE
1 pound = 4.4482 newtons

TORQUE
1 pound-foot = 1.3558 newton-meters
1 pound-foot = 0.13826 kilogram-meters
1 pound-inch = 0.1130 newton-meters

VELOCITY
1 foot per minute = 0.3048 meters per minute

POWER
1 horsepower = 745.7 watts

INERTIA
1 pound-foot^2 = 0.04214 kilogram-meter^2

MATERIAL THICKNESS
1 mil = 25.4 microns

TEMPERATURE
C = 5/9 (degrees F-32) or
F = 9/5 (degrees C) + 32

PRESSURE
1 pound per square inch = 6.89 kilopascals

MASS
1 pound = 0.4536 kilograms

Shortcut Web Formulas:

Example: Tension = 66 lb Velocity = 500 fpm
Full Roll Dia = 36 inches   Core Dia. = 9 inches

Web HP: $\dfrac{\text{Web Tension x Web Velocity}}{33,000}$

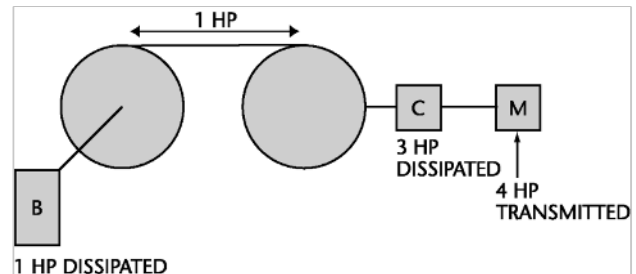$$= \frac{66(500)}{33,000} = 1\ HP$$

Unwind Dissipation = WEB HP = 1HP (746 Watts)

Rewind Dissipation = (DIAMETER RATIO - 1)(Web HP)

$$\left(\frac{36}{9} - 1 \right) \times 1\ HP = 3\ HP$$

Motor HP = (DIAMETER RATIO)(Web HP)

$$\frac{36}{9} \times 1\ HP = 4\ HP$$

APPLICATION PROBLEMS OR QUESTIONS?

CALL THE TENSION HOTLINE:
1-800-MAGPOWR
624-7697
www.magpowr.com

Clutch or Brake Placement

Application Data:

Rewind a material with constant tension

Tension = 40 lb

Full roll diam. = 3 feet

Core diam. = 0.5 feet

Velocity = 100 fpm

Calculating Requirements at the roll:

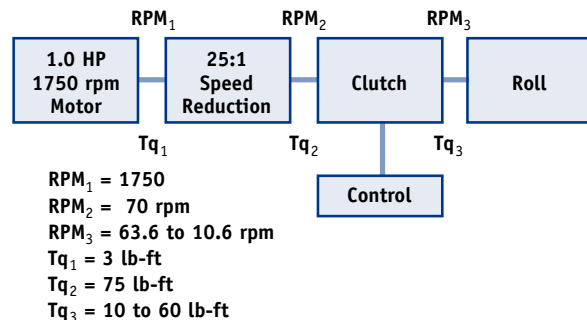Torque (max) = Tension x Radius (full roll)

Torque (max) = 40 lb x (3/2 ft) = 60 lb-ft

Torque (min) = T x R (core) = 40 lb (0.5/2 ft) = 10 lb-ft

RPM (full roll) = $\dfrac{100 \text{ fpm}}{(3 \text{ ft})\pi}$ = 10.6 rpm

RPM (core) = 10.6 (3/0.5) = 63.6 rpm

Case 1: Clutch is directly coupled to the rewind roll

RPM$_1$ = 1750
RPM$_2$ = 70 rpm
RPM$_3$ = 63.6 to 10.6 rpm
Tq$_1$ = 3 lb-ft
Tq$_2$ = 75 lb-ft
Tq$_3$ = 10 to 60 lb-ft

Clutch Sizing: Maximum torque required = 60 lb-ft
Minimum torque required = 10 lb-ft

Slipwatts: $\dfrac{\text{Tq (max) (RPM in – RPM out)}}{7}$ =

$\dfrac{60 \text{ lb-ft } (70 - 10.6)}{7}$ = 509 Watts

Therefore you should choose a C-100

NOTE: In this case a 1 lb-ft change in torque through the clutch will result in a 1 lb-ft change in torque at the roll.

Case 2: Clutch is placed between the motor and the speed reducer.

RPM$_1$ = 1750
RPM$_2$ = 1590 to 265 rpm
RPM$_3$ = 63.6 to 10.6 rpm

Tq$_1$ = 3 lb-ft
Tq$_2$ = 0.4 to 2.4 lb-ft
Tq$_3$ = 10 to 60 lb-ft
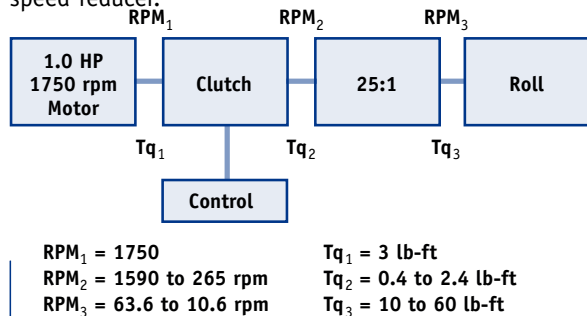
Clutch Sizing:

Maximum torque required = 2.4 lb-ft
Minimum torque required = 0.4 lb-ft

Slipwatts = $\dfrac{2.4 \text{ lb-ft } (1750 - 265)}{7}$ = **509 watts**

NOTE: Tentative selection would be a C-3A

Notice that the heat dissipation required has not changed, but it looks like a smaller clutch can be used. The major disadvantage is in the ability to control tension at the rewind roll. Now, a 1 lb-ft change in torque through the clutch will result in a 25 lb-ft change in torque at the roll. Relating this change to a change in tension at the core of the roll, the tension change due to 1 lb-ft in clutch torque is 100 lbs of tension change! This situation could result in stability problems when trying to control tension.

Conclusion: Whenever possible, place the clutch as close to the load as possible.

Use the C-100, Case 1

Taper Tension

In taper tension winding, two factors control the torque level. First, the torque must be increased in proportion to roll radius to provide constant tension, and second, at the same time the torque must be modified to decrease the tension as the roll builds. As a result of this, the actual peak torque requirement may occur at some intermediate point in the roll. The point of peak torque is determined by the percent of taper desired, and by the diameter ratio of the core to full roll. In the examples below, we see graphs of constant tension (0% taper), 50% taper tension, and 67% taper tension. These graphs are for a 3 inch core to a 15 inch OD, with 100 lbs starting tension.
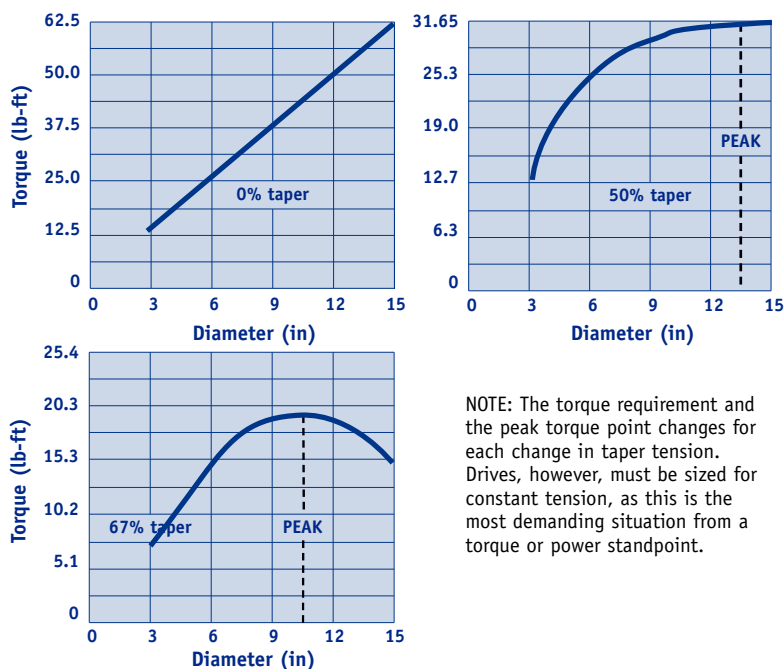
NOTE: The torque requirement and the peak torque point changes for each change in taper tension. Drives, however, must be sized for constant tension, as this is the most demanding situation from a torque or power standpoint.

Dancer Loading

TENSION

1. Provides consistent dancer loading
2. Allows free movement of dancer arm
3. Allows easy adjustment of dancer load

DANCER

CLUTCH   MOTOR   CONTROL (sets dancer load)

WINDING SPOOL
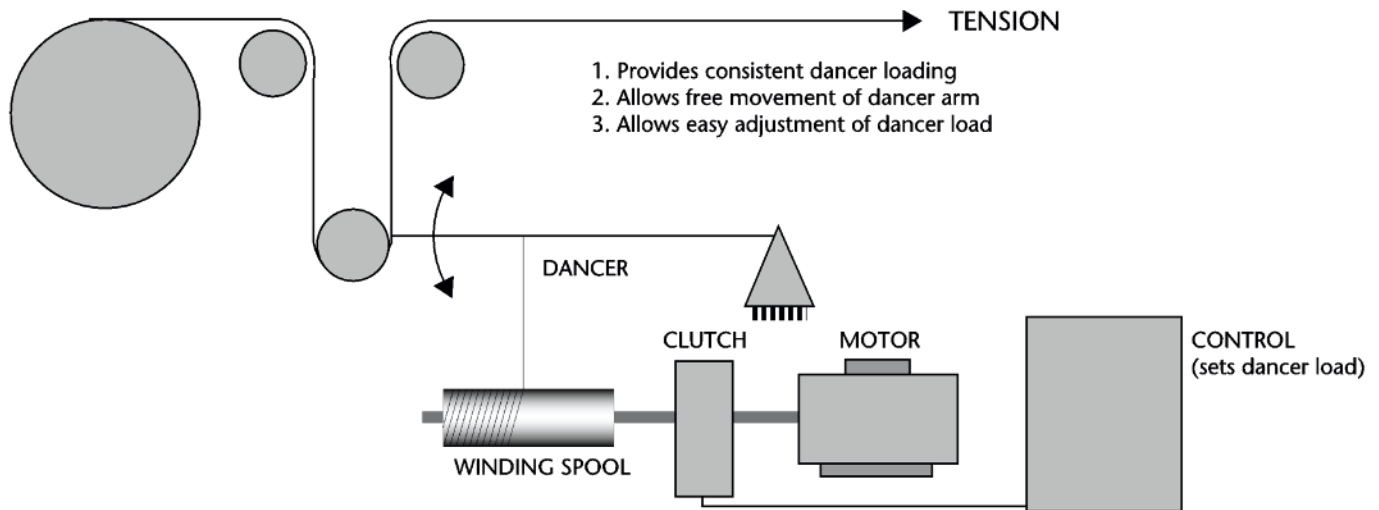
PNEUMATIC CYLINDER AND REGULATOR

TENSION

AIR CYLINDER   AIR SUPPLY

DANCER   PRESSURE REGULATOR
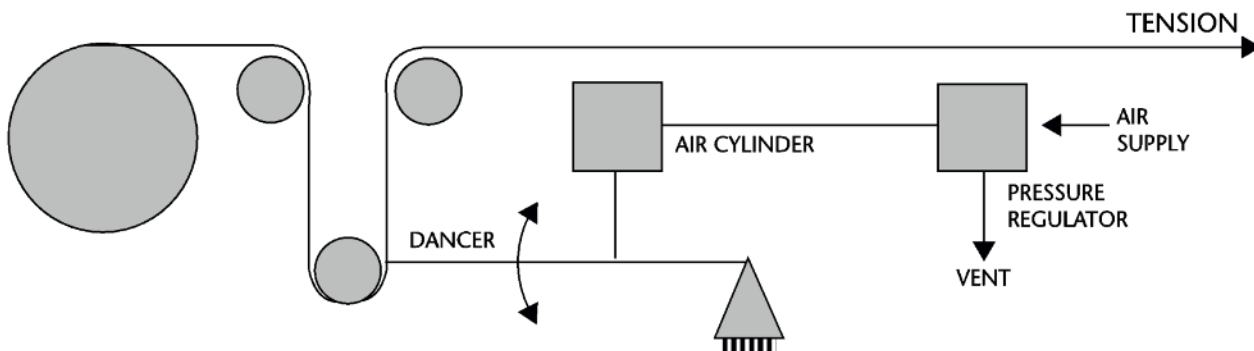
VENT

Recommended

1. Rolling diaphragm type pneumatic cylinder for its low friction characteristics

2. A pressure regulator with high volume flow capacity and fast relieving vent to allow rapid movement of dancer

Not Recommended

1. Weights impede rapid dancer arm movement by adding mass to dancer arm

2. Springs provide inconsistent loading, since spring force changes with deflection

3. Shock absorbers resist changes in dancer position by dampening

Web Tension Information

Material	Thickness		Tension	
	inches	mm	PLI	kg/cm
Foil	0.0005	0.0127	0.5	0.09
	0.001	0.0254	1	0.18
	0.002	0.0508	2	0.36
Film, Mylar (Polyester) Film	0.0005	0.0127	0.25	0.045
	0.001	0.0254	0.75	0.135
	0.002	0.0508	1.5	0.27
Polyethylene or Vinyl	0.0005	0.0127	0.125	0.0225
	0.001	0.0254	0.25	0.045
	0.002	0.0508	0.5	0.09
Acetate	0.0005	0.0127	0.25	0.045
	0.001	0.0254	0.5	0.09
	0.002	0.0508	1	0.18
Polystyrene	0.0005	0.0127	0.5	0.09
	0.001	0.0254	1	0.18
	0.002	0.0508	2	0.36
Cellophane	0.001	0.0254	0.5	0.09
Thin Wax Paper	0.001 to 0.002	0.0254 to 0.0508	1 to 2	0.18 to 0.36
Newspaper	0.002 to 0.003	0.0508 to 0.0762	0.25 to 0.75	0.045 to 0.135
Kraft Paper	0.005 to 0.01	0.127 to 0.254	1.5 to 4	0.27 to 0.72
Paperboard	8 pt	105 g/m2	3	0.54
	12 pt	157 g/m2	4	0.72
	15 pt	196 g/m2	5	0.9
	20 pt	262 g/m2	7	1.26
	25 pt	327 g/m2	9	1.62
	30 pt	393 g/m2	11	1.98

Material	Thickness		Tension	
	inches	mm	PLI	kg/cm
Paper				
15 lb	0.001-0.002	0.0254 to 0.0508	0.5	0.09
20 lb	0.002-0.003	0.0508 to 0.0762	0.75	0.135
30 lb	0.003-0.004	0.0762 to 0.102	1	0.18
40 lb	0.004-0.005	0.102 to 0.127	1.5	0.27
60 lb	0.005-0.007	0.127 to 0.178	2.5 to 4	0.45 to 0.72
100 lb	0.007-0.010	0.178 to 0.254	3 to 5	0.54 to 0.90
Copper Wire 1500 psi **Note: Run aluminum wire at 1/2 to 2/3 these values**	#40 (0.003)	0.08	0.10 lb	.05 kg
	#36 (0.005)	0.13	0.25 lb	.11 kg
	#34 (0.006)	0.16	0.50 lb	.23 kg
	#30 (0.010)	0.25	1.25 lb	.57 kg
	#28 (0.013)	0.32	1.75 lb	.79 kg
	#24 (0.020)	0.51	4.5 lb	2.0 kg
	#20 (0.032)	0.81	8.0 lb	3.6 kg
	#18 (0.040)	1.02	10.0 lb	4.5 kg
	#16 (0.051)	1.29	12.0 lb	5.4 kg
	#14 (0.064)	1.63	15.0 lb	6.8 kg
	#12 (0.081)	2.05	18.0 lb	8.2 kg
	#10 (0.102)	2.59	20.0 lb	9.1 kg
	#08 (0.128)	3.26	25.0 lb	11.3 kg

Laminates are generally processed at tensions equal to the sum of the individual webs

PLI = Pounds per linear inch of web width

kg/cm = Kilograms per centimeter of web width

Paper "weight" is the weight of a ream of paper

A ream is 500 sheets of a given size. The tensions above are based on a 3,000 square foot ream (278.7 m^2)

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T E N S I O N   C O N T R O L S

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Product Selection Chart

For the tension control solution that is right for you, simply find your application in the chart below, then select the combination of MAGPOWR products that best suits your specific requirements.

	CYGNUS TENSION CONTROL	SPYDER PLUS TENSION CONTROL	VERSATEC TENSION CONTROL	PA-90 / PA-2 POWER AMPLIFIERS	US-2 ULTRASONIC SENSOR	DFC-90 DIN RAIL MOUNTED TENSION CONTROL	DFC-A DIN MOUNTED TENSION CONTROL	TC-5 / TC-5P POWER SUPPLY	PS-90 / PS-24 POWER SUPPLY	IPT / IPT-E / IP-80 TENSION TRANSDUCERS	DFP / DFP-2 POSITION SENSORS
Manual Control											
Manual Unwind (Magnetic Particle)								X	X		
Manual Point-to-Point (Magnetic Particle)								X	X		
Manual Rewind (Magnetic Particle)								X	X		
Open Loop Ultrasonic											
Ultrasonic Unwind (Magnetic Particle)		X*	X	X	X				X		
Ultrasonic Rewind (Magnetic Particle)		X*	X	X	X				X		
Ultrasonic Unwind (Pneumatic)		X*	X		X					X	
Ultrasonic Rewind (Motor Drive)		X*	X		X						
Open Loop Follower Arm											
Follower Arm Unwind (Magnetic Particle)						X					X
Follower Arm Rewind (Magnetic Particle)						X					X
Follower Arm Unwind (Pneumatic)							X			X	X
Follower Arm Rewind (Motor Drive)							X				X
Closed Loop Ultrasonic											
Ultrasonic Free Loop Unwind (Motor Drive)			X	X							
Ultrasonic Free Loop Point-to-Point (Motor Drive)			X	X							
Ultrasonic Free Loop Rewind (Motor Drive)			X	X							
Closed Loop Load Cell											
Digital Tension Readout and Control Unwind (Magnetic Particle)	X	X							X		
Digital Tension Readout and Control Point-to-Point (Magnetic Particle)	X	X							X		
Digital Tension Readout and Control Rewind (Magnetic Particle)	X	X							X		
Digital Tension Readout and Control Unwind (Pneumatic)	X	X								X	
Digital Tension Readout and Control Unwind (Motor Drive)	X	X									
Digital Tension Readout and Control Point-to-Point (Motor Drive)	X	X									
Digital Tension Readout and Control Rewind (Motor Drive)	X	X									
Closed Loop Dancer											
Dancer Control Unwind (Magnetic Particle)		X	X	X	X	X			X		X
Dancer Control Rewind (Magnetic Particle)		X	X	X	X	X			X		X
Dancer Control Unwind (Pneumatic)		X	X	X			X			X	X
Dancer Control Unwind (Motor Drive)		X	X	X			X				X
Dancer Control Rewind (Motor Drive)		X	X	X			X				X

* requires 3rd party diameter sensor with a 0 to 10 VDC output.

Cygnus® Digital Tension Readout and Control

Cygnus-E

Cygnus-DIN

Never has so much power and so many features been designed into such a small package. At less than 101 mm (4 inches) deep, the Cygnus leaves plenty of space to mount other components. Now you can dramatically reduce setup time and improve consistency with powerful features like Auto Tuning, Out-of-Round Roll Compensation, Weightless Load Cell Calibration and Web Break Detection.

Web tension is easily maintained or adjusted using multi-function SmartKeys. Operators simply navigate the control using full text and on-screen prompts on the large backlit display. To ensure global operation, Cygnus can display multiple languages including German, French, Italian, Spanish and Chinese.

Cygnus provides the flexibility of remote tension readout and control over your standard industrial bus communication network, allowing you to harness all of the power, features and performance from a central control point.

The PS-90 or PS-24 power amplifier may be used to operate 90 VDC or 24 VDC magnetic particle clutches and brakes. The amplifier mounts inside of the Cygnus-E enclosure.

Features

Large backlit display for viewing in any light condition

Tactile feedback SmartKeys for confirmed data entry

Web Break Detection and Out-of-Round Roll Compensation features to reduce waste and the need for expensive dancer systems

Automatic tuning for quick setup

"Weightless" calibration and on-screen diagnostics simplify load cell setup and operation

Multiple memory setup for quick material/machine changeover

IP65 protection against dirt and liquids

Selectable language and metric or inch units for global installations

Choice of mounting options for flexibility

Bus Communication for remote operation over an existing DeviceNet, Profibus-DP, or Ethernet/IP network

UL and CE Compliant

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Cygnus® Keypad and Display

**Home Screen
with Digital
Tension Display**

Large Backlit Display

Tactile Feedback Keys

Backspace

Enter
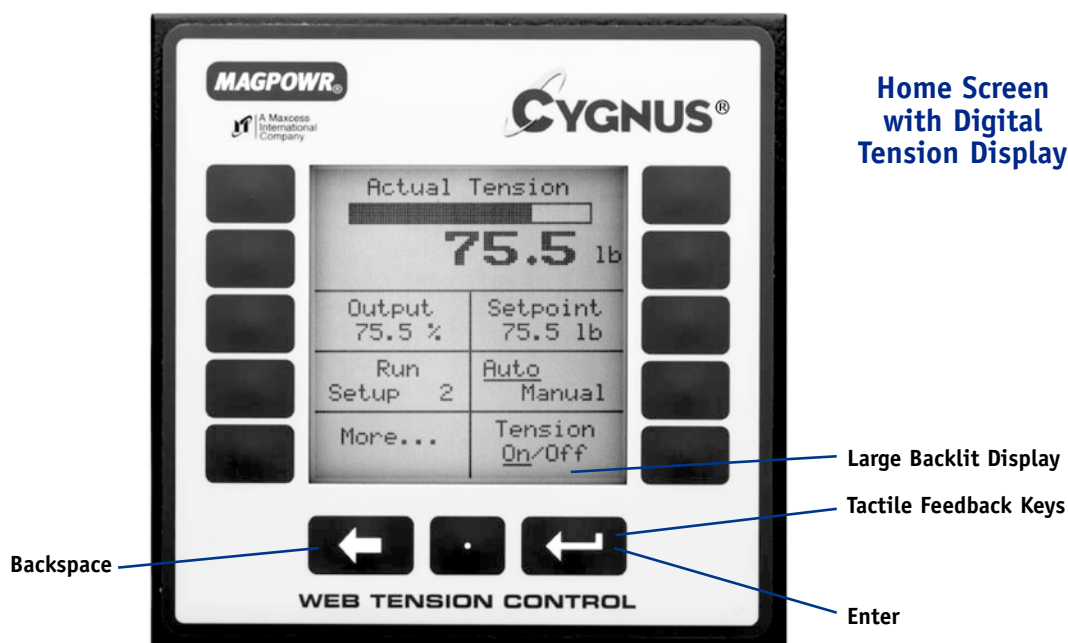
Home Digital
(Environmentally sealed, electrostatically protected touch keypad for setting tension and inputting data)
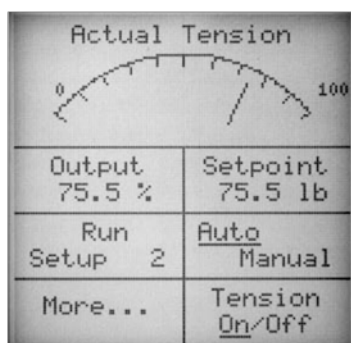
Home Analog Tension Display
For customers who prefer an analog readout
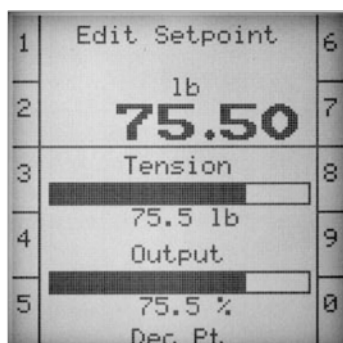
Edit Tension Setpoint Screen
Edit screens allow for easy numeric input using SmartKeys

Program Options Screen
Multiple displayed options make navigation more intuitive

More . . . Options Screen

Cygnus® Typical Applications

Closed Loop Load Cell
Rewind (Motor Drive in Torque Mode)

TS Load Cell

Cygnus-E Tension Control
with PS-90 or PS-24
mounted inside

Foot Mounted
C Series Clutch

Motor

TS Load Cell

Cygnus-E
Tension Control

Motor
Drive

Motor

Closed Loop Load Cell
Rewind (Magnetic Particle Clutch)

TS Load Cell

Pneumatic
Brake

IPT-E
Current-to-Pressure
Transducer

Cygnus DIN Tension Control

Closed Loop Load Cell
Unwind (Pneumatic Brake)

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Cygnus® Dimensions and Specifications

Cygnus-E

Cygnus-DIN
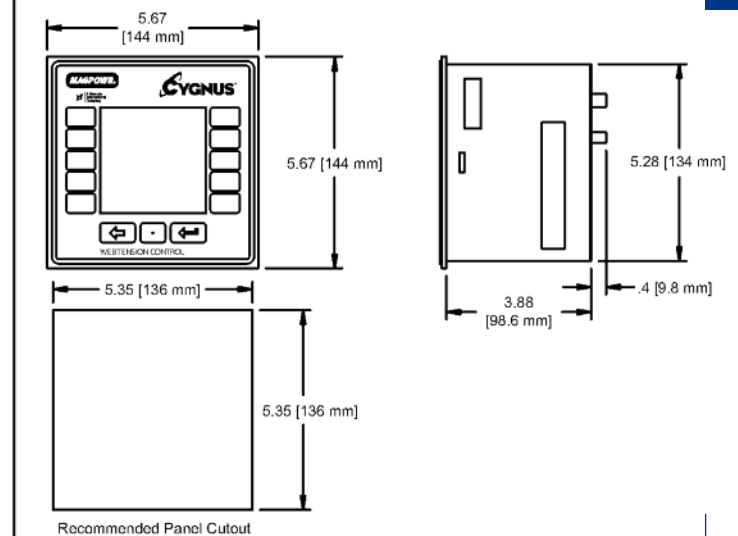
Inputs

Supply Power	115/230 VAC +/- 10%, 50/60 Hz, switch selectable
Tension Input	0 to 21 mVDC (1 or 2, 350 Ω full bridges), 0 to 500 mVDC (1 or 2, 120 Ω bridge), 0 to 5 VDC, 1 mADC max
Diameter Input	0 to 10 VDC analog or calculated using velocity/rpm
RPM/Web Speed	0 to 10 VDC analog, or 0.01 to 50,000 pulses per second, 5 VDC or 24 VDC logic
Auxilary Input	0 to 10 VDC
E-Stop, Run/Stop, Tension Off, Format, Splice	switch closure, 5 or 24 VDC logic, active high or low

Enclosure

Cygnus-DIN	Front Panel IP65 (IEC529) Enclosure IP20 (IEC529)
Cygnus-E	IP65 (IEC529)

Certifications

CE
UL 508C Listed

Outputs

Torque	0 to 10 VDC, 4 to 20 mADC (500 Ω max), -10 to +10 VDC
Inverse Diameter	0 to 10 VDC, 1 mADC max
Tension Reference	0 to 10 VDC, 1 mADC max
Load Cell Excitation	5 or 10 VDC, +5 and -5 VDC (10 VDC)
Low Tension (Web Break) Tension Status	DC solid state relay, 100 mADC with a 1.6 VDC drop, 30 VDC max, or 5 mADC with a 0.6 VDC drop 30 VDC max

Weight

Cygnus-DIN	4 lb (1.8 kg)
Cygnus-E	11 lb (5 kg)

Temperature

E-Operating	0 to 40˚ C
DIN Operating	0 to 50˚ C
Storage	-30 to 80˚ C

Bus Communication Gateways

COMMKIT-DN	DeviceNet
COMMKIT-EN	Ethernet/IP
COMMKIT-PB	Profibus-DP

VERSATEC® Versatile Tension Control

- **Unwind**
- **Rewind**
- **Dancer**
- **Free Loop**
- **Ranger**

VTC-E

US-2

VTC

c (UL) us LISTED

The VERSATEC Versatile Tension Control is a multi-function automatic tension or process controller. It uses the US-2 Ultrasonic Sensor to measure distance and roll diameter, and has selectable operating modes for Unwind, Rewind, Dancer, Free Loop, or Ranger applications. This flexibility eliminates the need to learn the operation of different controls for different tension zones.

The multi-line alphanumeric menu driven display simplifies setup and operation. Any selected parameter and its value are displayed simultaneously, and can be changed at the touch of a finger. From the keypad and display, you can control all operating parameters for any operating mode; including tension, distance, dancer position, loop position, alarm setpoints, security, language and units, and setup selection.

Standard control outputs interface with AC & DC drives, and with air brakes and clutches through a current-to-pressure transducer. An optional power amplifier is used to control magnetic particle brakes and clutches, and mounts inside either enclosure model. The PA-2 will operate either 24 or 90 VDC brakes and clutches, and the PA-90 will operate 90 VDC brakes and clutches. The VERSATEC accepts remote inputs from a PLC or remotely mounted push buttons to adjust the tension setpoint or change the operating setup.

For international installations the VERSATEC provides selectable operating languages of English, French, German, Italian or Spanish, and inch or metric operating units. The desired language and operating units can be selected from the keypad.

Features

Versatile, automatic, and easy to use control system

Unwind, Rewind, Dancer, Free Loop, and Ranger Control all in one package

Multi-line alphanumeric display simplifies setup and operation by displaying real words and values

Backlit display for viewing in any light condition

Stores four setups for quick, precise changeovers

Program security prevents unauthorized changes

Language selectable in English, French, German, Italian or Spanish

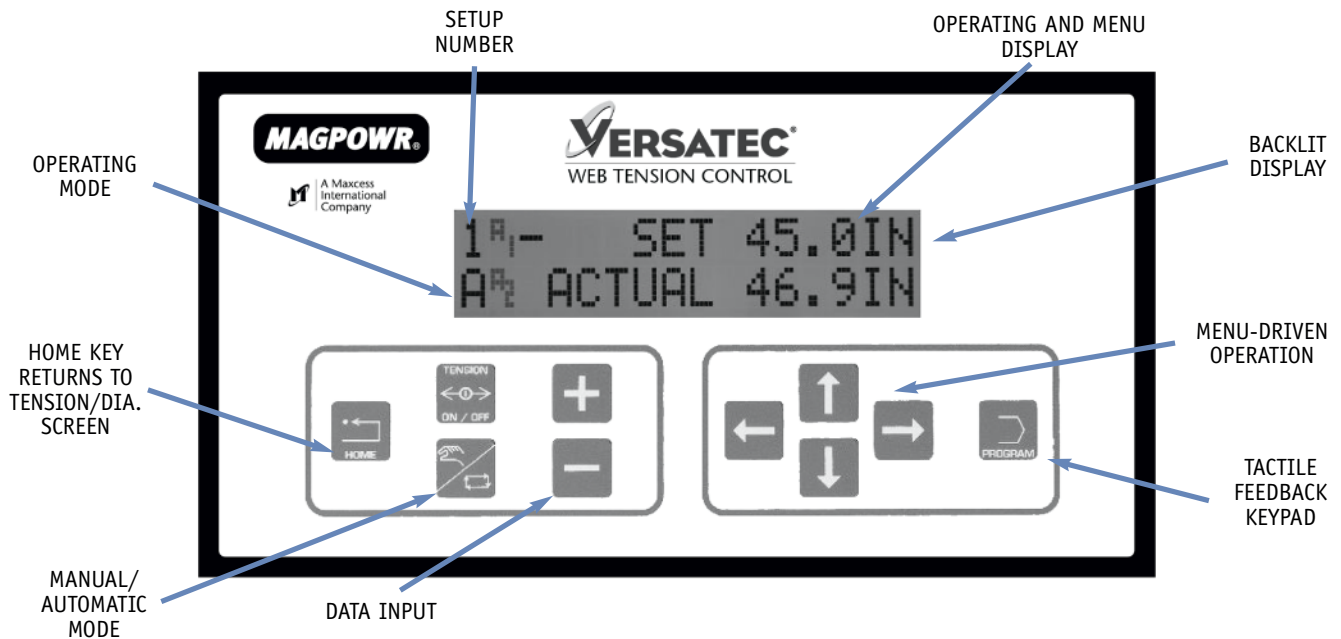**Selectable inch or metric units of measure**

4 to 20 mADC, 0 to 10 VDC, -10 to +10 VDC outputs all standard

Interfaces directly to a PLC for remote operation

Piezoelectric sensor and control enclosure are IP65 splash proof protected

VERSATEC and US-2 are UL listed and CE compliant for safety and electrical noise immunity

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VERSATEC® Keypad and Display

SETUP NUMBER

OPERATING AND MENU DISPLAY

OPERATING MODE

BACKLIT DISPLAY

HOME KEY RETURNS TO TENSION/DIA. SCREEN

MENU-DRIVEN OPERATION

TACTILE FEEDBACK KEYPAD

MANUAL/ AUTOMATIC MODE

DATA INPUT

MAGPOWR®
A Maxcess International Company

VERSATEC®
WEB TENSION CONTROL

1ª⌐ SET 45.0IN
Aª ACTUAL 46.9IN

Environmentally sealed, electrostatically protected touch keypad for setting tension and inputting data
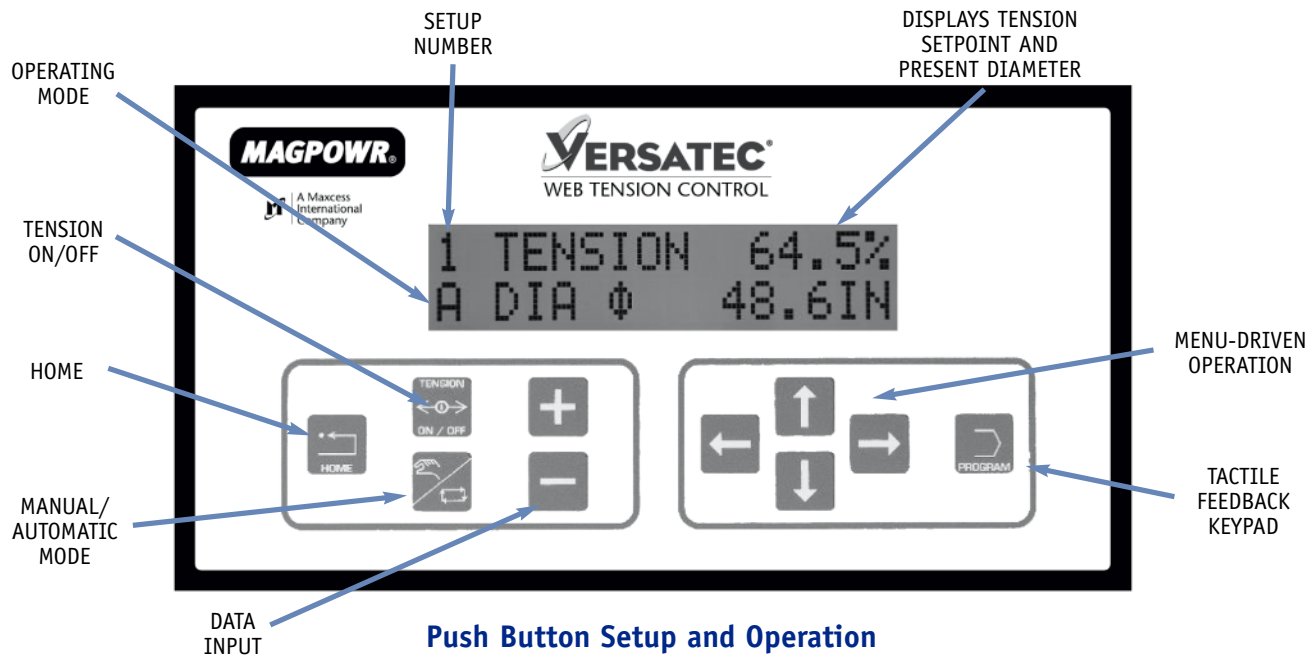
The VERSATEC keypad and display provide an intuitive, user friendly operator interface in any operating mode. The control is versatile and powerful, yet very easy to set up and operate. All setup and operating screens are indicated directly on the multi-line display in real words, not codes, with the corresponding value or status indicated. The screens are accessible from easy to follow scroll-through menus. Changing screens and the displayed information is as easy as pushing a button. It does not get any easier than this.

The control needs only minimal setup information to start. For example, in Tension Control mode you need to enter only the full roll and core diameters, distance to roll centerline, input a desired tension level, and the control is ready to use. Setup in the other operating modes is just as easy.

Accessible operator adjustments are minimal and require very little system knowledge. For example, in Tension Control mode the operator may adjust the desired level of tension by pushing the + and - keys. The control does the rest. The VERSATEC is truly automatic.

Parts and Ordering Information

VTC	DIN Model (0 to 10 VDC, 4 to 20 mADC, -10 to +10 VDC)
VTC-E	Enclosure Model (0 to 10 VDC, 4 to 20 mADC, -10 to +10 VDC)
US-2	Ultrasonic Sensor for use with VERSATEC
PA-90	90 VDC Power Amplifier
PA-2	24 or 90 VDC Power Amplifier
RAA	Right Angle Adapter, optional for US-2 right angle operation

VERSATEC®   Ultrasonic Tension Control Mode

ttemsa

DISPLAYS TENSION
SETPOINT AND
PRESENT DIAMETER

OPERATING
MODE

MAGPOWR

A Maxcess
International
Company

VERSATEC®
WEB TENSION CONTROL

TENSION
ON/OFF

```
1 TENSION    64.5%
A DIA Φ     48.6IN
```

HOME

MENU-DRIVEN
OPERATION

MANUAL/
AUTOMATIC
MODE

TACTILE
FEEDBACK
KEYPAD

DATA
INPUT

Push Button Setup and Operation
Operation & Alphanumeric Display
Menu driven operation and setup with online help

System Status

```
1 TENSION    64.5%
A DIA Φ     48.6IN
```

Home screen displays present diameter and tension setpoint. Adjust Tension using +/- keys

Display Actual Output

```
1 OUTPUT LEVEL
A          53.4 %
```

Displayed as percent of maximum

Adjustable Taper Tension

```
TAPER PERCENT
           24.0 %
```

Direct input of desired rewind taper

Add Stopping Torque

```
STOP MULTIPLIER
      2.50
```

Helps stop unwind rolls

Manual Operation

```
MANUAL LEVEL
           46.8 %
```

Output can be controlled manually during roll changes

Select Application

```
SYSTEM
         REWIND
```

Choose unwind or rewind

Easy Setup: Step 1

```
FULL ROLL DIA
          48.0 IN
```

Enter maximum roll diameter

Easy Setup: Step 2

```
CORE DIAMETER
           3.0 IN
```

Enter minimum core diameter

Easy Setup: Step 3

```
DISTANCE TO AXIS
          36.0 IN
```

Enter distance to roll centerline and desired tension, setup is complete

Ignore Spool Flanges

```
ECHO REJECT DIST
           6.0 IN
```

For narrow web spools, enter distance to flanges to be ignored

Select Language

```
LANGUAGE
        DEUTSCH
```

Choose English, French, German, Italian or Spanish

Select Units

```
UNITS
     METRIC (MM)
```

Choose English or metric units

Core and Full Roll Detect

```
MINIMUM DIAMETER
DETECT    3.2 IN
```

Core and full roll alarms flash on the display and trip external indicators

Copy Setups

```
COPY TO SETUP 1
FROM SETUP 4
```

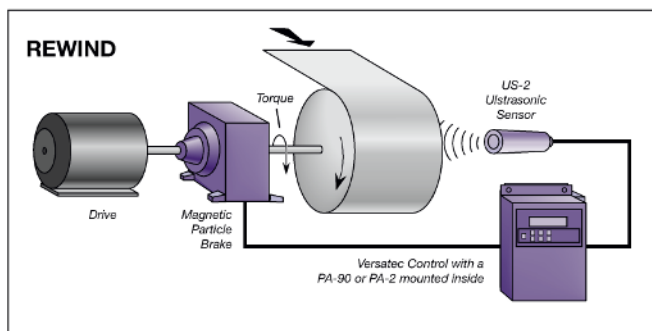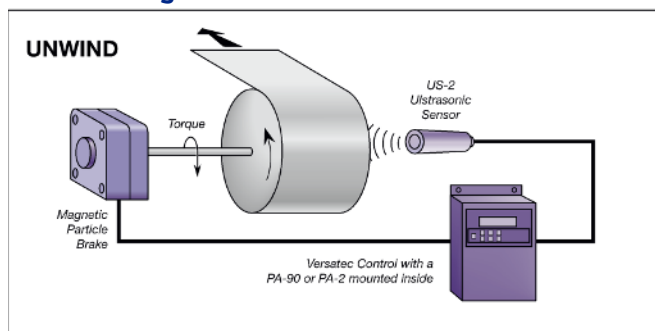Setup information can be copied between four setups

Program Security

```
ENTER CODE TO
LOCK       ****
```
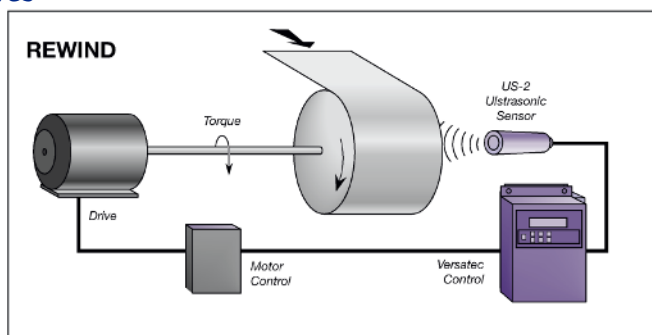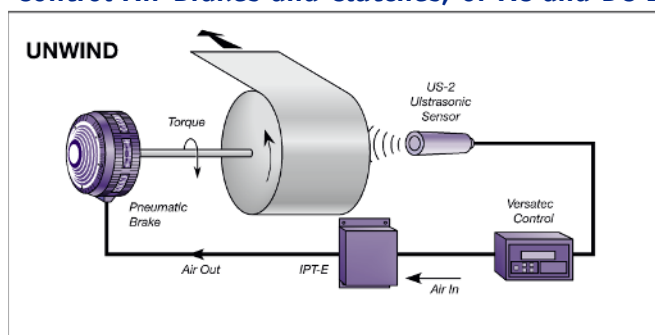
Personalized code prevents unauthorized changes to setup parameters

VERSATEC® Ultrasonic Tension Control Applications

Control Magnetic Particle Clutches and Brakes

Control Air Brakes and Clutches, or AC and DC Drives

The VERSATEC is a fully automatic ultrasonic tension control for unwind and rewind applications. It offers simple setup and operation at the touch of a finger, and conveniently displays operating and setup information on a multi-line alphanumeric backlit display.

By simply entering the core diameter, the full roll diameter, the distance to the roll centerline, and the desired tension from the front keypad, the VERSATEC is ready to use. It then measures the roll diameter, and commands the required torque to control tension. Tension adjustments and setup selections may be made from the keypad, from remotely mounted push buttons, or through a PLC.

In unwind applications the Stop Multiplier feature can be used to increase torque during machine stops to provide smooth stops and prevent slack webs. In rewind applications Taper Tension prevents telescoping rolls and insures good roll edges by reducing tension as the roll diameter increases. Core and Full Roll alarms can be adjusted to give the operator a signal before reaching the end of the roll. This signal appears on the display and can also be connected to an external indicator.

The Inverse Diameter Output is provided to reduce the speed of the rewind clutch input motor or the differential shaft overspeed as the roll diameter increases, thus reducing the slip rpm and extending the life of the clutch or the differential shaft.

Features

Fully automatic unwind or rewind tension control improves process quality

Multi-line alphanumeric display simplifies setup and operation

Simultaneously displays tension setpoint and roll diameter so operator can monitor progress

Ultrasonic non-contact sensor never touches the web

Control electric or pneumatic brakes and clutches, or AC and DC drives

Inverse Diameter Output reduces clutch slip for longer life

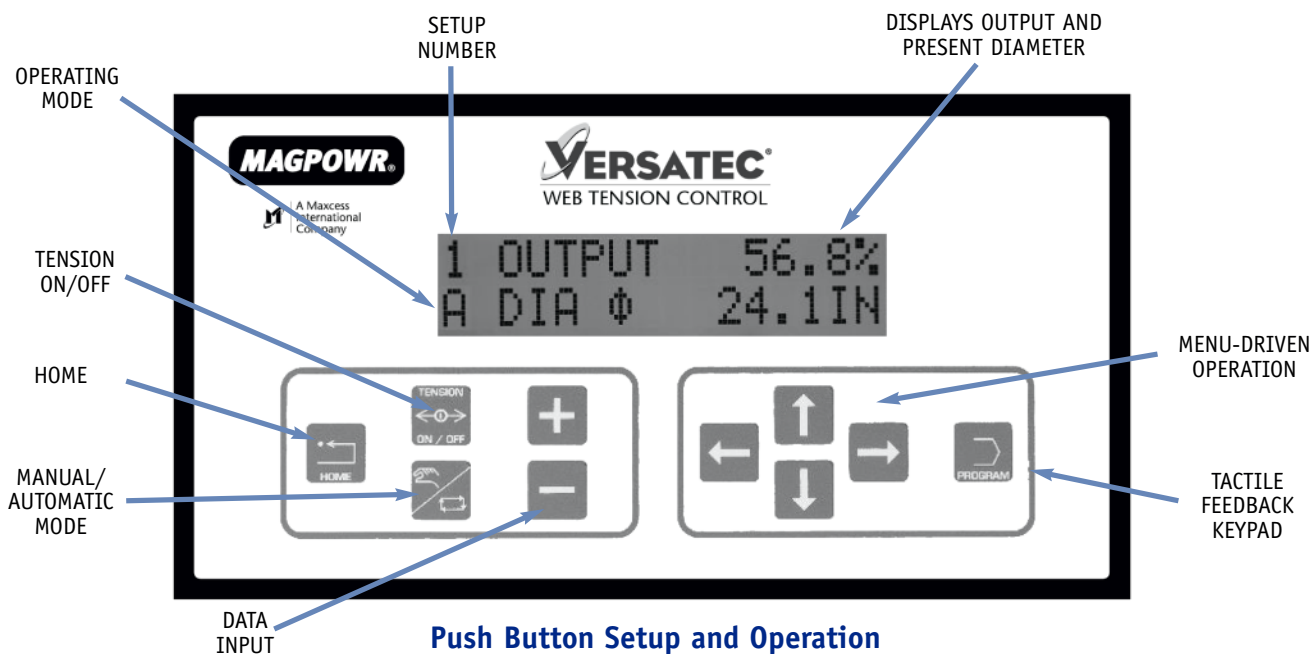**Adjustable Taper Tension for winding optimum rolls**

Inertia Compensation for stopping large rolls

Core and Full Roll Alarms alert operator for roll changes

Local or remote tension adjustment and setup selection

VERSATEC® Dancer Control Mode

OPERATING MODE

SETUP NUMBER

DISPLAYS OUTPUT AND PRESENT DIAMETER

TENSION ON/OFF

HOME

MANUAL/ AUTOMATIC MODE

DATA INPUT

MENU-DRIVEN OPERATION

TACTILE FEEDBACK KEYPAD

MAGPOWR®
A Maxcess International Company

VERSATEC®
WEB TENSION CONTROL

```
1 OUTPUT      56.8%
A DIA Φ      24.1IN
```

Push Button Setup and Operation
Operation & Alphanumeric Display
Menu driven operation and setup with online help

System Status

```
1 OUTPUT      56.8%
A DIA Φ      24.1IN
```

Home screen displays output, diameter (when US-2 sensor is used), setup number, and operating mode simultaneously

System Status

```
1 OUTPUT LEVEL
A             53.4 %
```

Home screen displays output, setup number and operating mode simultaneously (without diameter sensor)

Select Control Method

```
CONTROL DEVICE
          TORQUE
```

Optimized method for control of brake, clutch or drive in torque mode

Select Control Method

```
CONTROL DEVICE
           SPEED
```

Optimized method for control of drive in speed mode

Added Stopping Torque

```
STOP MULTIPLIER
          2.50
```

Helps stop unwind rolls with additional torque at machine stop

Push Button Tuning

```
DYNAMIC TUNING ↓
←              →
```

Two-step dynamic tuning of system response

Direct Data Access

```
INTEGRATOR TIME
         .125 SEC
```

Results of dynamic tuning can be accessed and recorded

Direct Data Input

```
PROPORTIONAL
GAIN         1.49
```

Parameters can be accessed and input directly

Select Language

```
LANGUAGE
         ESPANOL
```

Choose English, French, German, Italian or Spanish

Select Units

```
UNITS
      METRIC (MM)
```

Choose English or metric units

Control Dancer Loading

```
TENSION OUTPUT?
            YES
```

Tension Output sets Dancer loading for remote adjustment

Use US-2 Ultrasonic Sensor

```
DIA SENSOR?
            YES
```

Improves stability with large roll ratios, allows rewind taper and full roll and core detection

Push Button Data Entry

```
ROLL DIMENSIONS↓
←              →
```

Input minimum and maximum diameter and distance to axis

Adjustable Taper Tension

```
TAPER PERCENT
          24.0 %
```

Input desired rewind taper when using Tension Output and diameter sensor

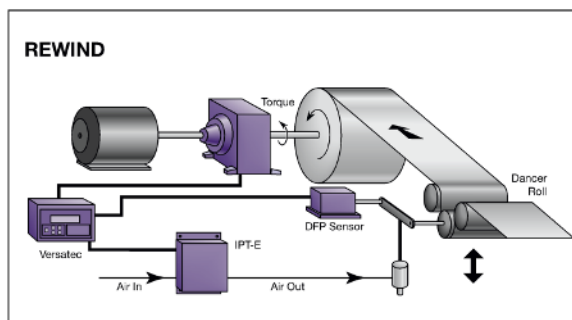### Core and Full Roll Detect

```
MINIMUM DIAMETER
DETECT    3.2 IN
```
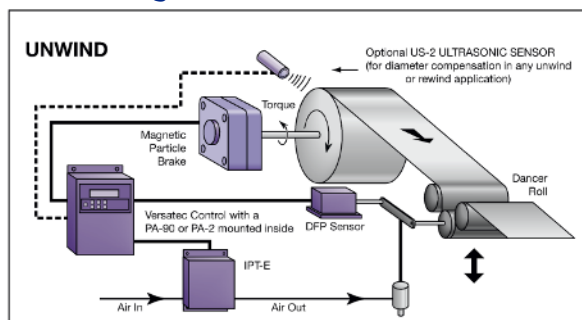
Core and full roll alarms flash on the display and trip external indicators when diameter sensor is used
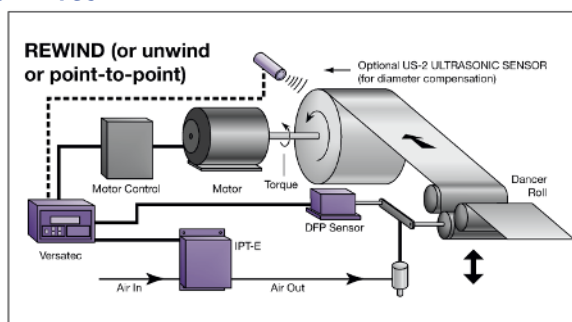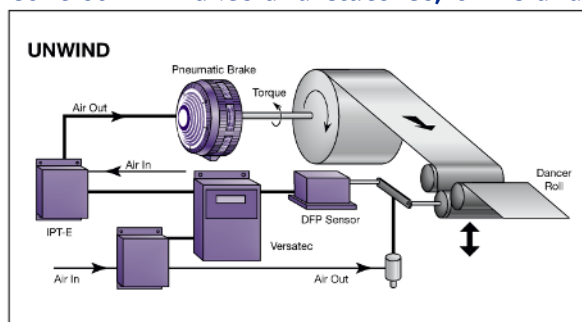
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VERSATEC® Dancer Control Applications

Control Magnetic Particle Clutches and Brakes

Control Air Brakes and Clutches, or AC and DC Drives

The VERSATEC provides closed loop tension control of a moving web in any dancer application. It measures the position of the dancer arm using a MAGPOWR DFP or DFP-2 Position Sensor, and commands the required output adjustment to achieve and maintain the desired position. It offers simple setup and operation at the touch of a finger, and conveniently displays operating and setup information on a multi-line alphanumeric display.
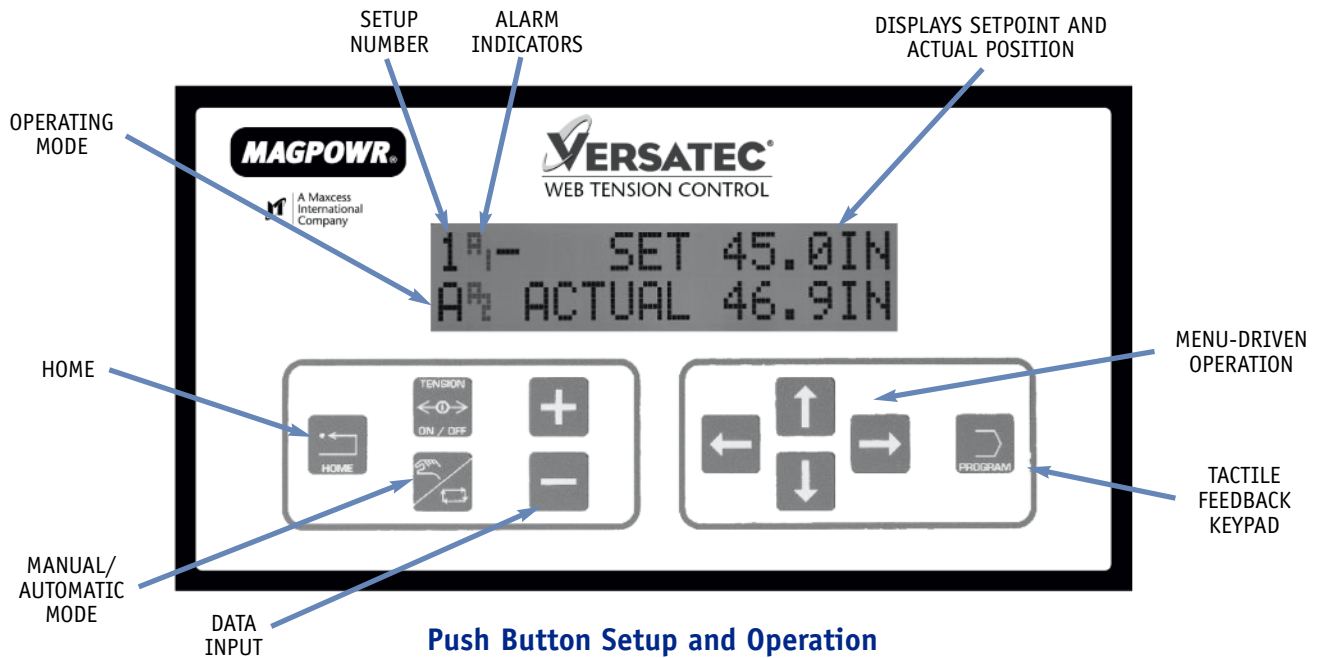
The VERSATEC program is optimized for torque or speed control applications, and will control a brake, clutch, AC or DC drive, or servo to maintain the dancer position. A simplified two-step tuning method provides stable operation through the entire roll. Use of the optional US-2 Ultrasonic Sensor allows diameter compensation for optimum control response through the entire roll, even with large roll ratios. This is an important new feature, since controllability changes dramatically with roll diameter changes. This feature is not available in other dancer controls.

Dancer position adjustments may be made through the VERSATEC keypad, through remotely mounted buttons, or through a PLC. Automatic centering maintains the desired dancer arm position automatically through the entire roll. Stop Multiplier and Inertia Compensation provide additional stopping torque during machine stops to prevent slack webs. And, the Tension Output can be used to adjust dancer loading, allowing taper tension in rewind dancer applications and automatic tension changes as you change setups.

Features

Provides closed loop control of tension in any dancer application

Optimized for torque or speed control operation

Simple two-step tuning provides stable operation through the entire roll

Automatic centering maintains dancer arm position through the entire roll

Optional ultrasonic sensor allows diameter compensation for optimum response even with large roll ratios

Multi-line display indicates actual output level and diameter simultaneously

Inertia Compensation stops large unwind rolls

Tension Output provides remote control of dancer loading

Provides adjustable taper tension in rewind applications

VERSATEC® Free Loop Control Mode

SETUP NUMBER

ALARM INDICATORS

DISPLAYS SETPOINT AND ACTUAL POSITION

OPERATING MODE

MAGPOWR

A Maxcess International Company

VERSATEC®
WEB TENSION CONTROL

```
1ᴬ₁-    SET 45.0IN
Aᴿ₂ ACTUAL 46.9IN
```

HOME

TENSION
ON / OFF

MENU-DRIVEN OPERATION

PROGRAM

TACTILE FEEDBACK KEYPAD

MANUAL/ AUTOMATIC MODE

DATA INPUT

Push Button Setup and Operation
Operation & Alphanumeric Display
Menu driven operation and setup with online help

System Status
```
1ᴬ₁-    SET 45.0IN
Aᴿ₂ ACTUAL 46.9IN
```
Home screen displays loop setpoint, actual position, setup number and operating mode

Display Actual Output
```
1 OUTPUT LEVEL
A         53.4 %
```
Displayed as percent of maximum

Push Button Adjustment
```
LOOP DISTANCES ↓
↑             ↓
```
Input loop position and limits

Easy Setup
```
DIST FOR MAX
OUTPUT   60.0 IN
```
Enter desired distance for maximum output

Easy Setup
```
DIST FOR MIN
OUTPUT    6.0 IN
```
Enter desired distance for minimum output

Push Button Tuning
```
DYNAMIC TUNING ↓
↑              ↓
```
Easy tuning of system response

Direct Data Access
```
INTEGRATOR TIME
      .125 SEC
```
Results of dynamic tuning can be accessed and recorded

Direct Data Input
```
PROPORTIONAL
GAIN       1.49
```
Parameters can be accessed and input directly

Two Limit Switch Alarms
```
ALARM 1 ON DIST
        60.0 IN
```
On-screen indicator and output for external indicator

Two Limit Switch Alarms
```
ALARM 2 ON DIST
         6.0 IN
```
On-screen indicator and output for external indicator

Select Language
```
LANGUAGE
        FRANCAIS
```
Choose English, French, German, Italian or Spanish

Select Units
```
UNITS
    METRIC (MM)
```
Choose English or metric units

Setup Assistance
```
ECHO DETECT
        46.9 IN
```
On-screen sensor alignment indicator

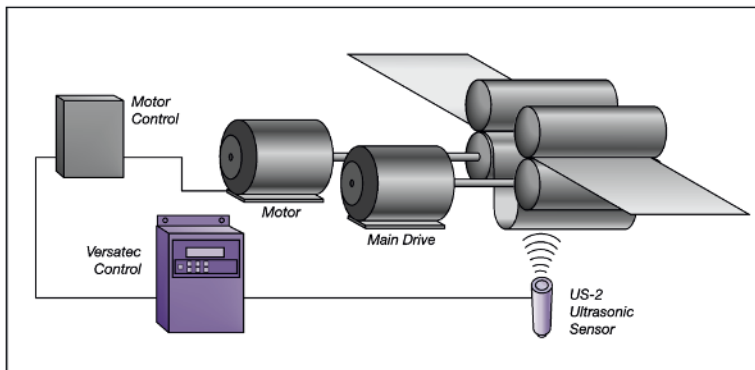### Copy Setups
```
COPY TO SETUP 1
FROM SETUP 4
```
Setup information can be copied between four setups

Program Security
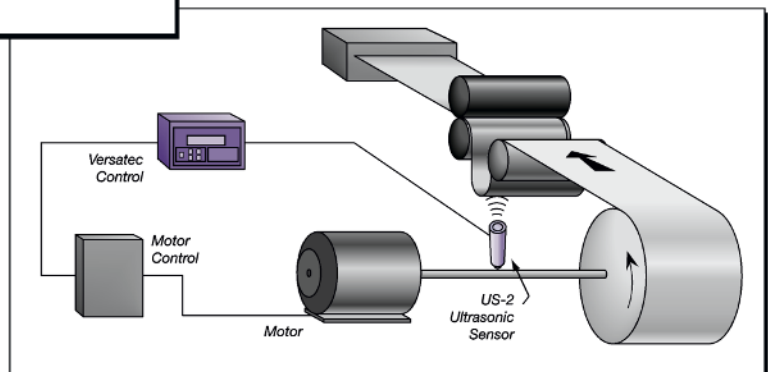```
ENTER CODE TO
LOCK   ****
```
**Personalized code prevents unauthorized changes to setup parameters**

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# VERSATEC® Free Loop Applications



**Free Loops**

**Powered Unwinds**

The VERSATEC is a fully automatic non-contact Free Loop control. The machine operator simply enters the desired distance for the minimum and maximum outputs and the desired loop position using the keypad. The VERSATEC then controls the loop position by ultrasonically measuring the actual position and commanding the necessary output to achieve and maintain the desired position.

The VERSATEC program is optimized for speed control applications, and will control an AC or DC drive or servo to maintain the loop position. The multi-line display indicates the setpoint and actual position simultaneously, and simplifies setup and operation.
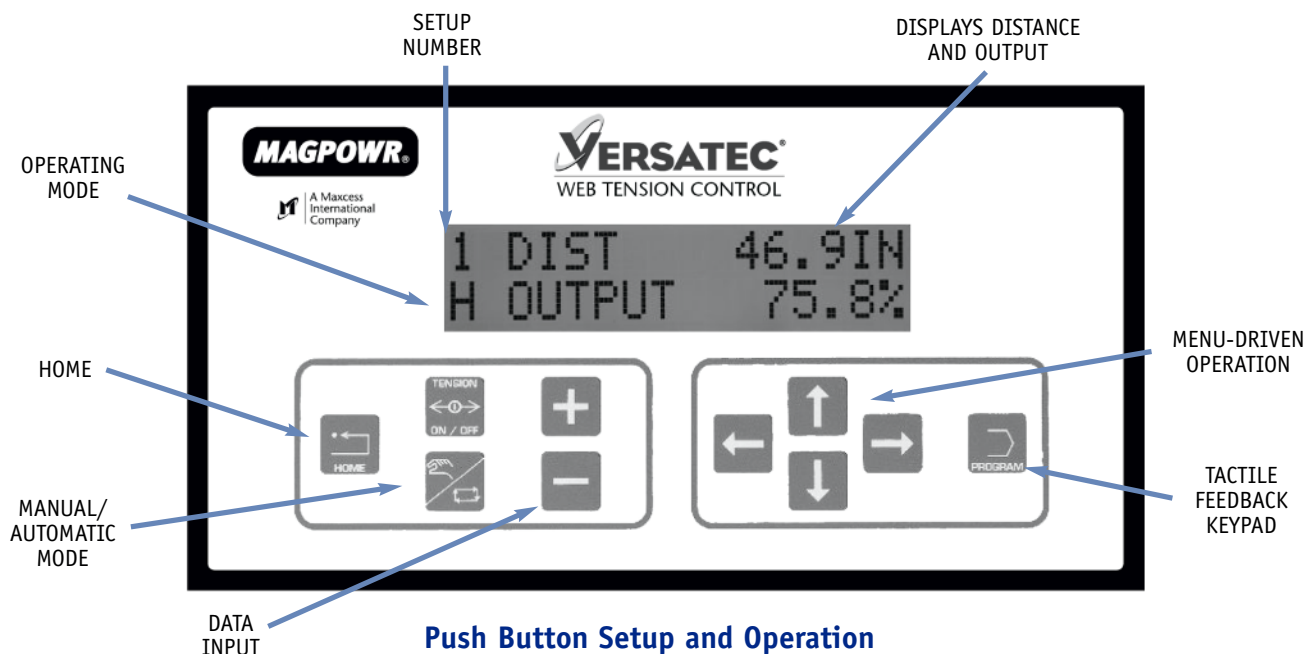
Position adjustments may be made from the VERSATEC keypad, through remotely mounted push buttons, or through a PLC. Its responsiveness to position changes is easily optimized for any system. Two alarm outputs can be adjusted to alert the operator before an out of range condition occurs, and an adjustable hysteresis feature prevents the alarms from chattering due to small changes in loop position.

Standard opto-isolated control inputs and outputs allow the VERSATEC to interface with PLCs, and AC & DC drives.

## Features

**Provides closed loop control of Free Loops for tension isolation**

**Optimized for speed control applications**

**Controls an AC or DC drive or servo to maintain loop position**

**Multi-line display indicates setpoint and actual loop position simultaneously**

**Loop position is controlled to an adjustable setpoint**

**Ultrasonic sensor never touches the web**

**Two alarm setpoints alert the operator when the loop reaches preset limits**

# VERSATEC® Ranger Mode

SETUP
NUMBER

DISPLAYS DISTANCE
AND OUTPUT

OPERATING
MODE

**MAGPOWR®**

A Maxcess International Company

**VERSATEC®**
WEB TENSION CONTROL

```
1 DIST      46.9IN
H OUTPUT    75.8%
```

MENU-DRIVEN
OPERATION

HOME

HOME

TENSION
ON / OFF

PROGRAM

TACTILE
FEEDBACK
KEYPAD

MANUAL/
AUTOMATIC
MODE

DATA
INPUT

Push Button Setup and Operation
Operation & Alphanumeric Display
Menu driven operation and setup with online help

System Status
```
1 DIST      46.9IN
H OUTPUT    75.8%
```
Home screen displays measured distance, output, setup number and operating mode

Easy Setup
```
TARGET DIST    ↓
←              →
```
Input distances and output is automatically scaled

Easy Setup: 1
```
DIST FOR MAX
OUTPUT    60.0 IN
```
Enter distance for maximum output

Easy Setup: 2
```
DIST FOR MIN
OUTPUT     6.0 IN
```
Enter distance for minimum output, setup is complete

Ignore Close Objects
```
ECHO REJECT DIST
          6.0 IN
```
Ignore stationary objects between sensor and target

Two Adjustable Alarms
```
ALARM 1 ON DIST
          60.0 IN
```
On-screen indicator and output for external indicator

Two Adjustable Alarms
```
ALARM 1 OFF DIST
          59.5 IN
```
Adjustable alarm off distance

Two Adjustable Alarms
```
ALARM 2 ON DIST
           6.0 IN
```
On-screen indicator and output for external indicator

Two Adjustable Alarms
```
ALARM 2 OFF DIST
           6.5 IN
```
Adjustable alarm off distance

Setup Assistance
```
ECHO DETECT
          46.9 IN
```
On-screen sensor alignment indicator

Select Language
```
LANGUAGE
        ITALIANO
```
Choose English, French, German, Italian or Spanish

Select Units
```
UNITS
    METRIC (MM)
```
Choose English or metric units

Select Units
```
UNITS
    ENGLISH (IN)
```
Choose English or metric units

Copy Setups
```
COPY TO SETUP 1
FROM SETUP 4
```
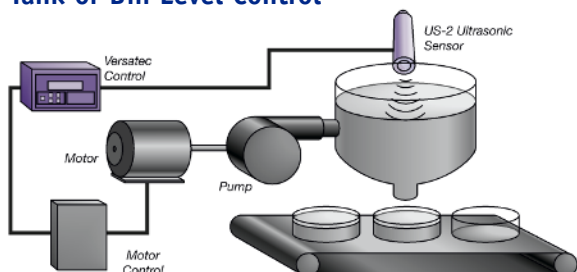**Setup information can be copied between setups**
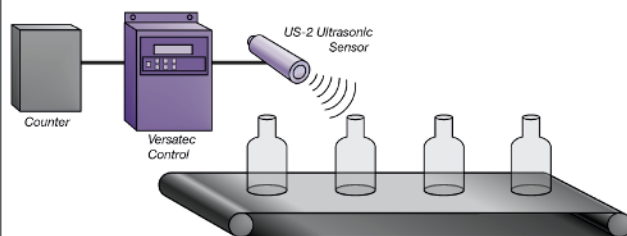
Program Security
```
ENTER CODE TO
LOCK        ****
```
Personalized code prevents unauthorized changes to setup parameters

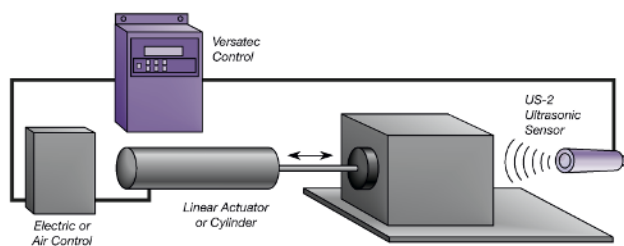**✳ttemsa**

VERSATEC® Ranger Applications
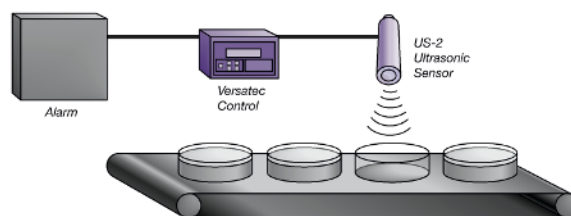
Tank or Bin Level Control

Transparent Object Counting

Actuator Control or Position Monitoring

Quality Control Presence Detection

The VERSATEC is an accurate ultrasonic ranging control and proximity detector featuring ease of operation in a wide range of applications. When used with the US-2 Ultrasonic Sensor, the VERSATEC provides an output proportional to the distance of an object from the sensor. The VERSATEC ranging control can be used anywhere proportional control, setpoint control, on-off control, or one or two level proximity switch control is needed. All of these operating modes are available and set from the keypad. The multi-line display provides easy setup and operation by displaying any parameter and its value simultaneously.

Two common modes of operation are: the Ranger mode, where the control output is proportional to distance, and the Bang-Bang mode, where the control operates like two proximity or limit switches. In all modes a proportional voltage or current, and two alarm outputs are available. Adjustable hysteresis prevents chatter of relays at the setpoint.

The control output is automatically scaled when the distance for minimum output and distance for maximum output are entered. The opto-isolated inputs and outputs can be connected directly to a PLC, AC or DC drive, computer system, pump control, or a MAGPOWR current-to-pressure transducer.

Features

Fully automatic control for a variety of process applications

Selectable and reversible outputs control many types of equipment

Control output is automatically ranged for easy setup

Multi-line display indicates actual distance and output simultaneously

Ultrasonic sensor never touches the object being sensed

Minimum and maximum alarms signal when preset limits are reached

VERSATEC® Specifications

Inputs

Supply Power	115/230 VAC +/- 10%, 50/60 Hz, switch selectable, 24 VA
Ultrasonic Sensor	MAGPOWR US-2 Ultrasonic Sensor Sensor range: 6 inches to 60 inches (152 mm to 1524 mm)
Beam Spread	±10˚
Dancer Position Sensor	1-10 kΩ Potentiometer Sensor MAGPOWR DFP or DFP-2 Sensor 0 to 5 VDC Signal
Run/Stop, Tension On/Off, Remote Setup Select, Reset Hold	Switch closure, or 5 or 24 VDC

Temperature

E-Operating	0 to 40˚ C (0-60˚ C for US-2)
Storage	-30 to 80˚ C

Certifications

UL 508C Listed

Outputs

Control	0 to 10 VDC, 1 mA max 4 to 20 mA, 500 Ω max -10 to +10 VDC, 1 mA max
Tension Reference	4 to 20 mA, 500 Ω max
Inverse Diameter	0 to 10 VDC, 1 mA max
Meter	0 to 1 mA, 500 Ω max
Alarm 1 & 2	DC solid state relay; 100 mA, 30 VDC max
Tension On/Off	DC solid state relay; 100 mA, 30 VDC max

Weight

VTC	3.2 kg (7 lb)
VTC-E	5 kg (11 lb)

Enclosure

VTC Front Panel Enclosure	IP65 (IEC529), IP20 (IEC529)
VTC-E & US-2	IP65 (IEC529)

NOTES

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VERSATEC® Dimensions

Model VTC

7.56 [192.0]

3.78 [96.0]

7.28 [184.9]

3.63 [92.2]

PANEL CUTOUT

7.21 [183.1]

Model VTC-E

8.25 [209.5]

7.00 [177.8]

6.00 [152.4]
MTG DIM

1.12 [28.5]

10.75 [273.1]
MTG DIM

10.25 [260.4]

0.75 [19.2]

0.31 DIA THRU
(4) MTG HOLES FOR

4.31 [109.5]

11.50 [292.1]

1.00 [25.4]

0.10 [2.7]

1.50 [38.1]

1.10 [27.9]

Note: Measurements in parenthesis are metric.
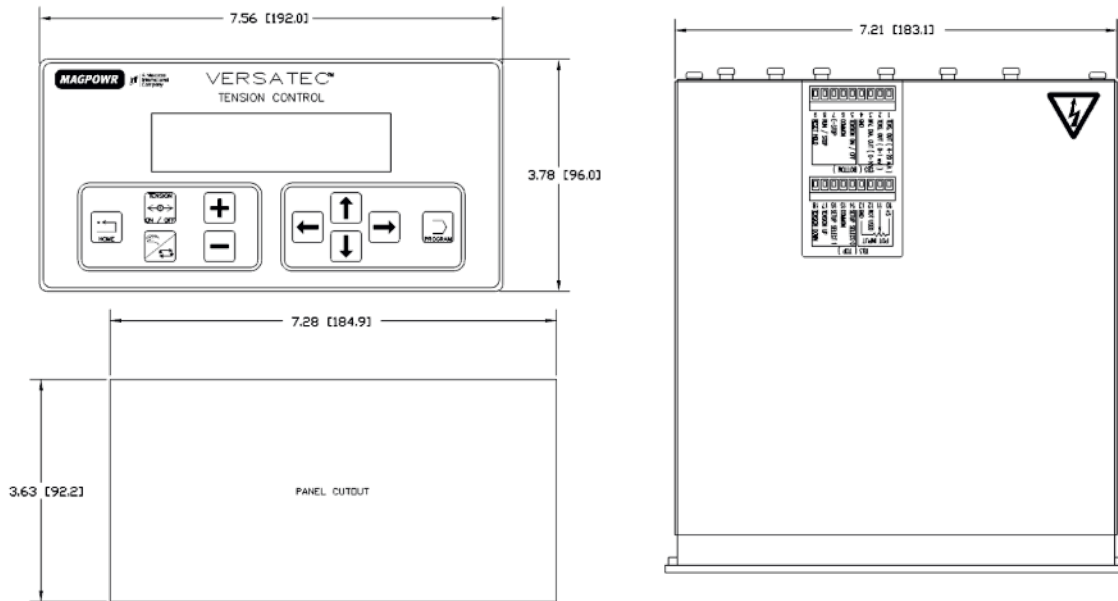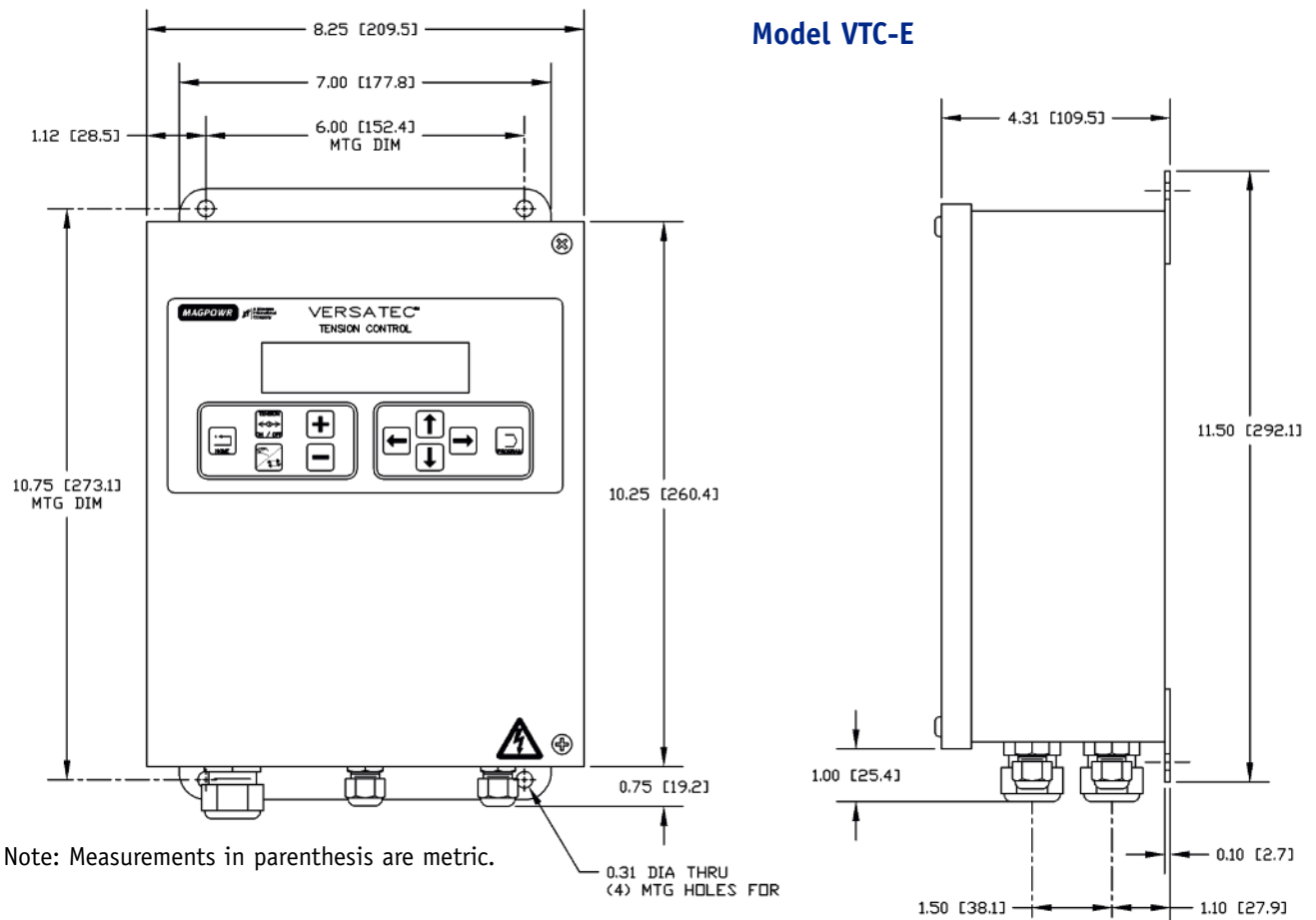
US-2 Ultrasonic Sensor for use with Versatec

Specifications

Range	152 mm to 1,524 mm (6 inches to 60 inches)
Resolution	.025% of span, or 0.18 mm (0.007 inch) whichever is larger
Enclosure	IP65

Model US-2

Model US-2 with RAA Right Angle Adapter
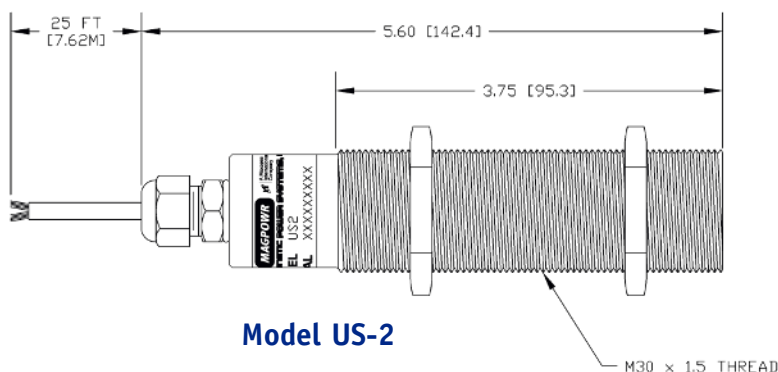
Notes:

Measurements in parenthesis are metric.

Face of roll cannot be closer than 152.4 mm (6 inches) or further than 1.524 m (60 inches) away from the face of sensor.

⁂ttemsa
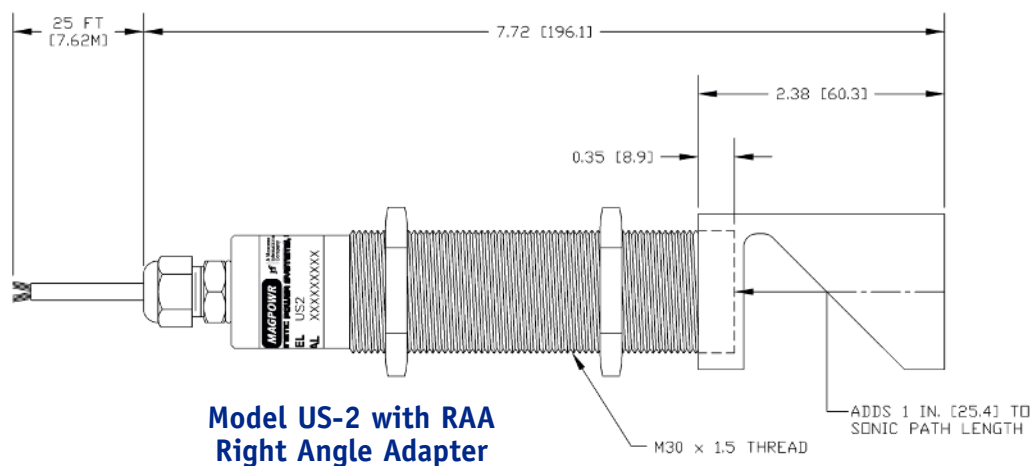
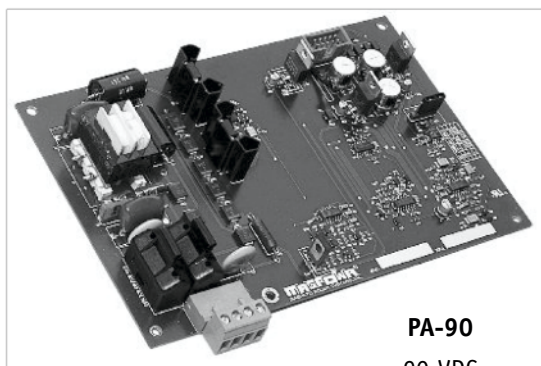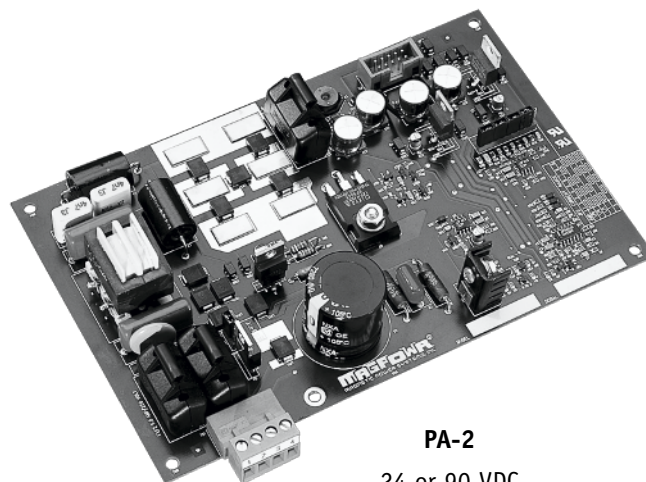# PA-90 & PA-2 Current Regulated Power Amplifiers For Versatec

PA-90
90 VDC

PA-2
24 or 90 VDC

The PA-2 and PA-90 Power Amplifiers are designed to be used with the VERSATEC to control magnetic particle brakes and clutches in tension control applications. Either model can be mounted inside any VERSATEC enclosure, and receives its control signals directly from the tension control.

The PA-90 is used to control 90 VDC brakes and clutches only, while the PA-2 can be used to control either 24 or 90 VDC units. With 115 VAC input, either power amplifier will provide a -3.6 to 90 VDC, current regulated output to accurately control a 90 VDC brake or clutch. With a 24 VDC input, the PA-2 will provide a -1.2 to 24 VDC, current regulated output to accurately control a 24 VDC unit.

Features

Control any size magnetic particle brake or clutch

Output is current regulated for better system response

Selectable operating current ranges for optimum controllability

Mounts inside either VERSATEC enclosure

Reverse current to extend torque range is standard

Specifications

PA-2 (24 VDC Brakes and Clutches)

Input	24 VDC ±10%
Output	-1.2 to 24 VDC, with selectable current ranges 1/8, 1/4, 1/2, 1, 2 amp max

PA-2 (90 VDC Brakes and Clutches)

Input	115 VAC ±10%, 50/60 Hz
Output	-3.6 to 90 VDC, with selectable current ranges 1/8, 1/4, 1/2 amp max

PA-90

Input	115 VAC ±10%, 50/60 Hz
Output	-3.6 to 90 VDC, with selectable current ranges 1/8, 1/4, 1/2 amp max

Certifications

UL 508C Recognized

Spyder Plus **Tension Control**

**Open Loop,
Load Cell or
Dancer Control**

Spyder Plus is a simple, powerful, cost-effective tension control that saves space in a control cabinet. The DIN rail mount simplifies installation and a user-friendly keypad and display makes it easy to learn and set up.

Spyder Plus provides accurate, reliable control in open loop or closed loop applications by providing feedback to clutches and brakes, or interfacing directly with a drive in unwind, rewind, or point-to-point applications.

Communications provide the ability to interface and share data with an existing PLC, remote PC, HMI or web browser, allowing for remote setpoint adjustment to further improve efficiency, especially when multiple controls are used in the same process.

Applications include open loop using 3rd party diameter input, closed loop using load cells, and closed loop using dancer feedback.

Features

Powerful tension control at an affordable price

Parameter access via keypad or internet browser

Advanced features for Dancer applications including Dancer Mode and Remote Setpoint Adjustment

Use to control magnetic particle or pneumatic clutches and brakes, or interface directly with a drive

Compact size for out-of-the-way mounting

Adjustable taper tension

Capable of closed loop, open loop, load cell or dancer control

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Spyder Plus Specifications and Dimensions

Inputs (from load cell, dancer position, or roll diameter)

Load cell	2.1 mV/V using +5 VDC and -5 VDC across one 350 Ω sensor or two 350 Ω sensors in parallel
Tension Setpoint, Manual Setpoint	0 VDC to +10 VDC, 0.25 mADC max, or 1k to 10k Ω potentiometer
E-Stop, Run/Stop, Tension Off, Auto/Manual	Switch closure or 5 VDC or 24 VDC active high/low logic, 8 mADC max
Dancer Position (for dancer mode)	1k to 10k Ω potentiometer, or a 0 to 10 VDC Signal
3rd party Ultrasonic, Laser, or other sensor for diameter input (for open loop mode)	0 to 10 VDC Signal

Certifications

CE
UL 508C Listed

Outputs

Torque (Main Output)	0 to +10 VDC, 1 mADC max 4 to 20 mADC, 500 Ω max -10 to +10 VDC, 1 mADC max
Tension meter	0 to 1 mADC or 0 to +10 VDC analog
Communications	Modbus/TCP, FTP Client, HTTP Web Server Interface
Web Browser File Format	html

Specifications

Supply Power	24 VDC, ±10%, 250 mA, 6 VA
Enclosure	IP-20 (IEC529)
Temperature Range	Operating: 0° C to 50° C Storage: -30° C to +80° C

Options

Power Converter	85 to 264 VAC to 24 VDC Din-Rail Mount
Part Number	93157-024

Spyder Plus Applications

CLOSED LOOP LOAD CELL APPLICATIONS

UNWIND

Load Cell
Load Cell
Pneumatic Brake
Torque
AIR
IPT or IPT-E
AIR IN
Spyder Plus Control

REWIND

Load Cell
Load Cell
Motor
Torque
Motor Control
Spyder Plus Control

UNWIND

Load Cell
Load Cell
Magnetic Particle Brake
Torque
PS-24 or PS-90
Spyder Plus Control

REWIND

Load Cell
Load Cell
Magnetic Particle Clutch
Motor
Torque
PS-24 or PS-90
Spyder Plus Control

CLOSED LOOP DANCER APPLICATIONS

DANCER UNWIND

PS-24 or PS-90
Torque
Magnetic Particle Brake
Dancer Roll
Spyder Plus Control
Regulator
Air In
Air Out
DFP or DFP2 Sensor

DANCER REWIND

Torque
Motor Control
Motor
Dancer Roll
Spyder Plus Control
Regulator
Air In
Air Out
DFP or DFP2 Sensor

OPEN LOOP APPLICATIONS

UNWIND

Torque
3rd Party Ultrasonic Sensor
Magnetic Particle Brake
PS-24 or PS-90
Spyder Plus Control

REWIND

Torque
3rd Party Ultrasonic Sensor
Drive
Magnetic Particle Clutch
PS-24 or PS-90
Spyder Plus Control

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DFC-90 & DFC-A Dancer/Follower Arm Controls

DFC-90

DFC-A

The DFC-90 and DFC-A are low cost tension controls with two operating modes. They can be used in Dancer or Follower Arm tension control applications. In Dancer Control applications, the DFC-90 and DFC-A are closed loop dancer controls. They control web tension by sensing the position of the dancer arm through a DFP or DFP-2 position sensor and adjusting the clutch, brake or motor control torque accordingly to maintain the dancer position setpoint.

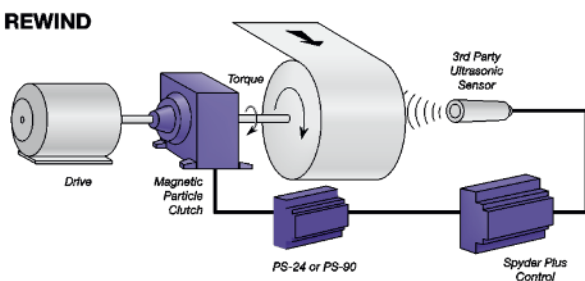An advanced control algorithm provides optimum control and ease of use. In follower arm applications, the DFC-90 and DFC-A control web tension by compensating for measured changes in the roll diameter. Roll diameter changes are measured through the DFP or DFP-2 position sensor and a follower arm. An optional Stop Multiplier provides additional stopping torque to help stop large unwind rolls.

Setup adjustments are made using easily accessible potentiometers, and all adjustments are intuitive and clearly marked. The DFC-90 and DFC-A Dancer/Follower Arm Controls meet all CE and UL requirements for safety and electrical noise immunity.

Features

Superior control performance at an affordable price

Enhanced dancer algorithm and tuning method for performance

Non-interactive Core and Full Roll adjustments

DFC-90: Current regulated 90 VDC output in four selectable ranges

DFC-A: Switch selectable 0 to 10 VDC or 4 to 20 mADC output

Compact enclosure requires minimal space

Simplicity of DIN rail mounting

DFC-90 & DFC-A Specifications and Applications

Parts and Ordering Information

DFC-90	Dancer / Follower Arm Control (-3.6 to 90 VDC output)
DFC-A	Dancer / Follower Arm Control (0 to 10 VDC, 4 to 20 mADC output)
DFP	Dancer / Follower Arm Position Sensor
DFP-2	Dancer / Follower Arm Position Sensor
9A13-1RPL	Analog Output Meter (0-100%)

Temperature

Operating	0 to 50˚ C
Storage	-30˚ to 80˚ C

Enclosure

DFC-A	Enclosure IP20 (IEC529)
DFC-90	Enclosure IP20 (IEC529)

Inputs

Supply Power	
DFC-90	115 VAC +/- 10%, 50/60 Hz, 1.1 amp max, 117 VA with clutch or brake coil
DFC-A	24 VDC, +/- 10%, 0.08 amp max, 2VA
Position Sensor	DFP, DFP-2 or 1 kΩ to 10 kΩ potentiometer, 1/4 watt minimum
Tension Potentiometer	10 kΩ minimum, 1/4 watt minimum

Outputs

DFC-90	Current regulated -3.6 to 90 VDC Adjustable in four current ranges: 1/8, 1/4 , 1/2 and 1 amp
DFC-A	0 to 10 VDC, 1 mADC max or (switch selectable) 4 to 20 mADC, 400 Ω max
Position Sensor Reference Voltage	10 VDC, 10 mADC max
Meter Signal	0 to 1 mADC

Certifications

CE
UL 508C Listed

Options

Power Converter	85 to 264 VAC to 24 VDC Din-Rail Mount
Part Number	93157-024

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DFC-90
Magnetic Particle Applications
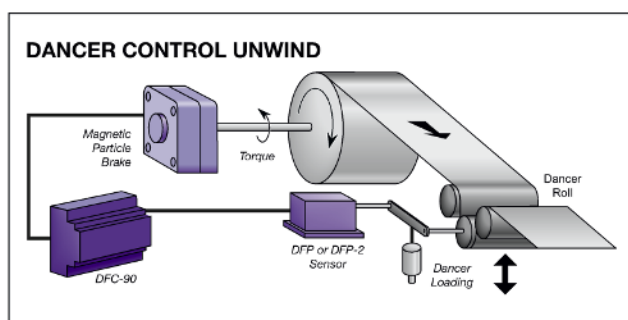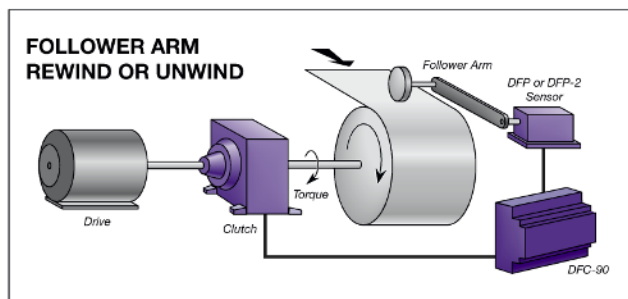
DFC-A
Pneumatic/Motor Drive Applications
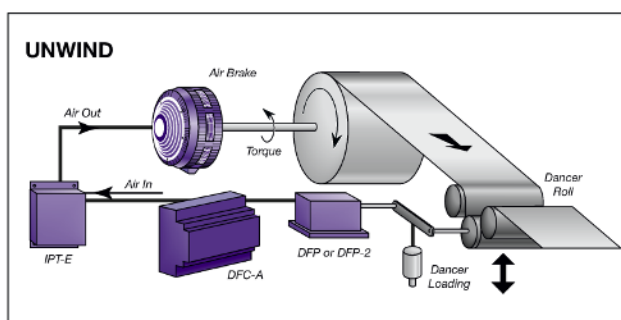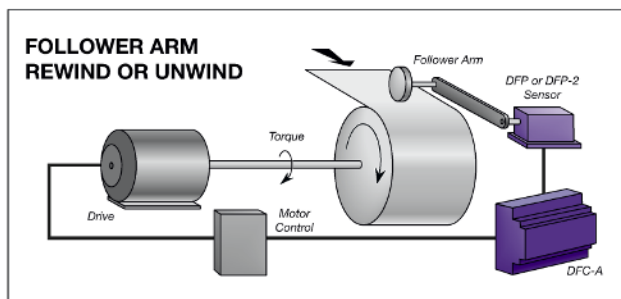
Applications

DFC-A	Dancer or Follower Arm Control with pneumatic brake, clutch or motor drive
DFC-90	Dancer or Follower Arm Control with magnetic particle clutch or brake
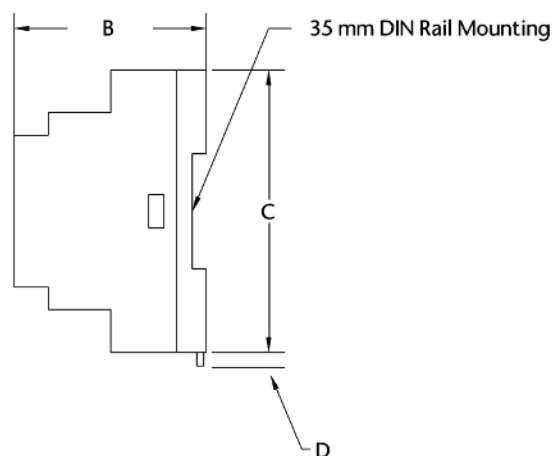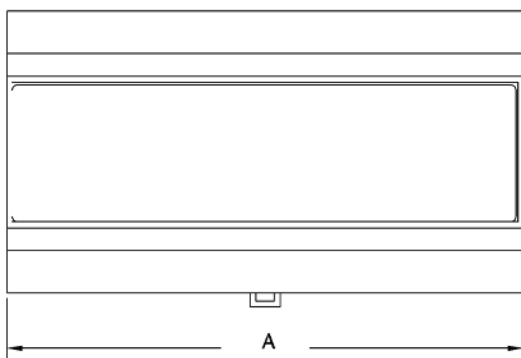
MODEL	A	B	C	D
DFC-A	104.9 mm (4.13 inches)	58.4 mm (2.30 inches)	85.8 mm (3.38 inches)	4.1 mm (0.16 inches)
DFC-90	157.0 mm (6.18 inches)	58.4 mm (2.30 inches)	85.8 mm (3.38 inches)	4.1 mm (0.16 inches)

TC-5 & TC-5P Current Regulated Power Supply

TC-5

TC-5P

The MAGPOWR TC-5 is a compact solid state current regulated power supply with output capability to 1 amp at 90 VDC. It will operate all standard MAGPOWR clutches and brakes. Four current ranges of 1/8, 1/4, 1/2 and 1 amp are provided. The current range is selected by a simple jumper on the circuit board. This unit also includes reverse current circuitry as a standard feature, thus allowing greater controllability in the lowest torque range of the clutch or brake being operated.

The front panel meter indicates the current output and automatically reads full scale for each current range selected. The operator controls the output by rotating the front panel potentiometer. The TC-5 is available as an enclosure mounted control, while the TC-5P is a front panel mounted unit.

Specifications

Input	95 to 135 VAC, 50/60 Hz,1.2 amp at 1 amp output, 117 VA with clutch or brake
Output	-3 to 90 VDC, full wave, SCR phase controlled, selectable current ranges 1/8, 1/4, 1/2, and 1 amp max
Regulation	Better than 2% of range selected
Operating Temperature	0 to 40° C
Storage Temperature	-30 to 85° C
Meter	Reads 0 to 100% of selected current range
Enclosure	IP20

Certifications

UL 508C Listed

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TC-5 & TC-5P Applications and Dimensions

REWIND

MOTOR

TC-5

CLUTCH

TORQUE

UNWIND

MAGNETIC
PARTICLE
BRAKE

TC-5

TORQUE

(4) .156
[4.0 mm]
DIA. THRU
MOUNTING
HOLES

5.13 [130 mm]
5.00 [127 mm]
4.687 [119.0 mm]
4.37 [111 mm]

3.36 [90 mm]

(4) .191 [4.8 mm]
DIA. THRU
MOUNTING
HOLES

7.13
[181 mm]

6.44
[163 mm]

7.00
[178 mm]

5.375
[136.5 mm]

TC-5
TORQUE CONTROLLER

PERCENT OF SELECTED
CURRENT RANGE

4.750
[120.6 mm]

1.19
[30 mm]

2.750
[69.8 mm]

1.19
[30 mm]

SUGGESTED TC-5 PANEL
MOUNT CUTOUT

.56 [14 mm]

2.13
[54 mm]

(2) .875 [22.2 mm] DIA.
HOLES THRU

1.06 [27 mm]

1.69 [43 mm]

1.750 [44.4 mm]

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PS-90 & PS-24

Current Regulated Power Supplies and Power Amplifiers for Spyder Plus, Cygnus and Optional for Versatec

Inputs

Supply Power	
PS-24	24 VAC or 24 VDC +/- 10%, 50/60 Hz, 2.1 amp max
PS-90	115 VAC +/- 10%, 50/60 Hz, 1.1 amp max
Tension	1 kΩ to 10 kΩ, 1/4 watt minimum or
Tension Voltage	0 to 10 VDC, 100 kΩ input impedance

Outputs

Clutch/Brake	
PS-24	Current regulated -1.2 to 24 VDC. Adjustable in three current ranges: 1/2, 1, 2 amp
PS-90	Current regulated -3.6 to 90 VDC. Adjustable in four current ranges: 1/8, 1/4 , 1/2, 1 amp
Meter Signal	0 to 1 mADC
Potentiometer Supply Voltage	10 VDC, 10 mADC max

PS-90

PS-24

The PS-24 and PS-90 provide current regulated power output to magnetic particle clutches and brakes for use in unwind, rewind, or intermediate tension control applications.

PS-24 and PS-90 power supply units can be adjusted manually or automatically for consistent, repeatable results. The reverse-current feature minimizes drag torque, allowing for use of the full torque range of magnetic particle devices. When used with a tension control, they can be automatically adjusted to maintain tension through the roll build. With selectable current ranges, these power supplies provide the flexibility to control any size clutch or brake with optimum resolution.

The PS-24 and PS-90 are compact, with DIN rails to mount easily inside a machine cabinet or Cygnus-E tension control. Torque can be adjusted with a conveniently mounted potentiometer or through input from a PLC or other automatic control device.

Features

Current regulated 24 VDC or 90 VDC output with selectable ranges

Reverse-current feature to minimize drag torque

0-1 mADC remote meter output is proportional to the current range selected and indicates output as a percentage of the selected range

Manually adjustable through remote potentiometer

Compact enclosure requires minimal mounting space

Simplicity of DIN rail mounting

CE compliant and UL listed

Temperature

Operating	0 to 50˚ C
Storage	-30˚ to 80˚ C

Enclosure

PS-24	IP20 (IEC529)
PS-90	IP20 (IEC529)

Certifications

CE
UL 508C Listed

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PS-90 & PS-24 Applications and Dimensions

REWIND - MANUAL CONTROL OF CLUTCH

Motor — Clutch — Torque
Potentiometer — PS-90

UNWIND - NIP

Potentiometer — Magnetic Particle Brake — Torque
PS-90

REWIND - POWER SUPPLY FOR OTHER CONTROL INPUT

Motor — Clutch — Torque
PLC — PS-90

Dimensions in inches (mm)

6.18 (157.0 mm)
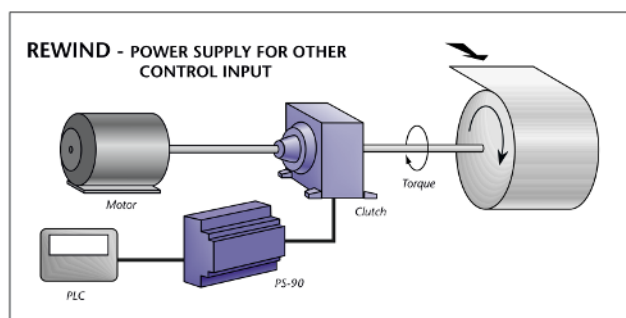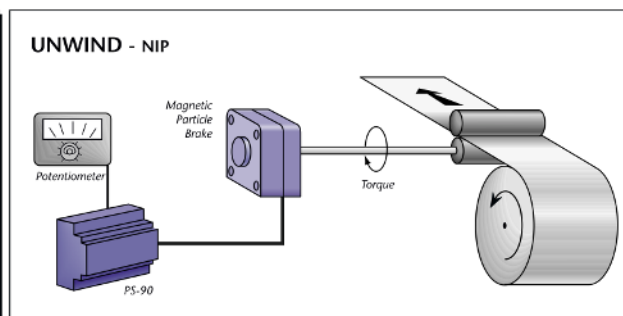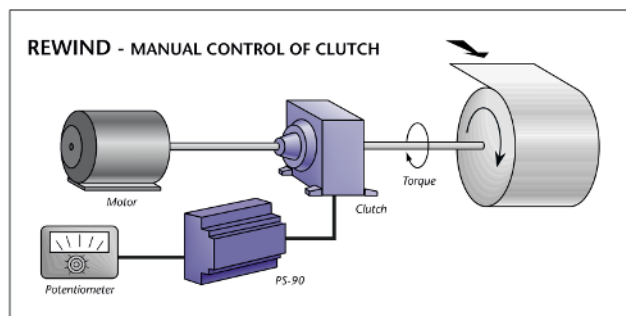
2.30 (58.4 mm)
35 mm DIN Rail Mounting
3.38 (85.8 mm)
.16 (4.1 mm)
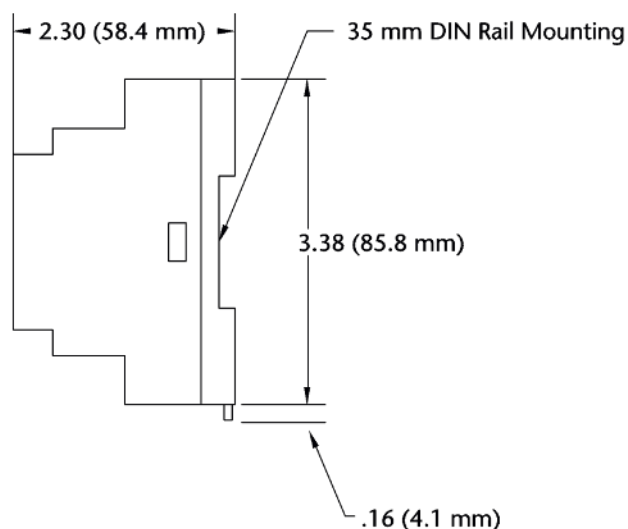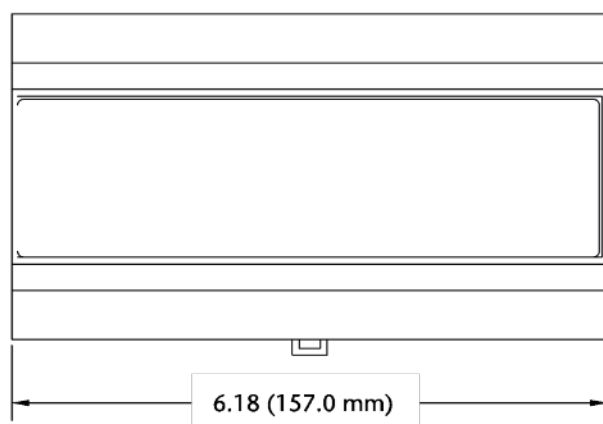
Parts and Ordering Information

PS-90	Power Supply, 90 VDC output,117VA with clutch or brake coil
PS-24	Power Supply, 24 VDC output
9A13-1RPL	Output Meter (optional)
1KPOT	Input Device (optional)

IPT-E **Current-to-Pressure Transducer**

IPT-E

GAUGE KIT

FILTER KIT

IPT-E WITH OPTIONAL
FILTER AND GAUGE KITS
INSTALLED

The MAGPOWR model IPT-E Current-to-Pressure Transducer
is a compact pressure controller designed to operate
pneumatic brakes and clutches in precise tensioning
applications. It offers superior response, accuracy, and flow
characteristics, which are critical in these applications.

The IP65 enclosure provides protection against dirt and
liquids common in factory environments, and allows the
IPT-E to be mounted near the brake or clutch for maximum
response and controllability. It can be mounted in any
orientation with no effect on performance.

The IPT-E is versatile and easy to use. It comes ready to
use requiring no calibration, and operates on 115/230 VAC,
normal dry shop air, and accepts a 4 to 20 mADC control
input signal.

The unit's small size is the result of its surface mount
technology design and single manifold construction.
Optional pressure gauge and air line filter kits are
available.

Features

- **Superior response for control applications**

- **Compact surface mount design**

- **Ready to use, no calibration required**

- **Operates any pneumatic clutch or brake, regardless of make or size**

- **Accepts 4 to 20 mADC control input signal**

- **Accurate and repeatable**
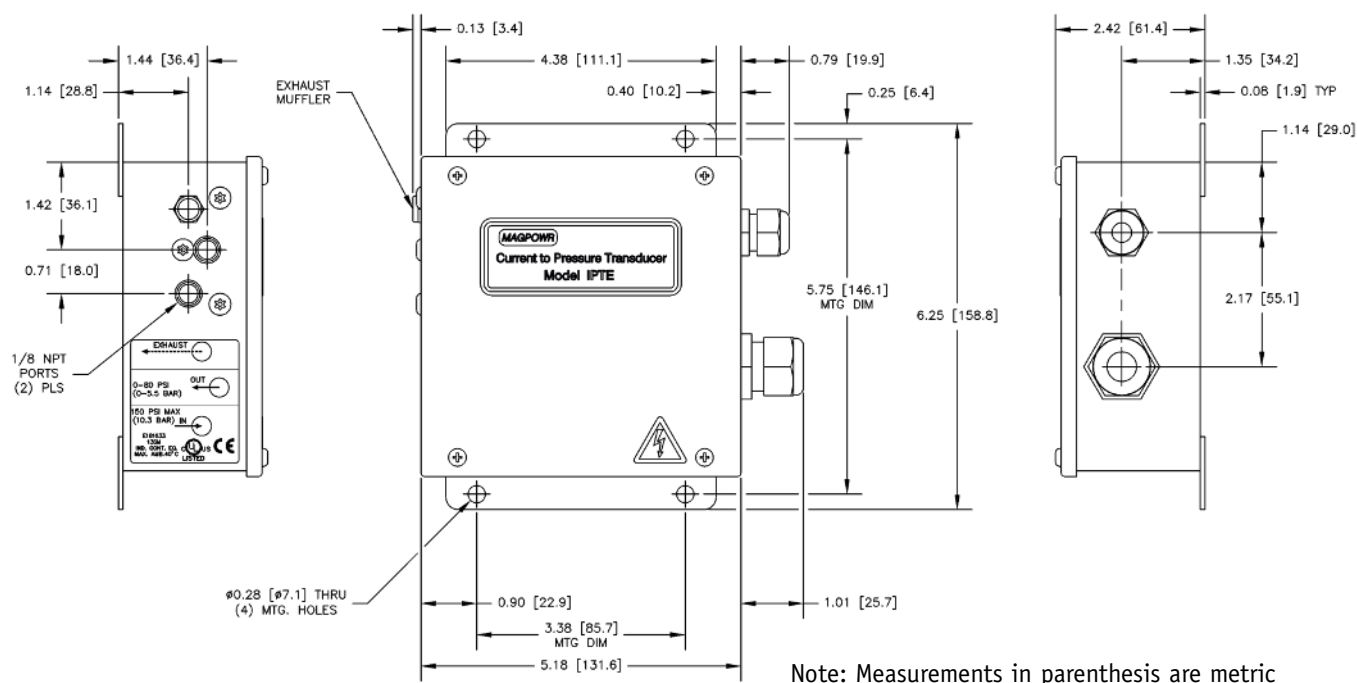
- **IP65 protection against dirt and liquids**

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IPT-E Dimensions and Specifications

Diagram measurements:

- 1.14 [28.8]
- 1.44 [36.4]
- 0.13 [3.4]
- 4.38 [111.1]
- 0.79 [19.9]
- 0.40 [10.2]
- 0.25 [6.4]
- 2.42 [61.4]
- 1.35 [34.2]
- 0.08 [1.9] TYP
- 1.14 [29.0]
- 1.42 [36.1]
- 0.71 [18.0]
- 5.75 [146.1] MTG DIM
- 6.25 [158.8]
- 2.17 [55.1]
- EXHAUST MUFFLER
- MAGPOWR Current to Pressure Transducer Model IPTE
- EXHAUST
- 1/8 NPT PORTS (2) PLS
- 0-80 PSI (0-5.5 BAR) OUT
- 150 PSI MAX (10.3 BAR) IN
- ø0.28 [ø7.1] THRU (4) MTG. HOLES
- 0.90 [22.9]
- 3.38 [85.7] MTG DIM
- 5.18 [131.6]
- 1.01 [25.7]

Note: Measurements in parenthesis are metric

Specifications

Output	0-80 psi (0-5.5 bar)
Input Power	115/230 VAC ± 10 %, 50/60 Hz switch selectable, 6 VA
Control Input	4 to 20 mADC, 249 Ω impedance
Linearity, Hysteresis & Repeatability	0.5% of full scale
Flow Rate	3 scfm
Minimum Supply Pressure	Greater than maximum desired output
Maximum Supply Pressure	150 psi (10.3 bar)
Temperature Range	Operating 0 to 40˚C Storage -30 to 80˚C
Pneumatic Ports	(3) 1/8 NPT threaded ports
Enclosure	IP65 (IEC529)

Certifications

CE
UL 508C Listed

Ordering Information

IPT-E	Standard Model, 115/230 VAC input power
140A61-1	Pressure Gauge Kit
140A62-1	Filter Kit
23A14-1	Replacement Filter Element

- GAUGE KIT
- REPLACEMENT FILTER ELEMENT
- FILTER KIT
- 1.8 MAX
- 3.7 MAX

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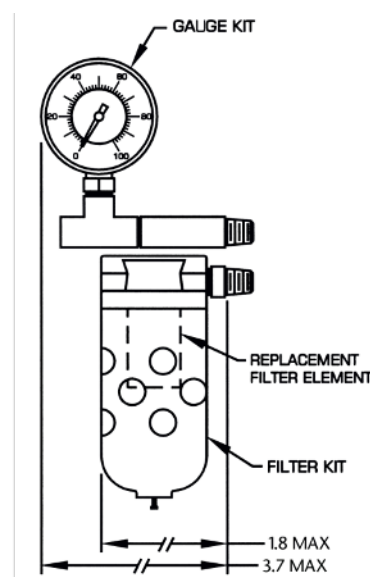
IPT Current- or Voltage-to-Pressure Transducer

The MAGPOWR Model IPT Current- or Voltage-to-Pressure Transducer is a compact p.c. board level pressure controller designed to be mounted inside a machine enclosure. The unit's small size is the result of its surface mount technology design and single manifold construction.

The IPT is perfect for control applications. It offers superior response, accuracy, and flow characteristics, which are critical in these applications. It comes ready to use, and requires no calibration. Therefore, the IPT can be mounted inside a cabinet and out of the way.

It is versatile and easy to use. The IPT operates on 115/230 VAC and filtered dry shop air, and can accept either a current or voltage control input signal. It is designed to be mounted in any orientation with no effect on performance, and offers multiple mounting options. The IPT can be mounted on standoffs through four provided mounting holes, or on a DIN 35 rail using the provided mounting clips, or in a customer supplied DIN 35 Modular Circuit Housing.

Features

- **Superior response for control applications**
- **Compact surface mount design**
- **Ready to use, no calibration needed**
- **Operates any pneumatic clutch or brake, regardless of make or size**
- **Accepts current or voltage control input signal**
- **Accurate and repeatable**
- **Multiple mounting options**

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IPT Dimensions and Specifications

Dimensions in inches (mm)
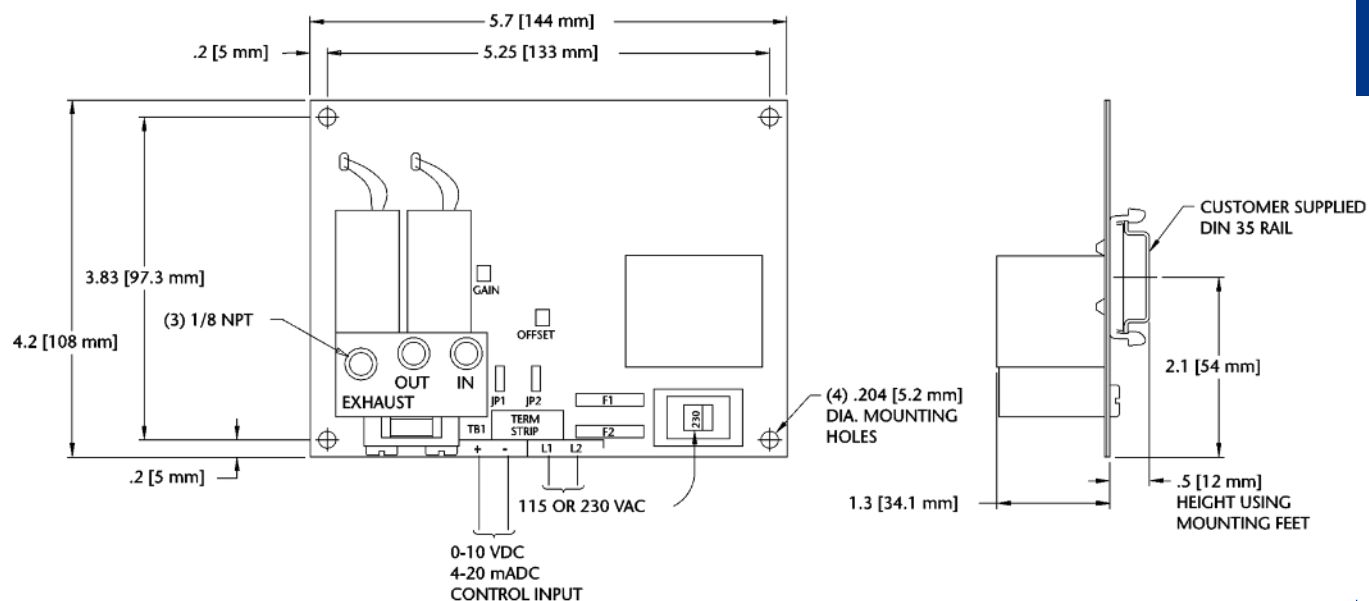
Certifications

UL 508C recognized

Ordering Information

IPT	Standard Model, 115/230 VAC Input power
140A61-1	Pressure Gauge Kit
140A62-1	Filter Kit
23A14-1	Replacement Filter Element

Specifications

Output	0-80 psi (0-5.5 bar)
Input Power	115/230 VAC ± 10%, 50/60 Hz switch selectable, 6 VA
Control Input	4 to 20 mADC, 249 Ω impedance or 0 to 10 VDC, 10 kΩ impedance
Linearity, Hysteresis & Repeatability	0.5% of full scale
Flow Rate	3 scfm
Minimum Supply Pressure	Greater than maximum desired output
Maximum Supply Pressure	150 psi (10.3 bar)
Temperature Range	Operating 0 to 40˚C Storage -30 to 80˚C
Pneumatic Ports	(3) 1/8 NPT threaded ports

IP-80 Current-to-Pressure Transducer

The MAGPOWR IP-80 is a complete, compact, ready to install Current-to-Pressure transducer assembly. Included are the transducer, 20 psi reference regulator, dual reference air filters with automatic drains, air regulator and volume pressure booster.

The IP-80 operates on normal filtered shop air and allows a wide variation in supply pressure. An accurate pressure gauge is displayed on the front cover to monitor output pressure.

All components are built to high industrial duty standards to resist vibration and shock.

High flow and exhaust characteristics insure rapid response of clutch or brake and allows for flexibility in placement of the I/P transducer.

Features

Versatile. Operates with any pneumatic clutch or brake regardless of make or size

Compact size

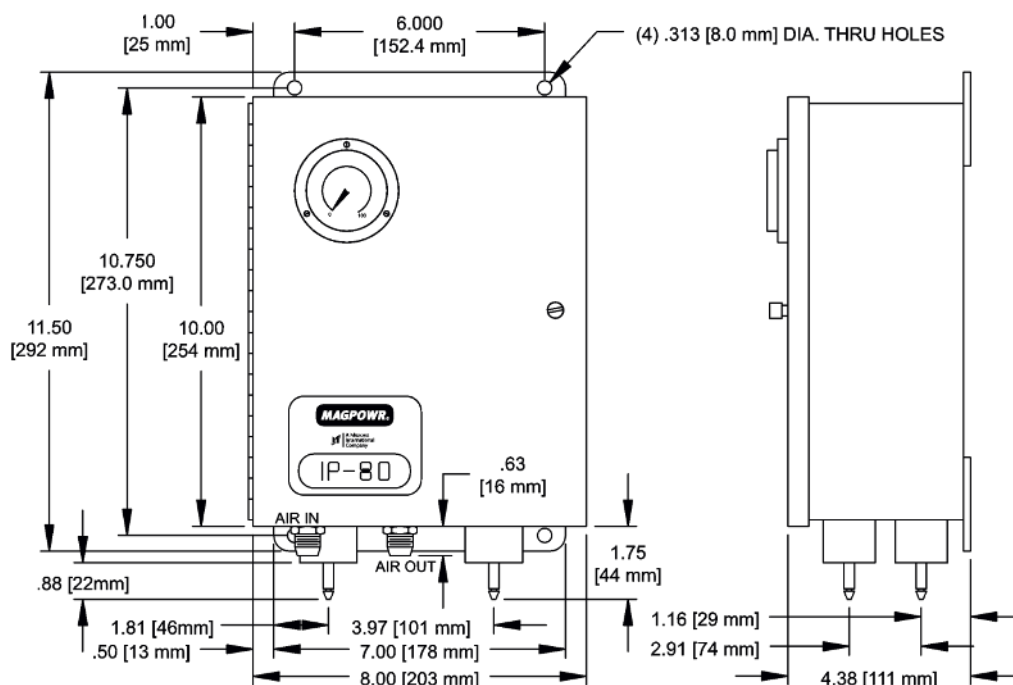Complete, ready to install

Pressure gauge for monitoring output pressure

Dual air filters with automatic drain

High flow and exhaust characteristics

Rugged vibration and shock resistant industrial duty unit

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IP-80 Dimensions and Specifications

Specifications

Output	0-80 psi
Maximum Supply	250 psi
Input	4 to 20 mADC
Minimum Supply Pressure	5 psi above max required, 35 psi minimum
Flow Capacity	40 scfm at 100 psi supply and 20 psi set
Exhaust Capacity	5.5 scfm at downstream pressure, 5 psi above setpoint
Shock & Vibration Effect on Output Pressure	Negligible at 3 G between 5 to 200 Hz
Brake Pressure Gauge	2 inch dial, 0 to 100 psi
Filters	3 micron with automatic drain .01 micron with automatic drain
Weight	13 lb
Overall Dimensions	318 mm x 203 mm x 111 mm (12 1/2 inches x 8 inches x 4 3/8 inches)
Mounting Dimensions	(4) 7.9 mm (5/16 inch) diameter holes spaced 273 mm x 152 mm (10 3/4 inches x 6 inches)
Enclosure	IP20

Ordering Information

IP-80	Standard Model
32A3-1	Current to Pressure Transducer
23A3-1	Oil Coalescing Filter Replacement
23A2-1	Airline Filter Replacement

IPT-E, IPT, IP-80 Applications

TENSION CONTROL
WEB TENSION CONTROL SYSTEMS USING AN AIR BRAKE OR CLUTCH

AIR BRAKE OR CLUTCH

TORQUE

IPT ELECTRIC-PNEUMATIC CONVERTER OR PS-90

CYGNUS OR SPYDER

LOAD CELL

LOAD CELL

SUBSTITUTION FOR A PRECISION REGULATOR

LOAD

POWER SUPPLY

CONTROL POTENTIOMETER

IPT ELECTRIC-PNEUMATIC CONVERTER

CYLINDER

FLOW CONTROL
FLOW CONTROL BY ADJUSTING THE AIR PRESSURE IN THE TANK

IPT ELECTRIC-PNEUMATIC CONVERTER

CONTROLLER

FLOW METER

FLUID TANK

FLOW DETECTOR

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IPT-E, IPT, IP-80 Applications

ROBOTICS
CONTROLS GRASPING FORCE
RELATIVE TO PRODUCT WEIGHT
AND SOFTNESS

IPT
ELECTRIC-PNEUMATIC
CONVERTER

COMPUTER

D/A CONVERTER

AIR CYLINDER
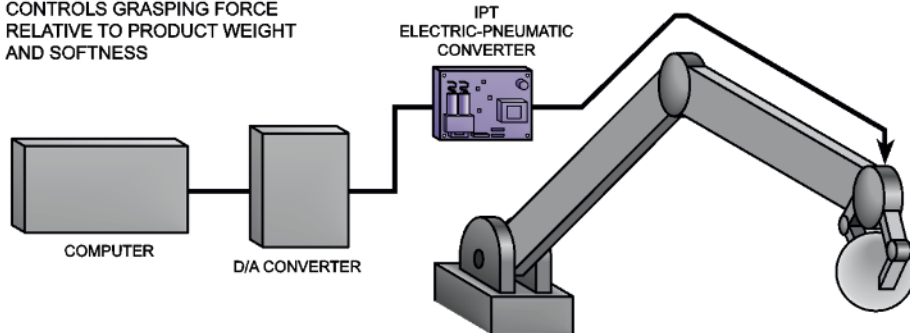
RIDER ROLL CONTROL
CONTROL ROLL HARDNESS AT THE
WINDER BY MEANS OF A RIDER ROLL

RIDER ROLL

WOUND
WEB
ROLL

SURFACE
DRUM

ULTRASONIC
SENSOR

VERSATEC
CONTROL

IPT
ELECTRIC-PNEUMATIC
CONVERTER
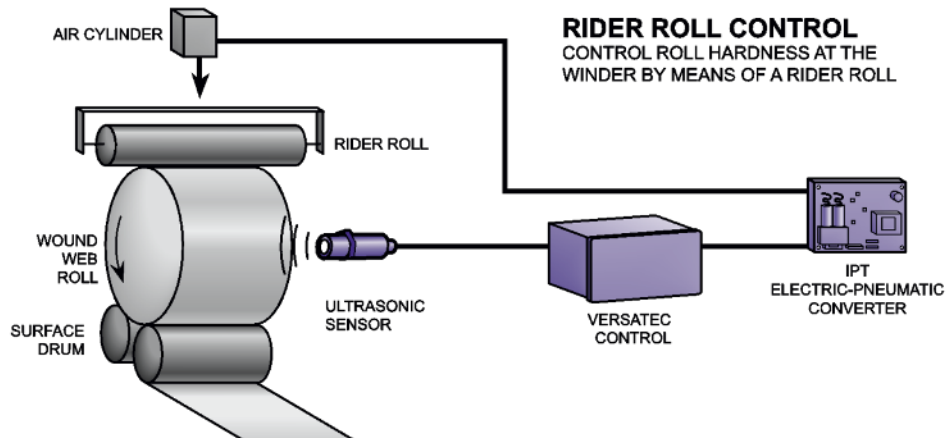
PAINT VOLUME CONTROL
WITH FULLY PROGRAMMED
PAINTING PROCESS

COMPUTER

D/A CONVERTER

IPT
ELECTRIC-PNEUMATIC
CONVERTER

PILOT
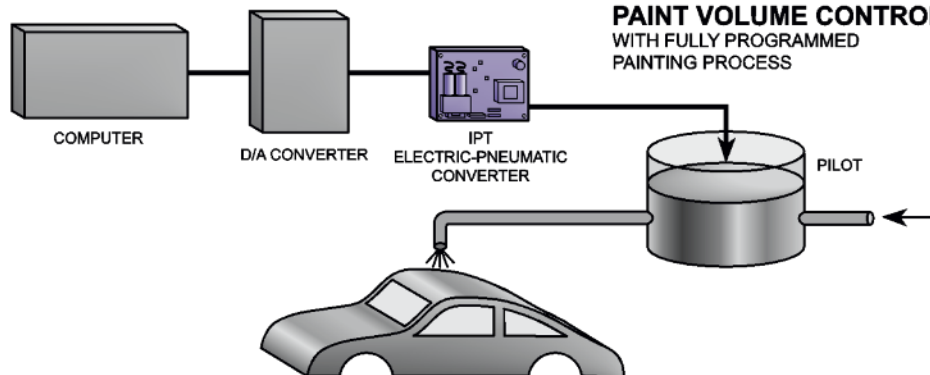
DFP Dancer/Follower Arm Position Sensor

Features

Rugged cast, non-magnetic housing

Water tight construction, heavy gasketed lid, sealed shaft and threaded conduit entrance

Easy to mount, roomy interior for wiring

Terminal block supplied. No wire nuts needed

Sturdy shaft supported on precision, sealed ball bearings

Sensor element protected from shaft loads by precision, zero backlash coupling

Electrical output vs. shaft rotation held within 1% linearity

Specifications

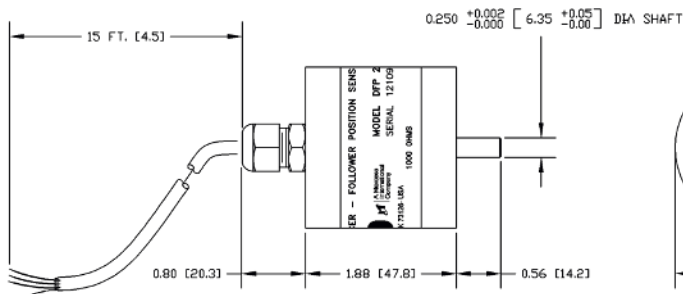| Potentiometer	1 kΩ, 360° rotation
Overhung Load Capacity	54.4 kg (120 lb) at center of shaft
Enclosure	IP62
Part Number	DFP

NOTES

1. Potentiometer output is centered when keyway is up

2. Continuous rotation is allowable

3. Overhung load capacity is 54.4 kg (120 lb)

DFP-2 Dancer/Follower Arm Position Sensor

CE
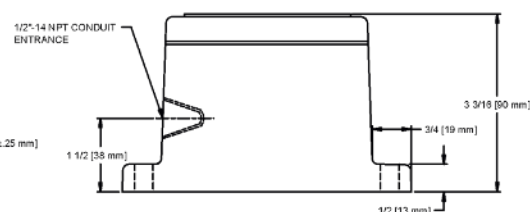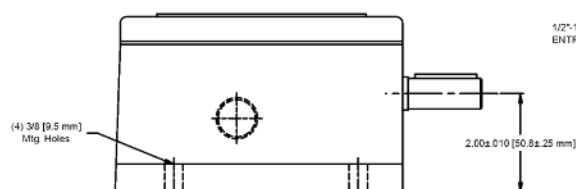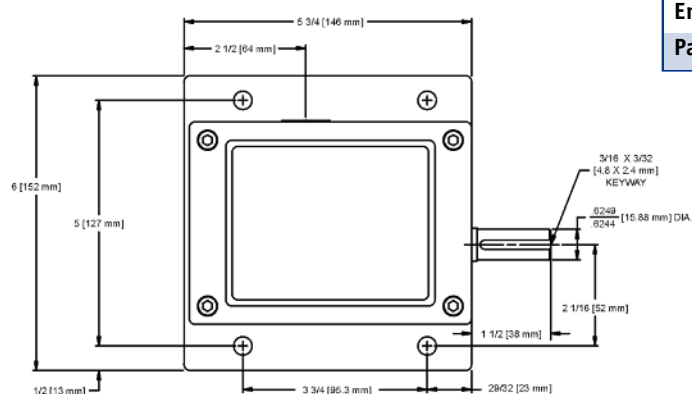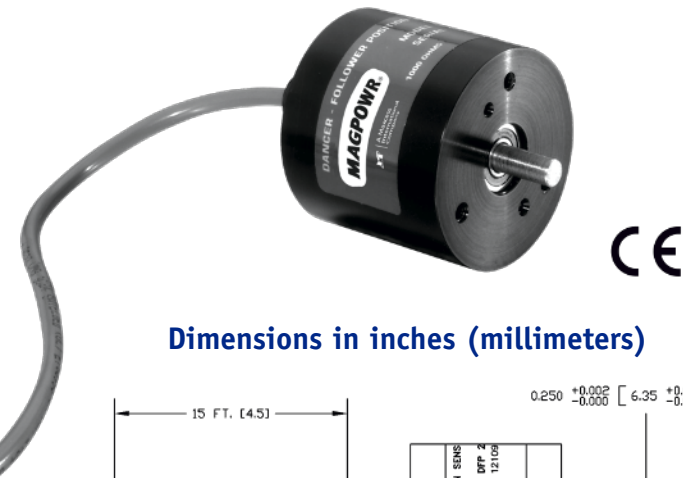
Dimensions in inches (millimeters)

Flexible Coupling (included)
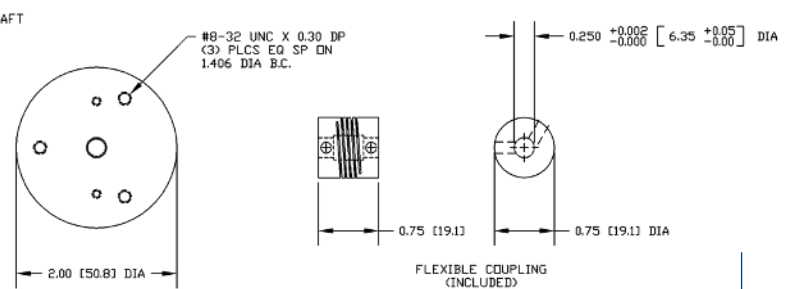
The DFP-2 position sensor is designed for use in Dancer Control applications with the VERSATEC, and in Dancer and Follower Arm applications with the Spyder, DFC-90, DFC-A and FAD. It offers the same exceptional sensing performance as the original DFP sensor, but in a lighter duty low cost housing.

A servo type flexible coupling is provided with the DFP-2 to allow for misalignment in shaft-to-shaft applications. Fifteen feet of shielded cable is also included for ease of installation.

Features

Compact size saves space

High quality potentiometer element provides essentially infinite resolution

360° rotation prevents sensor damage

Servo type flexible coupling accommodates installation misalignment with no backlash

Shielded cable included for wiring convenience

Specifications

Potentiometer	1 kΩ, 360° rotation
Shaft	Overhung load capacity, 4.5 kg (10 lb) at center of shaft
Flexible Coupling	Accommodates 5° angular and 0.25 mm (0.010 inch) offset misalignment with no backlash
Enclosure	IP62
Part Number	DFP-2

0 to 1 mA Tension and Output Reference Meters

9A22-1 Tension Meter

Installation Dimensions in inches (mm)

1.59 [40 mm]
5.72 [145 mm]
1.09 [28 mm]
5.250 [133.4 mm]
.66 [17 mm]
2.63 [67 mm]
2.25 [57 mm]
(4) #6-32 MOUNTING STUDS
3.000 [76.2mm]
4.49 [114.1mm]
2.75 [70 mm]
.65 [17 mm]
(2) #10-32 THREAD
.51 [13 mm]

9A13-1RPL Output Meter

5.250 [133.4 mm]
2.625 [66.7 mm]
.850 [21.6 mm]
3.000 [76.2 mm]
(4) .156 [4.0 mm] DIA.
2.880 [73.1 mm] DIA.
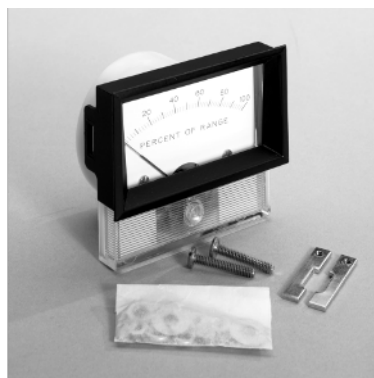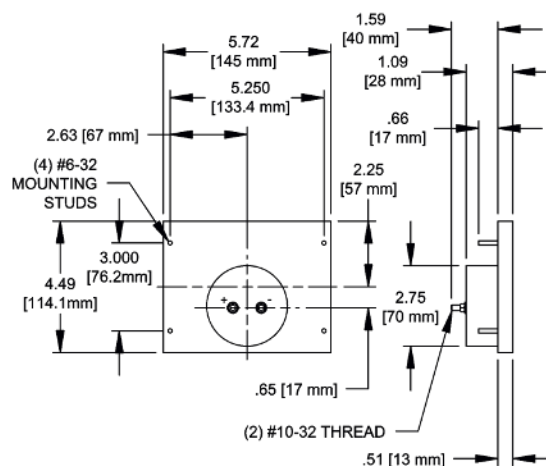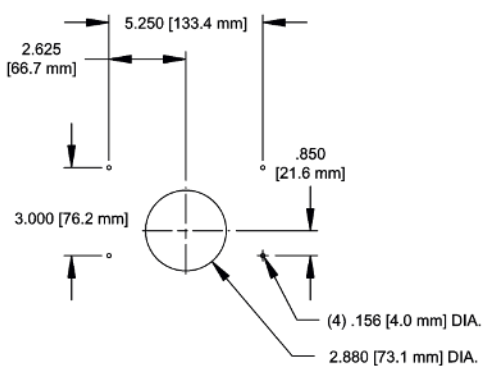
DTM Digital Tension Meter
Specifications on page 84

2.95 [74.8 mm]
1.96 [49.6 mm]
1.54 [38.1 mm]
PANEL CUT-OUT
1.30 + .024 (33 mm +.6) - .000   - .0
2.68 + .025 (68 mm +.6) - .000   - .0
.13 [3.3 mm]
.15 [3.8 mm]

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DIGITAL LOAD CELL AMPLIFIER

0500

MAXCESS
MAGPOWR

DLCA

\+   \-   Ø

DIGITAL LOAD CELL AMPLIFIER

DTR-65   0500

MAXCESS
MAGPOWR

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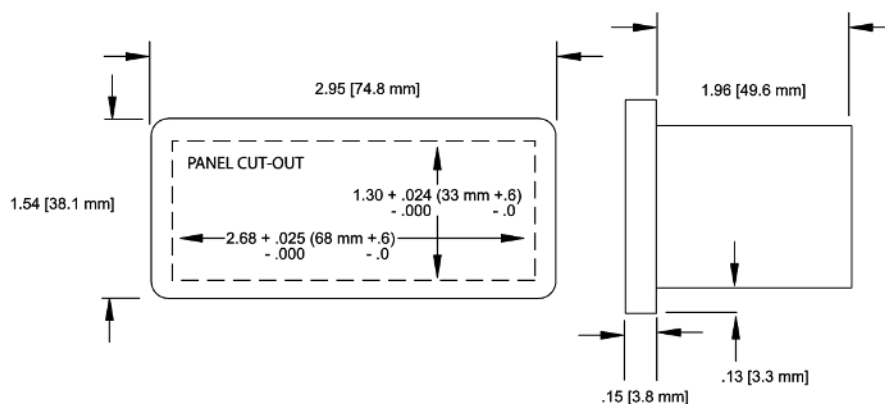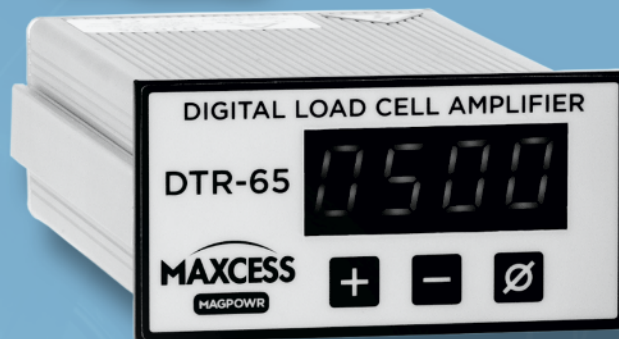
Product Selection Chart

For the tension readout solution that is right for you, simply find your application in the chart below, then select the product that best suits your specific requirements from the complete line of MAGPOWR Load Cells & Readouts.

	TS/CL/GTS/TSU/LC LOAD CELLS	DTR-65 DIGITAL TENSION READOUT	DLCA LOAD CELL AMPLIFIER	DTM DIGITAL TENSION METER	TR-5 LOAD CELL AMPLIFIER	TSA LOAD CELL AMPLIFIER	IS-2 INTRINSICALLY SAFE AMPLIFIER	9A22-1 TENSION METER
Tension Monitoring and Readout								
Tension Readout	X	X	X	X	X	X		X
Tension Readout for Hazardous Areas	X			X			X	X
Closed Loop Load Cell								
Digital Tension Readout and Control Unwind (Magnetic Particle)	X			X				X
Digital Tension Readout and Control Point-to-Point (Magnetic Particle)	X			X				X
Digital Tension Readout and Control Rewind (Magnetic Particle)	X			X				X
Digital Tension Readout and Control Unwind (Pneumatic)	X			X				X
Digital Tension Readout and Control Unwind (Motor Drive)	X			X				X
Digital Tension Readout and Control Point-to-Point (Motor Drive)	X			X				X
Digital Tension Readout and Control Rewind (Motor Drive)	X			X				X

Load Cells & Readouts

Load Cells Engineering Information

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MAGPOWR load cells and tension readouts are extremely accurate devices used to indicate tension in all types of unwinds, rewinds, and intermediate web processing. All MAGPOWR load cells are ruggedly constructed with built in mechanical overload stops in both force directions.

A full Wheatstone bridge arrangement of four foil strain gages is incorporated in each load cell for the most accurate means of measuring web tension. In addition, all load cells incorporate a dual beam construction design to insure linear output under all loading conditions.

MAGPOWR tension readouts and controls are designed to accurately display the signals from all MAGPOWR load cells. They are rugged enough to stand the heaviest and fastest process, reliable in their continuous accuracy, yet simple to install. All web tension readouts and controls feature an 8:1 gain adjustment and tare adjustment up to 50% of the rating of the load cell.

TENSION READOUT – SINGLE STRAND

Optional Meter

DLCA

CL Cantilevered Load Cell

TENSION REFERENCE – TO WINDER DRIVE

Motor

TS Load Cell

TS Load Cell

DLCA

Drive or PLC

TENSION READOUT – WIDE WEB

Optional Meter

TS Load Cell

TS Load Cell

DLCA
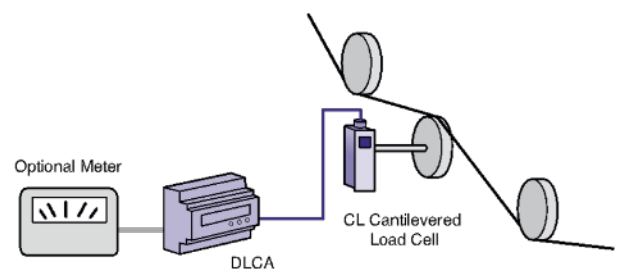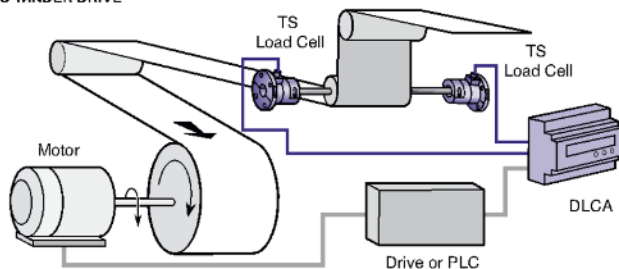
WRAP ANGLE
A constant wrap angle is necessary for accurate sensor operation
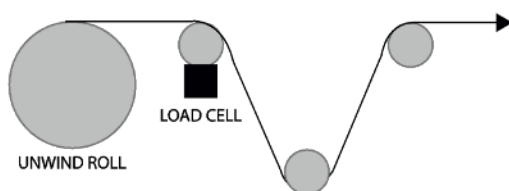
INCORRECT
Wrap angle changes with roll diameter
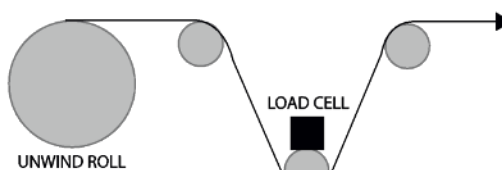
CORRECT
Wrap angle is constant

Suggested Wrap Angles
Minimum: 40˚
Maximum: 180˚

IDLER ROLL WEIGHT
All MAGPOWR load cell readouts allow a tare or zero adjustment up to 50% of the load cell rating

75 LB. IDLER ROLL

50 LB. IDLER ROLL

50 LB. LOAD CELL   50 LB. LOAD CELL

50 LB. LOAD CELL   50 LB. LOAD CELL
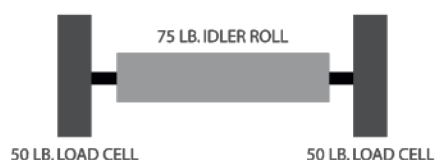
INCORRECT
Idler roll exceeds 50% of combined sensor rating

CORRECT
Idler roll does not exceed 50% of combined sensor rating

Tension Sensing Roll Weight

Weight per Foot in Pounds				
	Wall Thickness (in)			
Diameter (in)	**.250**	**.375**	**.5**	**1.0**
Steel Tubing 3.0	7.3	10.5	13.3	21.0
3.5	8.7	12.5	16.0	26.7
4.0	10.0	14.5	18.6	32.0
5.0	12.7	18.5	24.0	42.7
6.0	15.4	22.5	29.0	53.4
7.0	18.2	26.5	34.7	64.0
8.0	20.7	30.5	40.0	74.7
10.0	26.0	38.0	50.7	96.0
12.0	32.0	46.5	61.0	117.0
14.0	36.0	54.0	72.0	150.00
Aluminum Tubing 3.0	2.5	3.6	4.6	
3.5	3.0	4.3	5.5	
4.0	3.4	5.0	6.5	
5.0	4.4	6.5	8.3	
6.0	5.3	7.5	10.0	18.5
7.0	6.3	9.0	12.0	
8.0	7.0	10.6	13.9	26.0
10.0	9.6	14.0		
12.0				
14.0				

Weight per Foot in Pounds			
Diameter (in)	**Weight (lbs)**	**Diameter (in)**	**Weight (lbs)**
Steel Shafting .50	.67	2.0	10.7
.75	1.5	2.25	13.5
1.0	2.7	2.5	16.7
1.25	4.2	3.0	24.0
1.5	6.0	3.25	28.2
1.75	8.2	4.0	42.7

Idler Roll with a Dead Shaft and Live Roller

48 in.
60 in.
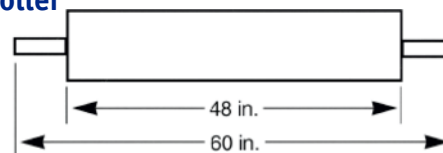
Idler Roll Weight Example

Roller: 4 inch diameter, 1/2 inch wall thickness, steel tubing

Shaft: 1-1/2 inch diameter, steel shaft

Bearings Weight: approximately 5 lb

Total Idler Roll Weight (approx) = roll weight + shaft weight + bearings weight

Total = 4' (18.6 lb/ft) + 5' (6 lb/ft) + 5 lb

Total = 109.4 lb

Therefore, use this number for tension sensor sizing   if actual idler roll weight is not known.

SENSOR WIRING DIAGRAM

PIN(A) +P
RED

PIN (D) -P
GREEN

T_1 C_1
350Ω   +S PIN (B)
                WHITE
C_2 T_2

-S PIN (C)
BLACK

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TS Load Cells

CE
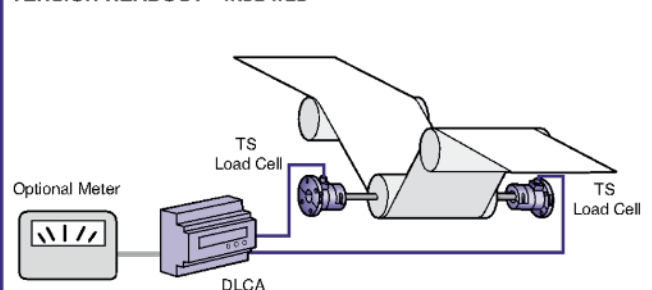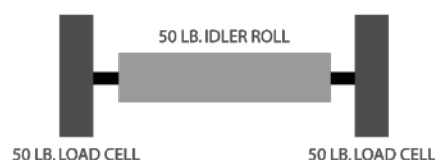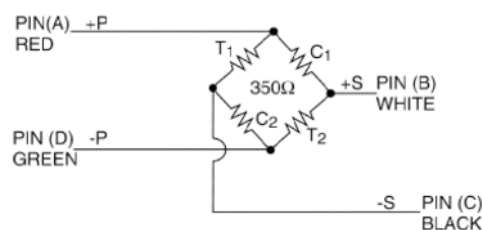
MAGPOWR TS load cells are extremely accurate devices used to measure tension in any unwind, rewind, or intermediate web processing application. The unique low profile design minimizes space requirements inside the machine frames, thus maximizing the potential for web width. The TS model load cells also offer the flexibility of a variety of mounting styles and coupling options.

They are ruggedly constructed with mechanical overload stops in both force directions to eliminate sensor damage and the need to recalibrate even after extreme overloads. A full Wheatstone bridge arrangement of four foil strain gages is used in each sensor for the most accurate means of measuring web tension. In addition, all load cells incorporate a dual beam construction design to insure linear output under all loading conditions.

Features

Low profile design allows maximum web widths

Multiple mounting options for maximum flexibility

Three coupling styles for use with any type idler roll

Ruggedly constructed for long life and dependability

Mechanical overload stops for protection even under severe overloads

Full Wheatstone bridge design for measurement accuracy

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TS Specifications and Sizing

Specifications

|	
Gage Resistance	350 Ω nominal
Excitation Voltage	10 VDC maximum
Output Signal	21 mVDC maximum per sensor at full load rating
Operating Temperature	-30˚C to 80˚C
Temperature Effect on Zero	0.02% of rating per ˚C
Combined Non-Linearity and Hysteresis	0.5% of full scale maximum
Repeatability	0.2% of full scale maximum
Deflection at Full Load	0.41 mm (0.016 inch) maximum
Protection Class	IP67
Certification	CE
Mating Cable Assembly	Use LCC Cable series
Mating Connector Only	12B220-1 (pin 1 + power; pin 2 + signal; pin 3 - signal; pin 4 - power)
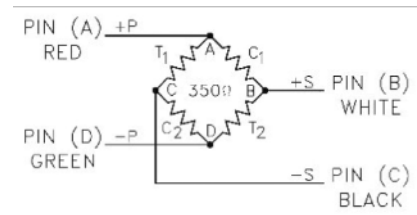
Wiring Diagram

Sine/Cosine Functions

Degrees	Sine	Cosine	Degrees	Sine	Cosine
0	.0000	1.000	50	.7660	.6428
5	.0872	.9962	55	.8192	.5736
10	.1736	.9848	60	.8660	.5000
15	.2588	.9659	65	.9063	.4226
20	.3420	.9397	70	.9397	.3420
25	.4226	.9063	75	.9659	.2588
30	.5000	.8660	80	.9849	.1736
35	.5736	.8192	85	.9962	.0872
40	.6428	.7660	90	1.000	.0000
45	.7071	.7071			

For tensions "upward" in this view, the roll weight is subtracted, i.e. – (W cos Y).
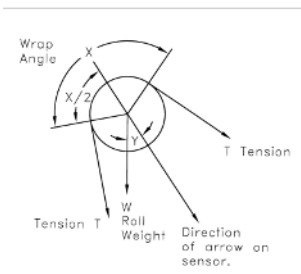
SIZING–2 Load Cell Application

To select the load cell, the total load on the sensing roll must be calculated. This load consists of the tension components in the sensing plane, plus the roll weight components in the sensing plane. The equation for this load is:

LOAD = 2T (sin (X/2)) + (W cos Y)

This is the total load. But, since tension transients are generally quite large, the "T" should be multiplied by 2, and since there are two sensors supporting this load, the total load is divided by 2. The final equation for load rating required for each sensor is then:

L=(4T (sin (X/2)) + (W cos Y)) ÷ 2

To select a load cell, apply this equation and choose a load cell with a load rating greater than L. For example, if the roll weight is 10 lb, the maximum web tension is 25 lb, the angle Y is 35˚, and the wrap angle is 130˚, the resulting load cell rating is:

L=(4 (25) (sin (130°/2)) + 10 cos 35°) ÷ 2

L = 49.4 lb

Therefore, use two TS-50-SC-EC12, TS-50-FC-EC12, TS-50-PC-EC12, TS-50-SR-EC12, TS-50-FR-EC12 or TS-50-PR-EC12 load cells.

SIZING–Single Strand Application

To select the load cell, the total load on the sensing roll must be calculated. This load consists of the tension components in the sensing plane, plus the pulley weight components in the sensing plane. The equation for this load is:

LOAD = 2T (sin (X/2)) + (W cos Y)

This is the total load. But, since tension transients are generally quite large, the "T" should be multiplied by 2. The final equation for load rating required for the sensor is then:

L= 4T (sin (X/2)) + (W cos Y)

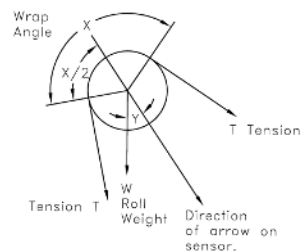To select a load cell, apply this equation and choose a load cell with a load rating greater than L. For example, if the pulley weight is 1 lb, the maximum web tension is 25 lb, the angle Y is 35˚, and the wrap angle is 130˚, the resulting load cell rating is:

L=4 (25) (sin (130°/2)) + 1 cos 35°

L = 91.4 lb

Therefore, use a TS-150-SW-EC12, TS-150-FW-EC12 or TS-150-PW-EC-12 load cells.

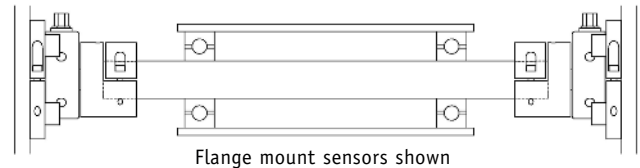# TS Split Coupling Model Load Cells

Stud Mount Load Cell

Flange Mount Load Cell

Pillow Block Load Cell

Typical Installation

The Split Coupling configuration supports the dead or live shaft on each side of the machine. Sensors with split couplings are available with all three mounting types.

Flange mount sensors shown

Split Couplings

Load Cells with Split Couplings can be used to measure web tension through dead-shaft or live-shaft idler rolls. With one load cell mounted to each side of the machine frame, the idler roll is supported between the two load cells. The resultant force of the web tension is measured as a load on the roll by the load cell.

The Split Coupling allows the idler roll to be easily installed after the load cells have been mounted to the machine frames. The coupling design also accommodates misalignment between the machine frames and allows for thermal expansion of the idler roll shaft during machine operation.

The unique coupling design also allows its use in both dead-shaft and live-shaft applications. As it is shipped from the factory, the coupling is configured to accommodate a dead-shaft installation as shown in the typical installation represented below. For applications in which the shaft itself must rotate, a single set screw may be removed from the coupling to allow its rotation on an internal bearing.

Split Coupling Models

SC-EC12M: Stud Mount Metric		**SC-EC12: Stud Mount Imperial**	
FC-EC12M: Flange Mount Metric		**FC-EC12: Flange Mount Imperial**	
PC-EC12M: Pillow Block Mount Metric		**PC-EC12: Pillow Block Mount Imperial**	
TS-2-xx-EC12M	2 kg load cell with split coupling	**TS-5-xx-EC12**	5 lb load cell with split coupling
TS-10-xx-EC12M	10 kg load cell with split coupling	**TS-25-xx-EC12**	25 lb load cell with split coupling
TS-25-xx-EC12M	25 kg load cell with split coupling	**TS-50-xx-EC12**	50 lb load cell with split coupling
TS-75-xx-EC12M	75 kg load cell with split coupling	**TS-150-xx-EC12**	150 lb load cell with split coupling
TS-150-xx-EC12	150 kg load cell with split coupling	**TS-330-xx-EC12**	330 lb load cell with split coupling
TS-250-xx-EC12M	250 kg load cell with split coupling	**TS-500-xx-EC12**	500 lb load cell with split coupling

Model Number System Example

TS	150	F	C	EC12	M
Load Cell Model	Load Rating	Mounting Type	Coupling Type	12 mm connector	Metric or Imperial
		S – Stud	C – Split Coupling		
		F – Flange	R – In-Roll		Blank - Imperial dimensions and load rating in pounds
		P – Pillow Block	W – Wire Pulley		M - Metric dimensions and load rating in kg

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TS Split Coupling Models — Dimensions

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Stud Mount Models

4.9 mm (0.191 inch) DIAMETER X 6.4 mm (0.25 inch) DEEP FOR ANTI-ROTATION PIN

H THREAD 12.7 mm (0.50 inch) MAXIMUM BOLT PENETRATION

REAR VIEW   SIDE VIEW

Pillow Block Models

SIDE VIEW   FRONT VIEW

(2) F DIA. THRU

Flange Mount Models

REAR VIEW   SIDE VIEW

METRIC MODELS Units are in millimeters

Model	A	AA	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V
TS-2-SC-EC12M		54.0	77.1	30.0	52.5	18.1			M12 X 1.75	48.4	22.20									
TS-10-SC-EC12M		54.0	77.1	30.0	52.5	18.1			M12 X 1.75	48.4	22.20									
TS-25-SC-EC12M		54.0	77.1	30.0	52.5	18.1			M12 X 1.75	48.4	22.20									
TS-75-SC-EC12M		66.0	91.7	30.0	63.5	26.5			M12 X 1.75	56.8	25.40									
TS-150-SC-EC12M		66.0	91.7	30.0	63.5	26.5			M12 X 1.75	56.8	25.40									
TS-250-SC-EC12M		66.0	91.7	30.0	63.5	26.5			M12 X 1.75	56.8	25.40									
TS-2-FC-EC12M	79.4		77.1	30.0	52.5	18.1	8.00	63.50		48.4	12.70									
TS-10-FC-EC12M	79.4		77.1	30.0	52.5	18.1	8.00	63.50		48.4	12.70									
TS-25-FC-EC12M	79.4		77.1	30.0	52.5	18.1	8.00	63.50		48.4	12.70									
TS-75-FC-EC12M	101.6		91.6	30.0	63.5	26.5	9.50	82.60		56.8	12.70									
TS-150-FC-EC12M	101.6		91.6	30.0	63.5	26.5	9.50	82.60		56.8	12.70									
TS-250-FC-EC12M	101.6		91.6	30.0	63.5	26.5	9.50	82.60		56.8	12.70									
TS-2-PC-EC12M	54.9		89.9	30.0	52.5	18.1	9.50	82.60		48.4	12.80	58.2	41.3	44.5	54.00	35.20	62.60	108.0	12.0
TS-10-PC-EC12M	54.9		89.9	30.0	52.5	18.1	9.50	82.60		48.4	12.80	58.2	41.3	44.5	54.00	35.20	62.60	108.0	12.0
TS-25-PC-EC12M	54.9		89.9	30.0	52.5	18.1	9.50	82.60		48.4	12.80	58.2	41.3	44.5	54.00	35.20	62.60	108.0	12.0
TS-75-PC-EC12M	66.0		104.3	30.0	63.5	26.5	12.70	101.60		56.8	12.80	69.3	50.8	50.8	66.70	41.40	74.40	133.4	12.0
TS-150-PC-EC12M	66.0		104.3	30.0	63.5	26.5	12.70	101.60		56.8	12.80	69.3	50.8	50.8	66.70	41.40	74.40	133.4	12.0
TS-250-PC-EC12M	66.0		104.3	30.0	63.5	26.5	12.70	101.60		56.8	12.80	69.3	50.8	50.8	66.70	41.40	74.40	133.4	12.0

(4) F DIA. THRU ON A G DIA. BOLT CIRCLE

IMPERIAL MODELS Units are in inches

Model	A	AA	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V
TS-5-SC-EC12		2.13	3.04	0.875	2.07	0.72			1/2 - 13	1.91	0.88									
TS-25-SC-EC12		2.13	3.04	0.875	2.07	0.72			1/2 - 13	1.91	0.88									
TS-50-SC-EC12		2.13	3.04	0.875	2.07	0.72			1/2 - 13	1.91	0.88									
TS-150-SC-EC12		2.60	3.61	1.250	2.50	1.05			1/2 - 13	2.24	1.00									
TS-330-SC-EC12		2.60	3.61	1.250	2.50	1.05			1/2 - 13	2.24	1.00									
TS-500-SC-EC12		2.60	3.61	1.250	2.50	1.05			1/2 - 13	2.24	1.00									
TS-5-FC-EC12	3.13		3.04	0.875	2.07	0.72	0.32	2.50		1.91		0.50								
TS-25-FC-EC12	3.13		3.04	0.875	2.07	0.72	0.32	2.50		1.91		0.50								
TS-50-FC-EC12	3.13		3.04	0.875	2.07	0.72	0.32	2.50		1.91		0.50								
TS-150-FC-EC12	4.00		3.61	1.250	2.50	1.05	0.38	3.25		2.24		0.50								
TS-330-FC-EC12	4.00		3.61	1.250	2.50	1.05	0.38	3.25		2.24		0.50								
TS-500-FC-EC12	4.00		3.61	1.250	2.50	1.05	0.38	3.25		2.24		0.50								
TS-5-PC-EC12	2.16		3.54	0.875	2.07	0.72	0.38	3.25		1.91		0.51	2.29	1.63	1.75	2.13	1.39	2.47	4.25	0.50
TS-25-PC-EC12	2.16		3.54	0.875	2.07	0.72	0.38	3.25		1.91		0.51	2.29	1.63	1.75	2.13	1.39	2.47	4.25	0.50
TS-50-PC-EC12	2.16		3.54	0.875	2.07	0.72	0.38	3.25		1.91		0.51	2.29	1.63	1.75	2.13	1.39	2.47	4.25	0.50
TS-150-PC-EC12	2.60		4.11	1.250	2.50	1.05	0.50	4.00		2.24		0.51	2.73	2.00	2.00	2.63	1.63	2.93	5.25	0.50
TS-330-PC-EC12	2.60		4.11	1.250	2.50	1.05	0.50	4.00		2.24		0.51	2.73	2.00	2.00	2.63	1.63	2.93	5.25	0.50
TS-500-PC-EC12	2.60		4.11	1.250	2.50	1.05	0.50	4.00		2.24		0.51	2.73	2.00	2.00	2.63	1.63	2.93	5.25	0.50

TS In-Roll Model Load Cells
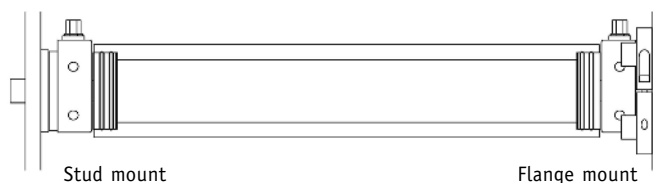
Stud Mount Load Cell

Flange Mount Load Cell

Pillow Block Load Cell

Typical Installation

The In-Roll configuration supports the roll assembly (hollow tube) on each side of the machine. Sensors with in-roll couplings are available with all three mounting types.

Stud mount   Flange mount

In-Roll Couplings

The In-Roll Coupling is designed to insert directly into the end of an idler roll. With one load cell mounted to each side of the machine frame, the idler roll is supported between the two load cells. The resultant force of the web tension is measured as a load on the roll by the load cells.

The In-Roll Coupling includes a spherical bearing to allow for smooth rotation of the idler roll and to accommodate misalignment between the machine frames. This coupling type eliminates the need for idler rolls with shafts and bearings, thus reducing the overall cost of the tension sensing system.

In-Roll Coupling Models

SR-EC12M: Stud Mount Metric
FR-EC12M: Flange Mount Metric
PR-EC12M: Pillow Block Mount Metric

TS-2-xx-EC12M	2 kg load cell with in-roll coupling
TS-10-xx-EC12M	10 kg load cell with in-roll coupling
TS-25-xx-EC12M	25 kg load cell with in-roll coupling
TS-75-xx-EC12M	75 kg load cell with in-roll coupling
TS-150-xx-EC12M	150 kg load cell with in-roll coupling
TS-250-xx-EC12M	250 kg load cell with in-roll coupling

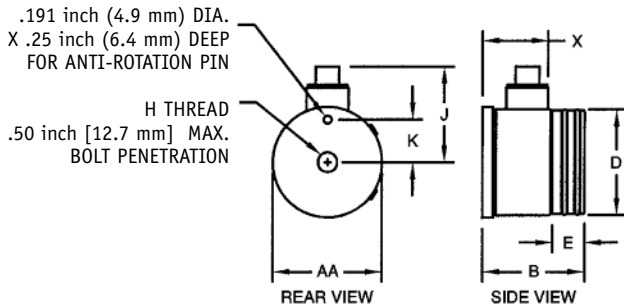**SR-EC12: Stud Mount Imperial**
FR-EC12: Flange Mount Imperial
PR-EC12: Pillow Block Mount Imperial

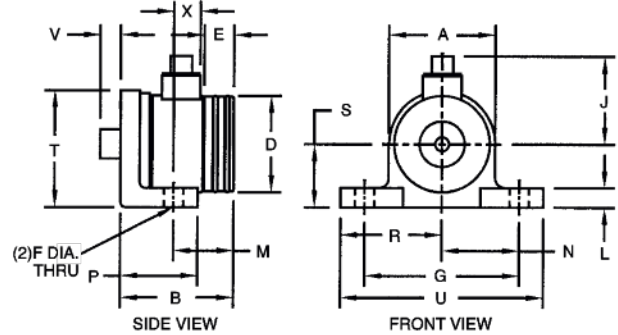|	
TS-5-xx-EC12	5 lb load cell with in-roll coupling
TS-25-xx-EC12	25 lb load cell with in-roll coupling
TS-50-xx-EC12	50 lb load cell with in-roll coupling
TS-150-xx-EC12	150 lb load cell with in-roll coupling
TS-330-xx-EC12	330 lb load cell with in-roll coupling
TS-500-xx-EC12	500 lb load cell with in-roll coupling

Model Number System Example

TS	150	F	R	EC12	M
Load Cell Model	Load Rating	Mounting Type	Coupling Type	12 mm connector	Metric or Imperial

S – Stud
F – Flange
P – Pillow Block

C – Split Coupling
R – In-Roll
W – Wire Pulley

Blank - Imperial dimensions and load rating in pounds
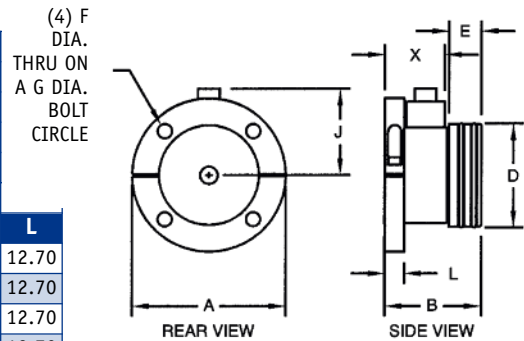M - Metric dimensions and load rating in kg

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TS In-Roll Models — Dimensions

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Stud Mount Models

.191 inch (4.9 mm) DIA.
X .25 inch (6.4 mm) DEEP
FOR ANTI-ROTATION PIN

H THREAD
.50 inch [12.7 mm] MAX.
BOLT PENETRATION

REAR VIEW   SIDE VIEW

Flange Mount Models

(2)F DIA.
THRU

SIDE VIEW   FRONT VIEW

Pillow Block Models

(4) F DIA.
THRU ON
A G DIA.
BOLT
CIRCLE

REAR VIEW   SIDE VIEW

METRIC MODELS Units are in millimeters

Model	A	AA	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	X
TS-2-SR-EC12M		54.0	56.6	51.9	13.4			M12 X 1.75	48.4	22.20										42.00
TS-10-SR-EC12M		54.0	56.6	51.9	13.4			M12 X 1.75	48.4	22.20										42.00
TS-25-SR-EC12M		54.0	56.6	51.9	13.4			M12 X 1.75	48.4	22.20										42.00
TS-75-SR-EC12M		66.0	62.7	61.9	19.4			M12 X 1.75	56.8	25.40										42.20
TS-150-SR-EC12M		66.0	62.7	61.9	19.4			M12 X 1.75	56.8	25.40										42.20
TS-250-SR-EC12M		66.0	62.7	61.9	19.4			M12 X 1.75	56.8	25.40										42.20
TS-2-FR-EC12M	79.4		56.6	51.9	13.4	8.00	63.50		48.4		12.70									42.00
TS-10-FR-EC12M	79.4		56.6	51.9	13.4	8.00	63.50		48.4		12.70									42.00
TS-25-FR-EC12M	79.4		56.6	51.9	13.4	8.00	63.50		48.4		12.70									42.00
TS-75-FR-EC12M	101.6		62.7	61.9	19.4	9.50	82.60		56.8		12.70									42.20
TS-150-FR-EC12M	101.6		62.7	61.9	19.4	9.50	82.60		56.8		12.70									42.20
TS-250-FR-EC12M	101.6		62.7	61.9	19.4	9.50	82.60		56.8		12.70									42.20
TS-2-PR-EC12M	54.9		69.3	51.9	13.4	9.50	82.60		48.4		12.80	37.5	41.3	44.5	54.00	35.20	62.60	108.0	12.0	37.50
TS-10-PR-EC12M	54.9		69.3	51.9	13.4	9.50	82.60		48.4		12.80	37.5	41.3	44.5	54.00	35.20	62.60	108.0	12.0	37.50
TS-25-PR-EC12M	54.9		69.3	51.9	13.4	9.50	82.60		48.4		12.80	37.5	41.3	44.5	54.00	35.20	62.60	108.0	12.0	37.50
TS-75-PR-EC12M	66.0		75.4	61.9	19.4	12.70	101.60		56.8		12.80	40.4	50.8	50.8	66.70	41.40	74.40	133.4	12.0	19.90
TS-150-PR-EC12M	66.0		75.4	61.9	19.4	12.70	101.60		56.8		12.80	40.4	50.8	50.8	66.70	41.40	74.40	133.4	12.0	19.90
TS-250-PR-EC12M	66.0		75.4	61.9	19.4	12.70	101.60		56.8		12.80	40.4	50.8	50.8	66.70	41.40	74.40	133.4	12.0	19.90

IMPERIAL MODELS Units are in inches

Model	A	AA	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	X
TS-5-SR-EC12		2.13	2.23	2.05	0.53			1/2 - 13	1.91	0.88										1.66
TS-25-SR-EC12		2.13	2.23	2.05	0.53			1/2 - 13	1.91	0.88										1.66
TS-50-SR-EC12		2.13	2.23	2.05	0.53			1/2 - 13	1.91	0.88										1.66
TS-150-SR-EC12		2.60	2.47	2.44	0.77			1/2 - 13	2.24	1.00										1.66
TS-330-SR-EC12		2.60	2.47	2.44	0.77			1/2 - 13	2.24	1.00										1.66
TS-500-SR-EC12		2.60	2.47	2.44	0.77			1/2 - 13	2.24	1.00										1.66
TS-5-FR-EC12	3.13		2.23	2.05	0.53	0.32	2.50		1.91		0.50									1.66
TS-25-FR-EC12	3.13		2.23	2.05	0.53	0.32	2.50		1.91		0.50									1.66
TS-50-FR-EC12	3.13		2.23	2.05	0.53	0.32	2.50		1.91		0.50									1.66
TS-150-FR-EC12	4.00		2.47	2.44	0.77	0.38	3.25		2.24		0.50									1.67
TS-330-FR-EC12	4.00		2.47	2.44	0.77	0.38	3.25		2.24		0.50									1.67
TS-500-FR-EC12	4.00		2.47	2.44	0.77	0.38	3.25		2.24		0.50									1.67
TS-5-PR-EC12	2.16		2.73	2.05	0.53	0.38	3.25		1.91		0.51	1.48	1.63	1.75	2.13	1.39	2.47	4.25	0.50	0.91
TS-25-PR-EC12	2.16		2.73	2.05	0.53	0.38	3.25		1.91		0.51	1.48	1.63	1.75	2.13	1.39	2.47	4.25	0.50	0.91
TS-50-PR-EC12	2.16		2.73	2.05	0.53	0.38	3.25		1.91		0.51	1.48	1.63	1.75	2.13	1.39	2.47	4.25	0.50	0.91
TS-150-PR-EC12	2.60		2.97	2.44	0.77	0.50	4.00		2.24		0.51	1.59	2.00	2.00	2.63	1.63	2.93	5.25	0.50	0.79
TS-330-PR-EC12	2.60		2.97	2.44	0.77	0.50	4.00		2.24		0.51	1.59	2.00	2.00	2.63	1.63	2.93	5.25	0.50	0.79
TS-500-PR-EC12	2.60		2.97	2.44	0.77	0.50	4.00		2.24		0.51	1.59	2.00	2.00	2.63	1.63	2.93	5.25	0.50	0.79

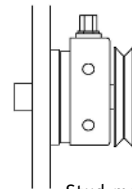# TS Wire Pulley Model Load Cells

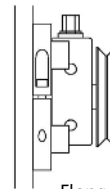**Stud Mount Load Cell**

Flange Mount Load Cell

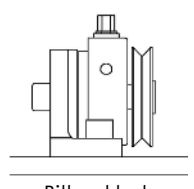**Pillow Block Load Cell**

Typical Installations

The Wire Pulley configuration supports the single strand or wire, and measures tension in the wire or strand as it passes over the pulley. Sensors with wire pulleys are available with all three mounting types.

Stud mount

Flange mount

Pillow block mount

Single Strand Pulleys

The Wire Pulley is used for single strand applications for any kind of material. When mounted to the side of a machine frame or bracket, a load cell measures tension in the strand as it passes over the nickel plated aluminum load cell pulley.

Wire Pulley Models

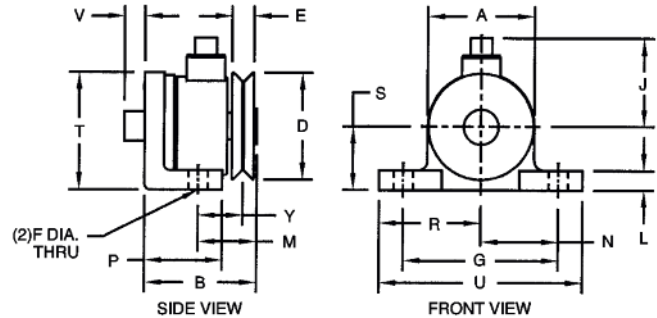|	
SW-EC12M: Stud Mount Metric	**SW-EC12: Stud Mount Imperial**
FW-EC12M: Flange Mount Metric	**FW-EC12: Flange Mount Imperial**
PW-EC12M: Pillow Block Mount Metric	**PW-EC12: Pillow Block Mount Imperial**
TS-2-xx-EC12M 2 kg load cell with wire pulley coupling	TS-5-xx-EC12 5 lb load cell with wire pulley coupling
TS-10-xx-EC12M 10 kg load cell with wire pulley coupling	TS-25-xx-EC12 25 lb load cell with wire pulley coupling
TS-25-xx-EC12M 25 kg load cell with wire pulley coupling	TS-50-xx-EC12 50 lb load cell with wire pulley coupling
TS-75-xx-EC12M 75 kg load cell with wire pulley coupling	TS-150-xx-EC12 150 lb load cell with wire pulley coupling
TS-150-xx-EC12M 150 kg load cell with wire pulley coupling	TS-330-xx-EC12 330 lb load cell with wire pulley coupling
TS-250-xx-EC12M 250 kg load cell with wire pulley coupling	TS-500-xx-EC12 500 lb load cell with wire pulley coupling

Model Number System Example

TS	150	F	W	EC12	M
Load Cell Model	Load Rating	Mounting Type	Coupling Type	12 mm connector	Metric or Imperial

S – Stud	C – Split Coupling	Blank - Imperial dimensions and load rating in pounds
F – Flange	R – In-Roll	M - Metric dimensions and load rating in kg
P – Pillow Block	W – Wire Pulley	

Note: Add S1 to the end of any sensor to have it shipped without pulley and bearings to allow customer to use own pulley and bearings.
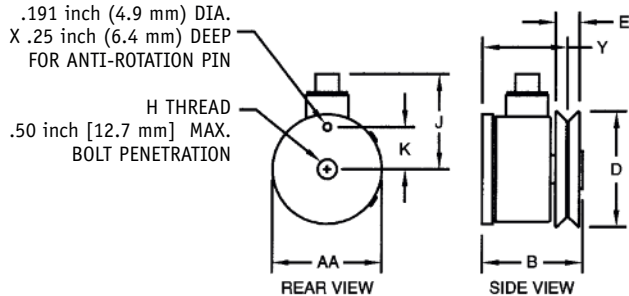
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TS Wire Pulley Models — Dimensions

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Stud Mount Models

.191 inch (4.9 mm) DIA.
X .25 inch (6.4 mm) DEEP
FOR ANTI-ROTATION PIN

H THREAD
.50 inch [12.7 mm] MAX.
BOLT PENETRATION

REAR VIEW SIDE VIEW

Pillow Block Models

(2)F DIA. THRU

SIDE VIEW FRONT VIEW

Flange Mount Models

(4) F DIA. THRU ON A G DIA. BOLT CIRCLE

REAR VIEW SIDE VIEW

METRIC MODELS Units are in millimeters

Model	A	AA	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	Y
TS-2-SW-EC12M		54.0	57.1	52.0	11.4			M12 X 1.75	48.4	22.20										50.50
TS-10-SW-EC12M		54.0	57.1	52.0	11.4			M12 X 1.75	48.4	22.20										50.50
TS-25-SW-EC12M		54.0	57.1	52.0	11.4			M12 X 1.75	48.4	22.20										50.50
TS-75-SW-EC12M		66.0	61.6	68.6	14.4			M12 X 1.75	56.8	25.40										52.40
TS-150-SW-EC12M		66.0	61.6	68.6	14.4			M12 X 1.75	56.8	25.40										52.40
TS-250-SW-EC12M		66.0	61.6	68.6	14.4			M12 X 1.75	56.8	25.40										52.40
TS-2-FW-EC12M	79.4		57.1	52.0	11.4	8.00	63.50		48.4		12.70									50.50
TS-10-FW-EC12M	79.4		57.1	52.0	11.4	8.00	63.50		48.4		12.70									50.50
TS-25-FW-EC12M	79.4		57.1	52.0	11.4	8.00	63.50		48.4		12.70									50.50
TS-75-FW-EC12M	101.6		61.6	68.6	14.4	9.50	82.60		56.8		12.70									52.40
TS-150-FW-EC12M	101.6		61.6	68.6	14.4	9.50	82.60		56.8		12.70									52.40
TS-250-FW-EC12M	101.6		61.6	68.6	14.4	9.50	82.60		56.8		12.70									52.40
TS-2-PW-EC12M	54.9		69.8	52.0	11.4	9.50	82.60		48.4		12.80	38.0	41.3	44.5	54.00	35.20	62.60	108.0	12.0	38.00
TS-10-PW-EC12M	54.9		69.8	52.0	11.4	9.50	82.60		48.4		12.80	38.0	41.3	44.5	54.00	35.20	62.60	108.0	12.0	38.00
TS-25-PW-EC12M	54.9		69.8	52.0	11.4	9.50	82.60		48.4		12.80	38.0	41.3	44.5	54.00	35.20	62.60	108.0	12.0	38.00
TS-75-PW-EC12M	66.0		74.3	68.6	14.4	12.70	101.60		56.8		12.80	39.3	50.8	50.8	66.70	56.80	74.40	133.4	12.0	30.10
TS-250-PW-EC12M	66.0		74.3	68.6	14.4	12.70	101.60		56.8		12.80	39.3	50.8	50.8	66.70	56.80	74.40	133.4	12.0	30.10
TS-250-PW-EC12M	66.0		74.3	68.6	14.4	12.70	101.60		56.8		12.80	39.3	50.8	50.8	66.70	56.80	74.40	133.4	12.0	30.10
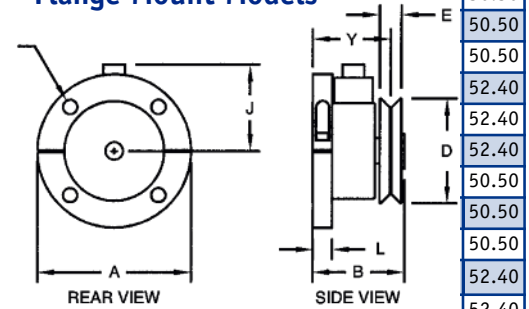
IMPERIAL MODELS Units are in inches

Model	A	AA	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	Y
TS-5-SW-EC12		2.13	2.25	2.05	0.45			1/2 - 13	1.91	0.88										1.99
TS-25-SW-EC12		2.13	2.25	2.05	0.45			1/2 - 13	1.91	0.88										1.99
TS-50-SW-EC12		2.13	2.25	2.05	0.45			1/2 - 13	1.91	0.88										1.99
TS-150-SW-EC12		2.60	2.43	2.70	0.57			1/2 - 13	2.24	1.00										2.07
TS-330-SW-EC12		2.60	2.43	2.70	0.57			1/2 - 13	2.24	1.00										2.07
TS-500-SW-EC12		2.60	2.43	2.70	0.57			1/2 - 13	2.24	1.00										2.07
TS-5-FW-EC12	3.13		2.25	2.05	0.45	0.32	2.50		1.91		0.50									1.99
TS-25-FW-EC12	3.13		2.25	2.05	0.45	0.32	2.50		1.91		0.50									1.99
TS-50-FW-EC12	3.13		2.25	2.05	0.45	0.32	2.50		1.91		0.50									1.99
TS-150-FW-EC12	4.00		2.43	2.70	0.57	0.38	3.25		2.24		0.50									2.07
TS-330-FW-EC12	4.00		2.43	2.70	0.57	0.38	3.25		2.24		0.50									2.07
TS-500-FW-EC12	4.00		2.43	2.70	0.57	0.38	3.25		2.24		0.50									2.07
TS-5-PW-EC12	2.16		2.75	2.05	0.45	0.38	3.25		1.91		0.51	1.50	1.63	1.75	2.13	1.39	2.47	4.25	0.50	1.24
TS-25-PW-EC12	2.16		2.75	2.05	0.45	0.38	3.25		1.91		0.51	1.50	1.63	1.75	2.13	1.39	2.47	4.25	0.50	1.24
TS-50-PW-EC12	2.16		2.75	2.05	0.45	0.38	3.25		1.91		0.51	1.50	1.63	1.75	2.13	1.39	2.47	4.25	0.50	1.24
TS-150-PW-EC12	2.60		2.93	2.70	0.57	0.50	4.00		2.24		0.51	1.55	2.00	2.00	2.63	1.63	2.93	5.25	0.50	1.55
TS-330-PW-EC12	2.60		2.93	2.70	0.57	0.50	4.00		2.24		0.51	1.55	2.00	2.00	2.63	1.63	2.93	5.25	0.50	1.55
TS-500-PW-EC12	2.60		2.93	2.70	0.57	0.50	4.00		2.24		0.51	1.55	2.00	2.00	2.63	1.63	2.93	5.25	0.50	1.55

Note: The TS model load cell ("no-coupling" option) is available for use with your pulley. Consult factory.

# CL Cantilevered Load Cells for Narrow Web Applications

Specifications

Gage Resistance	350 Ω
Excitation Voltage	10 VDC maximum
Output Signal	21 mVDC maximum per sensor at full load rating
Operating Temperature	-30˚C to 80˚C
Temp. Effect on Zero	0.02% of rating per ˚C
Combined Non-Linearity & Hysteresis	
Size 1	0.5% of full scale maximum
Size 2	1.5% of full scale maximum
Repeatability	0.2% of full scale maximum
Deflection at Full Load	0.28 mm (0.011 inch) maximum
Protection Class	IP67
Certification	CE
Mating Cable Assembly	Use LCC Cable series
Mating Connector Only	12B220-1 (pin 1 + power; pin 2 + signal; pin 3 - signal; pin 4 - power)

MAGPOWR model CL Cantilever Load Cells are designed to support cantilevered idler rolls in processing machines which only have one side frame, and to accurately measure and control tension in a narrow moving web. They are typically used on paper, film, foil, fabrics or any materials used in the label, tag, tape, printing or converting industry.

A unique advantage of these load cells is their ability to accept the customer's roll and shaft assembly. No longer is the user restricted in design to a special roll at the design location. He simply installs one of his own spare roll assemblies into the model CL Load Cell. Another advantage of these load cells is the capability to be mounted on either side of the machine frame. This allows the process rolls to be mounted flush to the machine frame to minimize overhang when the load cell is mounted on the back side of the machine frame.

The model CL Load Cells are ruggedly constructed with built-in mechanical overload stops. A full Wheatstone bridge arrangement is incorporated in each load cell for the most accurate means of measuring web tension. There are 2 sizes available with 5 tension sensing ranges up to 500 lb. IP67 protection ensures reliable operation in applications where wash-down (and even submersion) are required.
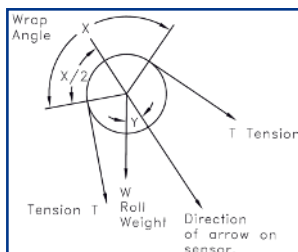
SIZING–Narrow Web

To select the load cell, the total load on the roll must be calculated. This load is the sum of the tension components in the sensing plane, plus the pulley weight components in the sensing plane. The equation for this load is:

LOAD = 2T (sin (X/2)) + (W cos Y)

This is the total load. But, since tension transients are unknown, and are generally quite large, a "factor of safety" of 2 should be used. The final equation for load rating required for the load cell is then:

L= 4T (sin (X/2)) + (W cos Y)

To select a load cell, apply this equation and choose a load cell with a load rating greater than L. For example, if the web tension is 15 lb, the angle Y is 30˚, and the wrap angle is 70˚, the resulting load cell rating is:

L=4 (15) (sin (70˚/2)) + 5 cos 30˚

L = 38.75 lb

Therefore, use a CL1-50 or CL2-50 load cell.

Sine/Cosine Functions

Degrees	Sine	Cosine	Degrees	Sine	Cosine
0	.0000	1.000	50	.7660	.6428
5	.0872	.9962	55	.8192	.5736
10	.1736	.9848	60	.8660	.5000
15	.2588	.9659	65	.9063	.4226
20	.3420	.9397	70	.9397	.3420
25	.4226	.9063	75	.9659	.2588
30	.5000	.8660	80	.9849	.1736
35	.5736	.8192	85	.9962	.0872
40	.6428	.7660	90	1.000	.0000
45	.7071	.7071			

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CL Dimensions

P DIAMETER HOUSING CLEARANCE

S BORE DIAMETER

T SET SCREWS (2) PLACES NEAR SIDE (2) PLACES FAR SIDE

N TYP X **O** DEEP (2) PLACES

Imperial Series

Model Number	Load Rating
CL1-5-EC12	5 lbs
CL1-15-EC12	15 lbs
CL1-50-EC12	50 lbs
CL2-15-EC12	15 lbs
CL2-50-EC12	50 lbs
CL2-150-EC12	150 lbs
CL2-500-EC12	500 lbs

Metric Series

Model Number	Load Rating
CL1-2-EC12M	2 kg
CL1-7-EC12M	7 kg
CL1-25-EC12M	25 kg
CL2-7-EC12M	7 kg
CL2-25-EC12M	25 kg
CL2-75-EC12M	75 kg
CL2-250-EC12M	250 kg

METRIC MODELS Units are in millimeters

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	S*	T
CL1-2-EC12M	114	95.8	38	31.2	54.5	41.4	15.6	25.4	19.1	25.4	50.8	3.8	M6 - 1.0	9.5	22.2	16	M4 X 0.7
CL1-7-EC12M	114	95.8	38	31.2	54.5	41.4	15.6	25.4	19.1	25.4	50.8	3.8	M6 - 1.0	9.5	22.2	16	M4 X 0.7
CL1-25-EC12M	114	95.8	38	31.2	54.5	41.4	15.6	25.4	19.1	25.4	50.8	3.8	M6 - 1.0	9.5	22.2	16	M4 X 0.7
CL2-7-EC12M	144	126.2	50	42.4	61.0	56.4	21.2	28.6	19.1	34.9	69.9	3.8	M10 - 1.5	12.7	31.8	25	M5X 0.8
CL2-25-EC12M	144	126.2	50	42.4	61.0	56.4	21.2	28.6	19.1	34.9	69.9	3.8	M10 - 1.5	12.7	31.8	25	M5X 0.8
CL2-75-EC12M	144	126.2	50	42.4	61.0	56.4	21.2	28.6	19.1	34.9	69.9	3.8	M10 - 1.5	12.7	31.8	25	M5X 0.8
CL2-250-EC12M	144	126.2	50	42.4	61.0	56.4	21.2	28.6	19.1	34.9	69.9	3.8	M10 - 1.5	12.7	31.8	25	M5X 0.8

Conversion Tolerance + .05/-.00

IMPERIAL MODELS Units are in inches

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	S*	T
CL1-5-EC12	4.5	3.77	1.5	1.23	2.15	1.63	0.62	1.00	0.75	1.00	2.00	0.15	1/4 - 20	0.38	0.88	0.625	#8 - 32
CL1-15-EC12	4.5	3.77	1.5	1.23	2.15	1.63	0.62	1.00	0.75	1.00	2.00	0.15	1/4 - 20	0.38	0.88	0.625	#8 - 32
CL1-50-EC12	4.5	3.77	1.5	1.23	2.15	1.63	0.62	1.00	0.75	1.00	2.00	0.15	1/4 - 20	0.38	0.88	0.625	#8 - 32
CL2-15-EC12	5.7	4.97	2.0	1.67	2.40	2.22	0.84	1.13	0.75	1.38	2.75	0.15	3/8 - 16	0.50	1.25	1.000	#10 - 32
CL2-50-EC12	5.7	4.97	2.0	1.67	2.40	2.22	0.84	1.13	0.75	1.38	2.75	0.15	3/8 - 16	0.50	1.25	1.000	#10 - 32
CL2-150-EC12	5.7	4.97	2.0	1.67	2.40	2.22	0.84	1.13	0.75	1.38	2.75	0.15	3/8 - 16	0.50	1.25	1.000	#10 - 32
CL2-500-EC12	5.7	4.97	2.0	1.67	2.40	2.22	0.84	1.13	0.75	1.38	2.75	0.15	3/8 - 16	0.50	1.25	1.000	#10 - 32

* Metric: H9, Imperial +0.002 / -0.000

This example shows the CL Load Cell mounted inside the machine frame.
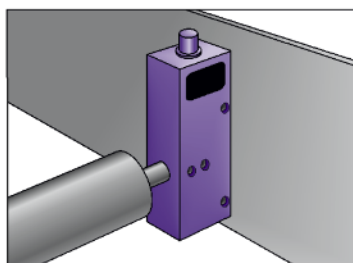
This example shows the CL Load Cell mounted outside of the machine frame.
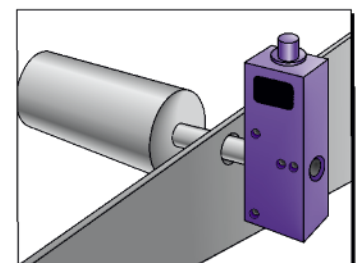
LC-500G Low Tension Load Cells for Single Strand Applications

LC-500G

LC-500GS1

CE

As manufacturing capability evolves and the demands for finer wire, filament and textile material increase, so does the need for tension control in extremely light applications. To meet this critical need MAGPOWR has developed the LC-500G, 500 gram load cell.

With a full Wheatstone bridge strain gage configuration, the LC-500G meets the same industry leading specifications as all other MAGPOWR load cells. The LC-500G also employs 360˚ of overload protection preventing the need for recalibration in the event of overload situations.

The LC-500G is designed to mount easily into almost any single strand installation. A pair of supplied jam nuts allow you to easily mount the unit into your machine frame with simple depth and orientation adjustment. The LC-500G is constructed from corrosion resistant, nickel-plated aluminum and is provided with a 1 inch diameter X 1/8 inch wide anodized aluminum pulley. For applications requiring special pulleys, the LC-500GS1 is available with provisions for a customer-supplied pulley.

Specifications

Gage Resistance	350 Ω
Excitation Voltage	10 VDC maximum
Output Signal	21 mVDC maximum at full load rating
Operating Temperature	-30˚C to 95˚C
Temp. Effect on Zero	0.02% of rating per ˚C
Combined Non-Linearity & Hysteresis	0.5% of full scale maximum
Repeatability	0.2% of full scale maximum
Deflection at Full Load	0.36 mm (0.014 inch) maximum
Protection Class	IP20
Certification	CE
Mating Cable Assembly	Use SCE Cable series
Mating Connector Only	12B193-6 (pin A + power; pin B + signal; pin C - signal; pin D - power)
Sizing - Single Strand	See page 55

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LC-500G Dimensions
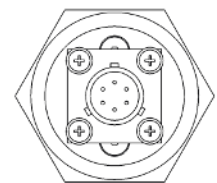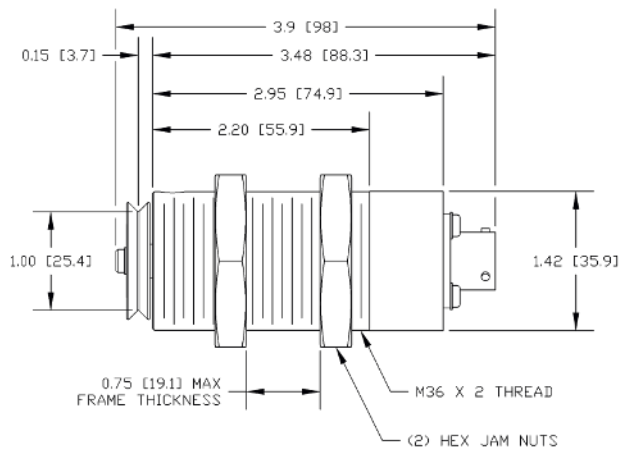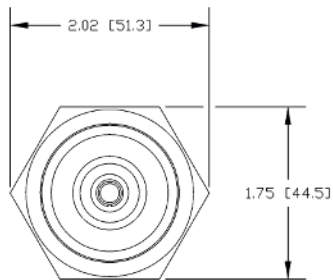
LC-500G
Inches (millimeters)
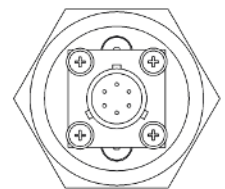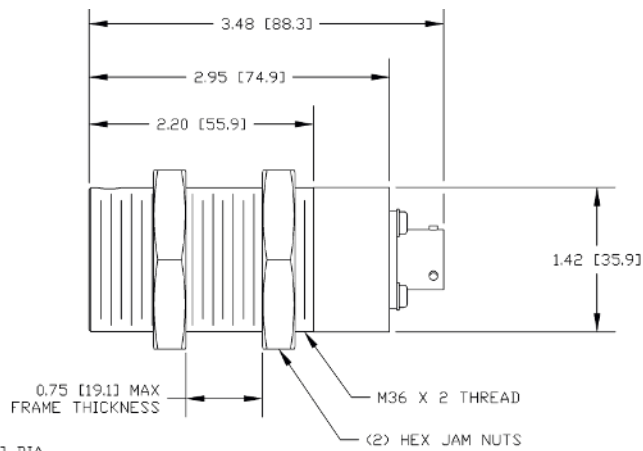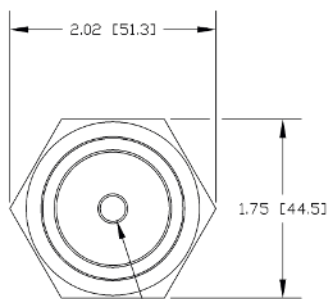
LC-500G-S1
Inches (millimeters)

GTS Global Load Cells for Under Pillow Block Applications

CE
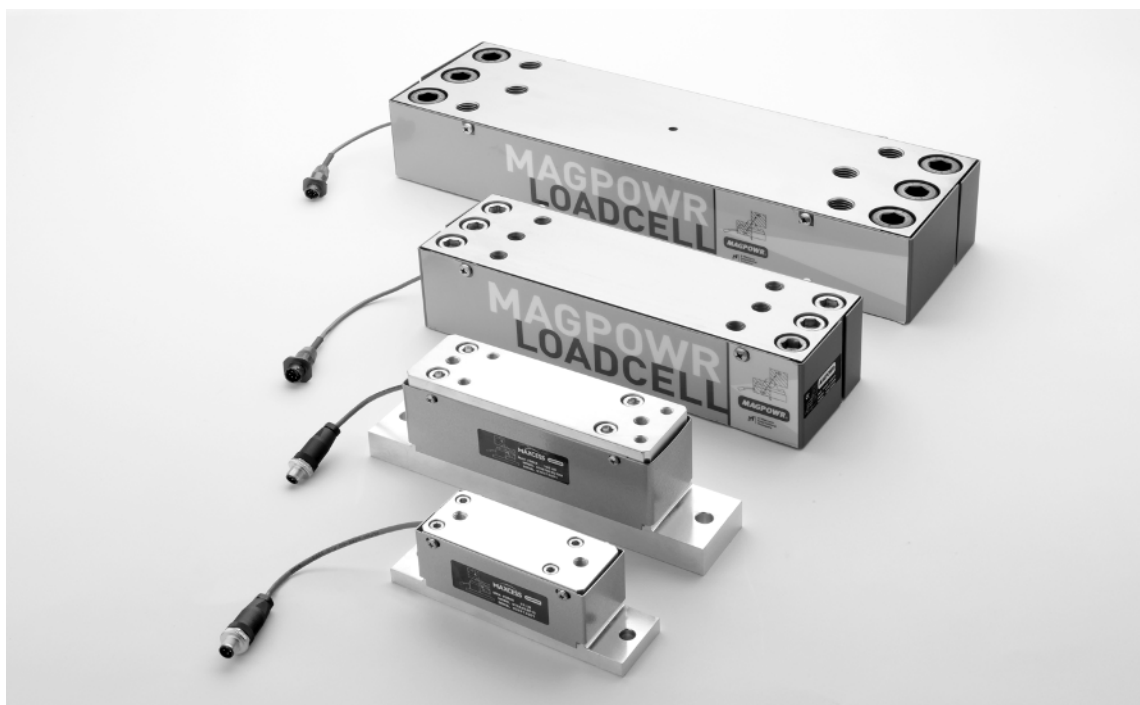
GTS Global Load Cells come in both inch and metric models for use in worldwide markets. These units are designed to be mounted under standard inch or metric pillow block bearings, which support a live or dead shaft roll. By measuring the load created by the web and acting on the sensing roll, precise and accurate web tension can be displayed and controlled.

Two GTS load cells should be used, one under each end of the sensing roll. When installed in this manner, the two load cells accurately measure the total web tension force acting on the roll, independent of web width or location. The new flexible cable connector eliminates the need for "left" and "right" models, since each GTS load cell can be mounted on either side of the machine.

Every load cell is constructed with mechanical overload stops in both force directions to prevent load cell damage and eliminate the need for recalibration even after extreme overloads. A full Wheatstone bridge is incorporated into each GTS load cell for maximum accuracy and stability. IP67 Protection ensures reliable operation in applications where wash-down and submersion up to 1 meter (3.28 ft) are required.

Features

Standard inch and metric models: Inch models for US applications, Metric models for global markets

Three sizes with sensing ranges 10 kg to 15,000 kg (22 lbs to 33,000 lbs)

Rugged, unitized construction

Positive overload stops prevent load cell damage

Full Wheatstone bridge in each load cell

Pre-drilled and tapped for standard pillow block bearings

Available T-slot and blank plate mounting adapters

Compatible with all MAGPOWR tension readouts and controls
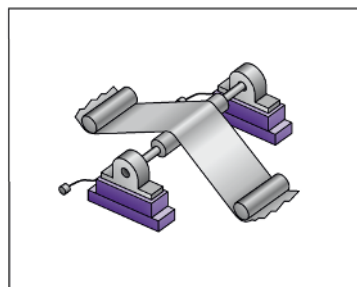
GTS Global load cells are adaptable. All sizes are pre-drilled and tapped to accept standard inch and metric pillow block bearings. Top Plate Adapter kits are also available for your special mounting requirements.
Shown left: TA3 Blank Top Plate Adapter for size B sensor. See page 70 for ordering information for all Top Plate Adapter Kits.

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GTSA and GTSB Load Cells
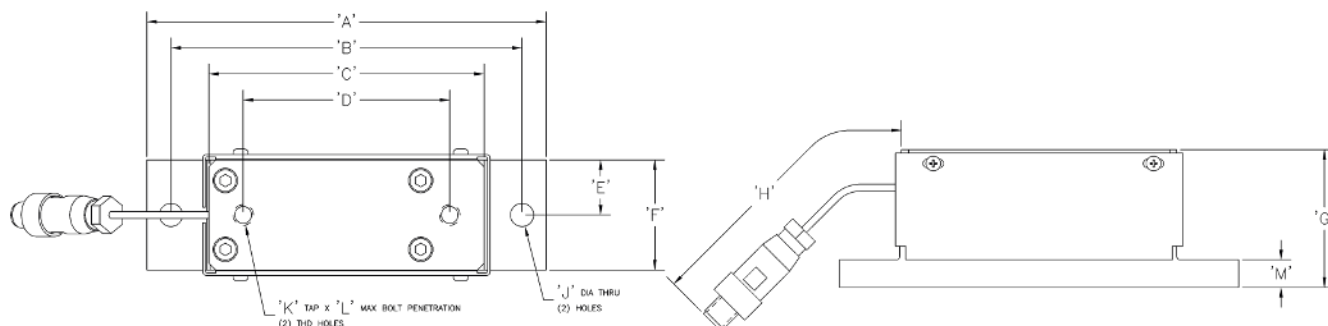
Dimensions (inches in shaded area)

Model	A	B	C	D	E	F	G	H	J	K	L	M
GTSA-EC12M	184.2	161.9	127.0	95.3	25.4	50.8	63.5	152	10.7	M10 - 1.5	16.0	12.7
GTSA-EC12	7.25	6.375	5.0	3.750	1.00	2.00	2.50	6.0	0.422	3/8 - 16	0.63	0.50
GTSB-EC12M	284.2	254.0	203.2	158.8	31.8	63.5	98.6	305	12.7	M12 - 1.75	25.0	25.4
GTSB-EC12	11.19	10.00	8.0	6.250	1.25	2.50	3.88	12.0	0.50	7/16 - 14	1.00	1.00

GTSC and GTSD Load Cells
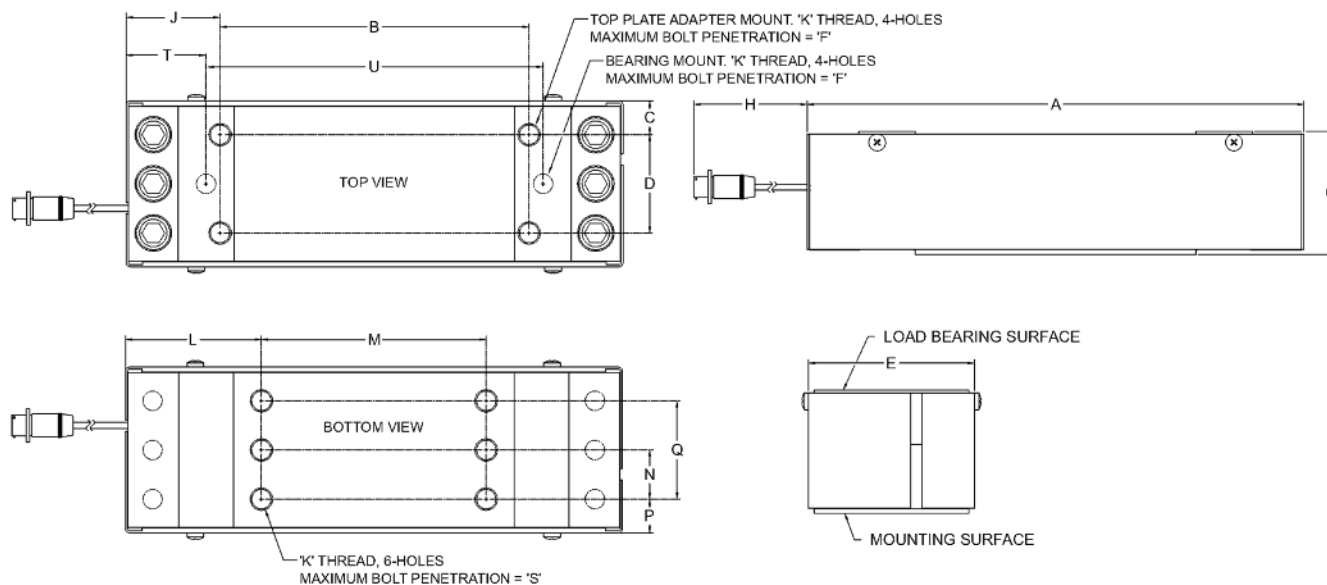
Dimensions (inches in shaded area)

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	S	T	U
GTSCM	357.7	220.0	23.1	70.0	116.2	23.0	87.8	152	68.85	M16 - 2 - 6H	98.85	160.00	35.00	23.00	70.00	40	63.55	230
	14.08	8.661	0.95	2.756	4.57	0.91	3.46	6.0	2.710	M16 - 2- 6H	3.89	6.299	1.378	0.91	2.756	1.57	2.51	9.06
GTSDM	541.0	390.0	27.6	114.0	169.2	34.0	95.0	152	75.5	M24 - 3 - 6H	140.5	260.00	57.00	27.50	114.00	40	95.50	350
	21.30	15.350	1.09	4.490	6.66	1.34	3.74	6.0	2.970	M24 - 3 - 6H	5.53	10.240	2.24	1.09	4.49	1.57	3.76	13.78

GTS Specifications and Ordering Information

Specifications

Gage Resistance	350 Ω
Excitation Voltage	10 VDC maximum
Output Signal	21 mVDC maximum per load cell at full load rating
Operating Temperature	-30˚ to 80˚ C
Temp. Effect on Zero	.02% of rating per ˚C
Combined Non-linearity and Hysteresis	.5% of full scale maximum
Repeatability	.2% of full scale maximum
Overload Stops	Internal at 105% to 150% of full load rating
Protection Class	IP67
Climate Class	3K4 (EN60721)

Deflection at Full Load	All GTSA = 0.38 mm (0.015 inch) GTSB 220 & 550 = 0.23 mm (0.009 inch) GTSB1100 = 0.15 mm (0.006 inch) GTSB2200 = 0.38 mm (0.015 inch) All GTSC = 0.30 mm (0.012 inch) GTSD10000 = 0.152 mm (0.006 inch) GTSD15000 = 0.203 mm (0.0084 inch)
Weight	GTSA = 1.4 kg (3 lbs) GTSB = 3.4 kg (7.5 lbs) GTSC = 23.8 kg (52.5 lbs) GTSD = 60.3 kg (133 lbs) TA1 = 0.14 kg (0.3 lb) TA2 = 0.18 kg (0.4 lb) TA3 = 0.9 kg (1.9 lb) TA4 = 10.3 kg (22.7 lbs) TA5 = 32.9 kg (72.5 lbs) BA1 = 11.7 kg (25.7 lbs) BA2 = 9.1 kg (20.0 lbs)
MAGPOWR Mating Cable	
A and B sizes	Use LCC Cable Series
C and D sizes	Use SCE Cable Series
Mating Connector Only	
A and B sizes	12B220-1 (pin 1 + power; pin 2 + signal; pin 3 - signal; pin 4 - power)
C and D sizes	12B193-6 (pin A + power; pin B + signal; pin C - signal; pin D - power)

Ordering Information

Order two load cells, one for each side of the sensing roll. GTS A and B Model Load Cells are available in both imperial and metric load ratings. Metric models carry an "M" designation after the load rating, which is in kilograms, with metric tapped holes to match standard pillow block housings. Imperial series load ratings are in pounds with inch dimension tapped holes in the top plate to match standard inch series pillow block housings.

Imperial Series		
Model Number	**Load Rating**	
GTSA-22-EC12	10 kg	22 lbs
GTSA-55-EC12	25 kg	55 lbs
GTSA-110-EC12	50 kg	110 lbs
GTSA-220-EC12	100 kg	220 lbs
GTSA-550-EC12	249 kg	550 lbs
GTSA-1100-EC12	499 kg	1100 lbs
GTSA-2200-EC12	998 kg	2200 lbs

Metric Series		
Model Number	**Load Rating**	
GTSA-10-EC12M	10 kg	22 lbs
GTSA-25-EC12M	25 kg	55 lbs
GTSA-50-EC12M	50 kg	110 lbs
GTSA-100-EC12M	100 kg	220 lbs
GTSA-250-EC12M	250 kg	551 lbs
GTSA-500-EC12M	500 kg	1102 lbs
GTSA-1000-EC12M	1000 kg	2205 lbs
GTSC-2500M	2500 kg	5512 lbs
GTSC-5000M	5000 kg	11023 lbs
GTSC-7500M	7500 kg	16535 lbs
GTSD-10000M	10000 kg	22046 lbs
GTSD-15000M	15000 kg	33069 lbs

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GTS Sizing

FOR SIZES A AND B, REFER TO STRIPED QUADRANTS
FOR SIZES C AND D, REFER TO SOLID QUADRANTS

CASE 1:
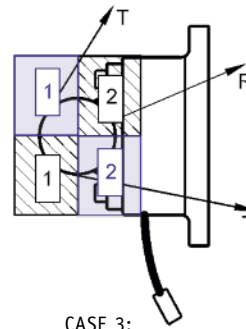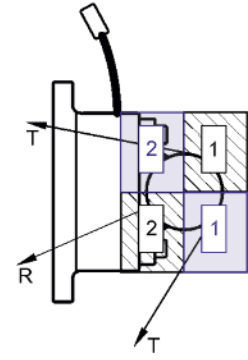
+ For resultant in quadrant 1
- For resultant in quadrant 2
(shown)

CASE 2:

- For resultant in quadrant 1
+ For resultant in quadrant 2
(shown)

CASE 3:

+ For resultant in quadrant 1
- For resultant in quadrant 2
(shown)

CASE 4:

- For resultant in quadrant 1
+ For resultant in quadrant 2
(shown)

Step 1

Select the mounting orientation which resembles your application from the examples shown above.

Step 2

Using your known maximum tension, roll weight and angles as shown below, apply the following equation to calculate a "load rating" L.

$$L = 2\ T\ SIN(X/2)\ (COS\ Y + SIN\ Y) +- (W/2)$$

SEE CASES ABOVE (RESULTANT FORCE DIRECTION MUST BE IN QUADRANTS 1 OR 2)

FOR SIZES A AND B
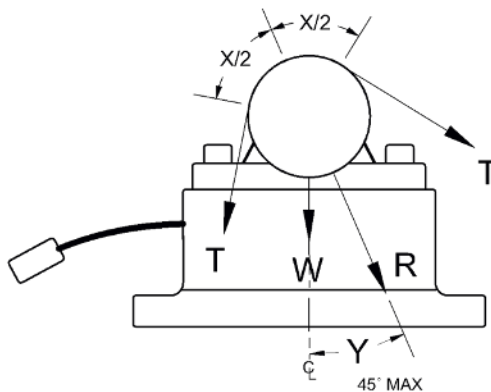
FOR SIZES C AND D
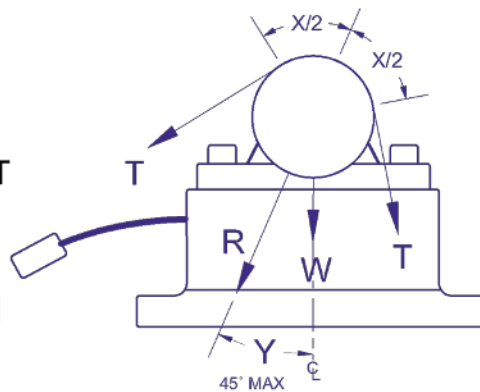
L = SENSOR LOAD RATING

T = MAXIMUM TENSION

R = RESULTANT FORCE DUE TO TENSION

W = ROLL WEIGHT

X = WRAP ANGLE

**Y = ANGLE BETWEEN RESULTANT FORCE
DIRECTION AND THE CENTERLINE
OF THE LOAD CELL**

NOTES: Angle Y cannot exceed 45˚. The second term (roll weight "W") of the equation must not exceed 50% of the selected load cell rating of both sensors combined. If it does exceed 50%, select the next larger load rating unit. When the resultant force (R) is pulling in a direction away from the load cell, the signal leads must be reversed at the terminal block of the control.

GTS Optional Adapter Kits

![ttemsa logo]

Load Cells & Readouts (sidebar)

Top Plate Adapter Kits:

Model	Description	Weight
TA1	11 mm T-Slot Kit for GTSAM; includes 2 rails and 4 screws	0.14 kg (0.3 lbs)
TA2	12 mm T-Slot Kit for GTSAM; includes 2 rails and 4 screws	0.18 kg (0.4 lbs)
TA3	Blank Top Plate Kit for GTSBM; includes plate and 4 screws	0.9 kg (1.9 lbs)
TA4	Blank Top Plate Kit for GTSCM; includes 4 M16 screws	10.3 kg (22.7 lbs)
TA5	Blank Top Plate Kit for GTSDM; includes 4 M24 screws	32.9 kg (72.5 lbs)
BA1	Bottom Plate Kit for GTSCM; 410 x 70 mm mounting holes. Includes 6 M16 screws	11.7 kg (25.7 lbs)
BA2	Bottom Plate Kit for GTSCM; 254 x 76 mm mounting holes. Includes 6 M16 screws	9.1 kg (20.0 lbs)

TA1 installed dimensions
T-Slot Top Plate Adapter
for size A metric sensor only

TA2 installed dimensions
T-Slot Top Plate Adapter
for size A metric sensor only

Length of adapter is 127 mm

TA3 installed dimensions
Blank Top Plate Adapter for size B metric sensor only
Length of adapter is 203 mm

TA4 installed dimensions
Blank Top Plate Adapter for size C metric sensor only
Length of adapter is 350 mm

GTS Optional Adapter Kits

```
┌─────────────────┐
│     GTSCM       │
│   LOAD CELL     │
├─────────────────┤
│      BA1        │  30
└─────────────────┘
    ←── 110 ──→
```

BA1 installed dimensions
Bottom Plate Adapter for size C metric sensor only
Length of adapter is 450 mm
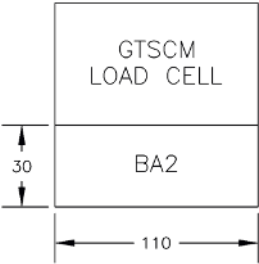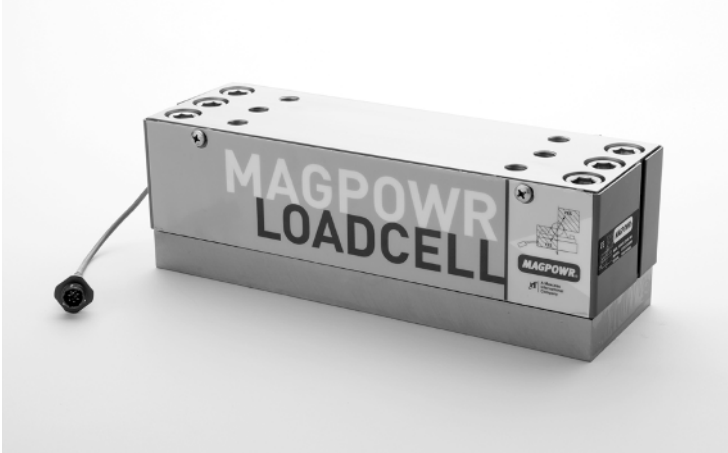

```
┌─────────────────┐
│     GTSCM       │
│   LOAD CELL     │
├─────────────────┤
│      BA2        │  30
└─────────────────┘
    ←── 110 ──→
```

BA2 installed dimensions
Bottom Plate Adapter for size C metric sensor only
Length of adapter is 350 mm


```
    ←──── 163 ────→
┌─────────────────┐
│      TA5        │  50
├─────────────────┤
│     GTSDM       │
│   LOAD CELL     │
└──────┐  ┌───────┘
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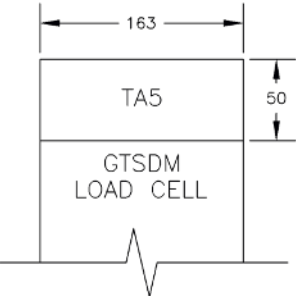
TA5 installed dimensions
Blank Top Plate Adapter for size D metric sensor only
Length of adapter is 534 mm

TSU Under Pillow Block Load Cells for Live Shaft Rolls

MAGPOWR model TSU Load Cells enable you to read and control web tension in your machine by simply bolting the model TSU load cell under your present roll support bearings. Once installed, they accurately measure the tension forces on the machine sensing roll created by the web, and can display and control the web tension through MAGPOWR tension readouts and controls.

The model TSU Load Cell is ruggedly constructed with built-in mechanical overload stops in both force directions, and will stand up to mill duty. A full Wheatstone bridge arrangement is incorporated in each load cell for the most accurate means of measuring web tension.

Application of the TSU Load Cells is normally in pairs, one under each pillow block bearing which supports the sensing roll. When installed in this manner, the two load cells accurately measure the total force on the entire roll created by tension in the web, and precisely display it on a MAGPOWR tension readout, regardless of web position.

MAGPOWR model TSU Load Cells are available in three sizes and seven load ratings with sensing capabilities of 0 to 5,000 lb. All sizes are already drilled and tapped to accept standard pillow block bearings. No additional adapter plates for mounting the pillow block bearings are required.

Features

Positive overload stops in both compression and tension modes of operation

Rugged industrial construction

Four foil strain gauges in a full Wheatstone bridge (same as expensive instrumentation load cells)

Corrosion resistant finish on all external parts

Simple installation

Sensing actual web tension

Pre-drilled and tapped mounting holes for pillow block bearings—no additional adapters required

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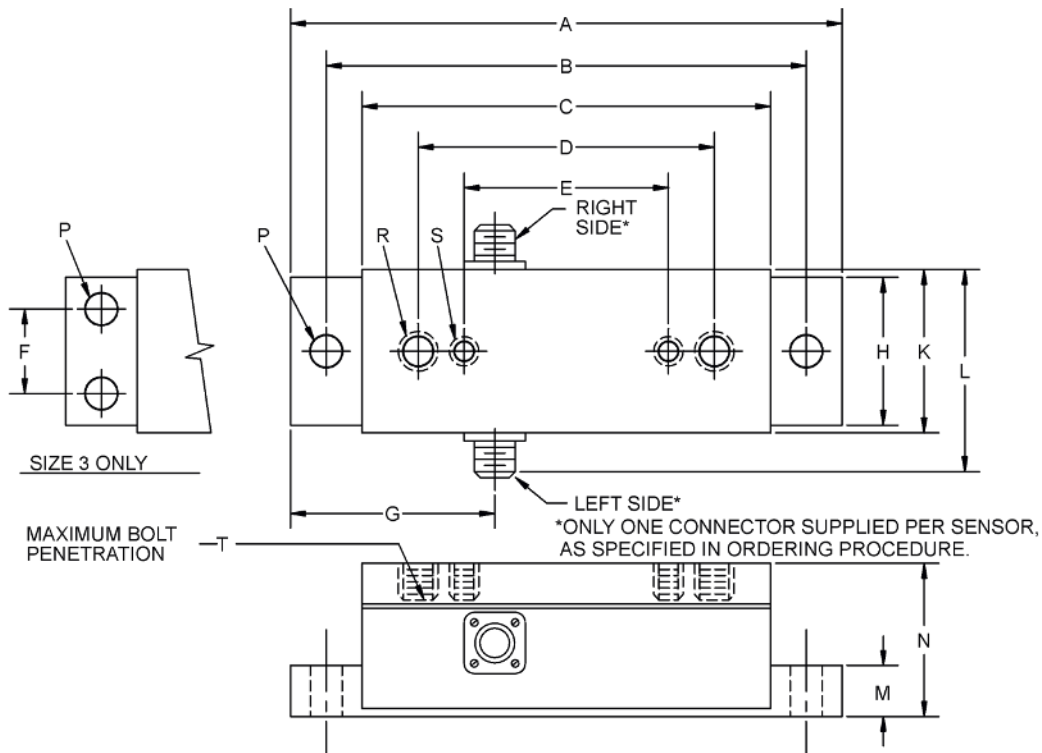
TSU Dimensions

Imperial Model Dimensions (Inches)

MODEL	A	B	C	D	E	F	G	H	K	L	M	N	P	R	S	T
1	6.75	5.875	5.0	3.625	—	—	2.75	1.812	2.02	2.55	.625	1.88	.406	3/8"-16	—	.625
2	9	8	7	5.125	3.625	—	3.75	2.812	3.03	3.56	.750	2.16	.531	1/2"-13	3/8"-16	.625
3	13.53	12.25	11.03	8.375	6.875	2.750	5	4.29	4.5	5.03	1	3.25	.531	3/4"-10	5/8"-11	1

Metric Model Dimensions (Millimeters)

Model	A	B	C	D	E	F	G	H	K	L	M	N	P	R	S	T
1	171	149.2	127	92.1	—	—	70	46	51	64	16	47	10.3	3/8"-16	—	16
2	229	203.2	178	130.2	92.1	—	95	71	76	90	19	54	13.5	1/2"-13	3/8"-16	16
3	343	311.2	279	212.7	174.6	69.8	159	110	114	128	25	81	13.5	3/4"-10	5/8"-11	25

SIZE	Load Ratings Available, lb (kg)
1	50 (22.7), 150 (68.0)
2	150 (68.0), 500 (227), 1000 (454)
3	1000 (454), 2500 (1,134), 5000 (2,268)

TSU Specifications and Ordering Information

Specifications

Gage Resistance	350 Ω
Excitation Voltage	10 VDC maximum
Output Signal	21 mVDC maximum per load cell at full load rating
Operating Temperature	-30˚ to 95˚ C
Temperature Effect on Zero	.02% of rating per ˚C
Combined Non-linearity and Hysteresis	.5% of full scale maximum
Repeatability	.2% of full scale maximum
Overload Stops	Internal at 105% to 150% of full load rating
Deflection at Full Load	23 mm (0.009 inch)
Weight	TSU-1, 4 1/4 lb; TSU-2, 10 1/2 lb; TSU-3, 36 lb
Mating Cable Assembly	Use SCE Cable series
Mating Connector Only	12B193-6 (pin A + power; pin B + signal; pin C - signal; pin D - power)

Ordering Information

Model TSU Load Cells are used in pairs—one on each side of the web. When ordering you must specify one left hand unit and one right hand unit for each sensing roll. Order by model number as shown in the following example.

Example:

A requirement for a 1,000 lb capacity load cell of size 2, as shown in the dimension sheet would be specified as TSU2-1000-L for the left side of the sensing roll and as TSU2-1000-R for the right side of the sensing roll.

TSU   2   1000 L

Model Number	Size	Force Rating	Configuration (R) RIGHT (L) LEFT

ttemsa

TSU Sizing
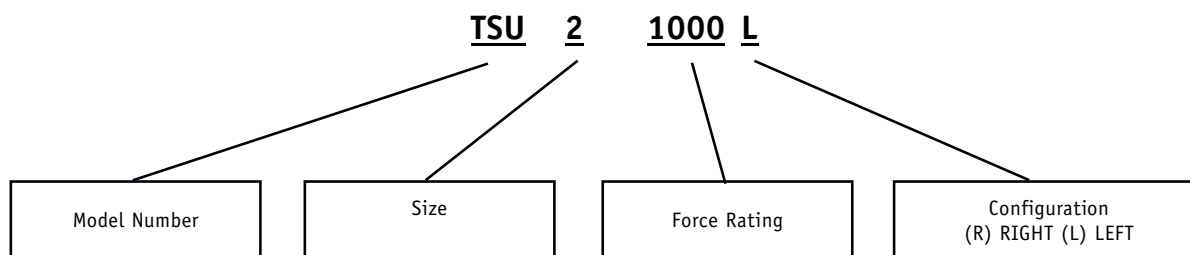
To properly size any TSU model load cell select the case (which resembles your application) from the examples shown below. Using your known maximum tension, roll weight and angles as shown, apply the equation to calculate a "load rating" L. Select a load cell with a load rating greater than that calculated.

Example:

In case 2 below, T=150 lb, X=180˚, Y=30˚, w=50 lb

then

L=2Tsin (X/2)(cos Y + sin Y) + w/2

L=2(150)sin 90˚ (cos 30˚ + sin 30˚) + 25

L=2(150)(1)(.866 + .500) + 25

L=435 lb

Select a TSU2-500 Load Cell

Sine/Cosine Functions

Degrees	Sine	Cosine	Degrees	Sine	Cosine
0	.0000	1.000	50	.7660	.6428
5	.0872	.9962	55	.8192	.5736
10	.1736	.9848	60	.8660	.5000
15	.2588	.9659	65	.9063	.4226
20	.3420	.9397	70	.9397	.3420
25	.4226	.9063	75	.9659	.2588
30	.5000	.8660	80	.9849	.1736
35	.5736	.8192	85	.9962	.0872
40	.6428	.7660	90	1.000	.0000
45	.7071	.7071			

Load Cells & Readouts

$$L = 2 T SIN(X/2) (COS Y + SIN Y) \pm (W/2)$$

SEE CASES BELOW

L = SENSOR LOAD RATING
T = MAXIMUM TENSION
R = RESULTANT FORCE DUE TO TENSION
W = ROLL WEIGHT
X = WRAP ANGLE
Y = ANGLE BETWEEN RESULTANT FORCE
    DIRECTION AND THE CENTERLINE OF THE
    SENSOR

45° MAX

RESULTANT FORCE DIRECTION MUST BE IN QUADRANTS 1 OR 2

CASE 1
+ FOR RESULTANT IN QUADRANT 1
− FOR RESULTANT IN QUADRANT 2 (SHOWN)

CASE 2
− FOR RESULTANT IN QUADRANT 1
+ FOR RESULTANT IN QUADRANT 2 (SHOWN)

CASE 3
+ FOR RESULTANT IN QUADRANT 1
− FOR RESULTANT IN QUADRANT 2 (SHOWN)

CASE 4
− FOR RESULTANT IN QUADRANT 1
+ FOR RESULTANT IN QUADRANT 2 (SHOWN)

NOTES:
Angle Y cannot exceed 45 degrees.
The second term (roll weight "W") of the equation must not exceed 50% of the selected sensor load rating. If it does exceed 50%, select the next larger load rating sensor.
When the resultant force (R) is pulling in a direction away from the sensor, the signal leads must be reversed at the terminal block of the control.

DTR-65 Digital Tension Readout
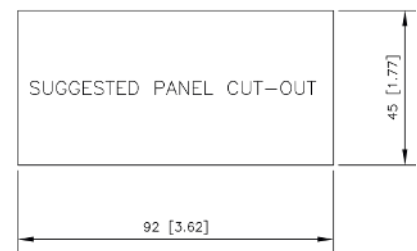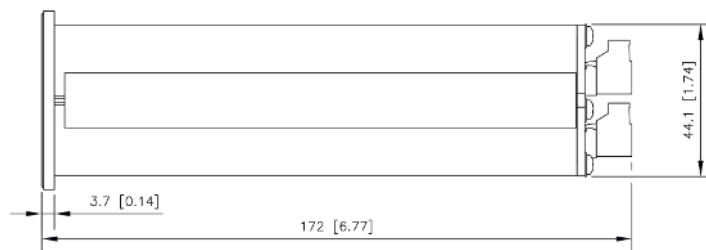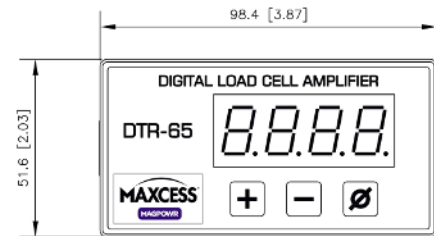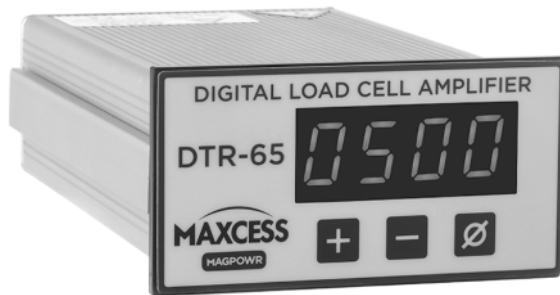
The new Digital Tension Readout (DTR-65) is a powerful and versatile panel-mounted digital amplifier used to display measured tension locally on a machine panel and will multiply a millvolt tension signal to a usable 0 to 10 VDC and 4 to 20 mADC analog output.

The DTR-65 is an 1/8 DIN panel mount enclosure that is IP65 protected on the face. It incorporates ease of use and setup with a keypad and a four-segment display, fully programmable low pass filter for each output, tension alarm set points, quick and easy calibration, and even weightless load cell calibration.

These features, combined with superior drift and linearity performance, make the DTR-65 an easy choice when needing a tension displayed on a machine panel with the option to also output a tension reference to a drive or PLC for remotely displaying or controlling tension.

Features

Small panel usage, 1/8 DIN enclosure (same as DTR-65)

Setup and calibration through keypad and digital display

Weightless load cell calibration

Outputs and display have fully adjustable and separate digital filtering

One push button for re-zeroing, with optional input for remote re-zeroing

Alarm output for high tension or low tension or high or low tension

Works with 5 and 7.5 volt excitation sensors with 1.5 to 100 mV/V signals

32:1 gain adjustment
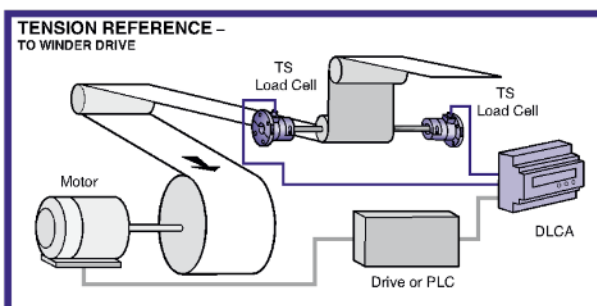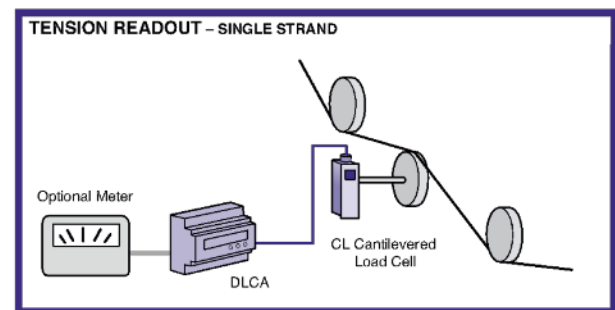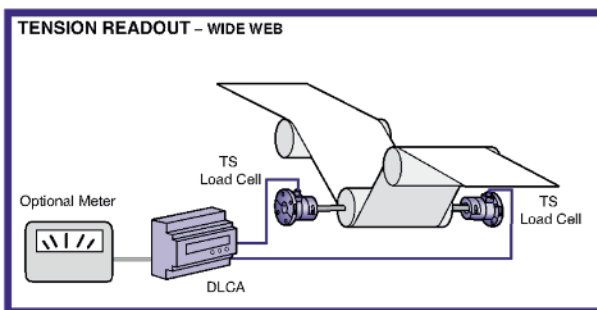
Automatic load cell diagnostics/fault indicator

Powered with 24 VDC or 100 to 240

DTR-65 Specifications and Applications

Supply Power	24 VDC, +/- 10%, 0.14 ADC maximum or 100 to 240 VAC +/- 10%, 50 to 60 HZ, 0.09A
Inputs	
Load Cell Excitation	5 or 7.5 VDC, 100mADC maximum
Load Cell Sensitivity	1.5 to 100 mV/V single sensor or pair
Digital Input (re-zero)	24 VDC maximum 5 VDC or 24 VDC selectable threshold
Outputs	
Analog Outputs	0 to 10 VDC, 5mA, 2 kohm minimum load 4 to 20 mADC, 450 ohm maximum load
Reference Meter Output	0 to 1 mADC, 1 kohm maximum load or 0 to 10 VDC, open circuit
Alarm Output	30 VDC maximum, 0.4 ADC maximum
Gain	32:1

Display	4-digit LED
Enclosure	IP20 (back and sides) IP65 (front panel)
Mounting	1/8 DIN panel mount
Certifications	CE TUV Mark (UL61010-1) CAN/CSA-C22.2# 61010-1 CB to IEC 61010-1 RoHS
Temperature Range	DC Supply Operating: 0 to 50 degrees C (32 to 122 degrees F) AC Supply Operating: 0 to 45 degrees C (32 to 113 degrees F) Storage: -20 to 80 degrees C (-4 to 176 degrees F)
Climate Class	3K3 (EN60721)

TENSION READOUT – WIDE WEB

TENSION READOUT – SINGLE STRAND

TENSION REFERENCE – TO WINDER DRIVE

DLCA Digital Load Cell Amplifier

ttemsa

DIGITAL LOAD CELL AMPLIFIER

0500

MAXCESS® DLCA
MAGPOWR

58.9 [2.32]

35.0 [1.38]

70.0 [2.76]

86.0 [3.39]
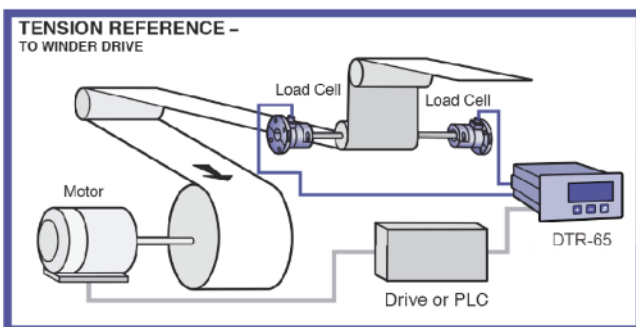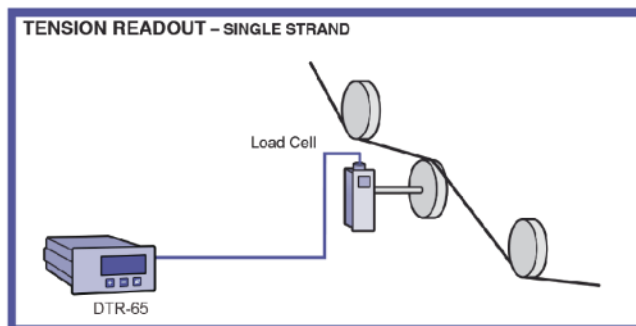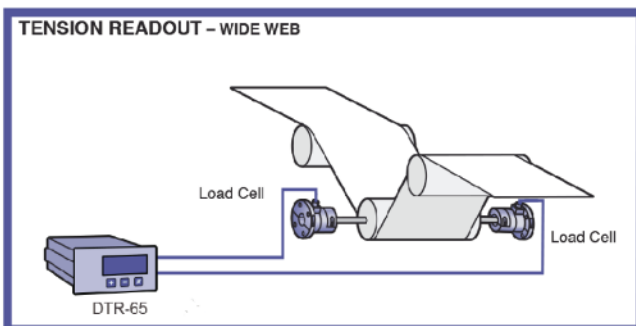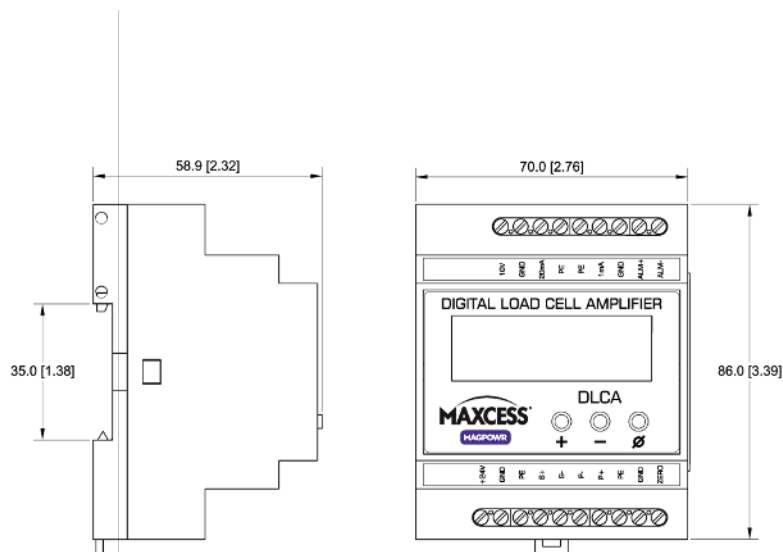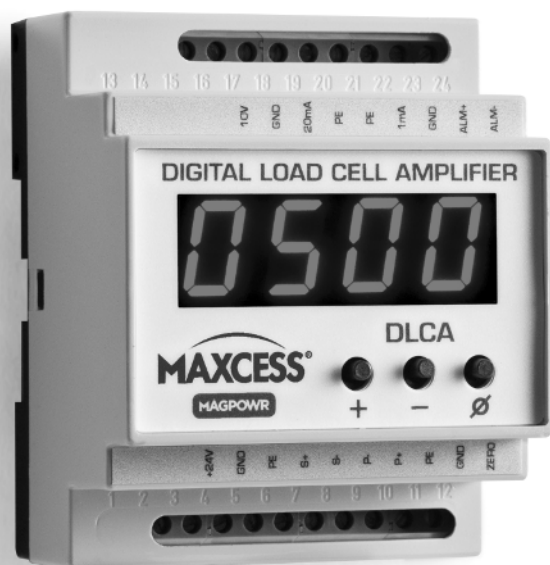
Dimensions shown in mm (inches)

CE   TÜVRheinland

The new Digital Load Cell Amplifier (DLCA) is a low-cost, yet powerful and versatile DIN rail mounted digital amplifier used to multiply a millivolt tension signal to a usable 0 to 10 VDC and 4 to 20 mADC analog output.

The DLCA is compact in size, but incorporates ease of use and setup with three push buttons and a four-segment display, fully programmable low pass filter for each output, tension alarm set points, quick and easy calibration, and even weightless load cell calibration.

These features combined with superior drift and linearity performance makes the DLCA an easy choice when needing a tension reference to a drive or PLC for displaying or controlling tension.

Features

Compact enclosure requires minimal space

Setup and calibration with 3 push buttons and digital display

Weightless load cell calibration

0 to 10 VDC and 4 to 20 mADC outputs

Current output can be adjusted to 0 to 20 mADC or 0 to 10 mADC

Meter reference output is 0 to 10 VDC or 0 to 1 mADC

Outputs and display have fully adjustable and separate digital filtering

One push button for re-zeroing, with optional input for remote re-zeroing

Alarm output configurable for high tension, low tension, high and low tension, or in between high and low tension

Works with 5 and 7.5 VDC excitation sensors with 1.5 to 100 mV/V sensitivity

32:1 gain adjustment

Automatic load cell diagnostics/fault indicator

DLCA Specifications and Applications

Supply Power	24 VDC, +/- 10%, 0.14 ADC maximum
Inputs	
Load Cell Excitation	5 or 7.5 VDC, 100mADC maximum
Load Cell Sensitivity	1.5 to 100 mV/V single sensor or pair
Digital Input (re-zero)	24 VDC maximum 5 VDC or 24 VDC selectable threshold
Outputs	
Analog Outputs	0 to 10 VDC, 5mA, 2 kohm minimum load 4 to 20 mADC, 450 ohm maximum load
Reference Meter Output	0 to 1 mADC, 1 kohm maximum load or 0 to 10 VDC, open circuit
Alarm Output	30 VDC maximum, 0.4 ADC maximum
Gain	32:1

Display	4-digit LED
Enclosure	IP20
Mounting	DIN 35 Rail
Certifications	CE TUV Mark (UL61010-1) CAN/CSA-C22.2# 61010-1 CB to IEC 61010-1 RoHS
Temperature Range	Operating: 0 to 50 degrees C (32 to 122 degrees F) Storage: -20 to 80 degrees C (-4 to 176 degrees F)
Climate Class	3K3 (EN60721)

Options

Power Converter	85 to 264 VAC to 24 VDC Din-Rail Mount
Part Number	93157-024

TENSION READOUT – WIDE WEB

TENSION READOUT – SINGLE STRAND

TENSION REFERENCE – TO WINDER DRIVE

TSA Analog Load Cell Amplifier

Features

Process improvement through repeatable machine settings

Superior drift and linearity performance for accuracy

Selectable 0 to 10 VDC, or 4 to 20 mADC analog output

Compact enclosure requires minimal space

Flexibility of an 8:1 gain adjustment range

Convenient DIN rail mounting

TSA load cell amplifiers provide superior drift and linearity performance for maximum accuracy when measuring the tension of a moving web, wire, or strand. These products amplify a millivolt tension signal to a usable 0 to 10 VDC or 4 to 20 mADC analog output.

Both products feature a gain adjustment range of 8:1, and a tare adjustment up to 50% of the combined load cell rating, giving you access to the entire tension sensing range of any load cell. The TSA offers selectable 115/230 VAC input.

Specifications

Supply Power	115/230 VAC +/- 10%,
OUTPUTS	
Tension Reference Output	0 to 10 VDC, or 4 to 20 mADC
Meter Signal	0 to 1 mADC
Load Cell Excitation Output	5 or 10 VDC, 64 mADC maximum
Tension Load Cell Signal Input	0 to 21 mV, or 0 to 500 mV, jumper selectable
Enclosure	IP20
Operating Temperature	0˚ C to 50˚ C (32 to 122 degrees F)
Storage Temperature	-30˚ C to 80˚ C (-22 to 176 degrees F)
Certifications	CE UL 508C Listed

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TSA Applications and Dimensions

TENSION READOUT – WIDE WEB

LOAD CELL

LOAD CELL

TSA

TENSION READOUT – SINGLE STRAND

LOAD CELL

TSA

TENSION REFERENCE – TO WINDER DRIVE

LOAD CELL   LOAD CELL

MOTOR   TORQUE

TSA

B

C

D

A
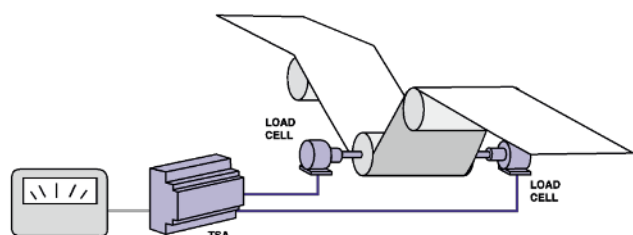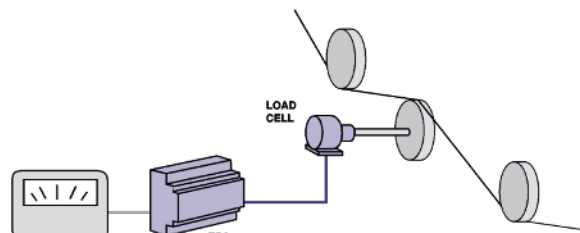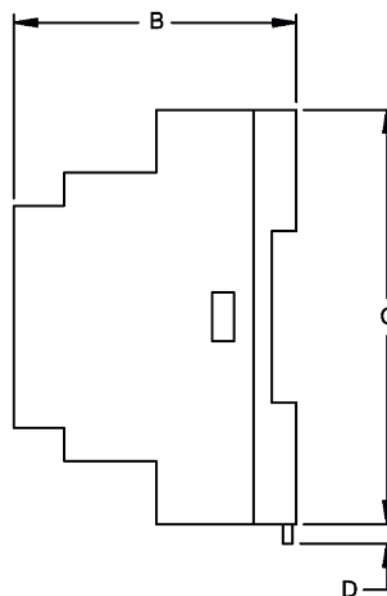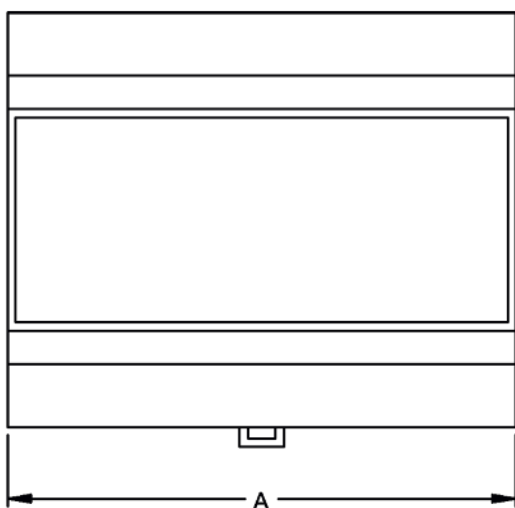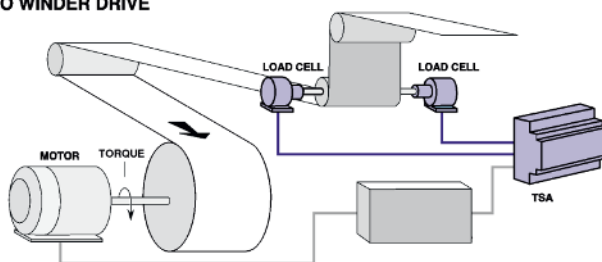
Dimensions in millimeters (inches)

Model	A	B	C	D
TSA	105 (4.13)	58.4 (2.30)	85.8 (3.38)	4.1 (0.16)

TR-5 Analog Tension Readout for Wide or Narrow Web Applications

The MAGPOWR model TR-5 Tension Readout is a device for measuring tension in a moving web, strand, wire or narrow tape. It uses either one or two MAGPOWR load cell(s) and interconnection cable(s).

This system can be used on any non-driven idler roll or at any position where the wrap angle of the web or strand does not change. Each load cell contains four foil type strain gages bonded to a sensing beam. These gages convert the load on the roll or sheave to an electrical signal. Within the TR-5, the signal from the load cell(s) is amplified and displayed on the tension meter.

The amplifier of the TR-5 has low drift and high linearity with a gain control range of 8:1 and tare adjustment of 50%. An auxiliary 0 to 10 VDC, or 4 to 20 mADC output is provided for interfacing to other products or systems.

Features

- Precision tension meter for direct tension readout
- 8:1 calibration range
- Tare adjustment of 50% load cell rating
- Overall system accuracy better than 1%
- Auxiliary 0 to 10 VDC or 4 to 20 mADC output
- Operates with either one or two load cells
- Easy to install and calibrate
- Improved productivity by eliminating operator dependency
- Improved quality through reproducible correct machine settings
- Switch selectable 115/230 VAC input

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TR-5 Dimensions, Specifications and Applications

WIDE WEB

SINGLE STRAND

LOAD CELL

LOAD CELL

TR-5

LOAD CELL

TR-5
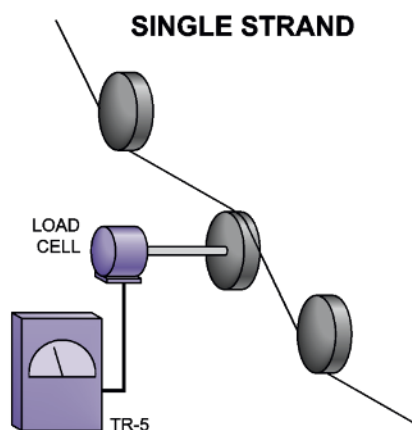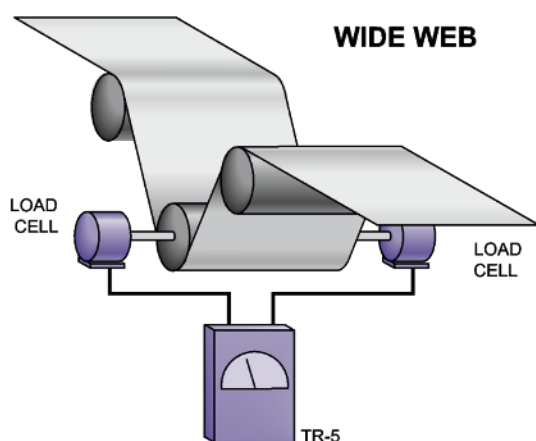
Specifications

TR-5 Supply Power	115/230 VAC ± 10%, 50/60 Hz, switch selectable, 6VA
Tension Input	0 to 21 mV (one or two 350 Ω full bridges), 0 to 500 mV (one 120 Ω full bridge), selectable
TR-5 Output	0 to 10 VDC or 4 to 20 mADC
Accuracy	Maximum null drift .005% of load cell rating per ˚C. Maximum gain drift .02% of reading per ˚C
Tension Load Cell Excitation	5 or 10 VDC

INTERNAL ADJUSTMENTS	
Gain	Calibrates meter (full scale) with load cell loading from 1/8 to full rating
Zero (Tare)	Up to 50% of combined load cell rating
TR-5 Meter	4 inch x 6 inch, 1 mADC scaled 0 to 100%
Temp. Range	0 to 40˚ C operating -30˚ to 65˚ C storage
Weight	5.5 kg (12 lb)
Enclosure	IP20

8.41 [214]
6.00 [152] MTG DIM
1.16 [30]
5.27 [134]
0.13 [3]
10.75 [273] MTG DIM
11.50 [292]
7.00 [178]
1.56 [38]
1.62 [41]
(4) 0.88 [22.38] DIA THRU TYP (4) HOLES
1.00 [25]
5.00 [127]
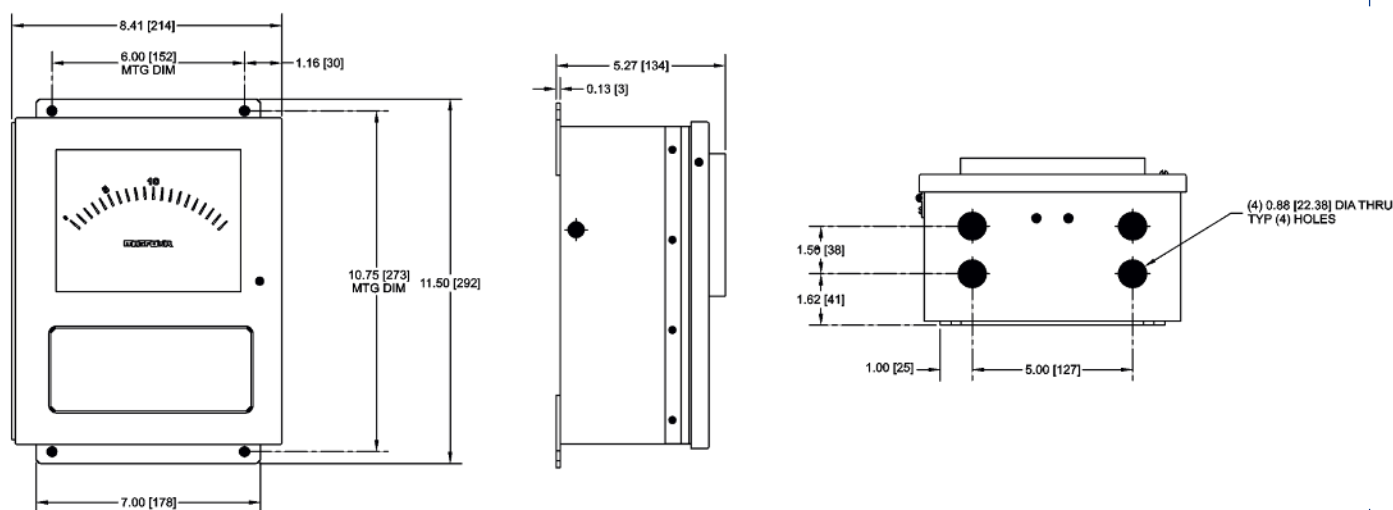
Dimensions shown in inches (mm)

IS-2 Intrinsically Safe Load Cell Amplifier

Features

- Rugged industrial enclosure

- Compatible with all MAGPOWR Load Cells

- Auxiliary 0 to 10 VDC output for interfacing to controllers

- 0 to 1 mADC meter output

- 8:1 range adjustment. Use sensor at 1/8th of its capacity and maintain full scale indication of total web tension

- Dual meter outputs for high and low range indication

- Listed by UL for Class I, Division 1, Groups A, B,C, and D; Class II, Division 1, Groups E,F, and G and Class III, Division 1

The Model IS-2 amplifier provides intrinsically safe circuitry for MAGPOWR load cells. It is specifically designed for safe, accurate measuring and controlling web tension in hazardous locations. When used with the IS-2, all MAGPOWR load cells are UL approved for Class I, Groups A, B, C and D; Class II, Groups E, F, G and Class III. This allows the load cells to be mounted directly in the hazardous area without air purging.

The IS-2 amplifier is compatible with all MAGPOWR load cells, tension readouts and tension controls. An auxiliary 0 to 10 VDC analog signal proportional to tension is available for interfacing to other controls. A calibration range of 8:1 allows you to use the load cells at 1/8th of their capacity and maintain full scale meter indication of total web tension. When used with MAGPOWR load cell cables, the IS-2 amplifier must not be mounted more than 30.5 meters (100 feet) from the load cells.

Specifications

Supply Power	115 VAC +/- 20% 50/60 Hz, 2.5 VA
Maximum Safe Area Voltage	250 VAC
Auxiliary Output	0 to 10 VDC
Meter Output	0 to 1 mADC Dual Scale 10:1 adjustment
Gain	8:1 adjustment range calibrates meter full scale with sensor loading 1/8 to full rating
Zero (Tare)	50% of sensor rating
Certifications	UL Listed
Enclosure	IP20

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IS-2 Applications and Dimensions

HAZARDOUS ATMOSPHERE

Load Cell

Load Cell

NON-HAZARDOUS ATMOSPHERE

Tension Meter

Recorder
or
Computer

MAGPOWR
Tension Control

U.C. Drive
Control

IS-2

Dimensions in inches (mm)

6.16 [156.4]

0.75 [19.0] TYP

4.66 [118.3]

0.25 [6.4]

0.312 [7.9] DIA THRU
(4) MTG HOLES

3.94
[100.0]
MTG DIM

5.44
[138.1]

4.94
[125.4]

0.50 [12.7]

0.37 [9.5]

5.41 [137.3]
MTG DIM

4.81 [122.2]

0.83 [21.0]

3.16 [80.2]

0.88 DIA THRU
(2) HOLES
(1) N.S. (1) F.S.

6.89 [175.0]

0.10 [2.6]
TYP
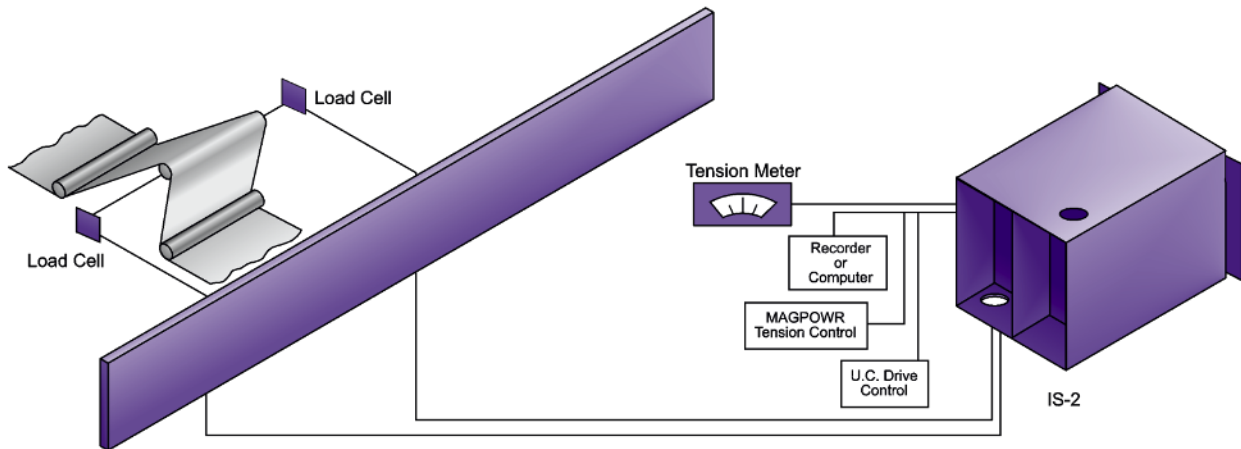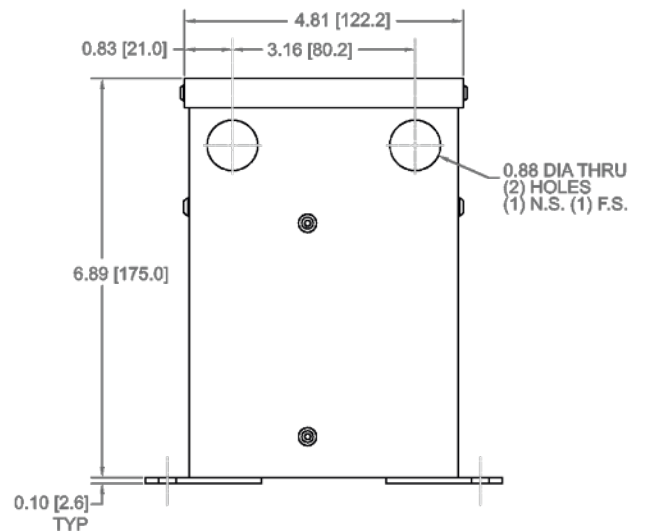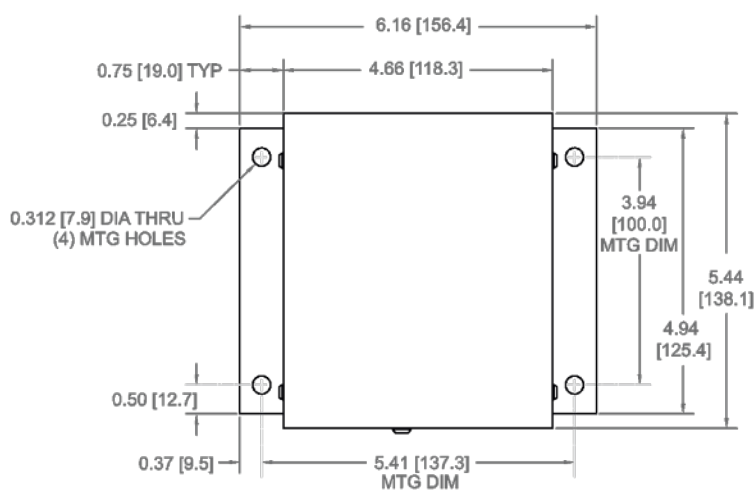
0 to 1 mA Digital Reference Meter and Load Cell Cables

These products are available for purchase separately

The DTM Digital Tension Meter is a compact, affordable instrument to display the value of the meter output, 0 to 1 mA, signal from MAGPOWR tension controls and amplifiers. Designed and manufactured using the latest technology, the DTM is constructed of a lightweight, high impact plastic case with a clear viewing window. The sealed front panel meets NEMA 4X/IP65 specifications for wash-down and/or dusty environments Analog readouts are also available, see page 48.

Features

- **Easy to read LCD with red 15.2 mm (0.6 inch) tall digits**
- **Built-in scaling**
- **Auto zeroing circuit**
- **Compact enclosure fits DIN standard cut-out: 68 mm x 33 mm (2.68 inches x 1.30 inches)**
- **NEMA 4X/IP65 sealed front panel bezel**
- **Wire connections made via screw clamp type terminals**

Specifications

Display	3 1/2 digit (-9999 to 9999), Minus (-) sign is displayed when current is negative
Power	9 to 28 VDC @ 35 mA max Above 26 VDC, derate operating temperature to 50° C
Input Ranges	± 1.000 mADC
Accuracy	(@ 23° C, less than 85% RH) ±(0.1% + 1 digit)
Input	10 mA maximum
Reading Rate	2.5 readings per second
Response Time	1.5 seconds for a step change
Input Impedance	200 MΩ

MAGPOWR products with 0-1 mA Meter Outputs

| Product | Terminals | | Usage |
	Negative	Positive	
Spyder	34	33	Tension
Cygnus	TB4.6	TB4.5	Tension
VERSATEC	TB3.4	TB3.2	Output Percent
DLCA	7	9	Tension
TSA	8	9	Tension
PS-90/DFC90	5	4	Output Percent
DFCA	6	5	Output Percent
PS-24	7	6	Output Percent
IS-2	TBD	TBD	Tension
DTR-65	TBD	TBD	Tension

LCC Cable Series with 12B220-1 connector shown. Lengths available from 5 to 200 meters in 5 meter increments.

SCE Cable Series with 12B193-6 connector shown. Lengths available from 15 to 200 feet.

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PNEUMATIC BRAKES   **MAXCESS**   MAGPOWR

HEB Pneumatic Brakes

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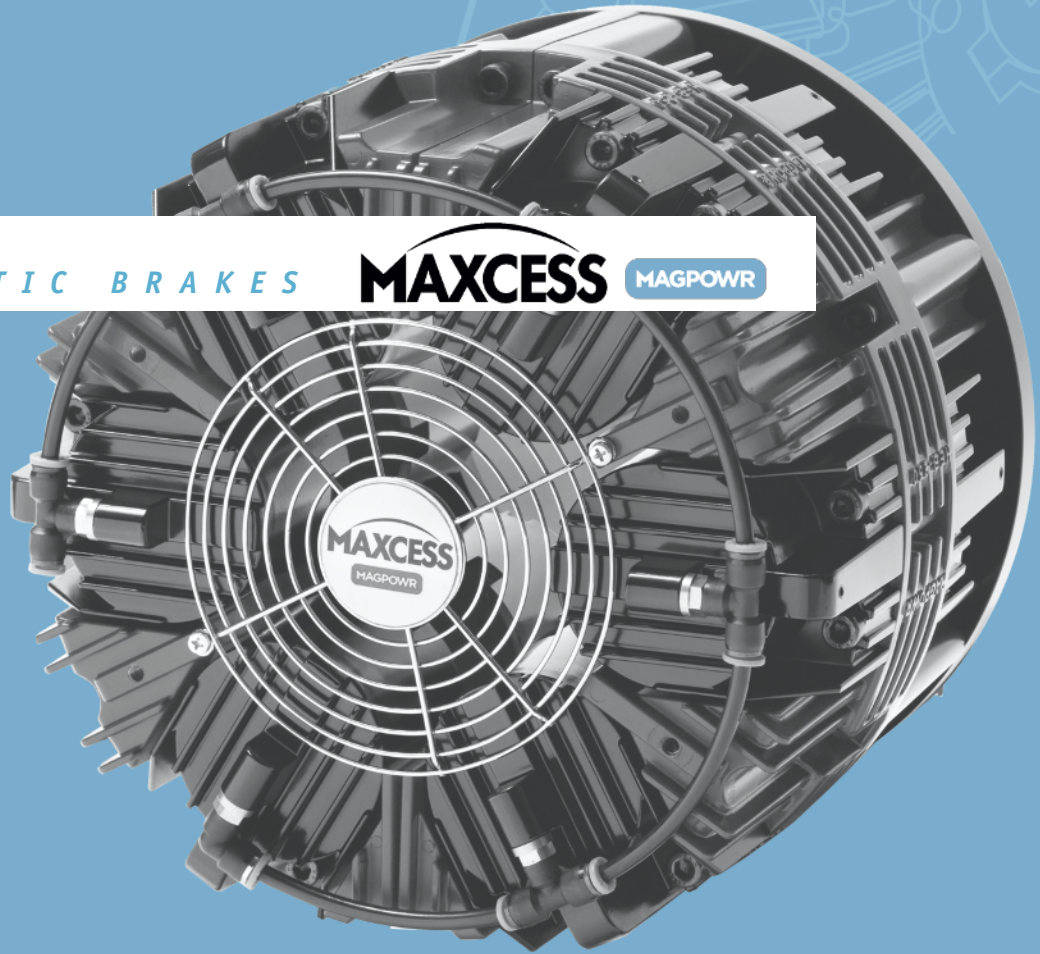
HEB250 without fan cooling option

HEB250 with fan cooling option

The MAGPOWR HEB250 pneumatic brake packs many powerful features into a compact design. Ideal for the demands of general converting and corrugating operations, the HEB produces higher torque at cooler brake pad temperatures. These cooler temperatures along with a thicker brake pad will ensure longer pad life to minimize downtime.

The HEB is engineered for rugged environments, utilizing a single, ventilated cast iron rotor with a bi-directional flute design which allows for efficient cooling when used in either direction of rotation, a through bore and keyway design for easy mounting of the rotor to the brake shaft and an integrated set of caliper mounting brackets that can be mounted directly to the machine frame. These caliper mounting brackets are also an integral part of the safety guarding along with the caliper bodies to reduce the overall size of the brake.

Web tension is accurately controlled by adjusting air pressure to the calipers, pushing brake pads against each side of the rotor to produce consistent brake torque.

Features

Small compact size

Through bores and keyways

Inch and metric bores

Optional mounting adapter

High torque output

High heat dissipation

Longer pad life

Bi-directional cooling

Optional integrated proximity sensor

HEB Specifications and Dimensions

Enclosure	IP20 (IEC529)
Climatic Class	3K3 (EN60721)
Temperature Range	Operating: 0˚ C to 50˚ C Storage: -30˚ C to 80˚ C
Pollution Degree	2 (IEC664-1)
Altitude	0 to 2000 meters
Mounting Style	Through bore and keyway
Maximum RPM	3200 RPM
Brake Pads	Do not contain asbestos
Pad Coefficient of Friction	Low: 0.12 Medium: 0.41 High: 0.51
Maximum Pressure	621 kPa (90 PSI)
Minimum Activation Pressure	21 kPa (3 PSI)
Fan Requirements	Voltage: 24 VDC Current: 1.5 ADC

Proximity Sensor Requirements	
Supply Voltage	24 VDC
Signal Output	NPN N.O.
Maximum Signal Current	200 mADC
Maximum Frequency	2kHz
One Pulse per Revolution	
Certifications	CE

Dimension reflects overall length of brake with fan cooling option

Dimension in millimeters (inches)

Dimension reflects overall length of brake without fan cooling option

HEB Applications

UNWIND

ULTRASONIC SENSOR

TORQUE

PNEUMATIC BRAKE

AIR OUT

VERSATEC CONTROL

AIR IN

CURRENT TO PRESSURE TRANSDUCER

PNEUMATIC BRAKE

UNWIND

TORQUE

AIR OUT

AIR IN

VERSATEC

DANCER ROLL

IP80

DFP SENSOR

AIR IN

AIR OUT

CURRENT TO PRESSURE TRANSDUCER

UNWIND

LOAD CELL

LOAD CELL

PNEUMATIC BRAKE

TORQUE

AIR IN

Cygnus or Spyder Tension Control

CURRENT TO PRESSURE TRANSDUCER

AIR

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HEB Product Selection

Number of Calipers	Number of Pads	Torque at 60 psi (414 kPa) lb-in (Nm) Coefficient of friction of pads			Torque at 80 psi (552 kPa) in lb-in (Nm) Coefficient of friction pads		
		Low (0.12)	Med (0.41)	High (0.51)	Low (0.12)	Medium (0.41)	High (0.51)
1	2	290 (33)	1007 (114)	1174 (133)	387 (44)	1343 (152)	1565 (177)
2	4	580 (66)	2014 (228)	2348 (265)	773 (87)	2685 (303)	3131 (354)
3	6	870 (99)	3021 (341)	3522 (398)	1160 (131)	4028 (455)	4696 (531)
4	8	1160 (132)	4028 (455)	4696 (531)	1547 (175)	5371 (607)	6261 (707)
5	10	1450 (164)	5035 (569)	5870 (663)	1933 (218)	6713 (759)	7827 (884)
6	12	1740 (197)	6042 (683)	7044 (796)	2320 (262)	8056 (910)	9392 (1061)

We recommend sizing the brake using values at 60 psi and medium coefficient of friction pads.

Step 1. Determine torque requirement in lb-in from maximum tension and maximum roll diameter.

Torque = Tension (pounds) x Radius (inches) at full roll

Step 2. Determine RPM for full roll. RPM at full roll diameter = $\dfrac{\text{Maximum Line Speed (fpm)}}{2 \times pi \times r \text{ (r is radius in feet at full roll)}}$

Step 3. Determine thermal heat dissipation required.

Thermal horsepower = $\dfrac{\text{Torque at full roll diameter (in inch-pounds) x RPM at full roll diameter}}{63,000}$

Step 4. Determine Effective Average RPM = $\dfrac{\text{Maximum Line Speed (fpm)}}{3.14 \left(\dfrac{\text{Maximum Roll Diameter (feet) + Core Diameter (feet)}}{2} \right)}$
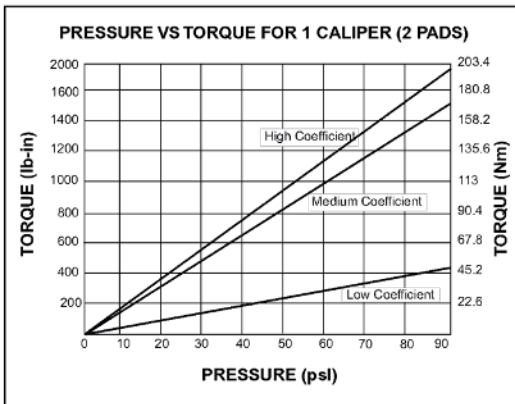
Step 5. Choose the number of calipers required from the chart above that will provide the torque required at the full roll diameter. Since not all facilities have a reliable air pressure source to supply the 80 or 90 psi full pressure rating to the brake, and as a factor of safety in initial applications, select the number of calipers required from the 60 psi table.
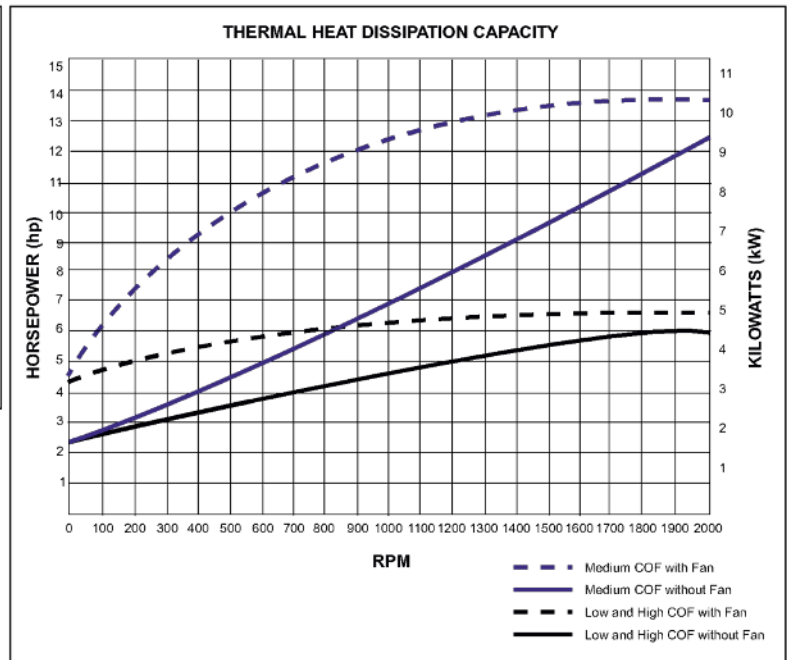
Step 6. Verify that the thermal horsepower generated by the application can be dissipated by looking at the chart to the right and ensure that the calculated horsepower falls on or under the line at the Effective Average RPM calculated in Step 4.

HEB   Ordering Information

A	Number of Calipers	B	Friction Coefficient	C	Fan	D	Proximity Sensor (1)	EE	Rotor Bore (2)
1	1 Caliper	L	Low = 0.12	0	No Fan	0	No Proximity Sensor	0	10 mm (pilot hole)
2	2 Calipers	M	Medium = 0.41	F	Fan	P	Proximity Sensor	10	28 mm
3	3 Calipers	H	High = 0.51					17	35 mm
4	4 Calipers							32	50 mm
5	5 Calipers							42	60 mm
6	6 Calipers							47	1.000 inch
								53	1.375 inches

Notes

(1) If a proximity sensor is selected, then a fan must be selected and the maximum number of calipers is 5

(2) Listed rotor bores are standard. Other non-standard bores are available from 19 mm (0.75 inch) through 60 mm (2.31 inches) for an additional charge

Product Options

Integrated Proximity Sensor

for measuring unwind RPM (assembly mounts in place of one caliper)

Adapter Plate

Used for mounting to Tidland System Boschert Safety Chucks. Adapter plate can also be used with competitive safety chucks, on other bearing housings, but different mounting holes may be needed and supplied by customer. The plate can also be used to mount to a machine frame with uneven surfaces. The Plate is steel and can be welded.

To order the adapter plate, use part number HEB250BKPLT.
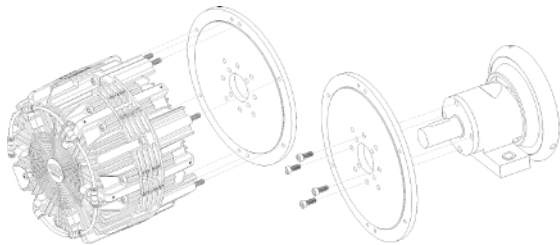
Replacement Pad Kits
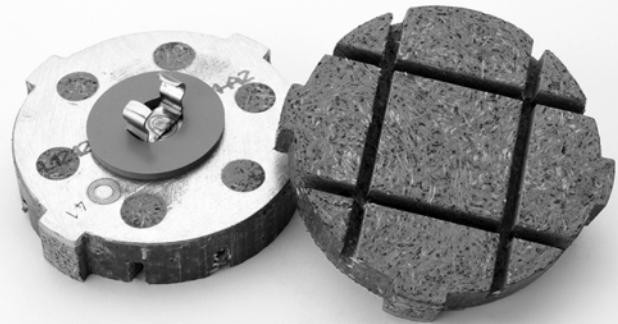
Part Number	Coefficient of Friction	Pad Material	Pad Frame Marked With
HEBPK-L	Low	Non-asbestos standard	.12
HEBPK-M	Medium	Non-asbestos standard	.41
HEBPK-H	High	Non-asbestos standard	.51
HEBPK-KV	Medium	Kevlar	KV

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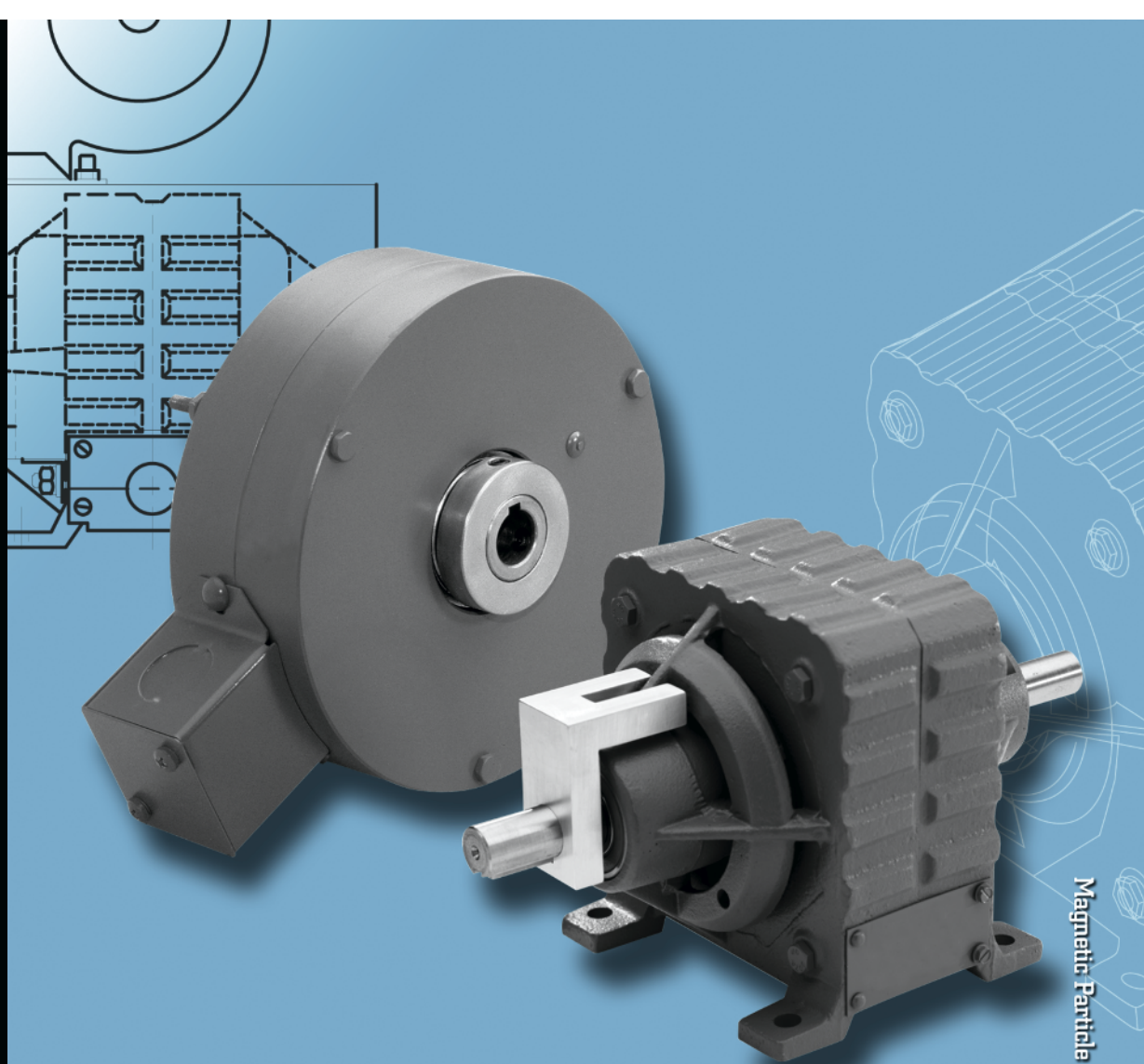
MAGNETIC PARTICLE
CLUTCHES & BRAKES

MAXCESS MAGPOWR

Product Selection Chart

For the tension control solution that is right for you, simply find your application in the chart below, then select the product that best suits your specific requirements from MAGPOWR's complete line of Magnetic Particle Brakes and Clutches.

	'C' STYLE CLUTCH (FOOT MOUNTED)	'C' STYLE BRAKE (FOOT MOUNTED)	GLOBAL CLUTCH (SHAFT MOUNTED)	GLOBAL BRAKE (SHAFT MOUNTED)	'B' STYLE BRAKE (SHAFT MOUNTED)	SOFSTEP CLUTCH (FOOT MOUNTED*)	SOFSTEP BRAKE (FOOT MOUNTED*)
Manual Control							
Manual Unwind (Magnetic Particle)		X		X	X		X
Manual Point-to-Point (Magnetic Particle)	X	X	X	X	X	X	X
Manual Rewind (Magnetic Particle)	X		X			X	
Open Loop Follower Arm							
Follower Arm Unwind (Magnetic Particle)		X		X	X		X
Follower Arm Rewind (Magnetic Particle)	X		X			X	
Open Loop Ultrasonic							
Ultrasonic Unwind (Magnetic Particle)		X		X	X		X
Ultrasonic Rewind (Magnetic Particle)	X		X			X	
Closed Loop Load Cell							
Digital Tension Readout and Control Unwind (Magnetic Particle)		X		X	X		X
Digital Tension Readout and Control Point-to-Point (Magnetic Particle)	X	X	X	X	X	X	X
Digital Tension Readout and Control Rewind (Magnetic Particle)	X		X			X	
Closed Loop Dancer							
Dancer Control Unwind (Magnetic Particle)		X		X	X		X
Dancer Control Rewind (Magnetic Particle)	X		X			X	

* with optional brackets at purchase

The MAGPOWR Clutch

MAGNETIC FIELD   COIL   MAGNETIC PARTICLES

STATOR

DRIVE CYLINDER

ROTOR

ROTOR SHAFT

BEARINGS

DRIVE CYLINDER SHAFT

c(UL)us LISTED   CE
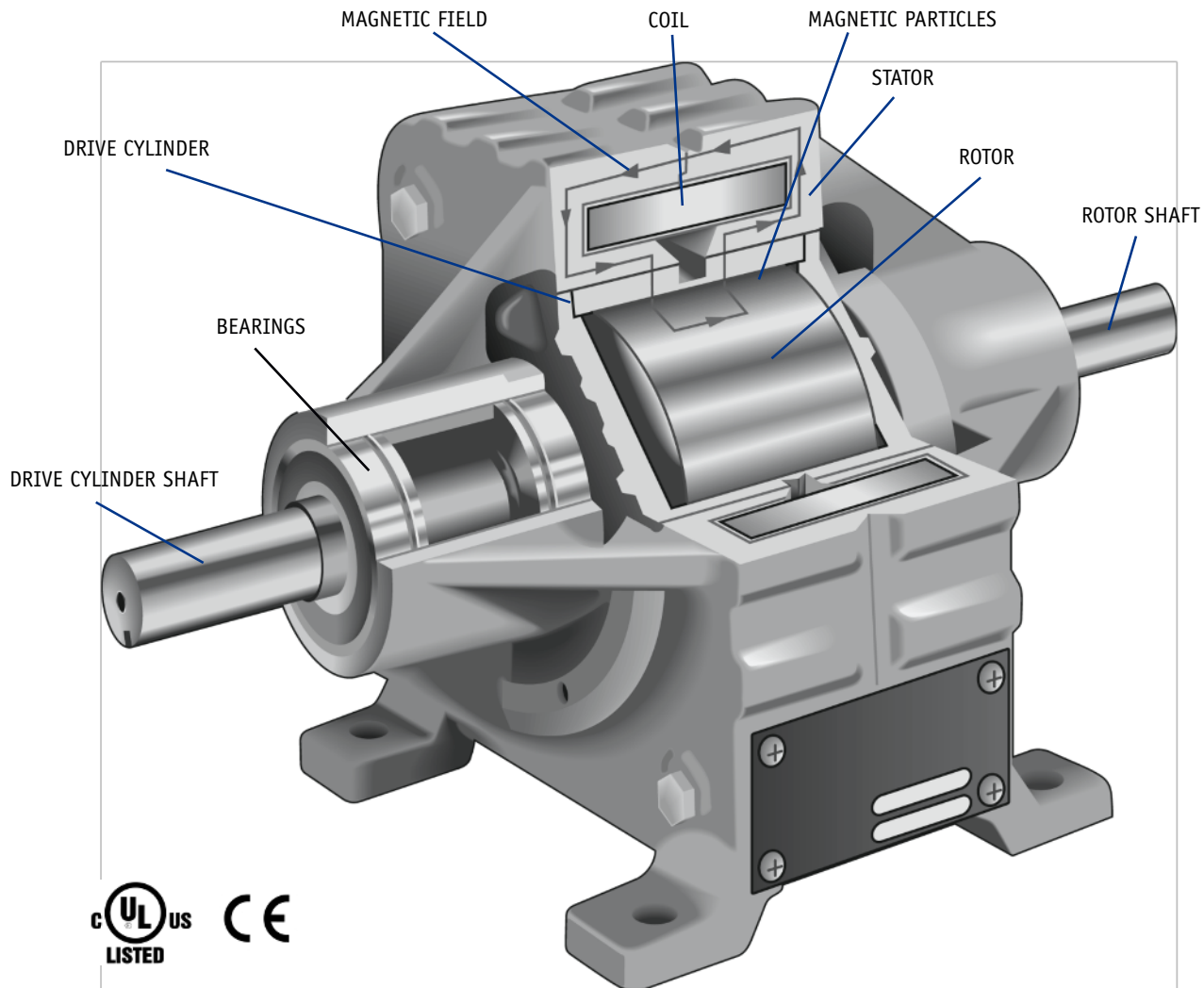
Features

- Long life
- Constant torque
- Torque proportional to current
- Torque independent of speed
- Constant tension
- Smooth, accurate, repeatable torque
- Silent operation

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The Magnetic Particle Clutch

The magnetic particle clutch is basically a very simple device. The illustration shows the principal parts of the clutch. At the inner-most position is a smooth solid rotor. This rotor is surrounded by the drive cylinder. This cylinder is also smooth on the inside and outside diameters, and is supported by the drive cylinder shaft which is mounted in ball bearings. Magnetic particles are located in the space between the OD of the rotor and the ID of the drive cylinder. The two matching stator frames surround the drive cylinder and coil, and provide support for the bearings.

With no current in the coil, the particles are free to lie loosely between the rotor and drive cylinder. When current is applied to the coil, it sets up a magnetic field in the stator. This field passes through the drive cylinder, through the magnetic particles and into the rotor. The magnetic particles line up with the magnetic field and couple the rotor to the drive cylinder. As the current is increased, the field strength increases. This coupling, or torque capacity, is proportional to the amount of current in the coil.

In normal operation, the drive cylinder is attached to the drive mechanism, and the rotor is connected to the load. With no current in the clutch, the load is not connected to the drive. As the current is increased, more torque ability is developed in the clutch and this torque is delivered to the load. As long as the load torque requirements are less than the torque setting in the clutch, the drive and the load are 100% coupled, with no slip. Slip only occurs when the clutch torque is commanded to a level equal to or less than the load requirements.

The magnetic particle clutch is unique in that it acts like a "torque valve", allowing any amount of torque to be passed to the load. Long life, smooth starts, and silent operation make it perfect for cycling and overload applications. Offered in a variety of mounting styles in both clutch and brake configurations, the machine designer can be assured of finding the proper unit for his machine.

MAGPOWR Tech Notes: Low Speed Application

MAGPOWR clutches and brakes provide torque independent of speed down to 0 rpm, however, the ability to dissipate heat generated under slip conditions limits the torque at higher slip speeds. The heat dissipation is dependent upon the speed of the outer rotating member.

The charts below list the maximum input speed each clutch can be run at its rated torque with the process side locked at 0 rpm. They also apply for brakes by defining the maximum input speed the process can be run at rated torque.

Clutches

Model	Torque lb-ft	Max rpm Input
C-1	1	430
C-3	3	427
C-3A	3	1170
C-10	10	145
C-10A	10	431
C-10W	10	1920
C-10WA	10	3020
C-50	50	38
C-50A	50	135
C-50W	50	350
C-50WA	50	810
C-100	100	34
C-100A	100	87
C-100W	100	272
C-100WA	100	497

Brakes

Model	Torque lb-ft	Max rpm Input
B-5	5	116
B-5A	5	428
B-25	25	47
B-25A	25	161
B-50	50	41
B-50A	50	108
C-10B	10	145
C-10AB	10	431
C-10WB	10	1920
C-10WAB	10	3020
C-50B	50	38
C-50AB	50	135
C-50WB	50	350
C-50WAB	50	810
C-100B	100	34
C-100AB	100	87
C-100WB	100	272
C-100WAB	100	497
B-7V	7	55
B-20V	20	35

Global Clutches

Model	Torque lb-ft	Max rpm Input
GCA	5.5	257
GCB	11	137
GCC	26	66
GCD	56	25
GCA-AIR	5.5	613
GCB-AIR	11	332
GCC-AIR	26	184
GCD-AIR	56	92

Global Brakes

Model	Torque lb-ft	Max rpm Input
GBA	5.5	92
GBA-AIR	5.5	350
GBB	11	39
GBB-AIR	11	191
GBC	26	38
GBC-AIR	26	141
GBD	56	19
GBD-AIR	56	73
GBE	100	22
GBE-AIR	100	87
GBF	325	12.9
GBF-AIR	325	41.8

Clutches/Brakes

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Information Required

REWIND

Core Diameter = 8 inches
Roll Diameter = 24 inches
Tension = 40 lb
Velocity = 150 fpm

MOTOR   CLUTCH   TORQUE
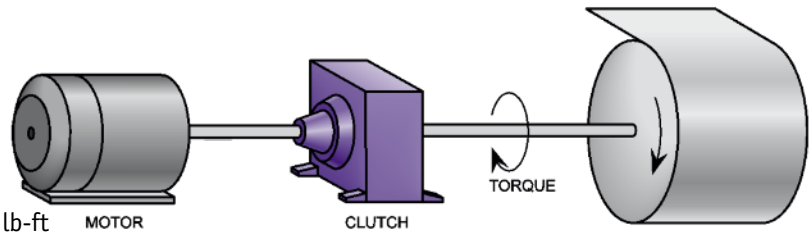
How to Size

Torque = Tension x Radius = 40(12/12) = 40 lb-ft

Maximum clutch rpm = $\dfrac{\text{Velocity}}{\pi(\text{Core Dia.})} = \dfrac{150}{\pi(8/12)}$ = 72 rpm

Minimum clutch rpm = $\dfrac{150}{\pi(24/12)}$ = 24 rpm

Maximum input rpm* = (maximum clutch rpm) x 1.10 = (72)(1.1) ≈ 79
*we recommend the motor be driven 10% faster than the maximum rollspeed to ensure constant tension in the web

Slipwatts = $\dfrac{\text{Torque x Slip rpm}}{7} = \dfrac{40(79-24)}{7}$ = 314 watts

Use a C-50 Clutch

Information Required

CYCLING

Tension = 150 lb
Motor = 200 rpm
Clutch continually energized

PRESS ALTERNATELY
HOLDS & RELEASES

12" DIAMETER NIPS

MOTOR   CLUTCH   TORQUE
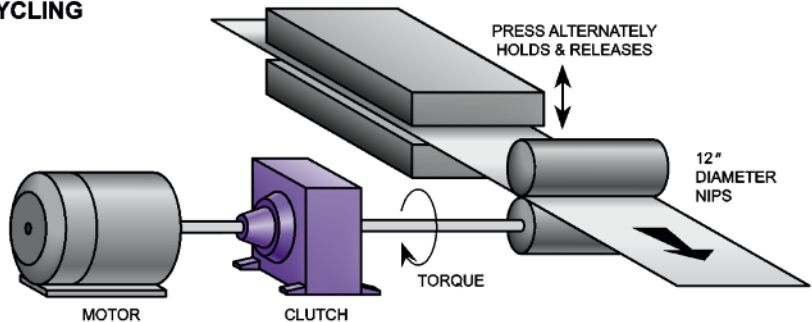
How to Size

Torque = Tension x Radius = 150(6/12) = 75 lb-ft

Slipwatts = $\dfrac{\text{Torque x rpm}}{7} = \dfrac{75(200)}{7}$ = 2142 watts

But clutch is only slipping half the time

watts = $\dfrac{2142}{2}$ = 1071

Use a C-100A Clutch

Applications & Calculations

Information Required

Motor = 3 hp
        1750 rpm

OVERLOAD PROTECTION

How to Size

Torque = $\dfrac{hp(5250)}{rpm}$ = $\dfrac{3(5250)}{1750}$ = 9 lb-ft

Use a C-10 Clutch

Information Required

Motor = 2 hp
        1800 rpm

SOFT START
(CONTROLLED ACCELERATION)

How to Size

Torque = $\dfrac{hp(5250)}{rpm}$ = $\dfrac{2(5250)}{1800}$ = 5.8 lb-ft
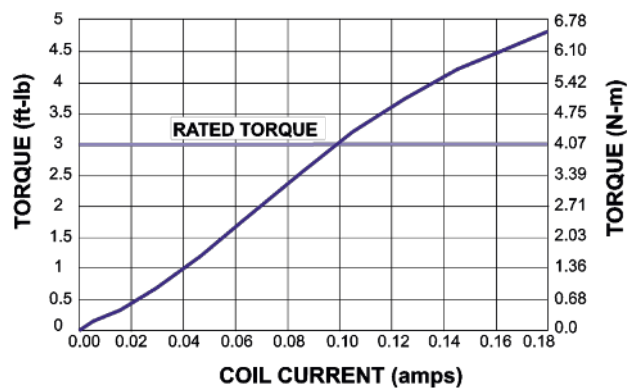
Use a C-10 Clutch
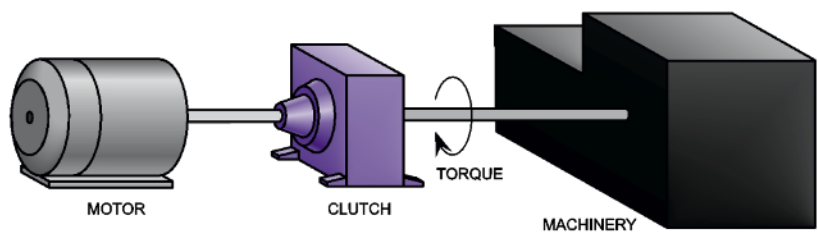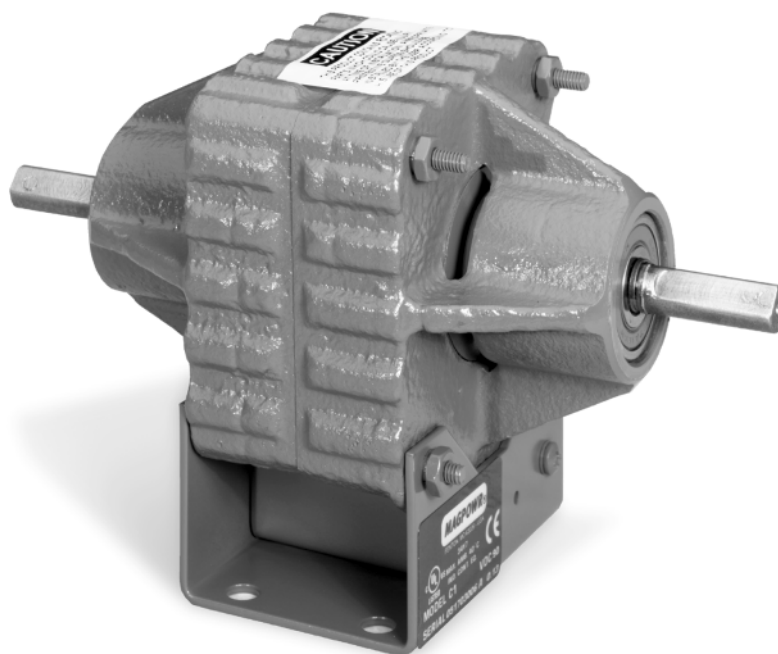
C-1 Clutch

## Typical Heat Dissipation Capacity
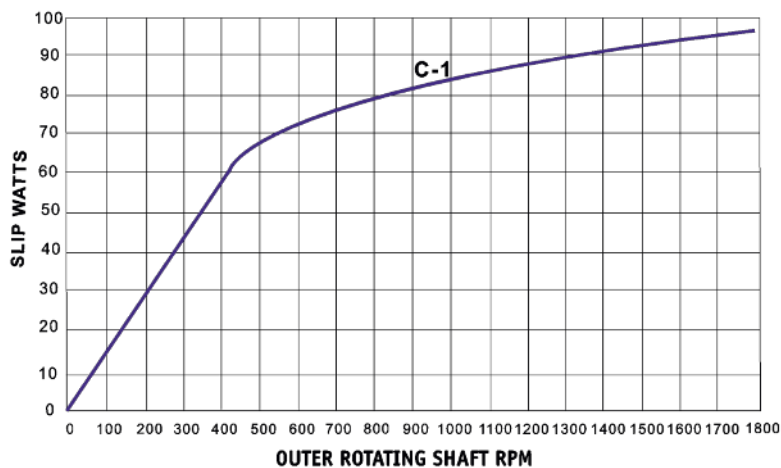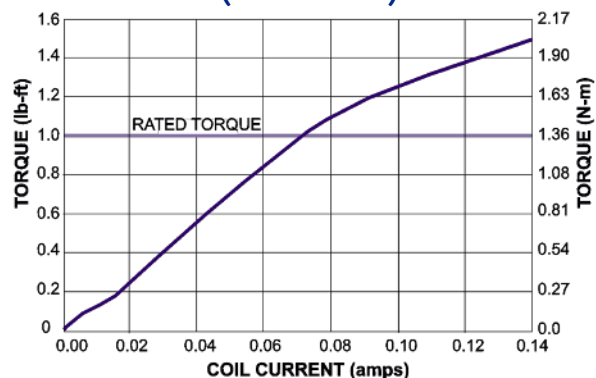
Typical Torque vs. Current (90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a clutch at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

Dimensions & Specifications
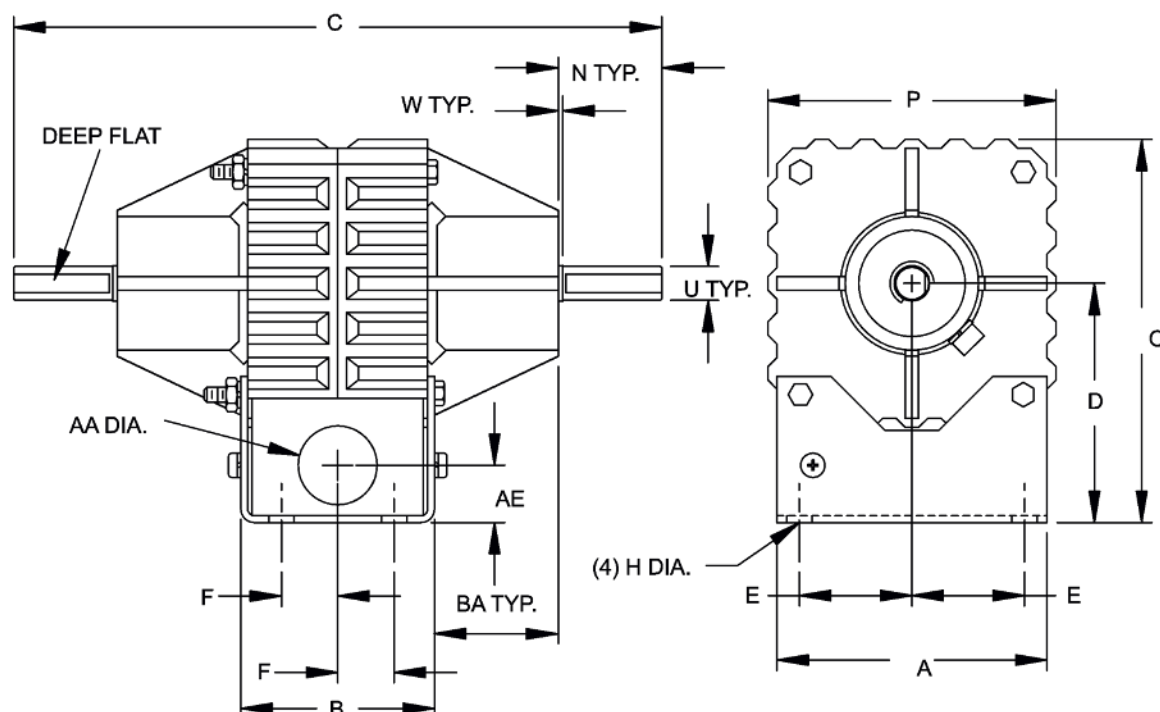
Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	H	N	O	P	U	W	AA	AE	BA
C-1	3.0	2.16	7.17	2.62	1.25	0.63	0.28	1.14	4.21	3.20	0.38	0.04	0.88	0.66	1.83
C-1	76.2	54.9	182.1	66.6	31.8	15.9	7.1	28.8	107.0	81.0	9.5	0.9	22.2	16.6	46.4

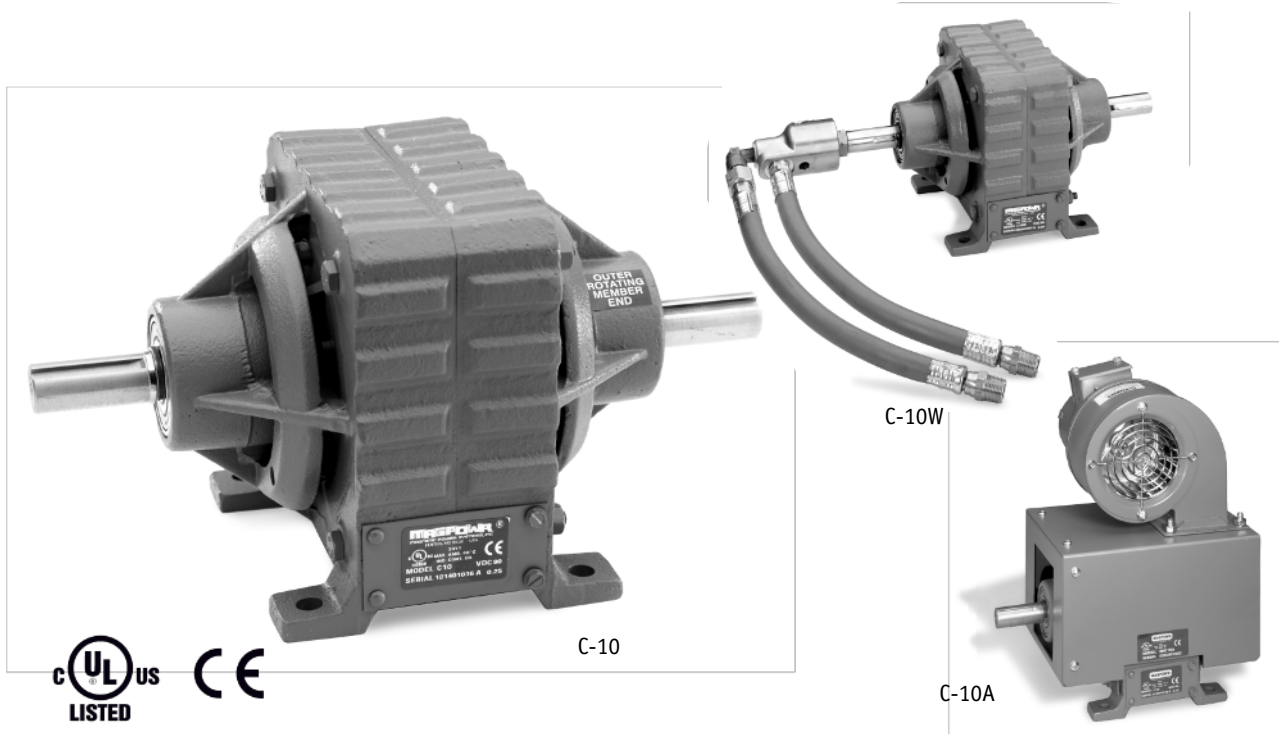| Model	2 shafts
C-1	0.05 Deep Flat
C-1	1.2 Deep Flat

Specifications (metric in shaded area)

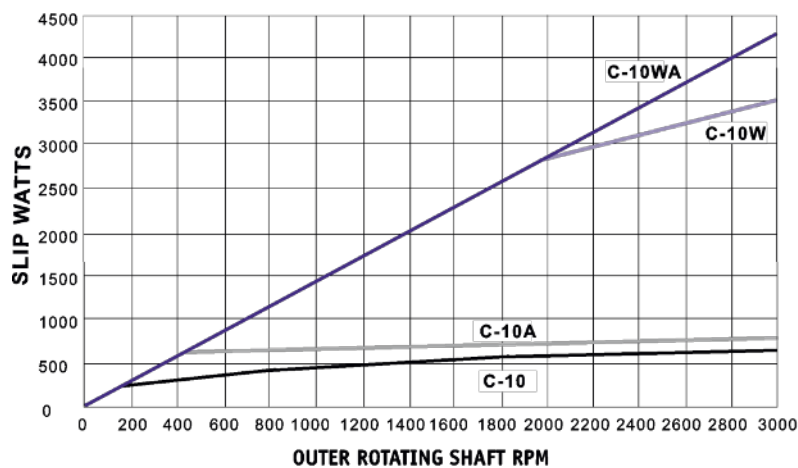| Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR^2) of Rotating Members (lb-ft^2) (kg-m^2)		WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp		Outer	Inner		Rated Current	Ω @ 20˚C	Current	Torque
C-1	1	95	0.13	.04	0.00103	0.00075	5.7	0.14	414	0.08	0.11
C-1	1.36	95	0.13	.05	0.000043	0.000032	2.6	0.14	414	0.08	0.11

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30˚ of horizontal.
Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.

C-3 Clutch
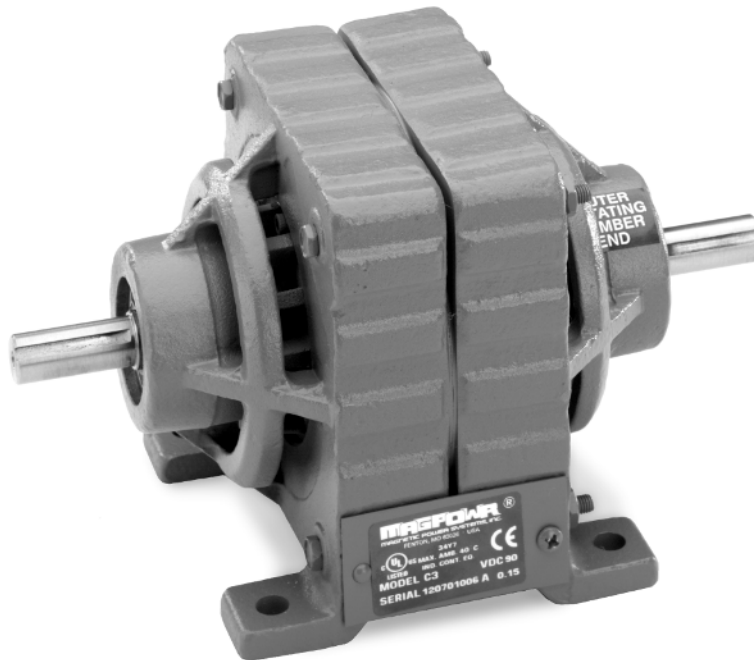
Typical Heat Dissipation Capacity
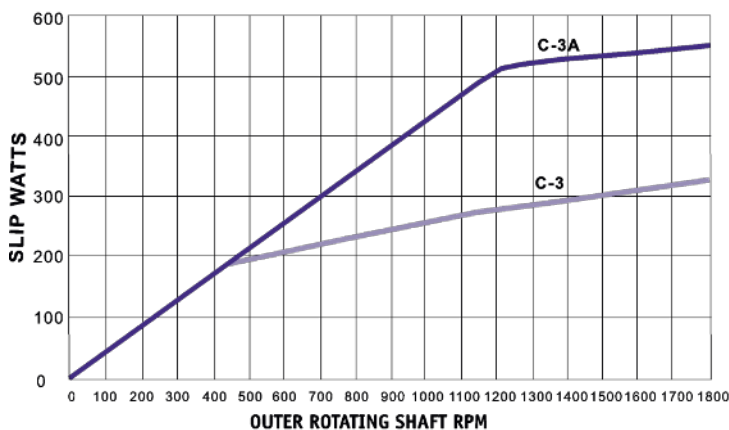
Typical Torque vs. Current (90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a clutch at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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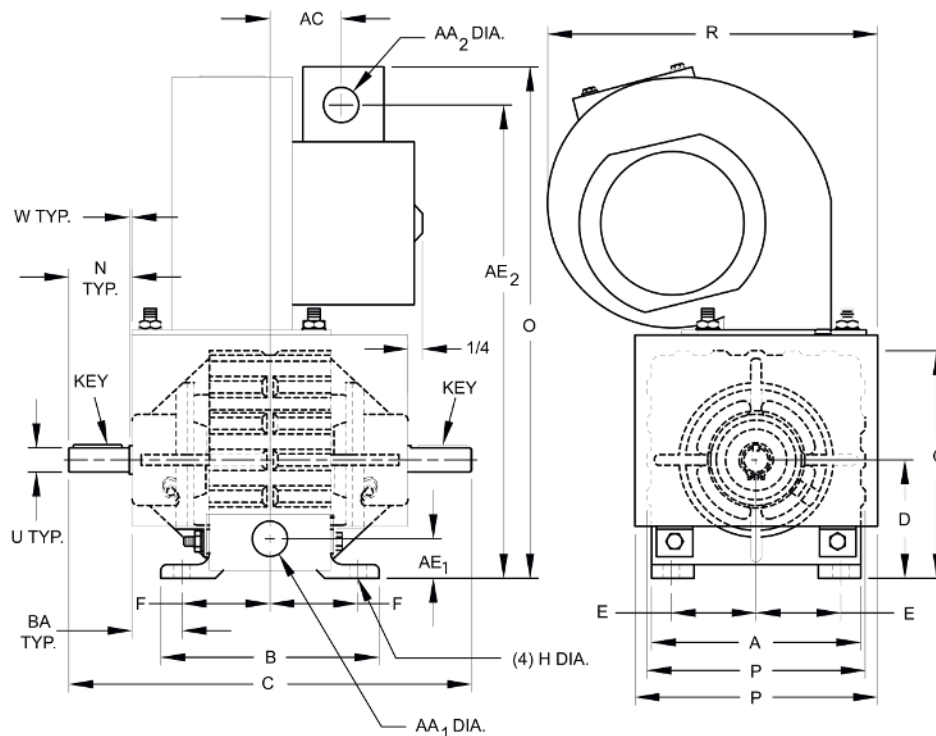
Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	H	N	O	P	R	U	W	AA1	AA2	AC
C-3	4.31	4.50	8.25	2.44	1.75	1.815	0.344	1.28	4.69	4.5	-	0.4997	0.03	7/8	-	-
C-3A	4.44	4.50	8.25	2.44	1.75	1.813	0.344	1.25	10.38	5.0	6.75	0.4997	0.03	7/8	0.88	2.55
C-3	109.5	114.3	209.6	61.9	44.5	46.1	8.74	32.5	119.1	114.3	-	12.69	0.8	22.2	-	-
C-3A	109.5	114.3	209.6	61.9	44.5	46.0	8.73	32.5	268.4	127.0	178.0	12.69	0.8	22.2	22.2	64.6

Model	AE1	AE2	BA	Key
C-3	0.81	-	1.03	1/8 X 1/8 X 1
C-3A	0.78	9.75	1.03	1/8 X 1/8 X 1
C-3	20.6	-	26.16	3.2 X 3.2 X 25.4
C-3A	19.9	247.7	26.16	3.2 X 3.2 X 25.4

Specifications (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR^2) of Rotating Members (lb-ft^2) (kg-m^2)		WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp		Outer	Inner		Rated Current	Ω @ 20°C	Current	Torque
C-3	3	321	0.43	0.11	0.00886	0.00418	11.8	0.17	350	0.08	0.11
C-3A	3	544	0.73	0.11	0.00886	0.00418	16.3	0.17	350	0.08	0.11
C-3	4.1	321	0.43	0.15	0.000373	0.000176	5.3	0.17	350	0.08	0.11
C-3A	4.1	544	0.73	0.15	0.000373	0.000176	7.4	0.17	350	0.08	0.11

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30° of horizontal. Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.
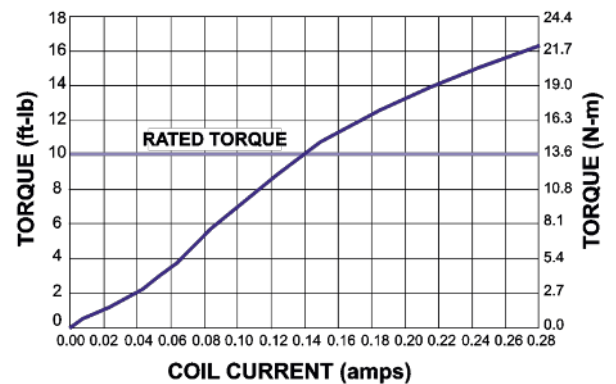* Fan power requirements: 115 VAC, 60 Hz, 0.60 amp

Magnetic Particle Clutches & Brakes

C-10 Clutch

OUTER ROTATING MEMBER END

C-10

C-10W

C-10A

Typical Heat Dissipation Capacity

C-10WA
C-10W
C-10A
C-10

SLIP WATTS
OUTER ROTATING SHAFT RPM

## Typical Torque vs. Current (90 VDC coil)

RATED TORQUE

TORQUE (ft-lb)
TORQUE (N-m)
COIL CURRENT (amps)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a clutch at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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C-10 Dimensions & Specifications
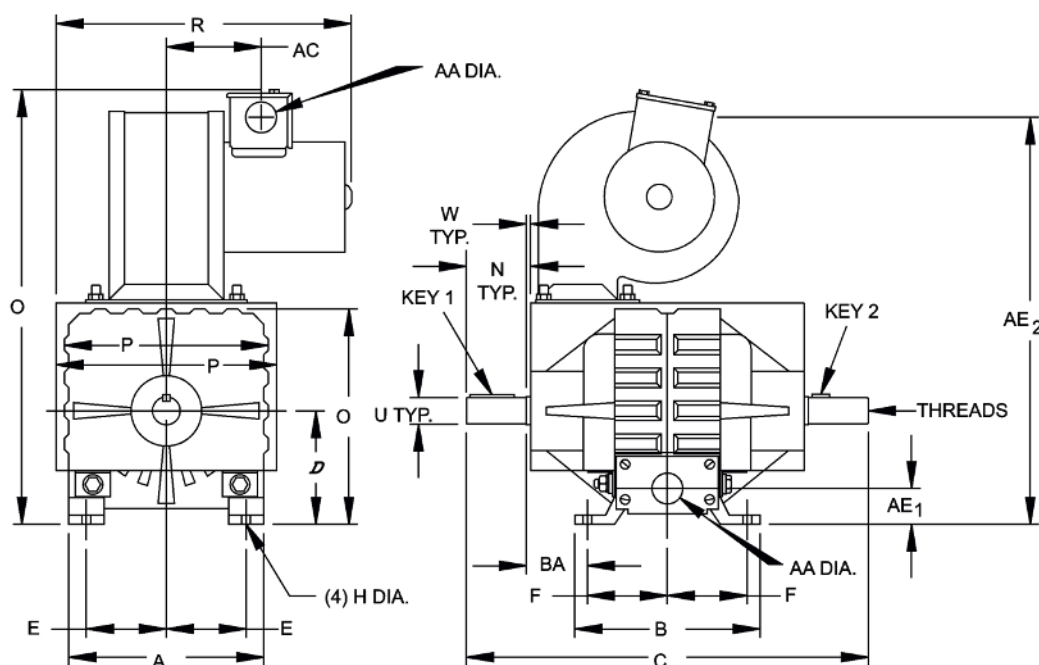
Key 1- All Models
3/16 X 3/16 X 1 1/4 inches
4.8 X 4.8 X 32 mm

Key 2 - C-10 and C-10A
3/16 X 3/16 X 1 1/4 inch
4.8 X 4.8 X 32 mm

Key 2 - C-10W and C-10WA
3/16 X 3/16 X 1/2 inch
4.8 X 4.8 X 16 mm

Threads - C10W and C-10WA
5/8 inch - 18NF x 0.68 inch Deep
5/8 inch - 18NF x 17 mm Deep

Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	H	N	O	P	R	U	AA	AC	AE1	AE2	BA	W
C-10	5.53	5.25	11.41	3.24	2.38	2.095	0.406	1.90	6.13	5.78	-	0.75	7/8	-	0.93	-	1.82	0.11
C-10W	5.53	5.25	11.41	3.24	2.38	2.095	0.406	1.90	6.13	5.78	-	0.75	7/8	-	0.93	-	1.82	0.11
C-10A	5.53	5.25	11.41	3.24	2.38	2.090	0.406	1.83	12.25	6.25	8.51	0.75	7/8	2.71	0.93	11.45	1.91	0.13
C-10WA	5.53	5.25	11.41	3.24	2.38	2.090	0.406	1.89	12.25	6.25	8.51	0.75	7/8	2.71	0.93	11.45	1.91	0.11
C-10	140.5	133.4	289.7	82.3	60.3	53.2	10.32	48.3	155.7	146.8	-	19.04	22.2	-	23.5	-	46.2	2.7
C-10W	140.5	133.4	289.7	82.3	60.3	53.2	10.32	48.3	155.7	146.8	-	19.04	22.2	-	23.5	-	46.2	2.7
C-10A	140.5	133.4	289.7	82.3	60.3	53.2	10.32	46.5	311.2	158.8	216.1	19.04	22.2	68.7	23.5	290.7	48.5	3.3
C-10WA	140.5	133.4	289.7	82.3	60.3	53.2	10.32	48.0	311.2	158.8	216.1	19.04	22.2	68.7	23.5	290.7	48.5	3.3

Specifications (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR^2) of Rotating Members (lb-ft^2) (kg-m^2)		WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp		Outer	Inner		Rated Current	Ω @ 20°C	Current	Torque
C-10	10	564	0.76	0.15	0.052	0.032	25	0.25	234	0.15	0.25
C-10W	10	2557	3.43	0.15	0.052	0.025	24	0.25	234	0.15	0.25
C-10A	10	725	0.97	0.15	0.052	0.032	34	0.25	234	0.15	0.25
C-10WA	10	2557	3.43	0.15	0.052	0.025	33	0.25	234	0.15	0.25
C-10	13.6	564	0.76	0.20	0.00219	0.00135	11	0.25	234	0.15	0.25
C-10W	13.6	2557	3.43	0.20	0.00219	0.00105	11	0.25	234	0.15	0.25
C-10A	13.6	725	0.97	0.20	0.00219	0.00135	15	0.25	234	0.15	0.25
C-10WA	13.6	2557	3.43	0.20	0.00219	0.00105	15	0.25	234	0.15	0.25

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30° of horizontal. Water requirements are 1/4 gpm minimum @ 103° F maximum. Separate water fitting required for W models. Fan power requirements are 115 VAC, 60 Hz, 1.37 amp. Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.

Magnetic Particle Clutches & Brakes
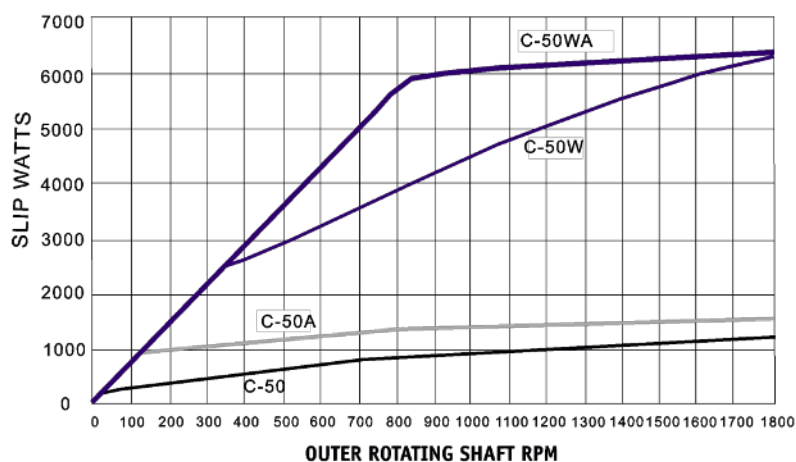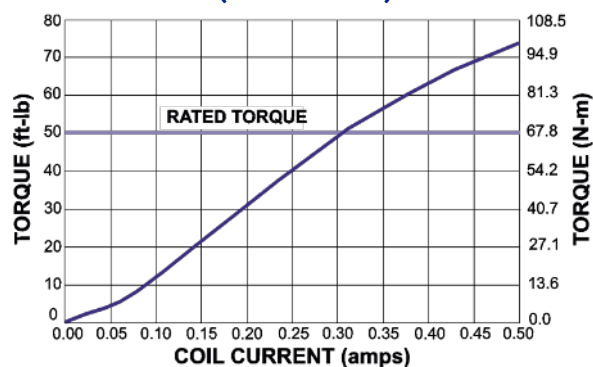
C-50 Clutch
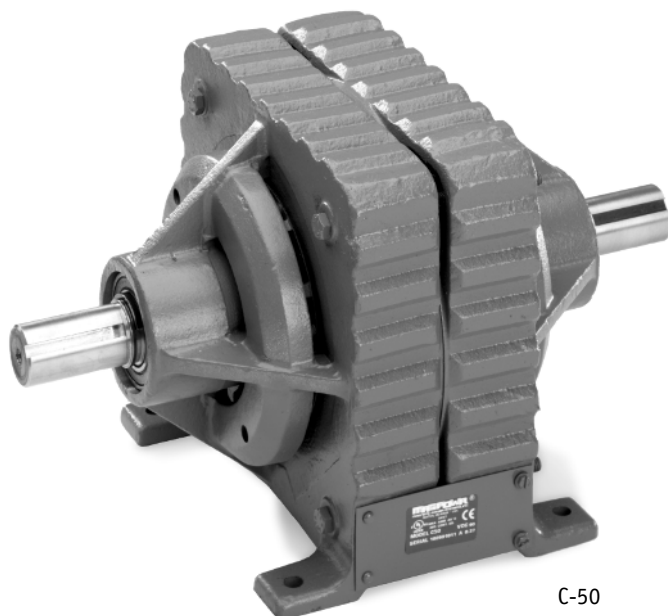
C-50

C-50W

C-50A

## Typical Heat Dissipation Capacity

Typical Torque vs. Current (90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a clutch at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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Dimensions & Specifications
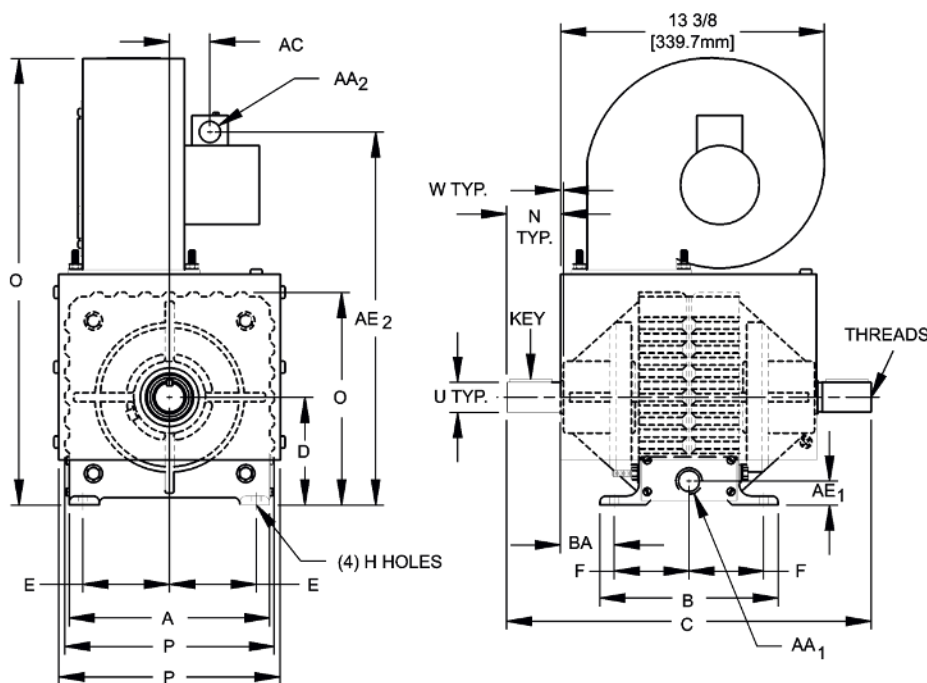
Key
1/4 X 1/4 X 1 3/4 inches
6.4 X 6.4 X 44 mm

Threads
3/4 inch - 16NF x 13/16 inch Deep
3/4 inch - 16NF x 21 mm Deep

Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	H	N	O	P	U	W	AA1	AE1	BA	AA2	AC	AE2
C-50	8.38	7.45	15.26	4.5	3.625	3.125	0.406	2.26	8.87	8.75	1.25	0.12	7/8, 1 1/8	0.93	2.25	-	-	-
C-50W	8.38	7.45	15.26	4.5	3.625	3.125	0.406	2.26	8.87	8.75	1.25	0.12	7/8, 1 1/8	0.93	2.25	-	-	-
C-50A	8.38	7.45	15.26	4.5	3.630	3.130	0.406	2.26	18.56	9.25	1.25	0.10	7/8, 1 1/8	0.93	2.25	0.88	1.70	15.62
C-50WA	8.38	7.45	15.26	4.5	3.630	3.130	0.406	2.26	18.56	9.25	1.25	0.10	7/8, 1 1/8	0.93	2.25	0.88	1.70	15.62
C-50	212.7	189.2	387.5	114.2	92.1	79.4	10.32	57.4	225.3	222.3	31.75	3.0	22.2	23.4	57.1	-	-	-
C-50W	212.7	189.2	387.5	114.2	92.1	79.4	10.32	57.4	225.3	222.3	31.75	3.0	22.2	23.4	57.1	-	-	-
C-50A	212.7	189.2	387.5	114.2	92.1	79.4	10.32	57.3	471.4	235.0	31.75	2.5	22.6	23.4	57.1	22.2	43.2	396.6
C-50WA	212.7	189.2	387.5	114.2	92.1	79.4	10.32	57.3	471.4	235.0	31.75	2.5	22.6	23.4	57.1	22.2	43.2	396.6

Specification (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR²) of Rotating Members (lb-ft²) (kg-m²)		WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp		Outer	Inner		Rated Current	Ω @ 20°C	Current	Torque
C-50	50	1297	1.74	0.80	0.36	0.26	89	0.49	119	0.30	1.00
C-50W	50	6254	8.38	0.80	0.36	0.24	85	0.49	119	0.30	1.00
C-50A	50	1538	2.06	0.80	0.36	0.26	109	0.49	119	0.30	1.00
C-50WA	50	6430	8.61	0.80	0.36	0.24	105	0.49	119	0.30	1.00
C-50	67.8	1297	1.74	1.10	0.0152	0.0110	40	0.49	119	0.30	1.00
C-50W	67.8	6254	8.38	1.10	0.0152	0.0101	39	0.49	119	0.30	1.00
C-50A	67.8	1538	2.06	1.10	0.0152	0.0110	49	0.49	119	0.30	1.00
C-50WA	67.8	6430	8.61	1.10	0.0152	0.0101	48	0.49	119	0.30	1.00

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30° of horizontal. Water requirements are 1 gpm minimum @ 103° F maximum. Separate water fitting required for W models. Fan power requirements are 115 VAC, 60 Hz, 1.86 amp. Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.

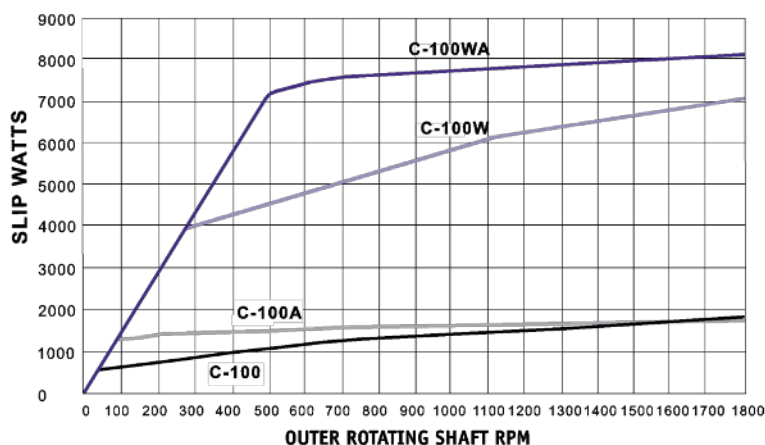**Magnetic Particle Clutches & Brakes**
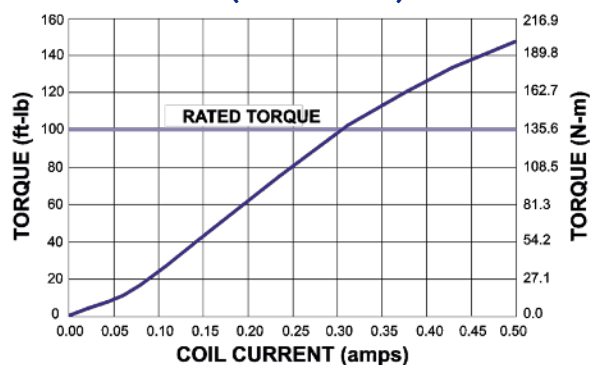
C-100 Clutch

C-100W

C-100

C-100A

Typical Heat Dissipation Capacity

C-100WA

C-100W

C-100A

C-100

SLIP WATTS

OUTER ROTATING SHAFT RPM

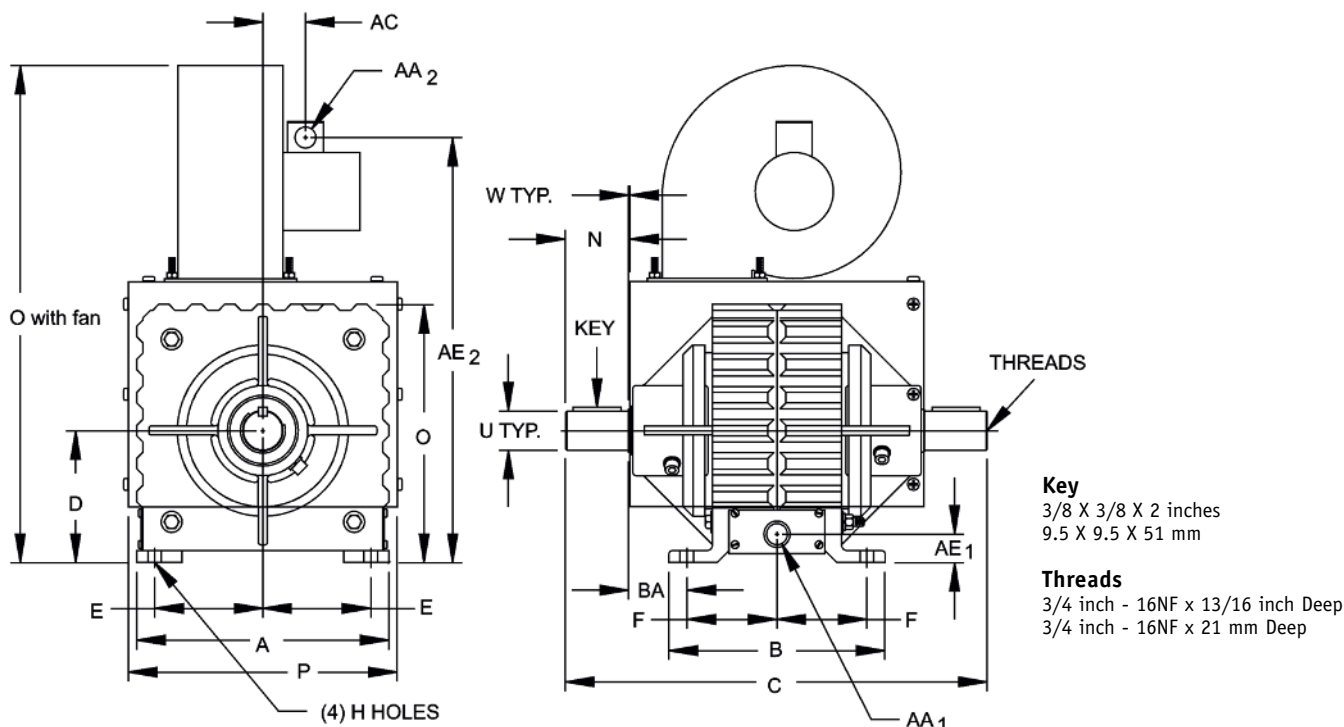## Typical Torque vs. Current (90 VDC coil)

RATED TORQUE

TORQUE (ft-lb)

TORQUE (N-m)

COIL CURRENT (amps)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a clutch at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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Dimensions & Specifications

Key
3/8 X 3/8 X 2 inches
9.5 X 9.5 X 51 mm

Threads
3/4 inch - 16NF x 13/16 inch Deep
3/4 inch - 16NF x 21 mm Deep

Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	H	N	O	P	U	W	AA1	AE1	BA	AA2	AC	AE2
C-100	10.50	9.00	17.50	5.50	4.5	3.75	0.562	2.75	10.75	10.50	1.625	0.13	7/8, 1 1/8	1.19	2.38	-	-	-
C-100W	10.50	9.00	17.50	5.50	4.5	3.75	0.562	2.75	10.75	10.50	1.625	0.13	7/8, 1 1/8	1.19	2.38	-	-	-
C-100A	10.50	9.00	17.50	5.50	4.5	3.75	0.562	2.67	20.44	11.19	1.625	0.05	7/8, 1 1/8	1.19	2.38	0.88	1.86	17.50
C-100WA	10.50	9.00	17.50	5.50	4.5	3.75	0.562	2.67	20.44	11.19	1.625	0.05	7/8, 1 1/8	1.19	2.38	0.88	1.86	17.50
C-100	266.7	228.6	444.5	139.7	114.3	95.3	14.29	69.9	273.1	266.7	41.28	3.3	22.2	30.2	60.5	-	-	-
C-100W	266.7	228.6	444.5	139.7	114.3	95.3	14.29	69.9	273.1	266.7	41.28	3.3	22.2	30.2	60.5	-	-	-
C-100A	266.7	228.6	444.5	139.7	114.3	95.3	14.29	67.9	519.3	284.2	41.28	1.4	22.2	30.2	60.5	22.2	47.2	444.5
C-100WA	266.7	228.6	444.5	139.7	114.3	95.3	14.29	67.9	519.3	284.2	41.28	1.4	22.2	30.2	60.5	22.2	47.2	444.5

Specifications (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR2) of Rotating Members (lb-ft2) (kg-m2)		WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp		Outer	Inner		Rated Current	Ω @ 20°C	Current	Torque
C-100	100	1714	2.30	1.20	0.65	0.61	156	0.50	118	0.60	1.15
C-100W	100	7013	9.40	1.20	0.65	0.60	153	0.50	118	0.60	1.15
C-100A	100	1714	2.30	1.20	0.65	0.61	180	0.50	118	0.60	1.15
C-100WA	100	8110	10.87	1.20	0.65	0.60	177	0.50	118	0.60	1.15
C-100	135.6	1714	2.30	1.63	0.0274	0.0257	71	0.50	118	0.60	1.15
C-100W	135.6	7013	9.40	1.63	0.0274	0.0253	69	0.50	118	0.60	1.15
C-100A	135.6	1714	2.30	1.63	0.0274	0.0257	82	0.50	118	0.60	1.15
C-100WA	135.6	8110	10.87	1.63	0.0274	0.0253	80	0.50	118	0.60	1.15

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30° of horizontal. Water requirements are 1 gpm minimum @ 103° F maximum. Separate water fitting required for W models. Fan power requirements are 115 VAC, 60 Hz, 1.86 amp. Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.

Global Shaft Mounted Magnetic Particle Clutches

$_c$(UL) CE

(24 vdc model only)
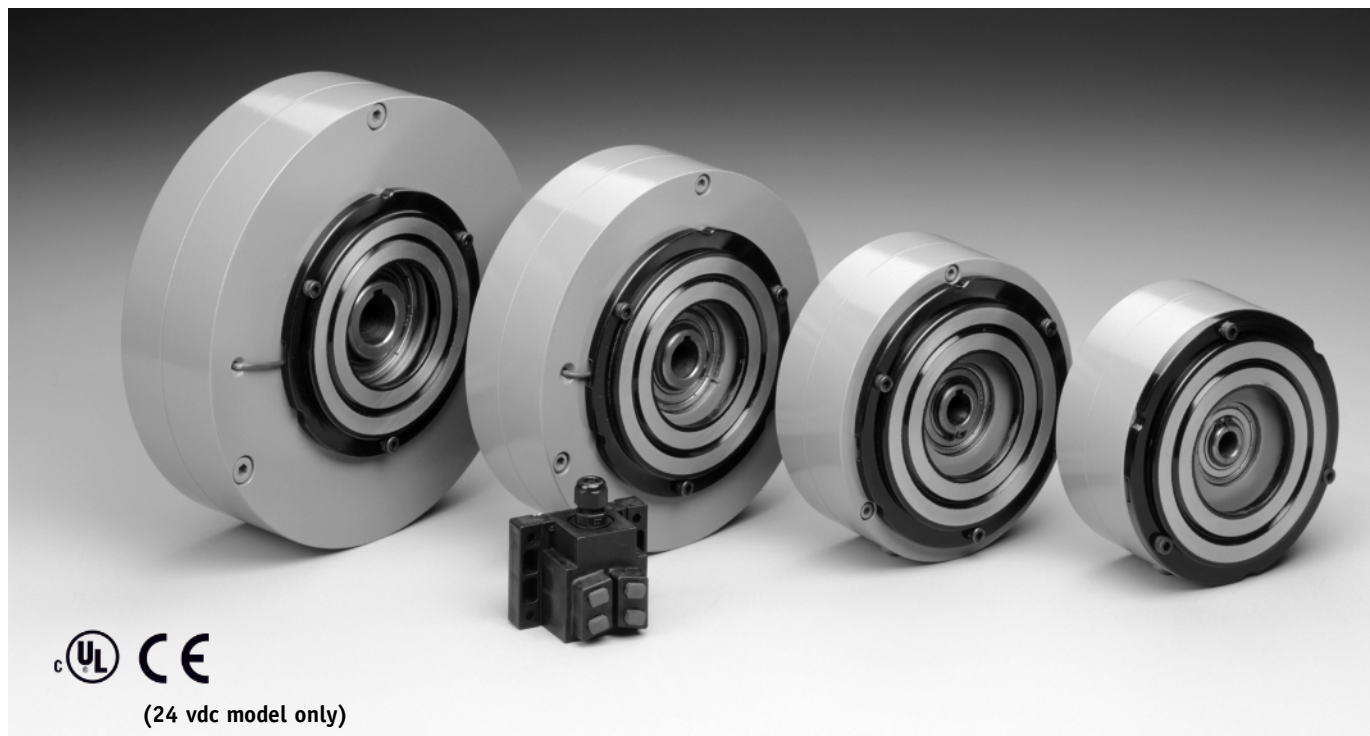
The MAGPOWR Global clutch line represents state-of-the-art magnetic particle technology. The latest materials and components, modern CNC manufacturing techniques and a sleek new design make these clutches the first choice of engineers designing machines or retrofit equipment.

The clutch consists of two rotating members. The inner member is the rotor, and the outer rotating member is the housing assembly. The rotor is the output member, and it is mounted on a rotating shaft in the machine. The housing assembly is the input member. It is driven by a gear, pulley, or sprocket attached to the mounting rabbet, which is provided on the side of the clutch housing.

Power is transmitted from the Brush Block assembly through slip rings to the coil inside the rotating clutch housing. The Brush Block assembly is mounted to a stationary portion of the machine frame, while the slip rings are an integral part of the rotating clutch housing.

The rotating coil design offers a very compact clutch with the added advantage of high heat dissipation without an auxiliary blower. No couplings, mounting feet or other attachments are required, since the clutch becomes an integral part of your machine.

Smooth controllable torque, torque repeatability and torque independent of speed make these clutches suitable for many power transmission and tensioning applications. Long life is assured by polished seal surfaces, high temperature materials and rugged construction. This line features compact size with through bores and all machined housings for ease of mounting.

This is truly a "Global" product with the M (Metric) series having full metric bores and keyways, as well as metric mounting hardware and set screws. Metric dimensioning is provided to support international design requirements. This is the clutch line for the global marketplace.

ttemsa

Global Clutch Applications

Information Required

Core Dia. = 8 inches
Roll Dia. = 24 inches
Tension = 20 lb
Velocity = 150 fpm

How to Size

Torque = Tension x Radius = 20(12/12) = 20 lb-ft

$$\text{Motor rpm} = \frac{\text{Velocity}}{\pi(\text{Core Dia.})} = \frac{150}{\pi(8/12)} = 72 \text{ rpm}$$

$$\text{Min. clutch rpm} = \frac{150}{\pi(24/12)} = 24 \text{ rpm}$$

$$\text{Slipwatts} = \frac{\text{Torque x Slip rpm}}{7} = \frac{20(72-24)}{7} = 137 \text{ watts}$$

Use a GCC Clutch

REWIND

MOTOR
CLUTCH
TORQUE
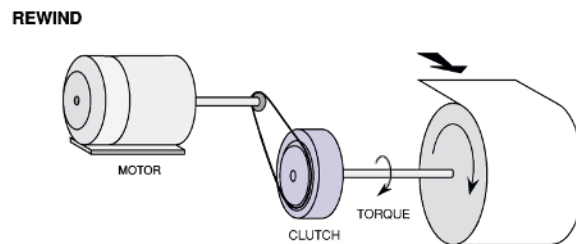
Information Required

Motor = 3 hp
　　　　1750 rpm

How to Size

$$\text{Torque} = \frac{\text{hp}(5250)}{\text{rpm}} = \frac{3(5250)}{1750} = 9 \text{ lb-ft}$$

Use a GCB Clutch

OVERLOAD PROTECTION

MOTOR
CLUTCH
TORQUE
JAM UP
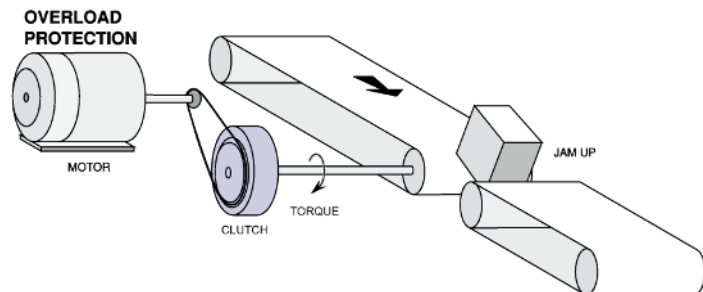
Information Required

Motor = 2 hp
　　　　1800 rpm

How to Size

$$\text{Torque} = \frac{\text{hp}(5250)}{\text{rpm}} = \frac{2(5250)}{1800} = 5.8 \text{ lb-ft}$$

Use a GCB Clutch

SOFT START (CONTROLLED ACCELERATION)

MOTOR
CLUTCH
TORQUE
MACHINERY
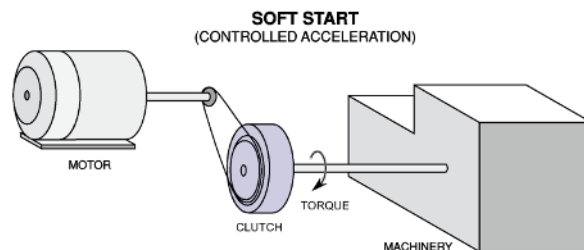
Information Required

Tension = 40 lb
Motor = 120 rpm
Clutch continually energized

How to Size

Torque = Tension x Radius = 40(6/12) = 20 lb-ft

$$\text{Slipwatts} = \frac{\text{Torque x rpm}}{7} = \frac{20(120)}{7} = 343 \text{ watts}$$

But clutch is only slipping half the time

$$\text{Slipwatts} = \frac{343}{2} = 172 \text{ watts}$$

Use a GCC Clutch

SOFT START (CONTROLLED ACCELERATION)

MOTOR
CLUTCH
TORQUE
MACHINERY
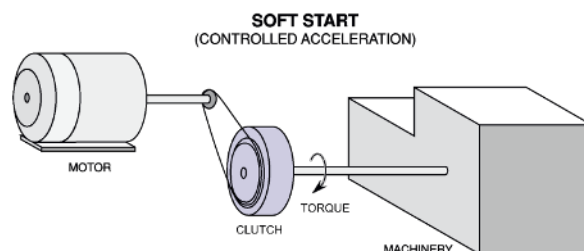
Global Clutch Dimensions and Ordering Information

BB Brush Block shown must be ordered separately
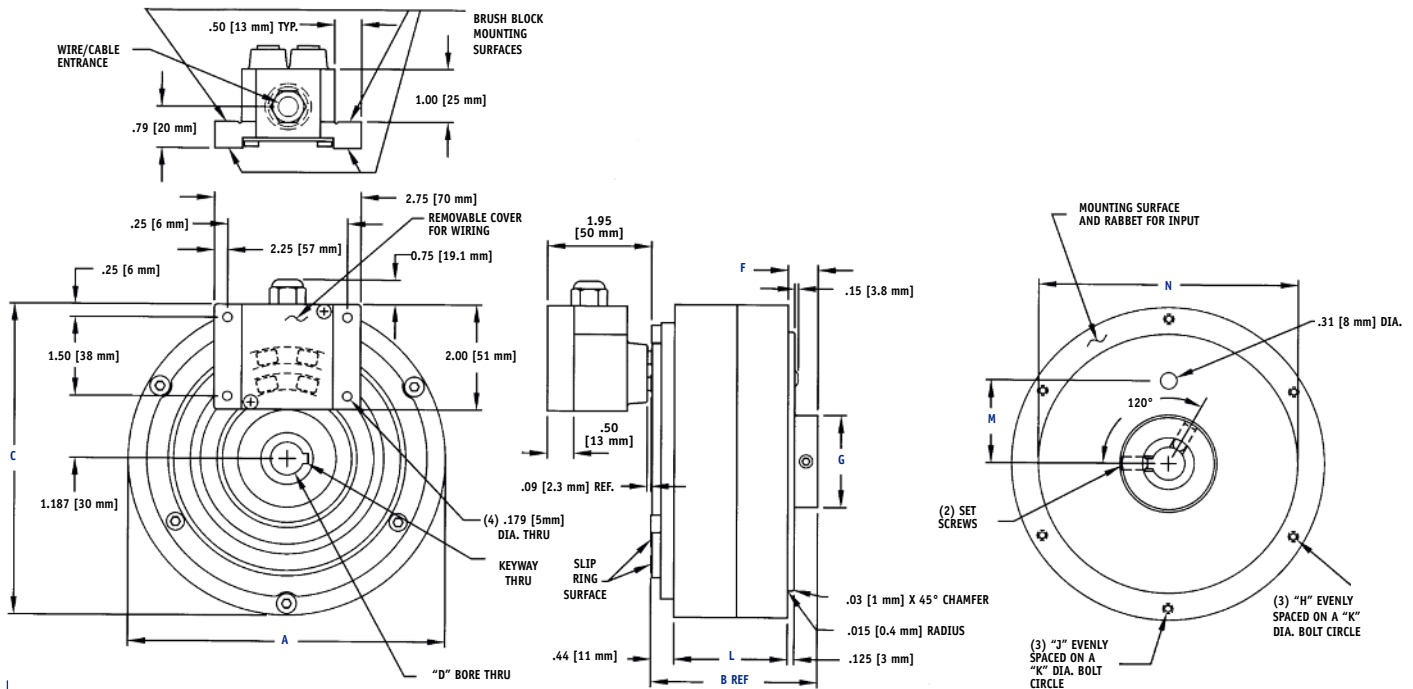
Dimensions (millimeters in shaded area)

Model	A	B	C	D*	Keyway	Set Screws	F	G	H	J	K	L	M	N**
GCA	5.31	3.07	5.59	0.500	None	M5 x .8	0.50	1.38	#10-32 x 0.90	M5 x 0.8 x 10 mm	4.812	2.13	1.30	3.937
GCAM	134.9	77.9	142.0	14 H8	None	M5 x .8	12.7	34.9	#10-32 x 0.90	M5 x 0.8 x 10 mm	122.20	54.1	33.0	100.00
GCB	5.94	3.16	5.91	0.625	3/16 x 3/32	M6 x 1.0	0.57	1.75	#10-32 x 0.90	M5 x 0.8 x 13 mm	5.500	2.15	1.57	4.921
GCBM	150.9	80.1	150.0	17 H8	5 x 2.5	M6 x 1.0	14.3	44.5	#10-32 x 0.90	M5 x 0.8 x 13 mm	139.70	54.7	39.9	125.00
GCC	7.50	3.38	6.69	0.750	3/16 x 3/32	M6 x 1.0	0.56	1.88	1/4-20 x 1.00	M6 x 1.0 x 13 mm	6.938	2.38	2.00	5.906
GCCM	190.5	85.6	169.9	19 H8	6 x 3	M6 x 1.0	14.3	47.6	1/4-20 x 1.00	M6 x 1.0 x 13 mm	176.23	60.3	50.8	150.00
GCD	8.88	3.75	7.38	1.000	1/4 x1/8	M8 x 1.25	0.62	2.38	5/16 -18 x 1.20	M8 x 1.25 x 14 mm	8.250	2.69	2.70	6.890
GCDM	225.6	95.2	187.4	25 H8	8 x 3.5	M8 x 1.25	15.9	60.3	5/16 -18 x 1.20	M8 x 1.25 x 14 mm	209.60	68.2	68.0	175.00

* +0.001 / -0.000   ** +0.000 / -0.003

Ordering Information

Global clutches are available in four sizes. You may also select the coil voltage, and inch or metric dimensions.
The model number indicates which options have been selected.

GC   A   M   90

| Global Clutch | Size A, B, C, D | Metric Model Metric bore and hardware (leave blank for Imperial) | Coil Voltage 90 VDC or 24 VDC |
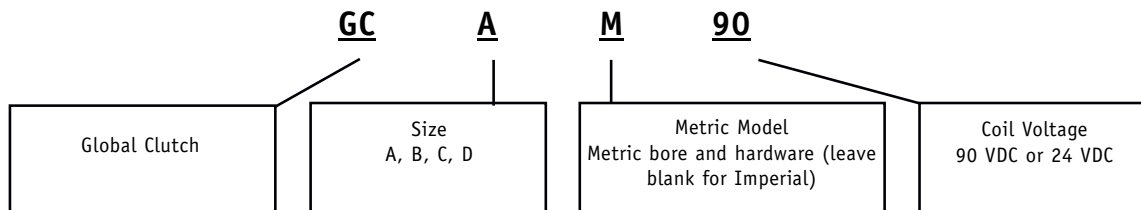
One (1) model BB brush block kit is required for each clutch. You must order this separately.
The model BB brush block is compatible with all clutch sizes and coil voltages.

Magnetic Particle Clutches & Brakes

⚹ttemsa

Global Clutch Specifications

Model	Rated Torque		Heat Dissipation at 1800 rpm of Outer Member (Watts)	Non-Excited Drag Torque		Inertia (WR²) of Rotating Members				Weight		Coil Data (90 VDC)		Time Constant (Seconds)	
						Outer		Inner							
	lb-ft	Nm		lb-ft	Nm	lb-ft²	kg-m²	lb-ft²	kg-m²	lb	kg	Rated Current	Ω @ 20°C	Current	Torque
GCA GCAM	5.5	7.5	392	.07	.09	.27	.012	.013	.00055	11	5	.16	361	.11	.17
GCB GCBM	11	14.9	411	.07	.09	.43	.018	.030	.0013	14	6	.21	278	.11	.17
GCC GCCM	26	35.2	575	.23	.31	1.19	.050	.08	.0034	25	11	.32	186	.17	.22
GCD GCDM	56	75.9	719	.53	.76	2.47	.104	.30	.013	37	17	.39	150	.18	.26

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30° of horizontal.
Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.

Typical Torque vs. Current
(90 VDC and 24 VDC Models)
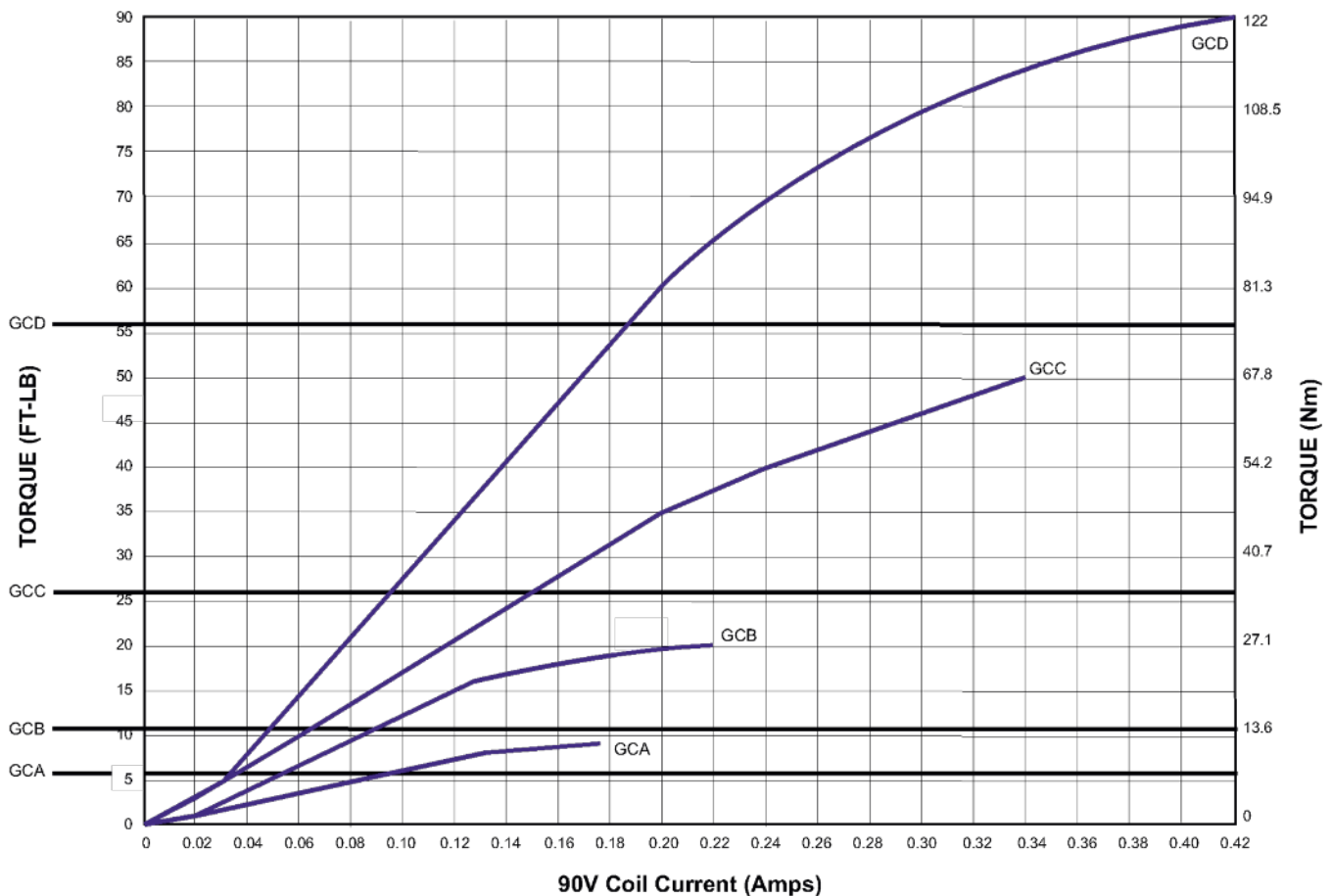
Global Clutch Heat Dissipation

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a clutch at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

*AIR curve achieved with a 100 CFM fan mounted 3 inches from the clutch surface.

GCA

GCB

Magnetic Particle Clutches & Brakes

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Global Clutch Heat Dissipation

GCC

GCD
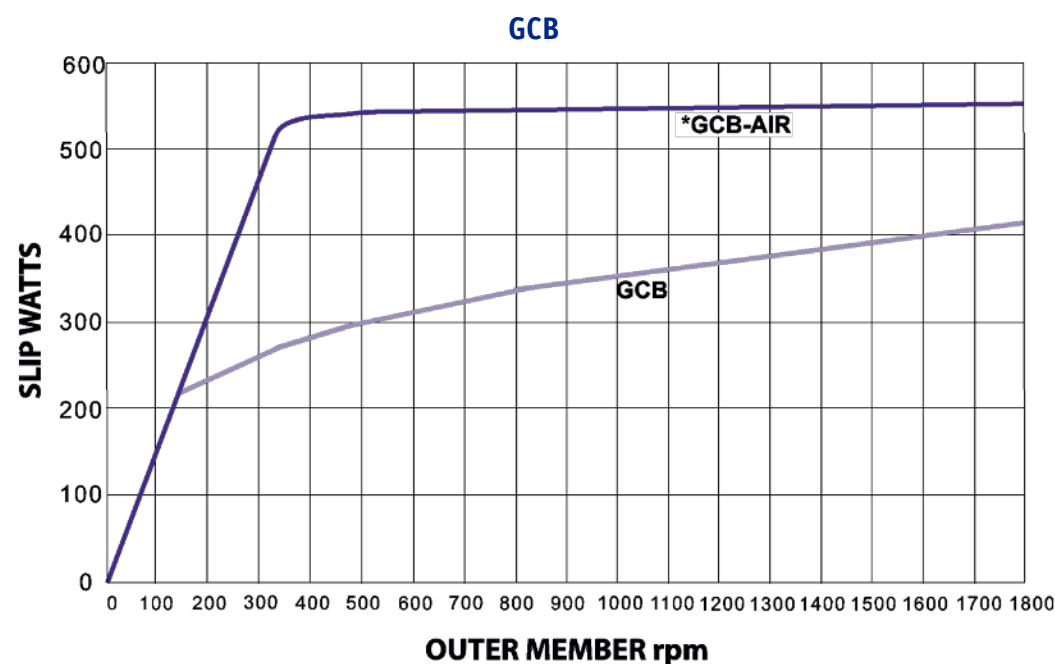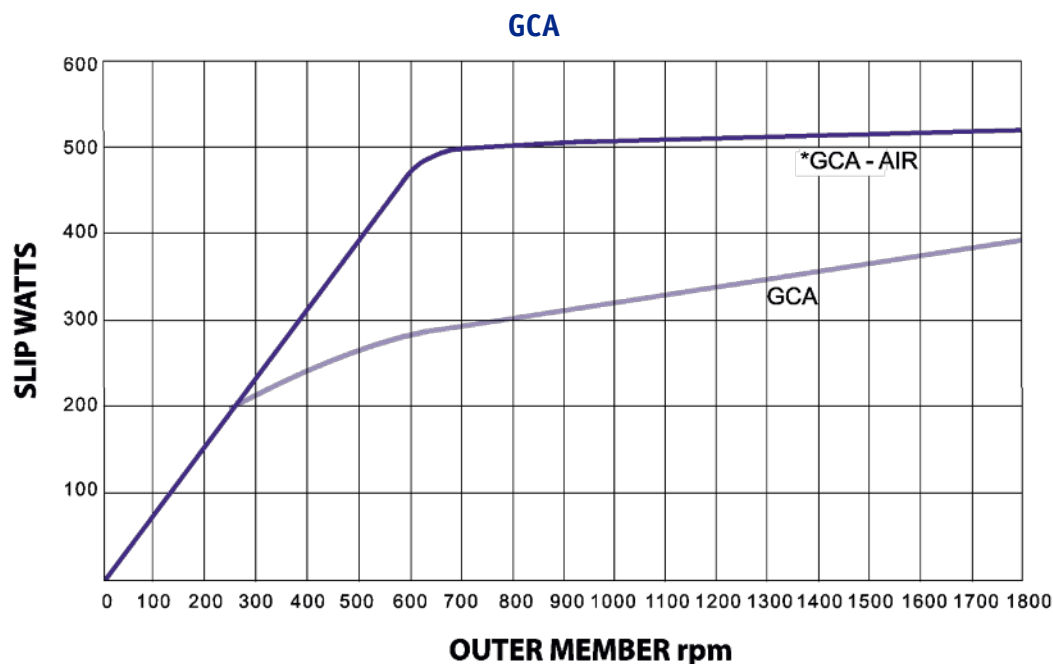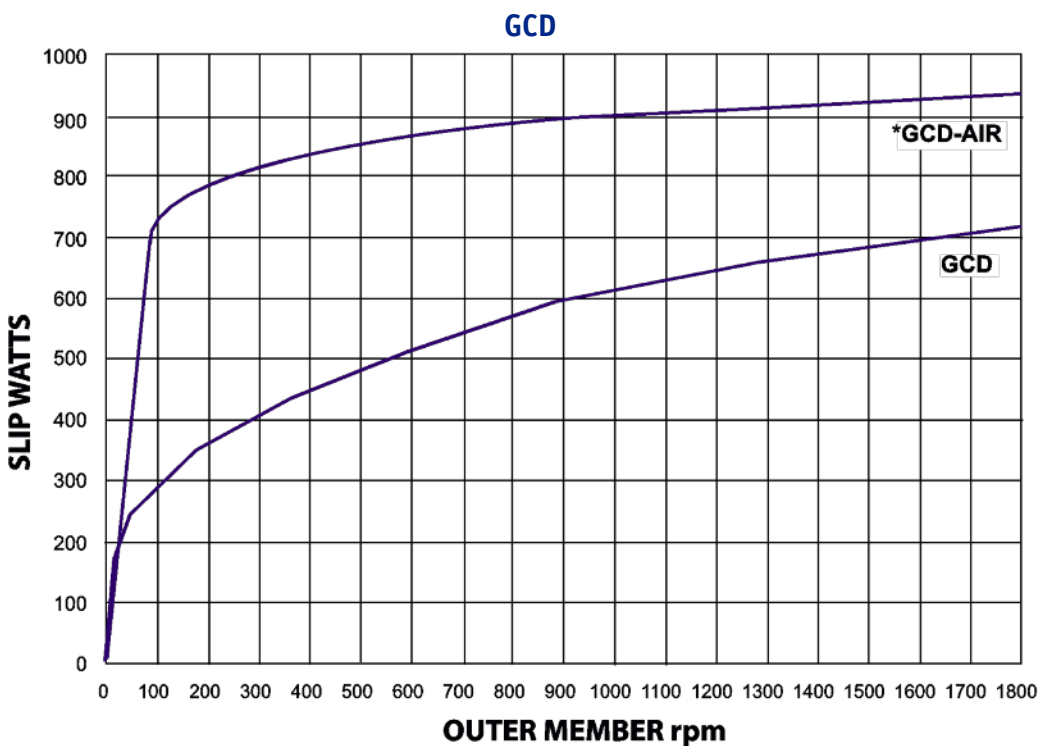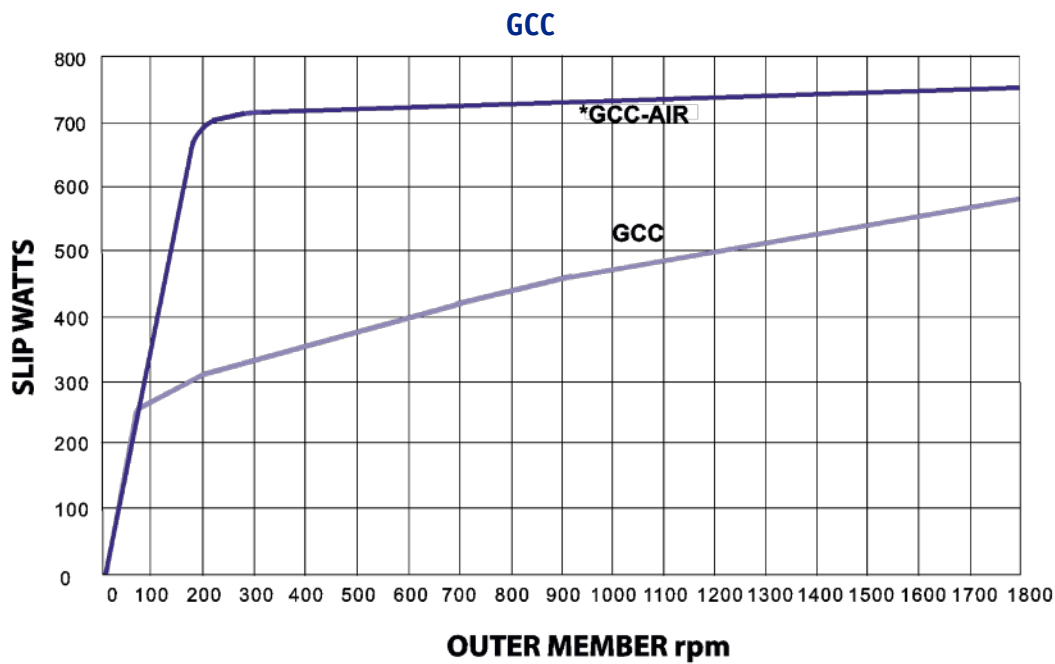
Global Shaft Mounted Brakes

Optional Air Cooled Unit

Global brakes represent the state-of-the-art in magnetic particle technology. The latest materials and components, modern CNC manufacturing techniques and a sleek design make these brakes the first choice of engineers designing machines or retrofits.

Smooth controllable torque, torque repeatability and torque independent of speed make these brakes suitable for many power transmission and tensioning applications. Long life is assured by polished seal surfaces, high temperature materials and rugged construction. This line features compact size with through bores and all machined housings for ease of mounting.

Features

Compact size and through bores for easy mounting to existing machine frames or shafts

Magnetic Particle technology provides smooth, repeatable torque independent of speed

Six sizes with true metric and imperial bores and keyways

Fast delivery

Rugged construction and no parts to wear out over time ensure long life

Compatible with all MAGPOWR tension controls including Cygnus, which features out-of-round roll compensation

Models and Rated Torque

Size A - 7.5 Nm (5.5 lb-ft)

Size B - 14.9 Nm (11 lb-ft)

Size C - 35.2 Nm (26 lb-ft)

Size D - 75.9 Nm (56 lb-ft)

Size E - 135 Nm (100 lb-ft)

Size F - 440.6 Nm (325 lb-ft)

Available Options

Inch or Metric bore models

24 VDC or 90 VDC coil voltage

115 VAC or 230 VAC fan

Offset fan shroud (for through-shaft applications, models C & D only)

1 inch or 1-3/8 inch adapters that easily mount to Tidland Safety Chucks

Magnetic Particle Clutches & Brakes

ttemsa

Global Brake Applications & Ordering Information

Information Required

Roll Dia. = 24 inches
Tension = 40 lb
Velocity = 150 fpm

How to Size

Torque = Tension x Radius = 40(12/12) = 40 lb-ft

$$rpm = \frac{Velocity}{\pi(Diameter)} = \frac{150}{\pi(24/12)} = 24 \text{ rpm}$$

$$Slipwatts = \frac{Torque \times rpm}{7} = \frac{40(24)}{7} = 137 \text{ watts}$$

Use a GBD Brake

UNWIND
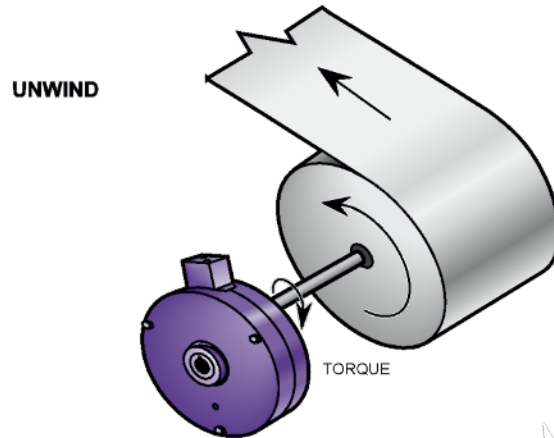
TORQUE

Information Required

rpm = 175
Stop Load in 2 sec
Inertia (WK^2) = 8 lb-ft^2

How to Size

$$Torque = \frac{(WK^2)(rpm)}{(308)(Seconds)} = \frac{8(175)}{308(2)} = 2.27 \text{ lb-ft}$$

$$Slipwatts = \frac{Torque \times (rpm)}{7} = \frac{2.27 \times (175)}{7} = 56.75 \text{ watts}$$

Use a GBA Brake

SOFT STOPS
(CONTROLLED DECELERATION)

TORQUE
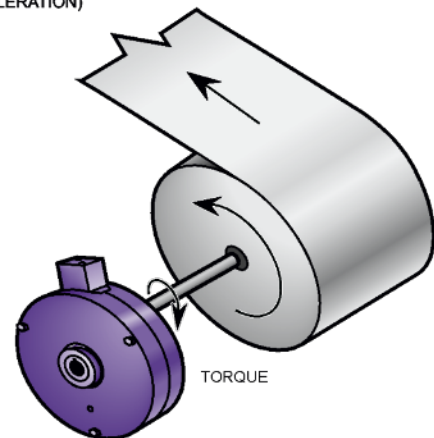
Ordering Information

Global Brakes are available in six sizes, with and without forced air cooling. You may also select the blower voltage. The model number indicates which options have been selected.

GB_	A	M	90	A115
Global Brake	Size A, B, C, D, E, F	Metric Model Metric bore and hardware (leave blank for imperial)	Coil Voltage 90 VDC or 24 VDC	Air Cooled 115 VAC or 230 VAC (leave blank if fan not needed)

Magnetic Particle Clutches & Brakes

Global Brake Dimensions

44 mm (1.75 inches)
AIR HOOD
BRAKE
W
A

"D" BORE, "V" DEEP
2 SET SCREWS "E" AT 120° FOR GBA, GBC, GBD
*GBB SET SCREWS = M6 X 1.00
*GBE & GBF SET SCREWS = M10 X 1.5

L
44 mm (1.75 inches)
22 mm (0.88 inch)
(2) 22 mm (0.88 inch) DIA. KNOCKOUTS
(1) EACH SIDE
3 mm (0.12 inch)
21 mm (0.81 inch)
G
C
H
J
K
B

"E" BOLTS ON "F" DIA. BOLT
CIRCLE. USE 1 ALL EXTENDED
BOLTS AS ANTI-ROTATION.
(3) BOLTS ON SIZE 'A' THROUGH 'D'
(4) BOLTS ON SIZES 'E' AND 'F'

X
U (FAN SHROUD)
B

"E" BOLTS ON "F" DIA. BOLT
CIRCLE. USE 1 ALL EXTENDED
BOLTS AS ANTI-ROTATION.
MOUNTING NOTE: BOLTS ARE
REVERSED ON FAN COOLED UNITS.
(3) BOLTS ON SIZE 'A' THROUGH 'D'
(4) BOLTS ON SIZES 'E' AND 'F'

Dimensions

Model	A	B	C	D*	Keyway	E	F	G	H	J	K	L	U	V	W	X
GBAM	-	57.3	173.1	14 H8	None	M5 x 0.8	122.2	34.9	9.3	3.5	22.8	11.6	211.8	THRU	134.9	60.4
GBAM-AIR	173.4	109.6	173.1	14 H8	None	M5 x 0.8	122.2	34.9	9.3	3.5	21.2	11.6	211.8	66.7	134.9	60.4
GBA	-	2.26	6.82	0.500	None	M5 x 0.8	4.81	1.38	0.37	0.14	0.90	0.46	8.34	THRU	5.31	2.38
GBA-AIR	6.84	4.32	6.82	0.500	None	M5 x 0.8	4.81	1.38	0.37	0.14	0.87	0.46	8.34	2.63	5.31	2.38
GBBM	-	58.1	189.3	17 H8	5 x 2.5	M5 x 0.8	139.7	44.5	11.1	3.5	22.0	12.0	211.8	THRU	150.9	61.2
GBBM-AIR	173.4	110.4	189.3	17 H8	5 x 2.5	M5 x 0.8	139.7	44.5	11.1	3.5	20.4	12.0	211.8	69.1	150.9	61.2
GBB	-	2.29	7.46	0.625	3/16 x 3/32	M5 x 0.8	5.50	1.75	0.44	0.20	0.81	0.48	8.34	THRU	5.94	2.41
GBB-AIR	6.84	4.35	7.46	0.625	3/16 x 3/32	M5 x 0.8	5.50	1.75	0.44	0.20	0.81	0.48	8.34	2.72	5.94	2.41
GBCM	-	63.4	229.7	19 H8	6 x 3	M6 x 1.0	176.2	47.6	11.1	4.0	26.6	14.6	246.0	THRU	190.5	66.8
GBCM-AIR	206.4	115.9	229.7	19 H8	6 x 3	M6 x 1.0	176.2	47.6	11.1	4.0	25.1	14.6	246.0	74.6	190.5	66.8
GBCA	-	2.50	9.05	0.750	3/16 x 3/32	M6 x 1.0	6.94	1.88	0.44	0.16	1.05	0.58	9.69	THRU	7.50	2.63
GBC-AIR	8.13	4.57	9.05	0.750	3/16 x 3/32	M6 x 1.0	6.94	1.88	0.44	0.16	0.99	0.58	9.69	2.94	7.50	2.63
GBDM	-	71.4	265.4	25 H8	8 x 3.5	M8 x 1.25	209.6	60.3	12.7	5.5	28.6	18.7	281.7	THRU	225.4	74.6
GBDM-AIR	241.3	123.7	265.4	25 H8	8 x 3.5	M8 x 1.25	209.6	60.3	12.7	5.5	27.1	18.7	281.7	84.1	225.4	74.6
GBD	-	2.81	10.45	1.000	1/4 x 1/8	M8 x 1.25	8.25	2.38	0.50	0.22	1.13	0.74	11.09	THRU	8.88	2.94
GBD-AIR	9.50	4.87	10.45	1.000	1/4 x 1/8	M8 x 1.25	8.25	2.38	0.50	0.22	1.07	0.74	11.09	3.31	8.88	2.94
GBEM	-	83.4	341.6	35 H8	10 X 4	M8 x 1.25	282.6	69.9	21.8	5.3	36.6	24.7	357.7	THRU	301.6	86.6
GBEM-AIR	317.5	142.1	341.6	35 H8	10 X 4	M8 x 1.25	282.6	69.9	21.8	5.3	35.1	24.7	357.7	111.0	301.6	86.6
GBE	-	3.28	13.46	1.375	5/16 x 3/16	M8 x 1.25	11.13	2.75	0.86	0.21	1.44	0.97	14.08	THRU	11.88	3.41
GBE-AIR	12.50	5.59	13.46	1.375	5/16 x 3/16	M8 x 1.25	11.13	2.75	0.86	2.75	1.38	0.97	14.08	4.37	11.88	3.41
GBFM	-	118.4	440.4	45 H8	14 x 5	M12 x 1.75	373.8	88.9	23.4	88.9	41.6	42.2	466.3	THRU	400.1	154.8
GBFM-AIR	425.5	210.3	440.4	45 H8	14 x 5	M12 x 1.75	373.8	88.9	23.4	88.9	40.1	42.2	466.3	170.0	400.1	154.8
GBF	-	4.66	17.35	1.750	3/8 x 3/16	M12 x 1.75	14.72	3.50	0.92	3.50	1.64	1.66	17.35	THRU	15.75	6.09
GBF-AIR	16.75	8.28	17.35	1.750	3/8 x 3/16	M12 x 1.75	14.72	3.50	0.92	3.50	1.58	1.66	17.35	6.69	15.75	6.09

* +0.001 / -0.000

Magnetic Particle Clutches & Brakes

Global Brake Specifications

Model	Rated Torque		Heat Dissipation at 1800 rpm of Outer Member (Watts)	Non-Excited Drag Torque		Inertia (WR²) of Rotating Members		Weight		Coil Data (90 VDC)		Coil Data (24 VDC)		Time Constant (Seconds) 90 & 24 VDC	
	lb-ft	Nm		lb-ft	Nm	lb-ft²	kg-m²	lb	kg	Rated Current	Ω @ 20˚C	Rated Current	Ω @ 20˚C	Current	Torque
GBA GBA-AIR	5.5	7.5	88 295	0.07	0.09	0.013	.00055	11 14	5 7	0.16	361	0.67	20.8	0.06	0.22
GBB GBB-AIR	11	14.9	85 351	0.07	0.09	0.030	0.0013	15 17	7 8	0.21	278	0.89	15.7	0.09	0.18
GBC GBC-AIR	26	35.2	155 556	0.23	0.31	0.08	0.0034	25 28	11 13	0.32	186	1.11	13.2	0.10	0.28
GBD GBD-AIR	56	75.9	195 657	0.56	0.76	0.30	0.013	38 42	17 19	0.39	150	1.42	10.2	0.16	0.36
GBE GBE-AIR	100	135	320 1230	1.3	1.76	0.33	0.014	75 86	34 39	0.45	129	1.46	9.9	0.56	1.38
GBF GBF-AIR	325	441	595 1930	3.3	4.47	1.97	0.083	180 191	81.6 86.6	0.53	111	1.61	9.21	1.12	1.88

Non excited drag torque and torque time constant measured at 1800 rpm. Minimum recommended rpm is 10 rpm. Axis of shafts must lie within 30˚ of horizontal. Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.
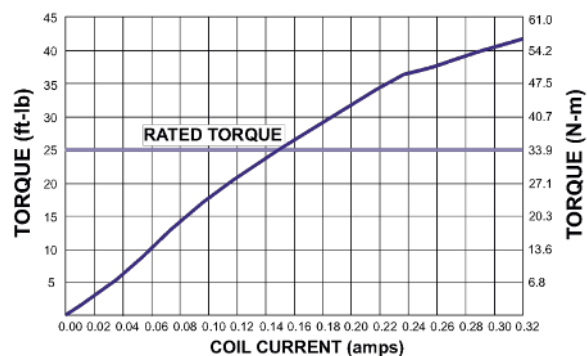
The time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation).

Typical Torque vs. Current (90 VDC and 24 VDC Models)

Magnetic Particle Clutches & Brakes

Global Brake Heat Dissipation

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a brake at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

Fan power requirements for GBA - GBD: 115 VAC, 0.19 amp, 230 VAC, 0.09 amp.

Magnetic Particle Clutches & Brakes

GBA

GBB

GBC

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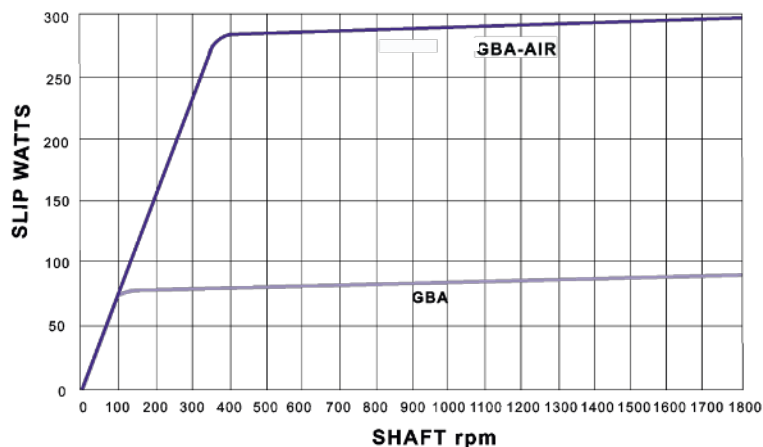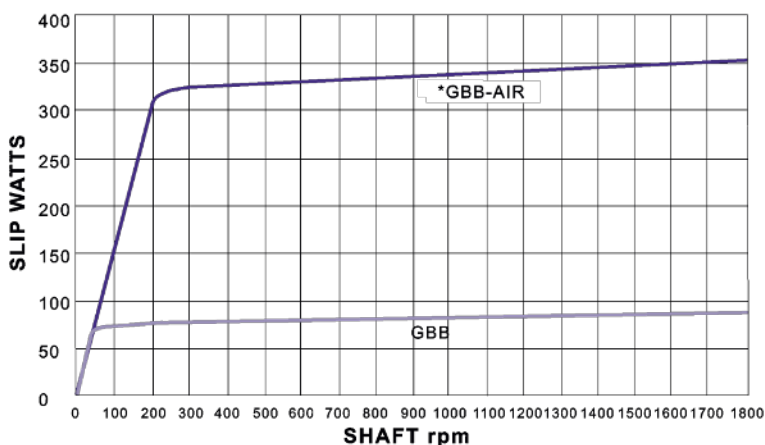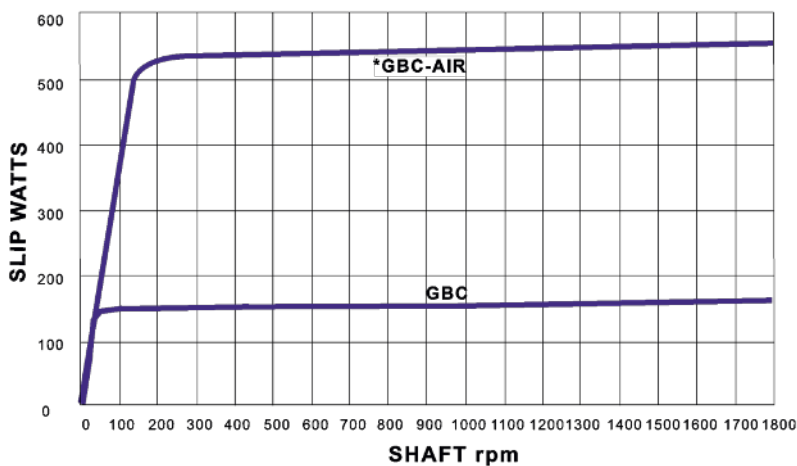
Global Brake Heat Dissipation

GBD
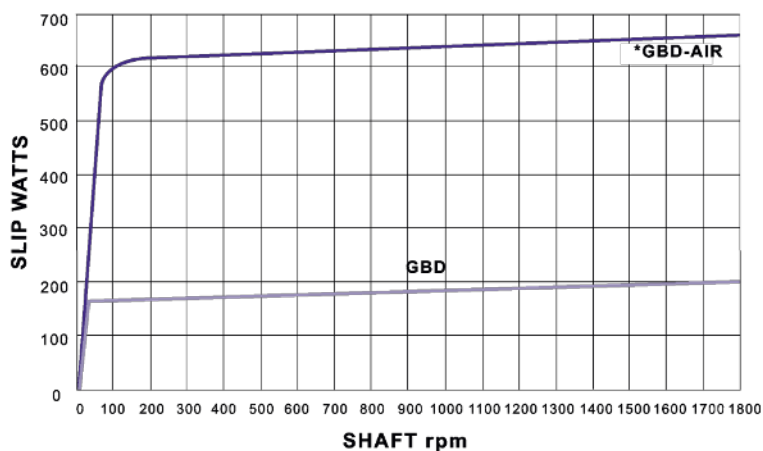
GBE & GBF
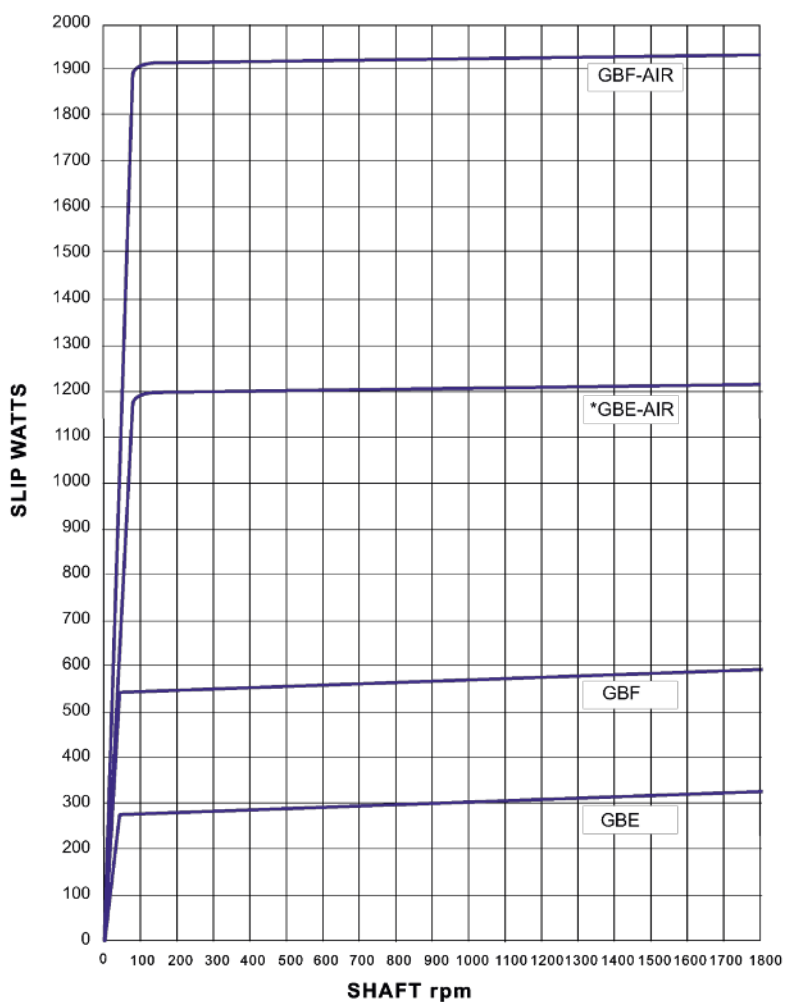
Fan power requirements for GBE: 115 VAC, 0.23 amp, 230 VAC, 0.11 amp
Fan power requirements for GBF: 115 VAC, 0.34 amp, 230 VAC, 0.17 amp
Brake mounting should be "floating" type, to prevent overloading bearings

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B-5 Brakes

Typical Heat Dissipation Capacity
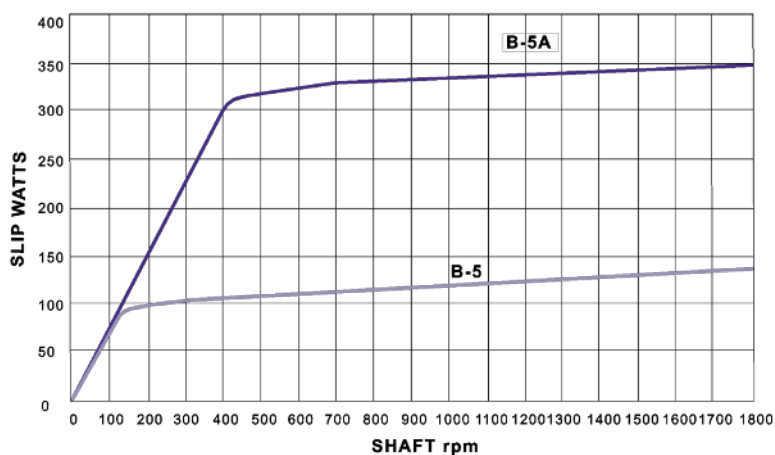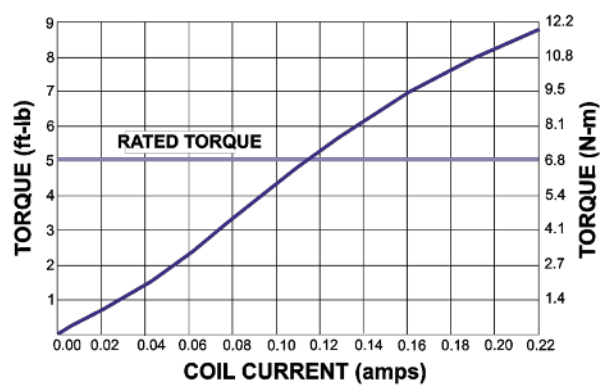
Typical Torque vs. Current (90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a brake at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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B-5 Dimensions & Specifications
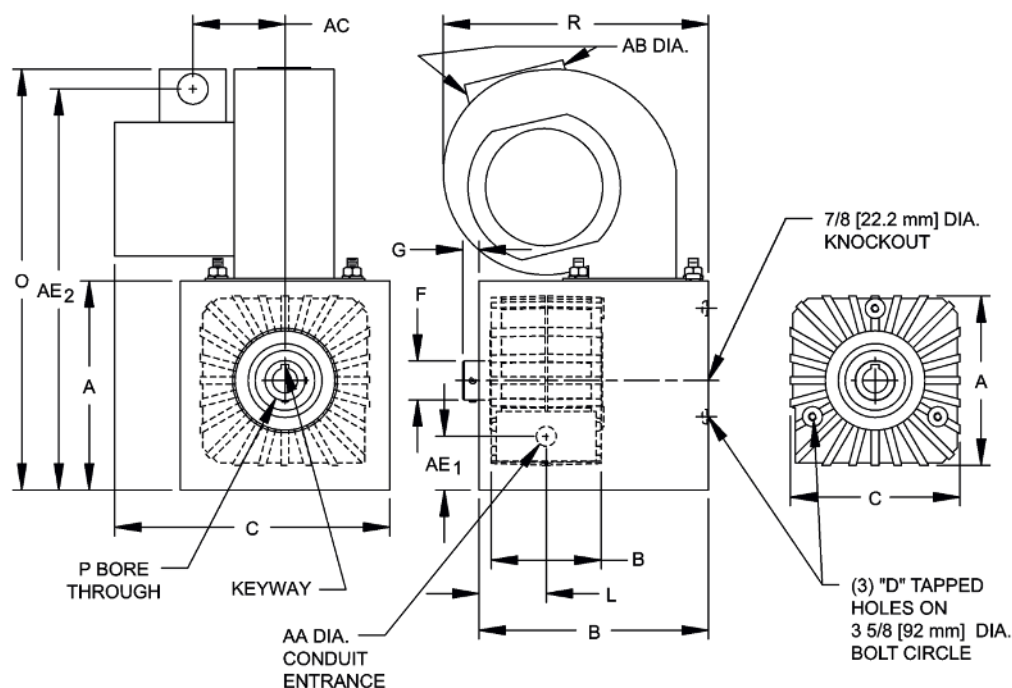
Dimensions (millimeters in shaded area)

Model	A	B	C	D	F	G	L	O	P	R	AA	AB	AC	AE1	AE2	Key
B-5	4.25	2.97	4.25	#10-24	0.98	0.66	1.41	-	0.63	-	0.50	-	-	-	-	3/16 X 3/32
B-5A	5.25	5.75	6.63	#10-24	0.98	0.31	0.81	11.00	0.63	6.63	0.50	0.88	2.41	1.38	9.50	3/16 X 3/32
B-5	108.0	72.7	108.0	#10-24	25.0	18.7	34.4	-	15.88	-	12.7	-	-	-	-	4.8 X 2.4
B-5A	133.4	146.1	181.4	#10-24	25.0	12.1	44.5	274.5	15.88	163.2	12.7	22.2	59.6	34.9	242.9	4.8 X 2.4

Specifications (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR^2) of Outer Rotating Member (lb-ft^2) (kg-m^2)	WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp				Rated Current	Ω @ 20˚C	Current	Torque
B-5	5	133	0.18	0.17	0.011	7.0	0.22	268	0.07	0.10
B-5A	5	347	0.47	0.17	0.011	11.0	0.22	268	0.07	0.10
B-5	6.78	133	0.18	0.23	0.00046	3.0	0.22	268	0.07	0.10
B-5A	6.78	347	0.47	0.23	0.00046	5.0	0.22	268	0.07	0.10

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30˚ of horizontal. Brake mounting should be 'floating' type, to prevent overloading bearings. Fan power requirements are 115 VAC, 60 Hz, 0.60 amp. Non-excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.
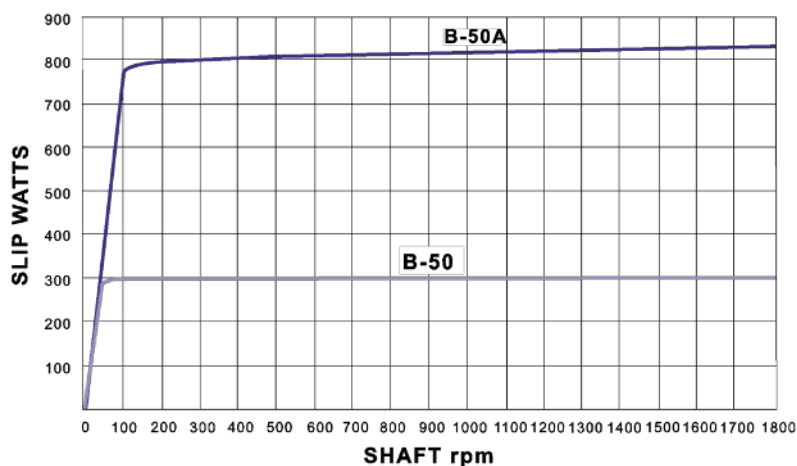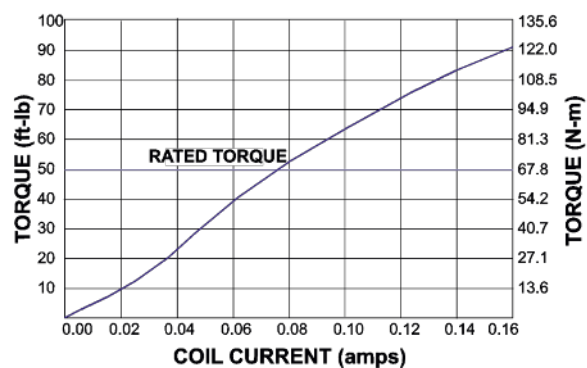
B-25 Brakes

B-25

B-25A

## Typical Heat Dissipation Capacity

Typical Torque vs. Current (90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a brake at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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B-25 Dimensions & Specifications
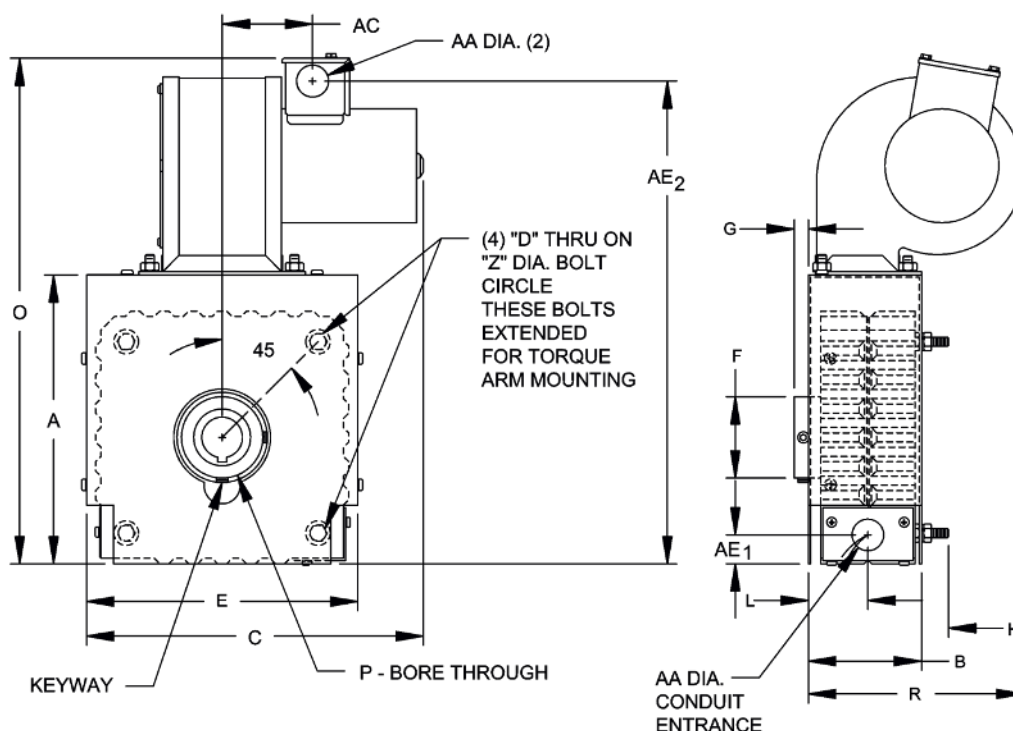
Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	G	H	L	O	P	R	AA	AC	AE1	AE2	Z	Keyway	Set Screws
B-25	7.00	2.60	-	1/4-20	7.00	2.25	0.50	0.39	1.31	-	1.1255	-	0.88	-	0.83	-	7.50	1/4 X 1/8	(2) 5/16-18
B-25A	8.00	3.13	9.23	1/4-20	7.50	2.25	0.35	0.76	1.46	13.94	1.1255	5.97	0.88	2.69	0.83	13.18	7.50	1/4 X 1/8	(2) 5/16-18
B-25	177.8	66.0	-	1/4-20	178.8	57.2	12.7	9.9	33.2	-	28.58	-	22.2	-	21.1	-	190.5	6.4 X 3.2	(2) 5/16-18
B-25A	203.2	79.4	239.4	1/4-20	190.5	57.2	8.9	19.4	37.0	354.2	28.58	151.6	22.2	68.4	21.1	334.8	190.5	6.4 X 3.2	(2) 5/16-18

Specifications (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR^2) of Outer Rotating Member (lb-ft^2) (kg-m^2)	WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp				Rated Current	Ω @ 20°C	Current	Torque
B-25	25	231	0.31	0.40	0.08	20.0	0.30	194	0.18	0.26
B-25A	25	646	0.87	0.40	0.08	28.0	0.30	194	0.18	0.26
B-25	33.9	231	0.31	0.50	0.00337	9.0	0.30	194	0.18	0.26
B-25A	33.9	646	0.87	0.50	0.00337	13.0	0.30	194	0.18	0.26

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30° of horizontal. Brake mounting should be 'floating' type, to prevent overloading bearings. Fan power requirements are 115 VAC, 60 Hz, 1.37 amp. Non-excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.
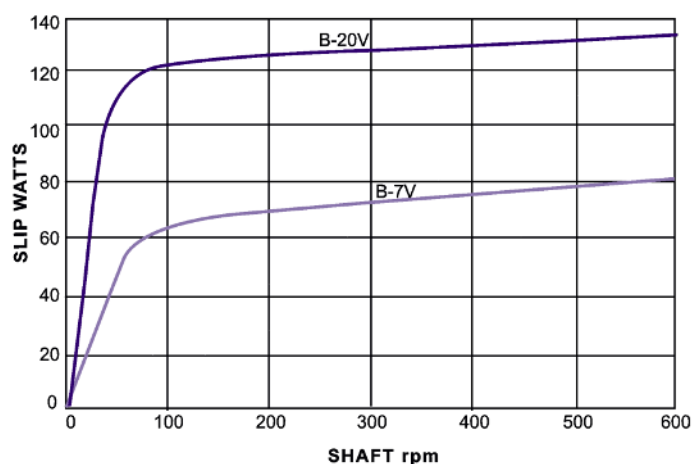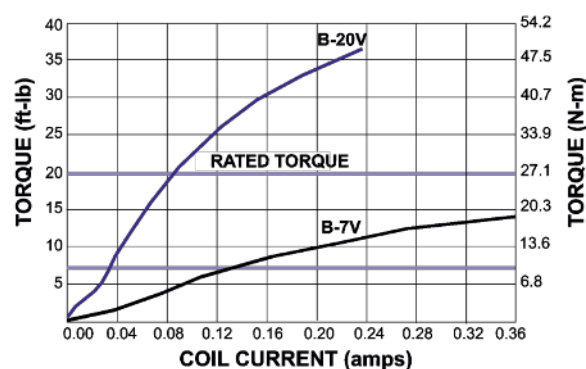
B-50 Brakes
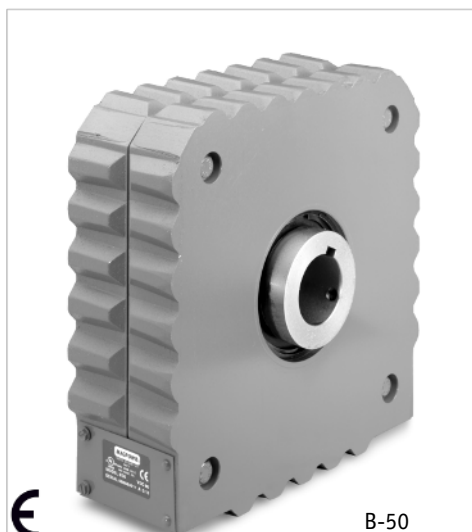
B-50

B-50A

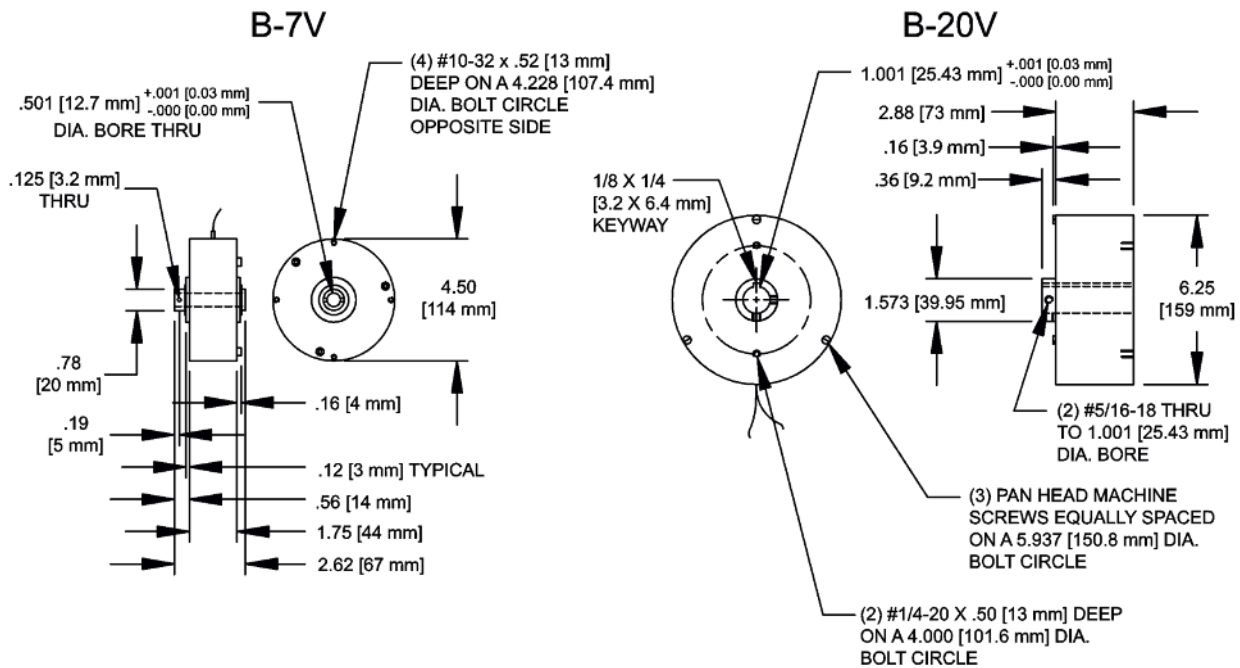## Typical Heat Dissipation Capacity

Typical Torque vs. Current (90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a brake at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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B-50 Dimensions & Specifications
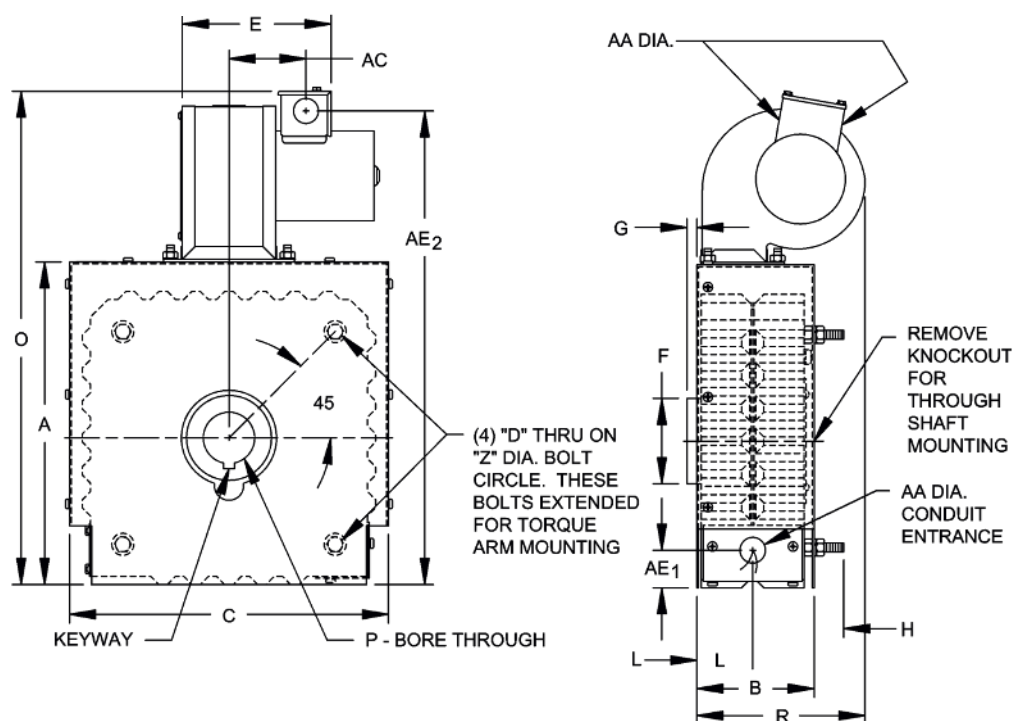
Dimensions (millimeters in shaded area)

Model	A	B	C	D	E	F	G	H	L	O	P	R	AA	AC	AE1	AE2	Z	Keyway	Set Screws
B-50	10.00	3.50	10.06	5/16-18	-	2.90	0.48	0.79	1.75	-	1.7505	-	0.88	-	1.22	-	10.25	3/8 X 3/16	(2) 3/8-16
B-50A	11.00	4.00	10.88	5/16-18	5.21	2.91	0.27	1.03	1.97	16.83	1.7505	5.97	0.88	2.69	1.22	16.18	10.25	3/8 X 3/16	(2) 3/8-16
B-50	254.0	89.0	254.0	5/16-18	-	73.7	12.3	20.2	44.5	-	44.46	-	22.2	-	31.0	-	260.4	9.5 X 4.8	(2) 3/8-16
B-50A	279.4	101.6	276.2	5/16-18	132.2	73.8	6.8	26.1	50.1	427.4	44.46	151.6	22.2	68.4	31.0	411.0	260.4	9.5 X 4.8	(2) 3/8-16

Specifications (metric in shaded area)

Model	Rated Torque (lb-ft) (Nm)	Heat Dissipation at 1800 rpm of Outer Member		Non Excited Drag Torque (lb-ft) (Nm)	Inertia (WR^2) of Outer Rotating Member (lb-ft^2) (kg-m^2)	WT (lb) (kg)	Coil Data (90 VDC)		Time Constants (Seconds)	
		Watts	hp				Rated Current	Ω @ 20˚C	Current	Torque
B-50	50	302	0.40	0.70	0.40	54.0	0.17	356	0.38	0.60
B-50A	50	825	1.11	0.70	0.40	63.0	0.17	356	0.38	0.60
B-50	67.8	302	0.40	0.90	0.0168	24.0	0.17	356	0.38	0.60
B-50A	67.8	825	1.11	0.90	0.0168	29.0	0.17	356	0.38	0.60

Time constants are the time in seconds for current or torque to reach 63% of the final value after step function voltage is applied. "Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 1800 rpm. Axis of shafts must lie within 30˚ of horizontal. Brake mounting should be 'floating' type, to prevent overloading bearings. Fan power requirements are 115 VAC, 60 Hz, 1.37 amp. Non-excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.
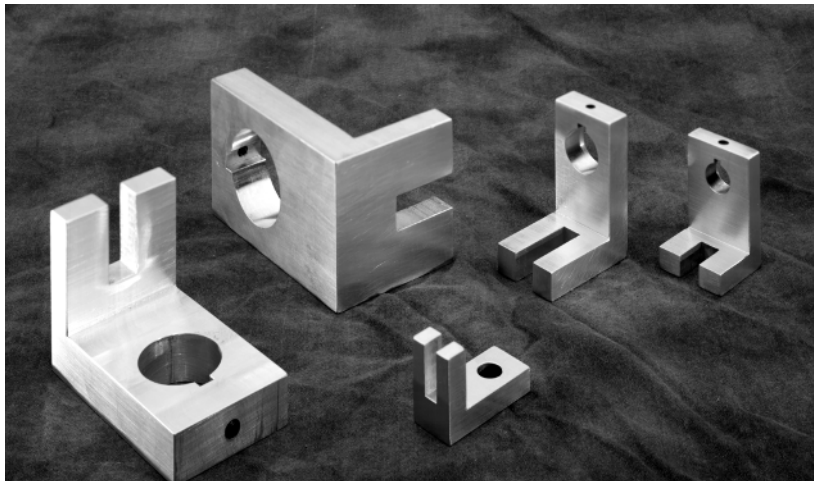
B-7V & B-20V Brakes

The B-7V and B-20V are designed for those applications where the axis of the shaft may not be horizontal. These brakes will operate with the axis vertical, horizontal, or at any angle you require.

Instead of the cylindrical design of other magnetic particle brakes, these units have a disk shaped rotor. The space between the rotor and two sides is filled with the magnetic particles so the unit can be operated in any orientation. Applications include tensioning of film rolls on vertical shafts, packaging machines, and machine tools.

B-20V

Typical Heat Dissipation Capacity

Typical Torque vs. Current
(90 VDC coil)

Curves show heat dissipation capability of models under continuous duty conditions. No "de-rating" or "service" factors need to be applied. **Do not size a brake at a torque rating over its rated torque.**

CAUTION: This product contains rotating parts which could cause injury. At the time of installation, appropriate protective guards should be installed by the user according to the use of this product.

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B-7V & B-20V Dimensions & Specifications

B-7V

- .501 [12.7 mm] +.001 [0.03 mm] / -.000 [0.00 mm] DIA. BORE THRU
- .125 [3.2 mm] THRU
- (4) #10-32 x .52 [13 mm] DEEP ON A 4.228 [107.4 mm] DIA. BOLT CIRCLE OPPOSITE SIDE
- 4.50 [114 mm]
- .78 [20 mm]
- .19 [5 mm]
- .16 [4 mm]
- .12 [3 mm] TYPICAL
- .56 [14 mm]
- 1.75 [44 mm]
- 2.62 [67 mm]

B-20V

- 1.001 [25.43 mm] +.001 [0.03 mm] / -.000 [0.00 mm]
- 2.88 [73 mm]
- .16 [3.9 mm]
- .36 [9.2 mm]
- 1/8 X 1/4 [3.2 X 6.4 mm] KEYWAY
- 1.573 [39.95 mm]
- 6.25 [159 mm]
- (2) #5/16-18 THRU TO 1.001 [25.43 mm] DIA. BORE
- (3) PAN HEAD MACHINE SCREWS EQUALLY SPACED ON A 5.937 [150.8 mm] DIA. BOLT CIRCLE
- (2) #1/4-20 X .50 [13 mm] DEEP ON A 4.000 [101.6 mm] DIA. BOLT CIRCLE

Specifications

Model	Rated Torque		Heat Dissipation at 600 rpm of Outer Member (Watts)	Non-Excited Drag Torque		Inertia (WR²) of Rotating Members		Weight		Coil Data (90 VDC)		Time Constants (Seconds)	
	lb-ft	N-m		lb-ft	N-m	lb-ft²	kg-m²	lb	kg	Rated Current	Ω @ 20°C	Current	Torque
B-7V	7	9.5	79	.40	.54	.002	.000084	7	3	.36	162	.09	.10
B-20V	20	27.1	132	2.0	2.7	.013	.00057	19	9	.20	290	.25	.25

The time in seconds for current or torque to reach 63% of the final value after step function voltage is applied.

"Rated current" is the current which will occur from a 90 VDC input to the clutch when the unit is operated at its rated temperature (maximum heat dissipation). Non excited drag torque and torque time constant measured at 500 rpm. Brake mounting should be 'floating' type, to prevent overloading bearings. Non excited drag torque values represent a typical unit after a few minutes of use. Drag torque in a new, unused unit may initially be higher.

Coil Voltage

B7V and B20V are 90VDC models

B7VS1 and B20VS6 are 24VDC models, and are CE

Foot Mounted Brakes

Model	Torque lb-ft	Max rpm Input
C-1B	1	430
C-3B	3	427
C-3AB	3	1170
C-10B	10	145
C-10AB	10	431
C-10WB	10	1920
C-10WAB	10	3020
C-50B	50	38
C-50AB	50	135
C-50WB	50	350
C-50WAB	50	810
C-100B	100	34
C-100AB	100	87
C-100WB	100	272
C-100WAB	100	497
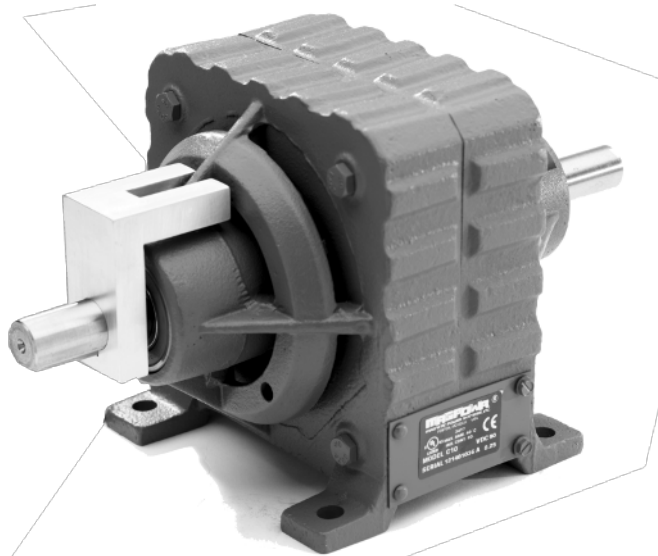
All foot mounted clutches can be converted into foot mounted brakes with the addition of a locking bracket. The model numbers for factory converted units are listed. The locking bracket may also be installed on-site.

Locking Brackets

LB-1 for C-1

LB-3 for C-3

LB-10 for C-10

LB-50 for C-50

LB-100 for C-100

Note: For typical heat dissipation capacity and specifications, see C Style Clutch, Beginning on page 100.

Magnetic Particle Clutches & Brakes

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Cooling Options Clutches & Brakes

When MAGPOWR Clutches or Brakes are used under slip conditions heat is generated that must be dissipated. For those applications where the heat generated exceeds the dissipation capacity of a convection-cooled model, additional heat dissipation capacity can be achieved through the addition of one or both MAGPOWR cooling options: Forced Air and/or Water cooling.

Adding one or both of these cooling options to a MAGPOWR unit increases its heat dissipation capacity by 300% to 500%. This allows you to select the model that will deliver the required torque for the application, rather than selecting a larger (more expensive) unit of a higher torque rating, simply to dissipate the anticipated higher heat generated by the application.

When the smaller sized unit is selected, the result is more precise control because the full torque range of the unit is being utilized.

Forced Air Cooled

Air hood and blower assembly is a complete pre-assembled shroud constructed so that air from the blower is forced over the clutch or brake. The forced air cooling is particularly useful on applications having a low rpm input. Factory assembled units with this option are designated by the letter A appearing after the model number. This cooling option is also available as a kit that can be added, in place of any installed MAGPOWR unit. This becomes an advantage in those cases where the material being handled in a process changes, or upgrading the machine requires additional heat dissipation capacity.

Water Cooled

In these units, water is forced into the hollow rotor through a tube in the shaft and is returned through the shaft to the special water fitting or coupling. Water cooled clutches and brakes are designated by the letter W appearing after the model number.

Water fittings are not included with MAGPOWR clutches and must be ordered separately, specifying RWF for rotary water fittings, or SWF for stationary water fittings.

Forced Air/Water Cooled

The combination of the Forced Air option on a Water Cooled MAGPOWR unit gives maximum heat dissipation capacity.

Factory assembled units with both options are designated by the letters WA appearing after the model number.

Air Hood & Blower Kit Assemblies

Model No.	Used With
BKGBA/B115	GBA & GBB Brakes, 115 VAC
BKGBA/B230	GBA & GBB Brakes, 230 VAC
BKGBC115	GBC Brakes, 115 VAC
BKGBC230	GBC Brakes, 230 VAC
BKGBD115	GBD Brakes, 115 VAC
BKGBD230	GBD Brakes, 230 VAC
BK-C3A	C-3 Clutch, C-3B Brake
BK-B5A	B-5 Brake
BK-C10A	C-10 and C-10W Clutch, C-10B and C-10WB Brake
BK-B25A	B-25 Brake
BK-B50A	B-50 Brake
BK-C50A	C-50 and C-50W Clutch, C-50B and C-50WB Brake
BK-C100A	C-100 and C-100W Clutch, C-100B and C-100WB Brake

Cooling Options Clutches & Brakes
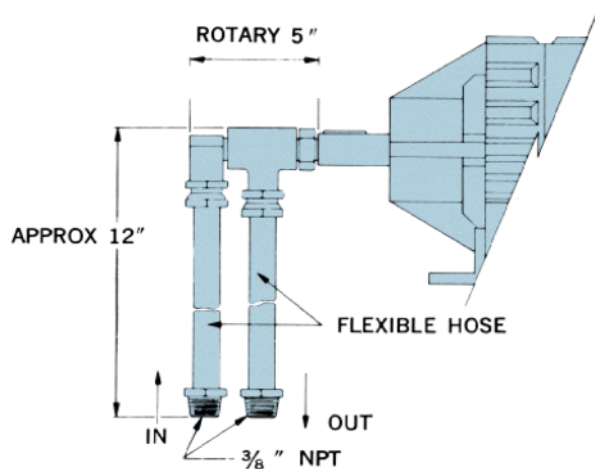
Stationary Water Fittings for Brakes*	
SWF-10	C-10WB and C-10WAB Brake
SWF-50	C-50WB and C-50WAB Brake
SWF-100	C-100WB and C-100WAB Brake

Rotary Water Fittings for Clutches*	
RWF-10	C-10W and C-10WA Clutch
RWF-50	C-50W and C-50WA Clutch
RWF-100	C-100W and C-100WA Clutch

* All water fittings must be ordered separately

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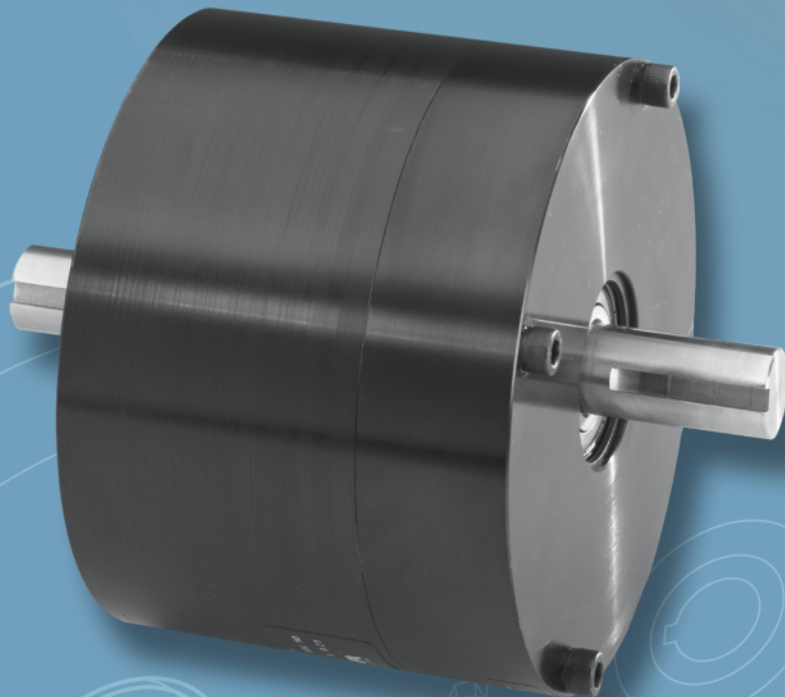
**SOFSTEP   CLUTCHES
&   BRAKES**

MAXCESS MAGPOWR

Sofstep® Magnetic Particle Clutches and Brakes

Design Features

LOW DRAG TORQUE SEALS

CONVENIENT BOLT CIRCLE MOUNTING

$C\epsilon$

(24 vdc model only)

INPUT SHAFT

MOUNTING BRACKETS AVAILABLE

BRAKE COIL GENERATES MAGNETIC FIELD

LOW INERTIA BRAKE DISC NO FRICTION SURFACES

MAGNETIC PARTICLE CAVITY. RESPONSE OF PARTICLES TO MAGNETIC FIELD IS VIRTUALLY INSTANTANEOUS

MAGNETIC FIELD

PRE-ALIGNED, PACKAGED UNIT. EXTREMELY CLEAN PRODUCT. NO WEAR PARTICLES TO CONTAMINATE ENVIRONMENT
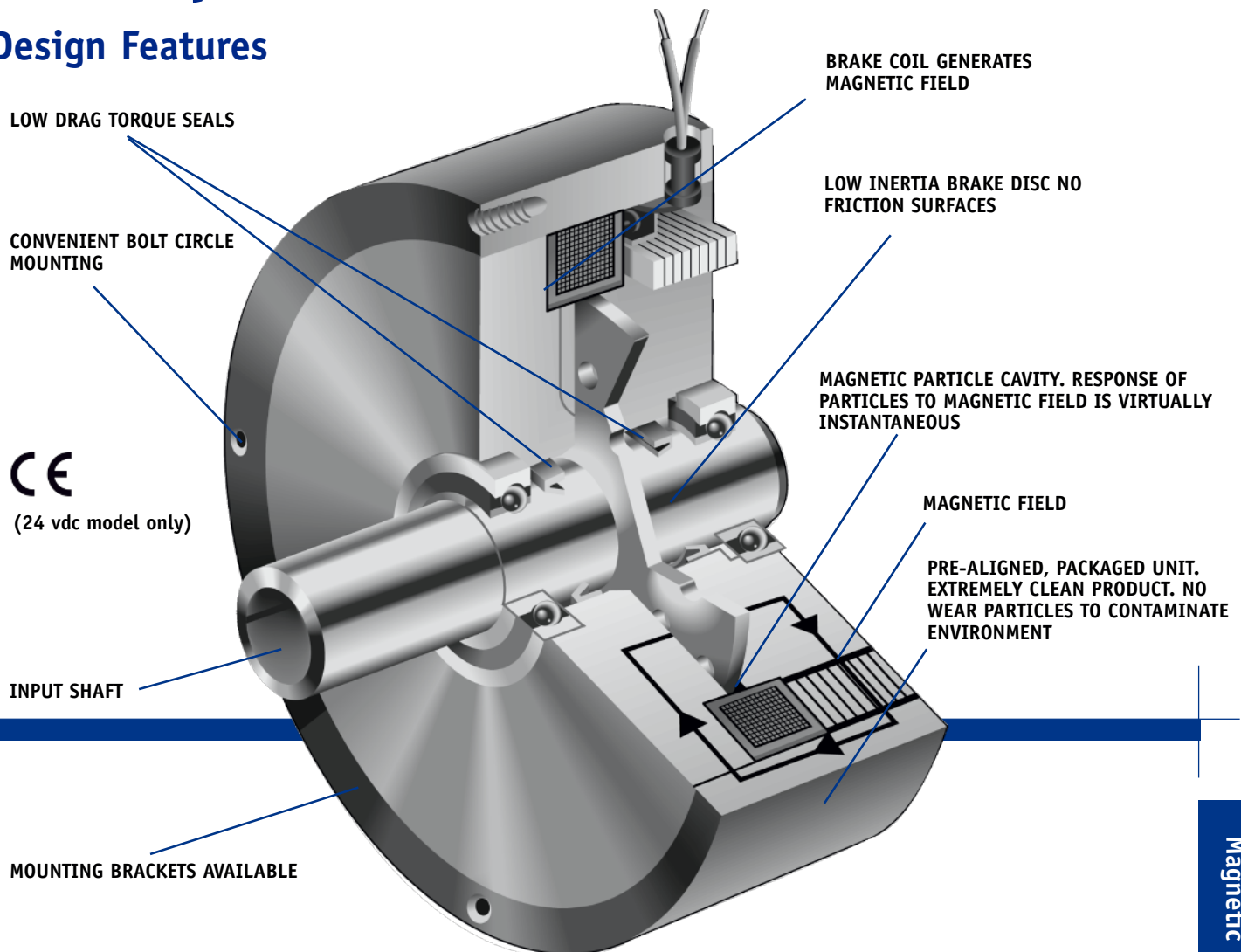
Sofstep Clutches and Brakes are available in a variety of sizes with torque ratings from 2 to 240 lb-in.

They provide smooth, controllable torque for power transmission and tension control applications.

For precise torque and tension control, use Sofstep Clutches and Brakes with MAGPOWR controls. MAGPOWR offers a broad range of tension control alternatives to fit your specific application.

Exceptional Controllability

Torque is independent of slip speed and directly proportional to input current. When combined with MAGPOWR controls and sensors, unmatched system capability is provided.

Smooth Engagement

No shock or torque spikes during engagement for controlled acceleration of load.

High Heat Dissipation

Unique design and the use of special materials allows for efficient heat dissipation and long life.

Fast Response

No mechanical parts to move—provides engagement in milliseconds.

Totally Enclosed

No wear particles to contaminate environment. Ideal for clean-room conditions

No Maintenance

Nothing to monitor or adjust

Quiet Operation

No slap or squeaks

Energy Efficient

Low consumption of electrical power

Compact Design

High torque to size ratio

Sofstep® Design Features

Principle of Operation

Sofstep Magnetic Particle Clutches & Brakes deliver smooth, controllable, precise torque. They engage magnetically with no moving mechanical parts. Operation is fast and free of backlash. Designed for ease of mounting, they can be installed in any orientation.

The primary components of a magnetic particle brake are the coil, housing and rotor. The precision machined rotor is positioned within the housing. There is an air gap between the rotor and housing filled with a dry magnetic powder. The powder is free flowing until a magnetic field is applied from the coil. "Chains" are formed along the magnetic lines of force linking the rotor (disk) to the housing. The "stick-slip" phenomenon is virtually eliminated due to the characteristics of the magnetic powder chains. The result is extremely smooth torque.

Output torque is controlled by varying the current applied to the coil. As current is increased, the powder chains link together tighter and, as a result, the torque transmitted is increased. As can be seen by the torque vs. current curve, the increase in torque is approximately proportional to the increase in current.

The unique characteristics of the Sofstep Clutches and Brakes make it the ideal device for many applications.
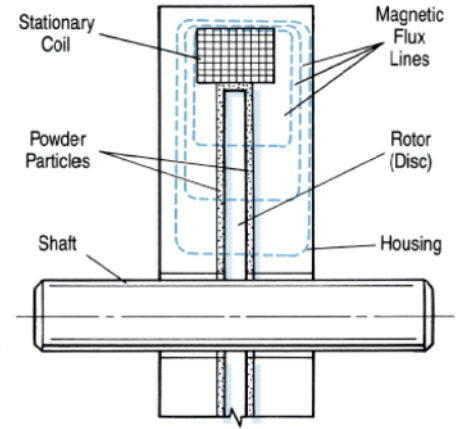
Tensioning

Sofstep units are widely used as tension control devices. Consistent tension can be maintained in the processing of wire, fiber, foil or film. The amount of tension is controlled by changing the level electrical excitation. Since torque is proportional to current, Sofstep brakes are very accurate in open loop tensioning systems. For more precise control, Sofstep brakes may be incorporated in a closed loop system. MAGPOWR tension controls can be integrated with Sofstep Brakes to precisely control tension in a variety of applications.

Soft Starts and Stops

Sofstep Magnetic Particle Clutches and Brakes are superior in applications requiring gradual, jerk-free engagement. For smooth response, the voltage is applied gradually to obtain the acceleration or deceleration required.

Indexing / Cycling

Sofstep Magnetic Particle Clutches and Brakes provide ultra-fast response when used with an overexcitation control. The response time of Sofstep Magnetic Particle Clutches and Brakes is defined as the time from application of rated voltage until the unit develops 63% of its rated torque. This response time, though short, can be dramatically reduced through a concept called overexcitation. Overexcitation is the momentary application of higher than rated voltages to drive the current through the coil very quickly. The result is nearly instant magnetic flux and torque buildup to dramatically reduce response time and provide an increase in accuracy and cycle rate capability.

Magnetic Particle Clutches & Brakes

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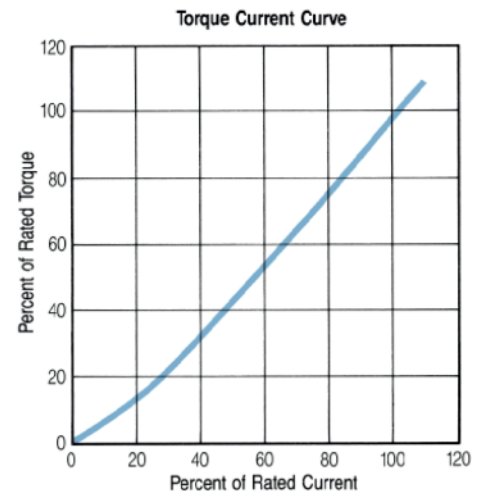
Sofstep® Applications

Magnetic Particle Clutches and Brakes are preferred in a wide variety of torque control applications. The majority of these applications fall into three categories:

1. Tensioning

2. Indexing/Cycling

3. Controlled Stop/Start

1. Tensioning

Magnetic Particle Brakes provide smooth, continuous slip precisely controlled in a compact easy to mount package. The combination of Sofstep Brakes, MAGPOWR Controls and MAGPOWR Sensors allows for complete system capability. The most important point about tensioning with Magnetic Particle Brakes or Clutches is the independence of slip speed (see chart below).

Chart: TORQUE >> (y-axis) vs SLIP SPEED >> (x-axis), showing Full Rated Current and Half Rated Current.
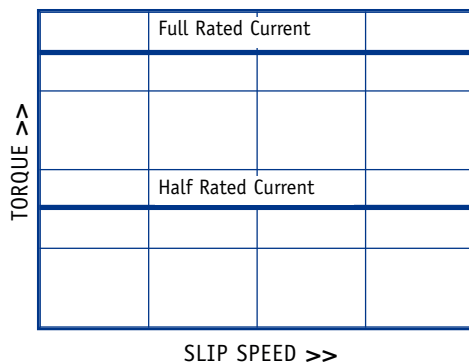
This is a distinct advantage over competing technologies (see chart below)

Chart: TORQUE >> (y-axis) vs SLIP SPEED >> (x-axis), showing Eddy Current, Magnetic Particle, and Friction.
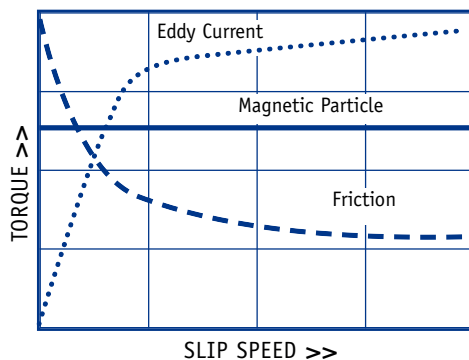
Web Tensioning

Closed Loop Tension Control

DFP Position Sensor

Sofstep Brake

Torque

VERSATEC™
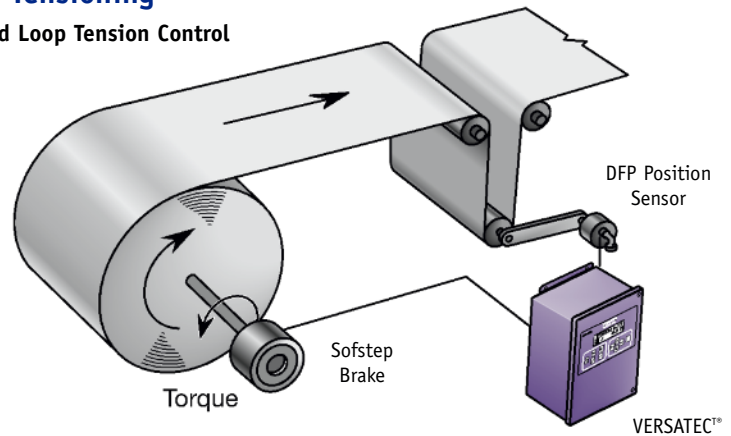
Web Tensioning

Roll Follower Diameter Compensation

DFP Position Sensor

DFC-90 Dancer/ Follower Arm Control

Sofstep Brake
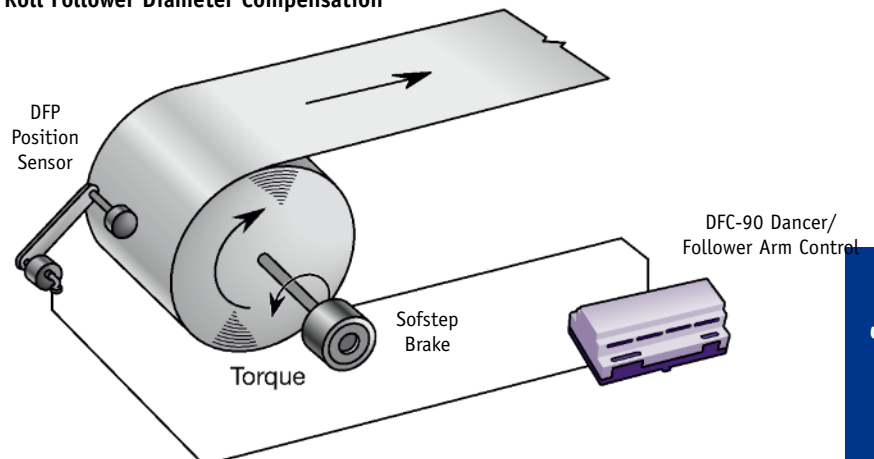
Torque

Web Tensioning

Magnetic Particle Clutch On A Powered Rewind

DFP Position Sensor

Sofstep Clutch

Torque

DFC-90 Dancer/ Follower Arm Control
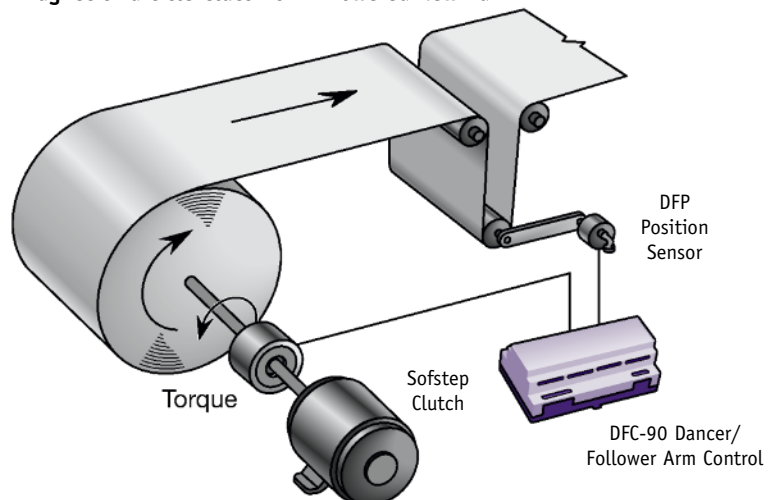
Sofstep® Applications

2. Indexing/Cycling

Fast response and low output shaft inertia allows for faster accelerations. No backlash or slip occurs unless applied torque exceeds output torque. Stepping is precise and repeatable with low overshoot and fast setting times.
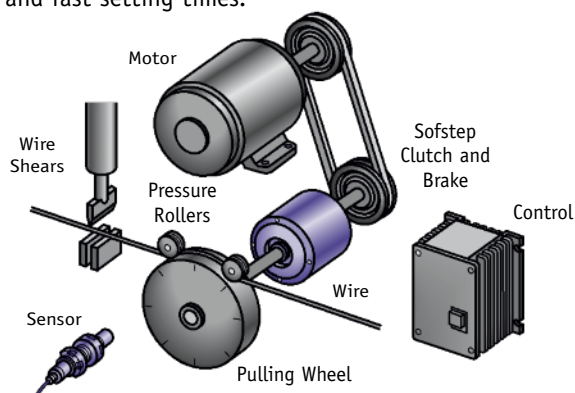
Wire Cut Off Machine

Magnetic Particle Clutch and Brake used together provide indexing capabilities for wire cutting machine
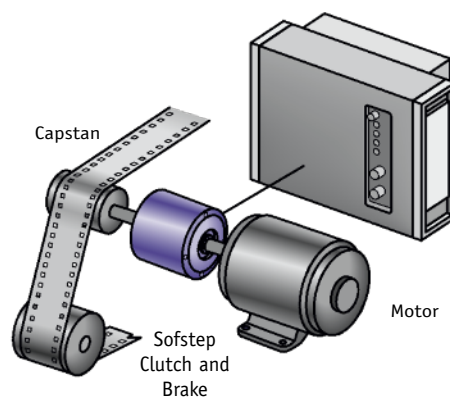
Film Processing

Magnetic Particle Clutch and Brake used together provide indexing for film processing

3. Controlled Start/Stop

Controllable stops and starts are possible with Sofstep Magnetic Clutches and Brakes. By controlling input current, ramped acceleration and deceleration profiles are attainable which help avoid torque spikes and shock during acceleration and provide smooth, jerk-free engagement.
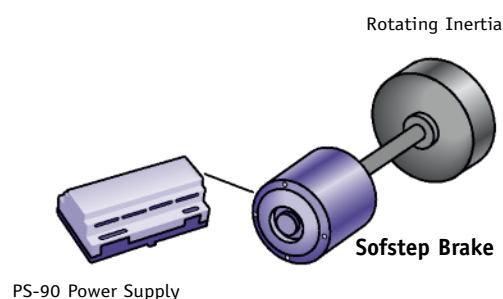
Controlled Stop

Controlled deceleration provided by a Sofstep Brake
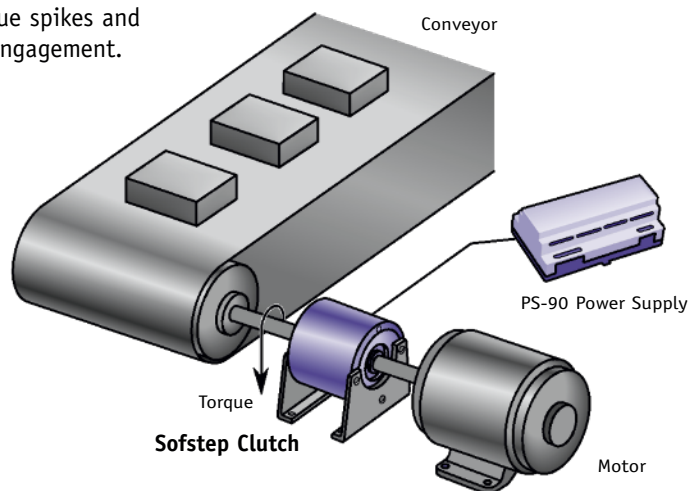
Controlled Start

Sofstep Clutch provides controlled, smooth engagement

Magnetic Particle Clutches & Brakes

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Sofstep® Applications

Additional Applications

There are many more applications where magnetic clutches and brakes performance characteristics are desired.

Dynamometer

TC-5 Power Supply

Torque

Sofstep Clutch

Motor

Motor

Torque

Sofstep Clutch

PS-90 Power Supply
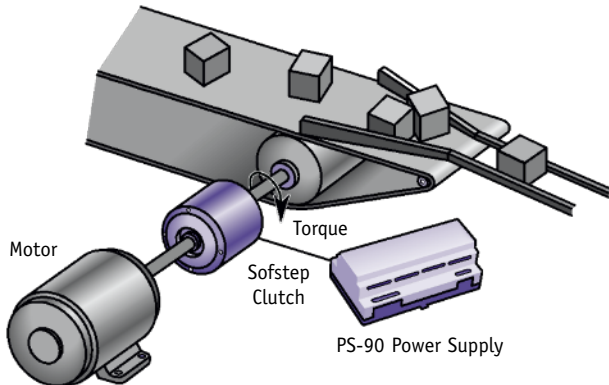
Overload Protection

Softstep Clutch provides protection against jam ups
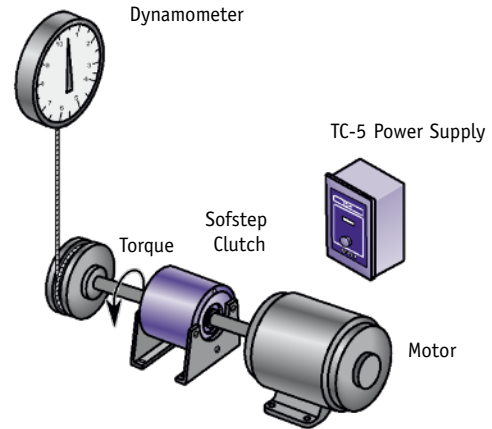
Motor Testing

Sofstep provides load for motor testing

Drive Gears

Sofstep Clutch

Torque

Capping Head

PS-90 Power Supply

Bottles on Conveyor

Fitness Machine

Encoder Position Feedback

Microprocessor Control Unit

Torque

Chain and Sprocket Drive

Sofstep Brake

Isometric Force Curve

FORCE >

POSITION>
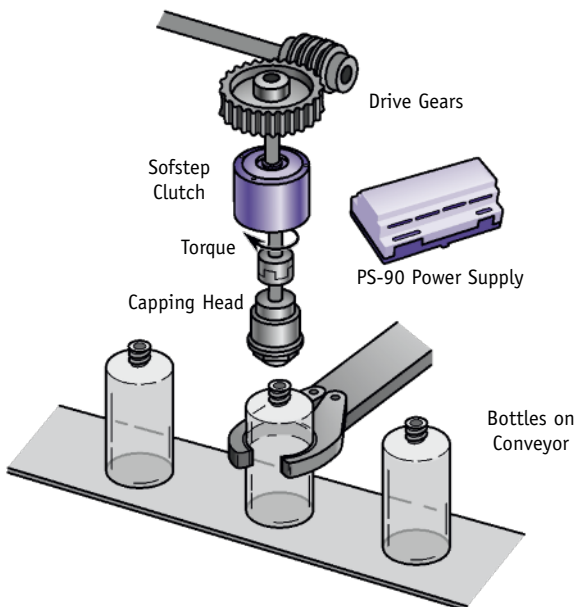
Torque Limiting

Precise adjustable torque supplied by a Sofstep Clutch
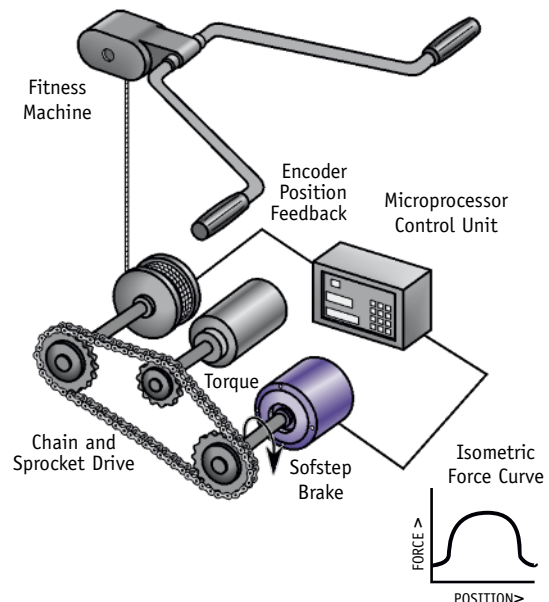
Exercise Equipment

Brake models provide a smooth controllable resistance for exercise machines. When integrated with a microprocessor control, programming load profiles is possible

Sofstep® Selection

To properly size a magnetic particle brake, clutch or clutch/brake, two factors must be considered:

1. **Torque**
2. **Watts**

1. Torque

Use the torque equation to determine your required torque in pound-inches.

2. Slip Watts

When a brake is providing resistance to a rotating shaft, or when a clutch is slipping, mechanical energy is being converted to thermal energy. The rate that energy is being converted is expressed in terms of slip watts and is a function of torque and slip speed.

For continuous slip applications, such as tensioning, use the appropriate selection example to determine your slip speed. Once slip speed is determined, use the quick selection chart to choose a unit that will be thermally sufficient.

In cycling applications, heat is being generated intermittently. However, the brake or clutch acts as a "heat reservoir" that continuously dissipates the heat to the environment. Therefore, use the cycling example to determine average slip watts. Then, use the performance chart to select a unit that will produce the required torque and dissipate the average slip wattage.

In cycling applications, peak watts may be high enough to cause temperatures to temporarily exceed recommended operating temperatures. For unusual environmental conditions or applications, call your MAGPOWR sales engineer.
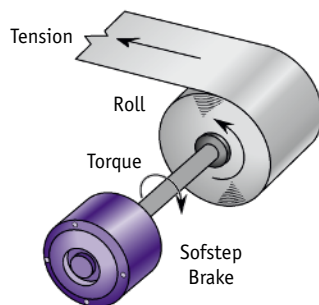
Unwind Tension Control

Information Required:

Full roll diameter = 10 inches

Tension* = 2 lb

Velocity = 200 fpm

How to size:

Torque (lb-in) =

$$\frac{\text{Tension (lb) x Full Roll Diameter (in)}}{2}$$

$$= \frac{2 \times 10}{2} = 10 \text{ lb-in}$$

Slip RPM $= \dfrac{12 \times \text{Velocity (fpm)}}{\pi \times \text{Full Roll Diameter (in)}}$

$$= \frac{12 \times 200}{\pi \times 10} = 76 \text{ RPM}$$

Slip Watts = .0118 x Torque (lb-in) x RPM

= .0118 x 10 x 76

= 9 Watts

Select brake model PSB-15 from quick selection chart below.

*Note: If tension is unknown see section on calculating web tension.

Quick Selection Charts

(Continuous slip only)
First find slip rpm on vertical axis, then locate torque on horizontal axis. Find intersection of two lines. If below line and in blue area, the brake is thermally sufficient to handle the generated heat. If it lands on the line or in the white area, the a larger unit is required.

PSB-2 / PSC-2 — 10 Watts

PSB-15 / PSC-15 — 20 Watts

PSB-120 / PSC-120 — 140 Watts

PSB-70 / PSC-70 — 100 Watts

PSB-240 — 200 Watts
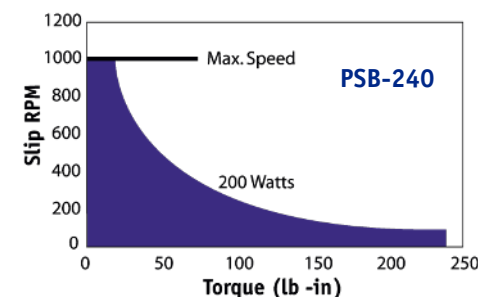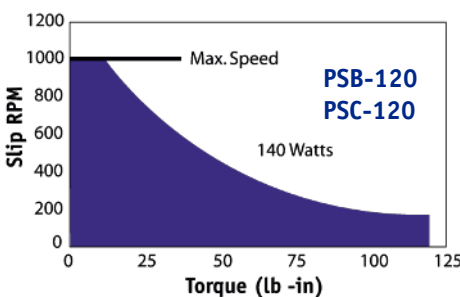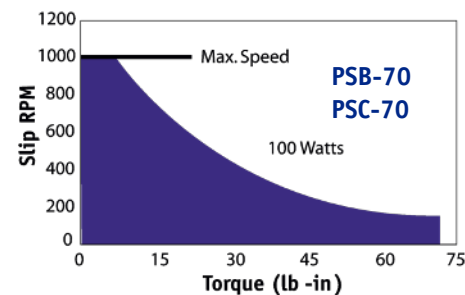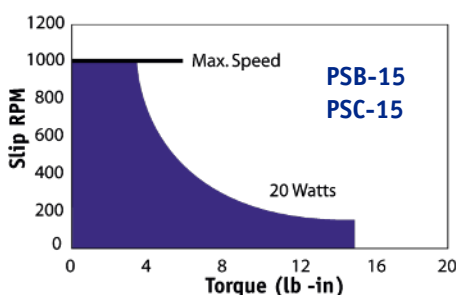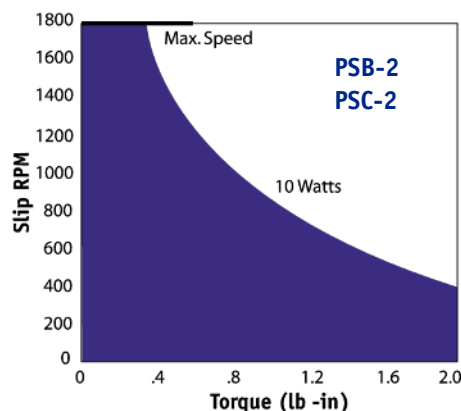
Sofstep® Selection

Rewind Tension Control

Information required:

Core dia. = 2 inches

Full roll dia. = 8 inches

Tension* = 2 lbs

Velocity = 200 fpm

Input RPM = 400 RPM
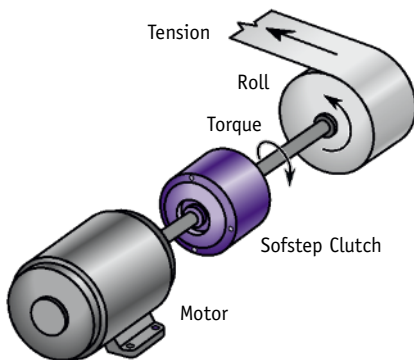
How to size:

$$\text{Torque} = \frac{\text{Tension (lbs) x Full Roll Diameter (in)}}{2}$$

$$= 2 \times \frac{8}{2} = 8 \text{ lb-in}$$

$$\text{Core RPM} = \frac{12 \times \text{Velocity (fpm)}}{\pi \times \text{Core Diameter}}$$

$$= \frac{12 \times 200}{\pi \times 2} = 382 \text{ RPM}$$

$$\text{Full Roll RPM} = \frac{12 \times \text{Velocity (fpm)}}{\pi \times \text{Full Roll Diameter (in)}}$$

$$= \frac{12 \times 200}{\pi \times 8} = 95 \text{ RPM}$$

Slip RPM = Input RPM - Full Roll RPM

$$= 400 - 95 = 305 \text{ RPM}$$

Slip Watts

$$= .0118 \times \text{Torque (lb-in)} \times \text{Slip RPM}$$

$$= .0118 \times 8 \times (305) = 29 \text{ Watts}$$

Select clutch model PSC-70 from quick selection chart

*Note: If tension is unknown see section on calculating web tension.

**Note: If inertia is unknown see section on calculating inertia.

Soft Stops/Controlled Deceleration

Information required:

RPM = 1000 RPM

Time to Stop Load = 4 secs.

Inertia** = 144 lb-in²
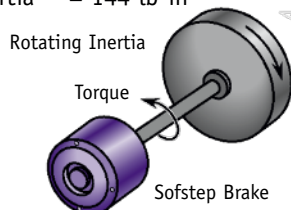
How to size:

$$\text{Torque (lb-in)} = \frac{\text{Inertia (lb-in}^2\text{) x RPM}}{3690 \times \text{time(s)}}$$

$$= \frac{144 \times 1000}{3690 \times 4} = 10 \text{ lb-in}$$

Select brake model PSB-70 from specification chart.

Overload Protection/Torque Limiting/Soft Start

Information required:

Motor HP = 1 hp

Motor RPM = 900 RPM

Motor horsepower method:
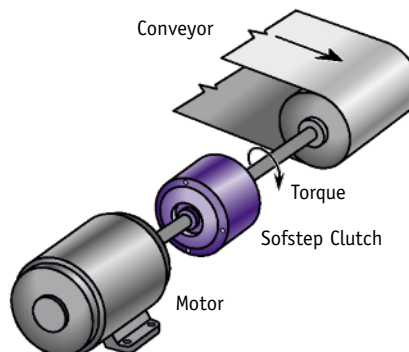
How to size:

$$\text{Torque (lb-in)} = \text{HP} \times 63000 / \text{RPM}$$

$$= \frac{1 \times 63000}{900} = 70 \text{ lb-in}$$

Select clutch model PSC-70 from specification chart

String and Pulley Method

Affix a pulley to the shaft of a machine to be measured. Secure a string or cord to the outer surface of the pulley and wrap the cord around a few times. Tie the other end of the cord to a spring scale. Pull on the scale until the shaft turns. The force (in pounds) indicated on the scale, multiplied by the radius of the pulley (in inches) gives the torque in pound-inches.
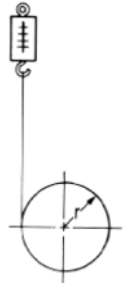
Cycling

Information required:

RPM = 800 RPM

Inertia** = 18 lb-in²

Time = .050 secs

Frequency = 300 cycles/minute
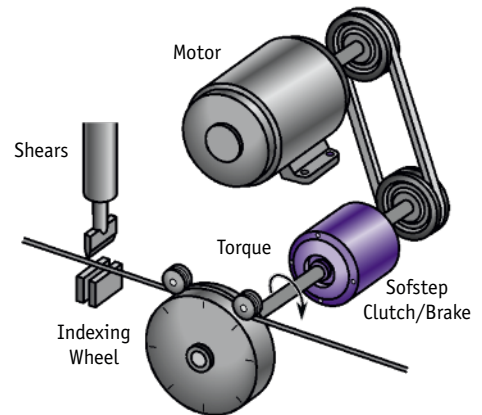
How to size:

$$\text{Torque} = \frac{\text{Inertia (lb-in}^2\text{) x RPM}}{3690 \times \text{time(s)}}$$

$$= \frac{18 \times 800}{3690 \times .05} = 78 \text{ lb-in}$$

Watts =

$$2.67 \times \text{Inertia (lb-in}^2\text{)} \times \left(\frac{PM}{10000}\right)^2 \times F \frac{\text{cycle}}{\text{min}}$$

$$= 2.67 \times 18 \times \left(\frac{800}{10000}\right)^2 \times 300 = 92 \text{ watts}$$

Select clutch model PSC-120 from specification chart

Sofstep® Selection

Material	Tension (lbs/inch of web width)
Aluminum foils	0.5 to 1.5 (1.0 avg)/mil
Cellophanes	0.5 to 1.0/mil
Acetate	0.5 to 1.0/mil
Mylar (Polyester)	0.5 to 1.0 (.75 avg)/mil
Polyethylene	0.25 to 0.30/mil
Polypropylene	0.25 to 0.30/mil
Polystyrene	1.0/mil
	0.05 to 0.20 (0.10 avg)/mil
Vinyl	0.05 to 0.20 (0.10 avg)/mil
Paper and Laminations	
20#/R–32.54 gm/m2	0.50 to 1.0
40#/R–65.08 gm/m2	1.0 to 2.0
Paper	
15 lbs/ream (3000 sq. ft.)	0.5
20 lbs/ream	0.75
30 lbs/ream	1.0
Laminations	
25 lb paper/.005 inch PE/.00035 inch Foil/.001 inch PDE	3.0
.001 inch Cello/.0005 inch PE/.001 inch Cello	1.5

When these substrates are coated with polyethylene, nylon, polypropylene, EVA, EAA, and EEA, add the following tension to the values listed above for the substrate only.

Coating Thickness	
0.00005 inch to 0.001	0.12
0.0011 inch to 0.002	0.25
Cellophane	
.00075 inch	0.5
.001 inch	0.75
.002 inch	1.0
Nylon and Cast Propylene (Non-Oriented)	
.00075 inch	0.15
.001 inch	0.25
.002 inch	0.5
Paperboard	
8 pt.	3.0
12 pt.	4.0
15 pt.	5.0
Mylar and Oriented Propylene	
.00005 inch	0.25
.001 inch	0.5
.002 inch	1.0

Material	lbs/strand
Aluminum Wire	
#20 AWG	4.00
#18 AWG	5.50
#16 AWG	9.00
#14 AWG	10.00
Copper Wire	
#20 AWG	8.00
#18 AWG	10.00
#16 AWG	12.00
#14 AWG	15.00

Calculating Web Tension

For sizing brakes on applications in which the applied web tension is unknown, use the following information to determine the approximate tension value.

Applied Web Tension = Approx. Material Tension x Roll Width

Example:

The tension for a twelve inch wide roll of 20# paper stock is unknown. What is the prescribed tension?

Solution:

The approximate tension value as noted in the chart to the left for 20# paper stock is 0.75 lb/in; thus the tension for this application is (0.75 lb/in x 12) = 9 lbs

Inertia (WK^2)

The inertia of the components must be known or calculated for cycling applications and for controlled starting or stopping applications.

For a simple rotating cylinder:

$$\text{Inertia} = WK^2$$

Where:

W = Weight of body
K = Radius of gyration

The equations for calculating the radius of gyration of a cylinder about its axis are given in the illustration below:

Solid
$K^2 = 1/2\, r^2$

Hollow
$K^2 = 1/2\, (r_1^2 + r_2^2)$
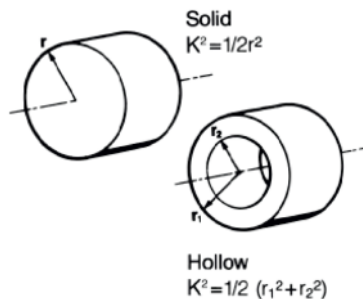
Reflected Inertia (Rotational)

In most practical mechanical systems the rotating parts such as gears, drums, rolls, pulleys, etc., do not necessarily operate at the same speed. In clutch and brake problems it is common practice to calculate the WK^2 of the parts operating at each speed and reduce them to an equivalent WK^2 at the clutch or brake mounting shaft speed, so that they can all be added together and treated as a unit.

The formula for determining the equivalent WK^2 of a rotating part referred to the clutch or brake shaft is:

$$WK_e^2 = WK^2 \times \left(\frac{N}{Ncb}\right)^2$$

Where:

WK^2 = inertia of the rotating part at N (RPM)

N = speed (RPM) of the rotating part

Ncb = speed (RPM) of the clutch or brake shaft

Reflected Inertia (Linear)

There are also complex systems involving both linear and rotating motion. The inertia of the linearly moving parts can also be reduced to the clutch or brake speed by the equation:

$$WK_e^2 = W \times \left(\frac{V}{2\pi N}\right)^2$$

Where:

W = weight of the body
V = velocity in feet per minute
N = RPM of the clutch or brake shaft

This equation can be used only where the linear speed bears a continuous fixed relation to the rotating speed, such as a conveyor driven by a motor, etc.

Thus it can be seen that it is possible to reduce the WK^2 of the individual parts of a complex system to an equivalent WK^2 at the clutch or brake shaft speed. These values of equivalent WK^2 may be added directly and the total equivalent WK^2 plus the WK^2 of the clutch and/or brake parts represent the total WK^2 of the complete system which the clutch or brake must accelerate or decelerate. From the above formula it is apparent that parts operating at speeds substantially lower than the clutch or brake mounting shaft speed are usually a small factor in the total equivalent WK^2.
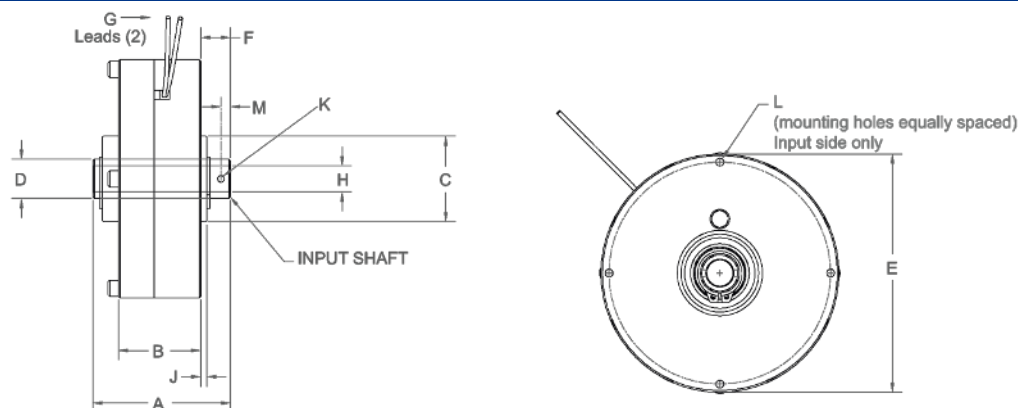
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Sofstep® Dimensions

Clutch
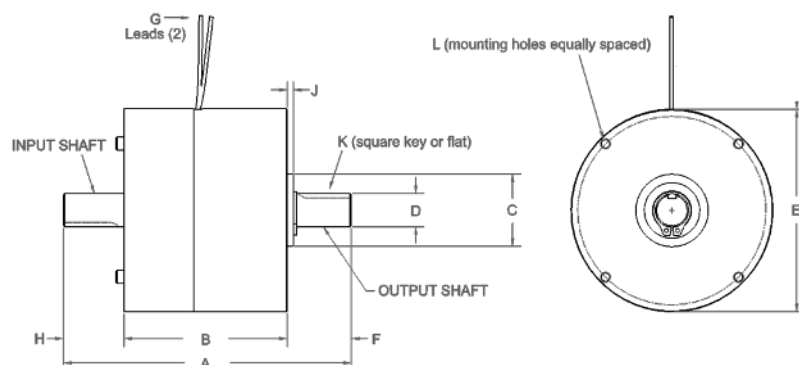
Model	A	B	C	D +.000 −.001	E	F	G inches	H	J	K	L Tap	L BC	L Holes
PSC-2	3.8	1.86	.750*	.250	1.87	.98	12	.96	.1	Flat	6-32*	1.350	3
PSC-15	4.9	2.82	–	.500	2.88	1.0	12	1.1	–	Flat	8-32	2.000	3
PSC-70	6.5	3.67	1.625	.750	4.54	1.5	12	1.4	.1	.1875	10-32	4.228	4
PSC-120	7.0	4.00	–	.750	5.25	1.5	12	1.5	–	.1875	1/4-20	4.812	4

Dimensions C, D, J, K and L are the same on both ends of housing   *Pilot and mounting holes on output end only

Brake

Model	A	B	C	D +.000 −.001	E	F	G inches Loc.	H +.001 −.000	J	K	L Tap	L BC	L Holes	M Hole
PSB-2*	2.5	1.15	.7500	.250	1.88	.88	12	Solid Shaft	.10	Flat	6-32*	1.350	3	–
PSB-15	2.6	1.57	1.125	.500	2.88	1.0	12		.05	Flat	8-32	2.000	3	–
PSB-70	2.6	1.76	1.625	.750	4.56	.45	12	.500	.12	.125/.129	10-32	4.228	4	.18
PSB-120	3.15	2.24	1.625	.750	5.25	.70**	12	.500	.06	.156***/.160	1/4-20	4.812	4	.28
PSB-240	3.8	2.61	2.250	1.250	6.48	.85**	12	.875	.04	.1875 Keyway	5/16-18	5.875	4	–

Dimensions C, D and H are the same on both ends of housing

*Mounting bolt pattern both sides typical on PSB-2
**Set screw collar, not shown
***PSB-120 also has 1/8″ Keyway

Magnetic Particle Clutches & Brakes

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Sofstep® Specifications/Ordering Information

Mounting Bracket
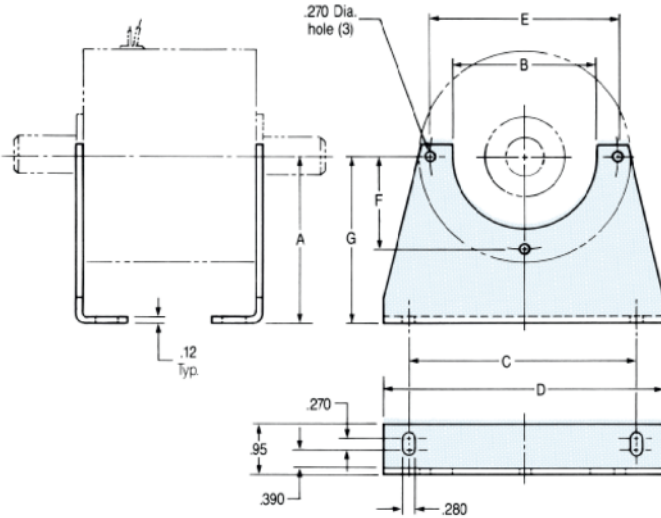
Convenient mounting brackets are available for the Sofstep units listed below. The 2 lb-in series is normally face mounted. Tapped holes are incorporated on the face of each model for attaching the brackets. The hole pattern information is included in the unit tabular data. Two brackets are required for the clutch. Only one bracket is required for the brake.

New Part Number	Model Size	A	B	C	D	E	F	G
PS15	15	2.00	1.25	2.5	3.5	1.732	1.500	2.50
PS70	70	3.50	3.0	4.88	6.0	4.228	2.114	3.50
PS120	120	3.50	4.0	4.88	6.0	4.812	2.406	3.50

24 vdc models are CE

Softstep Unit	Model No.	Rated Torque (lb-in)	Rated Voltage	Resistance (Ω)	Rated Current (Amps)	Coil Response Time (Millisec)	Inertia of Output Shaft (in-lbs^2)	Max. Heat Dissipation (Watts)	Max. Speed Recom. (RPM)	Weight (lbs)	Max. Drag Torque Zero Excitation (lb. in.)
Clutch	PSC2-24V PSC2-90V	2	24 90	72.1 1180	.3 .07	8	0.00085	10	1800	1.1	.2
	PSC15-24V PSC15-90V	15	24 90	49 803	.49 .11	40	0.019	20	1000	5.3	.5
	PSC70-24V PSC70-90V	70	24 90	53 834	.41 .11	105	0.12	100	1000	13	1.0
	PSC120-24V PSC120-90V	120	24 90	31 452	.78 .20	85	0.30	140	1000	24	2.0
Brake	PSB2-24V PSB2-90V	2	24 90	72.1 1180	.3 .07	8	0.00085	10	1000	.6	.2
	PSB15-24V PSB15-90V	15	24 90	49 803	.49 .11	55	0.02	20	1000	2.25	.8
	PSB70-24V PSB70-90V	70	24 90	53 834	.41 .11	125	0.11	100	1000	6.5	1.0
	PSB120-24V PSB120-90V	120	24 90	31 452	.78 .20	110	0.27	140	1000	12	2.0
	PSB240-24V PSB240-90V	240	24 90	47 687	.51 .13	210	0.78	200	1000	12	4.0

Ordering Procedure

Example: Clutch

PSC   2   24V

Clutch	Torque Rating (lb-in)	Coil Voltage (24 or 90)

Example: Brake

PSB   70   90V

Brake	Torque Rating (lb-in)	Coil Voltage (24 or 90)

Magnetic Particle Clutches & Brakes

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P E R M A N E N T   M A G N E T
C L U T C H E S   &   B R A K E S

MAXCESS MAGPOWR

Perma-Tork® Permanent Magnet Clutches and Brakes

Design Features

Multiple pole ceramic magnets

Rotating center disc

Low drag seals

Precision ball bearings. There are no other mechanical wear parts or electrical components to fail

Hollow shaft for direct mounting

Bolt circles on both ends for versatile mounting

Torque adjustment ring establishes position of permanent magnets to vary the amount of torque

Easy-to-read graduations

MAGPOWR clutches and brakes are available in three types; Pneumatic, Hysteresis and Magnetic Particle. **Hysteresis** and **Magnetic Particle** units provide constant torque independent of slip speed and are popular in light tensioning applications. Hysteresis units offer excellent overload and jam protection for all drive train components. Hysteresis units also provide soft starts with zero slip until a preset torque is reached. PERMA-TORK Permanent Magnet Clutches and Brakes do not require maintenance and provide extremely long life.

No external power is required to produce highly accurate, dependable torques. As the center disc rotates, lines of magnetic force retard its motion. The amount of retarding force is adjusted by rotating a large knurled adjustment ring. Repeatability and accuracy is excellent.

With the housing fixed, a hysteresis clutch or magnetic particle brake functions as a constant torque brake.

When a stub shaft adapter is mounted to the housing, the hysteresis clutch can be used as a torque limiter for inline applications.

Features and Benefits

Fast, precise torque adjustment

Torque is set with a large knurled adjustment ring

Infinite adjustability between minimum and maximum settings. This allows units to be fine tuned to your unique requirements

Constant torque

You can solve most torque problems by using either the hysteresis or magnetic particle unit

No external control or power source

Simple to install

Nothing to monitor

Dependable performance

Virtually eliminates the "stick-slip" phenomenon associated with friction devices

Long life. The only wearing parts are the ball bearings

Extremely accurate. The hysteresis models out-perform other devices at low RPM

Versatile mounting: easy to retrofit

Clutches are available with hollow bores for mounting on motor shafts or jack shafts

Stub shaft adapters are available for inline applications

Bolt circles allow for fixed mounting, adding a pulley, or stub shaft adapters

Brakes are available with solid shaft inputs

Perma-Tork®Design Features

Operating Principles

Perma-Tork clutches and brakes are designed to handle any light torque control application. High energy, multipole magnets are used to establish magnetic fields. Therefore, an outside power source is not required for torque control The strength of the magnetic field is controlled using two different methods:

A. Twin Magnet

This style uses the relative position of the magnetic poles to determine the field strength.

Twin Magnetic Style

Hysteresis Disc

End Cap

S N | S N
N S | N S

Housing

Magnetic Assembly

"O" Ring
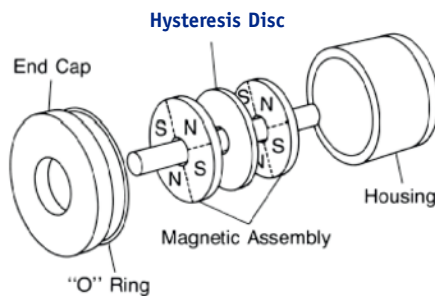
B. Flux Gate

This style uses the position of the flux gate relative to the magnetic poles to determine the field strength.

Housing

Rotating Disc

S N
N S
N S

Flux Gate

Magnet Assembly
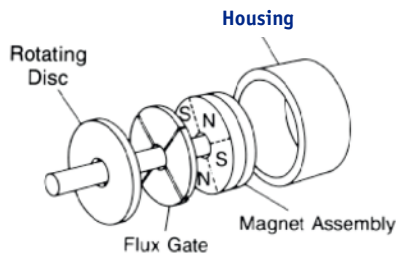
These two methods of controlling magnetic field strength are incorporated into two types of magnetic clutches and brakes:

1. Hysteresis

2. Magnetic particle

Hysteresis (HC, HB)

Constant torque with respect to speed

The hysteresis units utilize the twin magnet construction (except for the HB $1/2$ which uses a flux gate). When in the maximum position, similar magnetic poles are on opposite sides of the disk. Magnetic lines of force are directed through the very narrow width of the hysteresis disk which produces high magnetic field strength. In the minimum position, lines of force are not concentrated and field strengths are low.

As the hysteresis disk rotates through the field established by alternating poles, the magnetic state of the disk alternates. The resistance of the disk to change magnetic states, produces a retarding force. This retarding force is converted to a smooth consistent torque unaffected by speed.

Maximum Position

S | S   Magnetic Flux Path

Backup Plates

N | N

Rotating Hysteresis Disc

Minimum Position

S | N   Magnetic Flux Path

Backup Plates

N | S

Rotating Hysteresis Disc
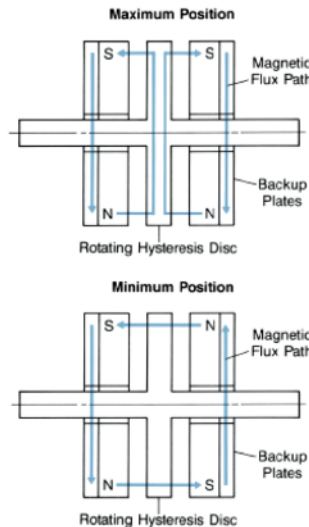
Magnetic Particle (PB)

Constant torque with respect to speed

The magnetic particle units utilize the flux gate design. In the maximum position, magnetic lines of force pass through the flux gate and across the power gap. In the minimum position, magnetic lines of force are "short-circuited" by the flux gate. When magnetic lines of force pass through the powder gap, the particles form chains between the flux gate and the rotating disk. These chains produce a retarding force or torque that is unaffected by speed.

Maximum

Magnetic Flux Path

N   Backup Plate

Rotating Disc

S

Flux Gate

Minimum

Magnetic Flux Path

N   Backup Plate

Rotating Disc

S

Flux Gate

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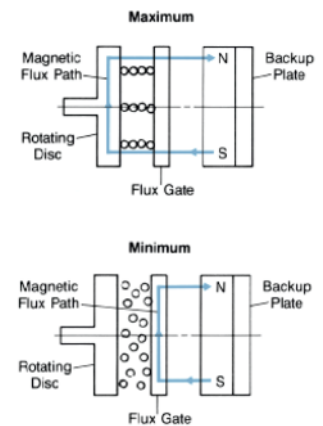
Perma-Tork® Typical Applications

1. As A Tensioner

By using one of the Perma-Tork assemblies, you can accurately control tension. The hysteresis unit is best suited for tensioning on unwind stands and nip rolls.

2. As A Torque Limiting Device

The power-free, maintenance-free, Perma-Tork design is particularly suitable for protecting all drive train, winding or unwinding components. It not only provides overload and jam load protection, but there are no complicated electrical feedback systems or mechanical wearing parts to break down or require maintenance. The only wearing parts are the bearings themselves, and nothing but the highest quality ball bearings are used.

3. As A Magnetic Coupling

Perma-Tork clutches guarantee a soft transfer of power between prime mover and load at start-up. In this application, Perma-Tork behaves similar to a fluid coupling, but locks in at zero slip once torque is reached.

4. Testing

Perma-Tork hysteresis units provide a constant slip torque unaffected by wear, humidity or "stick-slip". This makes it an ideal device for many testing applications. The torque can be precisely adjusted (even at low speeds). Torque will not fluctuate over extremely long testing periods.
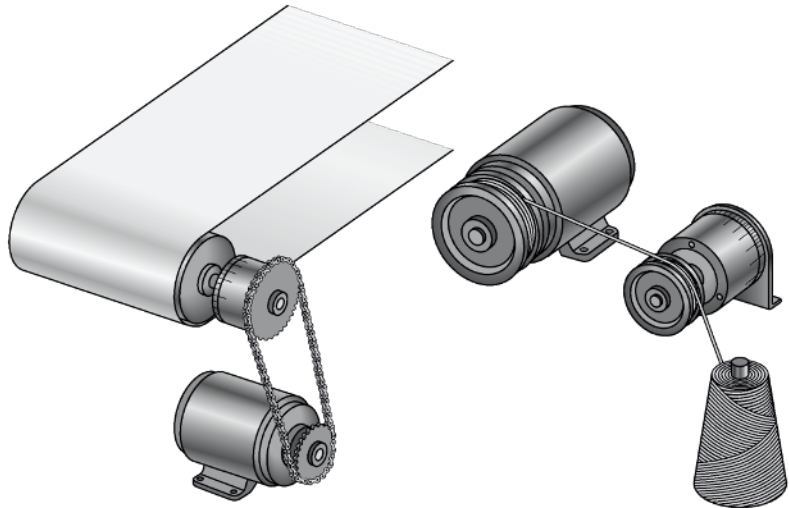
Material Handling
Hysteresis clutch can provide overload protection and soft start

Coil Winding
Constant tension provided by hysteresis or magnetic particle unit
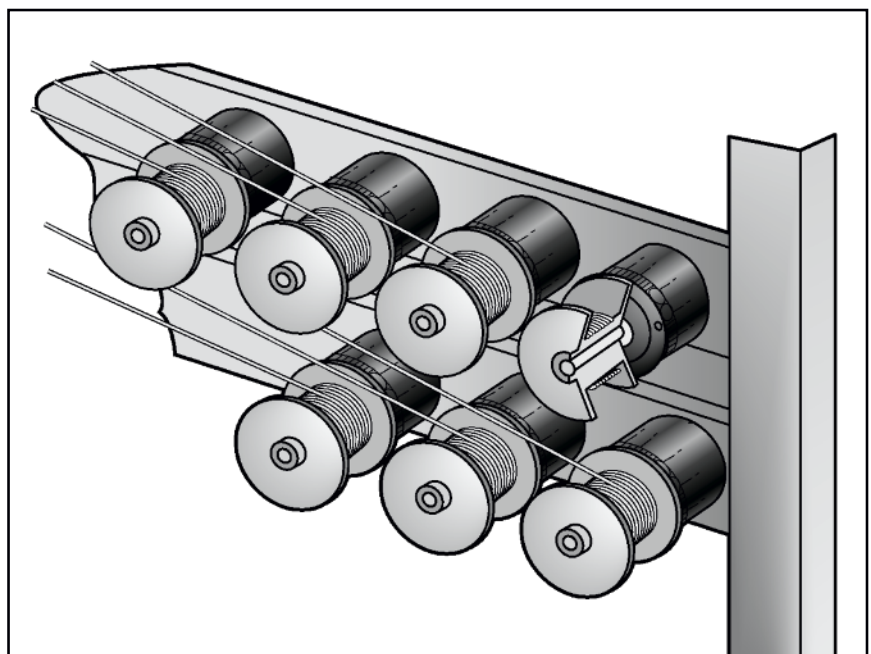
Stranding, Braiding, Bunching
Tension provided by hysteresis or magnetic particle unit

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Perma-Tork® Typical Applications
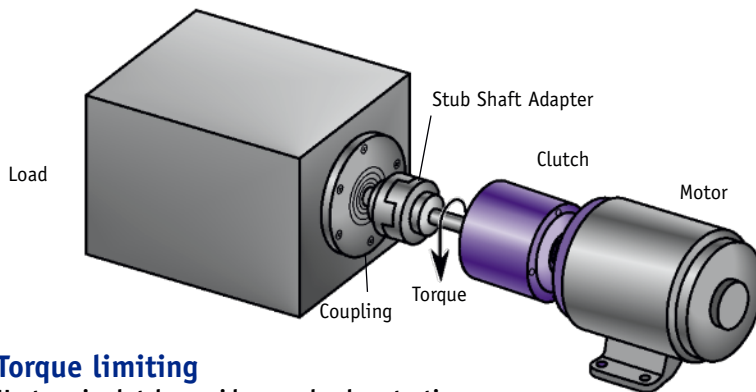
Torque limiting
Hysteresis clutch provides overload protection

Load

Stub Shaft Adapter

Clutch

Motor

Torque

Coupling

Web tensioning
Hysteresis clutch on a web rewind providing a taper tension

Clutch

Torque

Drive Belt
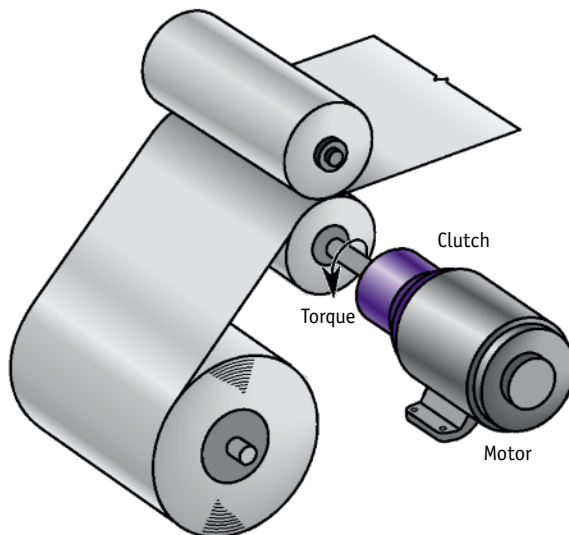
Film tensioning
Constant tensioning provided by magnetic particle unit

Clutch

Torque

Motor

Drive Gears

Clutch

Torque

Capping Head

Bottles on Conveyor
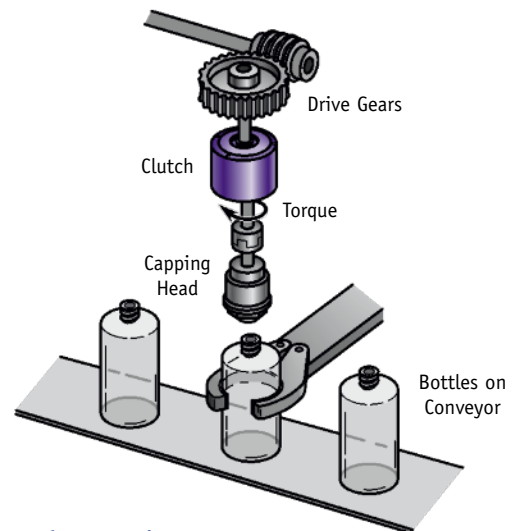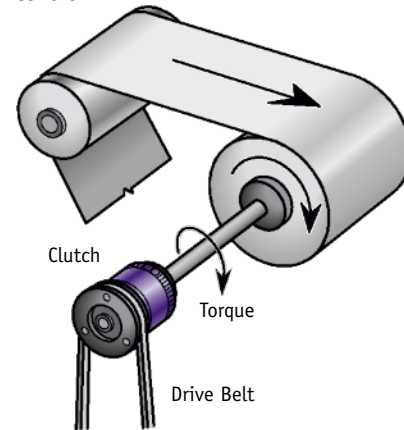
Bottle capping
Constant torque provided by a hysteresis clutch

Teflon tape slitter
Eddy current clutches provide a diameter compensated tension control on rewind

Rewind Spools

Clutches

Torque

Motor
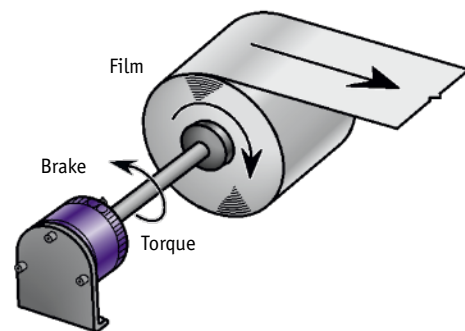
Film unwind
Tension provided by a hysteresis or magnetic particle unit

Film

Brake

Torque

Permanent Magnet Clutches & Brakes

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Perma-Tork® Selection

Model Selection

Two types of Perma-Torks are available:

1. Hysteresis

The hysteresis clutches and brakes offer the smoothest torque and longest life. Torque is infinitely adjustable within its range and is unaffected by speed. Hysteresis units can be mounted as clutches or brakes.

2. Magnetic Particle

The Magnetic Particle Brakes feature high torques in small packages. Torque is smooth, adjustable, and unaffected by speed. Typically, these units are mounted as brakes.

Selection Criteria

Torque

Hysteresis and magnetic particle applications.

For Perma-Tork applications torque requirements must be calculated in units of pound-inches (lb-in). If the torque value is very small it may be necessary to express torque in units of ounce-inches (oz-in). Simply multiply the value in lb-in by 16 to get the value in oz-in.

Slip Watts

When a brake or clutch is slipping, mechanical energy is being converted to thermal energy. The rate that thermal energy is being created is expressed in terms of slip watts. Slip watts are a function of torque and slip speed. The model selected must have a dissipation rating sufficient to dissipate the slip watts created.

The hysteresis models do not slip unless the set torque value is reached. In some applications, such as overloaded protection applications, slip does not occur unless an "overload" takes place. As long as the system is being monitored for overloads, it is not necessary to size for slip watts.

Selection Procedure

Quick Selection
(Constant slip applications)

If you know your torque requirement and slip RPM, you can proceed directly to the quick selection charts.

Standard selection procedure

Step 1.

Determine torque required

Step 2.

Determine heat dissipation required

Step 3.

Select model from specification chart

Nip Roll Or Pulley Tension Control
(Coil Winding)

Information required:

Pulley or nip roll diameter* = 4 inches

Tension = 6 lb

Velocity = 100 fpm

How to size:

Torque (lb-in) = $\dfrac{\text{Tension (lb) x Diameter (inch)}}{2}$

$= 6 \times \dfrac{4}{2} = 12$ lb-in

Slip watts = $\dfrac{\text{Tension (lb) x velocity (fpm)}}{44.2}$

$= 6 \times \dfrac{100}{44.2} = 13.5$ watts

Select a HC-5 from the specification chart

Unwind Tension Control

(Unwind Tensioning)

Brake mounted on shaft or unwind spool or bobbin.

Note: Tension will change as material diameter changes. If constant tension is required, it may be necessary to mount the constant torque brake on a pulley or nip roll.

Information required:

Full roll diameter (inch) = 6 inches

Core diameter (inch) = 4 inches

Average tension (lbs) = 4 lbs

Velocity (feet per in/min) = 100 fpm

How to size:

Average radius (in)

$= \dfrac{\text{Full roll diameter (inch) + Core diameter (inch)}}{4}$

$= 6 + \dfrac{4}{4} = 2.5$ inches

Torque (lb-in)

$=$ Avg. tension (lb) x Avg. radius (inch)

$= 4 \times 2.5 = 10$ lb-in

Check tension range:

Max tension = Torque (lb-in) x $\dfrac{2}{\text{Core dia. (inch)}}$

$= 10 \times \dfrac{2}{4} = 5$ lb

Min. tension = Torque (lb-in) x $\dfrac{2}{\text{Full roll dia. (inch)}}$

$= 10 \times \dfrac{2}{6} = 3.3$ lb

Slip watts = $\dfrac{\text{Max. tension (lb) x velocity (fpm)}}{44.2}$

$= 11.3$ watts

Select an HC-4 from the specification chart

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Perma-Tork® Selection

Rewind tension control

(Web Tensioning)

Perma-Tork clutches provide constant tension or controlled taper tension on rewinds. If you need assistance selecting an eddy current or hysteresis clutch for your rewind application, call the factory.

Overload protection/Torque limiting/Soft start

(Torque Limiting)

Motor horsepower method

Information required:

Motor HP = $1/2$ HP

Motor RPM = 1750 RPM

How to size:

Torque (lb in) $= \dfrac{HP \times 63000}{RPM}$

$= \dfrac{1/2 \times 63000}{1750} = 18$ lb-in

Select a HC-5 from the specification chart

String and Pulley Method

Affix a pulley to the shaft of a machine to be measured. Secure a string or cord to the outer surface of the pulley and wrap the cord around a few times. Tie the other end of the cord to a spring scale. Pull on the scale until the shaft turns. The force (in pounds) indicated on the scale, multiplied by the radius of the pulley (in inches) gives the torque in pound-inches.

Cycling

(Bottle Capping)

Information required:

Slip RPM = 500 RPM

Torque - 8 lb-in

% slip time of total cycle time = 25%

How to size:

Watts* = .0118 x Torque (lb-in) x Slip RPM x % slip time = .0118 x 8 x 500 x .25 = 11.8 watts

Select an HC-4 from the specification chart

*Note: Consult factory if peak slip watts are extremely high or if duration of slip period is in excess of 1 minute.

Quick selection charts
Continuous slip applications

First find slip RPM on the vertical axis, then locate torque on the horizontal axis. Find the intersection of two lines. If you fall below the line and in the dark area, the brake is thermally sufficient to handle the heat generated. If it lands on the line or in the white area, a larger unit is required.

The dotted curve represents the thermally safe area for intermittent duty, such as 3 minutes on, 3 minutes off.
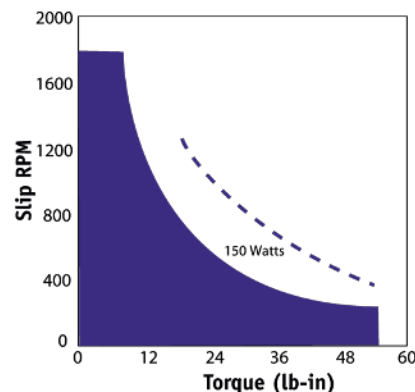
Model HB$1/2$
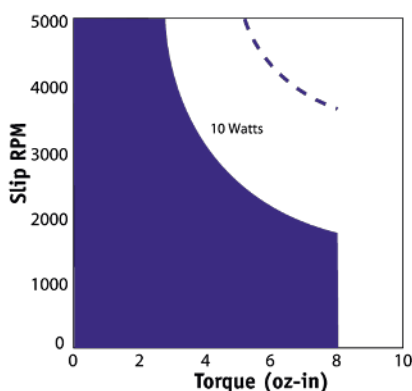
Model HC4
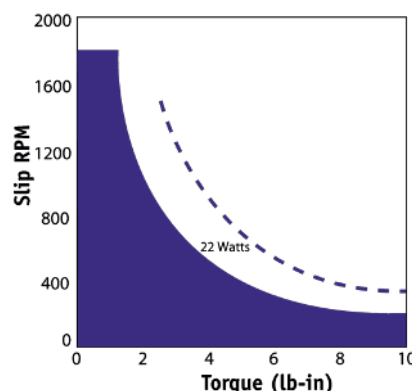
Model HC2
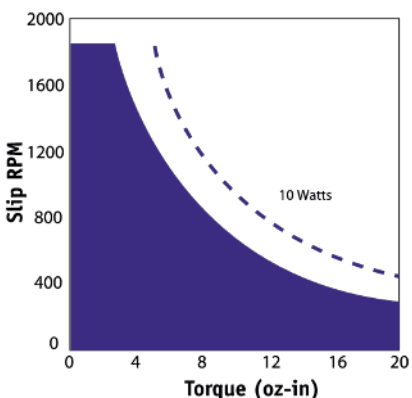
Model HC5

Model PB6

Model HC6, HB6

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Perma-Tork® Specifications

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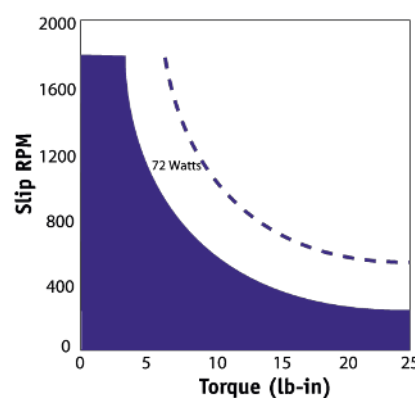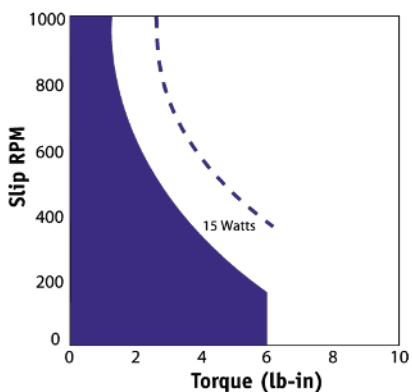
HC011 Brake

HC2 Clutch

HC4 Clutch

HC5 Clutch

HC6 Clutch

PB6 Brake

HB6 Brake

5 Clutch Models

3 Brake Models

Five clutch models and three brake models are available to fit many applications and brake requirements. Clutch models can be used as brakes when properly mounted. Torque ratings from 0.1 oz-inch to 55 lb-inch and heat dissipation ratings up to 150 watts are available. If a standard unit will not fit your specific mounting configuration, special designs can be manufactured. Contact your MAGPOWR Sales Engineer.

Imperial Models (Dimensions in inches)

Hysteresis and Magnetic Particle Models	Torque	Heat (watts)	Inertia (in-lb²)	Max RPMs	Adjustment	Weight
HC01-1	.14-1.1 oz-in	3	0.000042	3600	Rotate adjustment ring Tighten set screws	2.2 oz
HB-1/2	.25-8 oz-in	10	0.28	5000	Rotate adjustment ring	11 oz
HC2-14	1-20 oz-in	10	0.00072	1800	Rotate adjustment ring Tighten set screws	10 oz
PB6	.5-6.0 lb-in	15	0.0024	1000	Rotate adjustment ring Tighten wing nut	15 oz
HC4-58	.5-10 lb-in	22	0.012	1800	Rotate adjustment ring Tighten set screws	2.5 lbs
HC4-12	.5-10 lb-in	22	0.012	1800		2.5 lbs
HC5-58	2-25 lb-in	72	0.068	1800	Rotate adjustment ring Tighten set screws	8 lbs
HC5-12	2-25 lb-in	72	0.068	1800		8 lbs
HC6-58	2-55 lb-in	150	0.2	1800	Rotate adjustment ring with spanner wrench. Tighten socket head cap screws	12 lbs
HC6-34	2-55 lb-in	150	0.2	1800		12 lbs
HB6-1	2-55 lb-in	150	0.2	1800		12 lbs

Note - Minimum and maximum torque gains are given

Metric Models (Dimensions in mm)

Hysteresis Models	Torque	Heat (watts)	Inertia (kg-cm²)	Max rpm	Adjustment	Weight
HC2-M6	0.0071 to 0.141 Nm	10	0.00211	1800	Rotate adjustment ring Tighten set screws	0.28 kg
HC4-M14	0.0035 to 0.071 Nm	22	0.0351	1800	Rotate adjustment ring Tighten set screws	1.13 kg
HC5-M17	0.0141 to 0.177 Nm	72	0.199	1800	Rotate adjustment ring Tighten set screws	3.63 kg
HC6-M19	0.0141 to 0.388 Nm	150	0.585	1800	Rotate adjustment ring with spanner wrench Tighten socket head cap screws	5.44 kg

Perma-Tork® Dimensions

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Clutches — Hollow Shaft

1

2
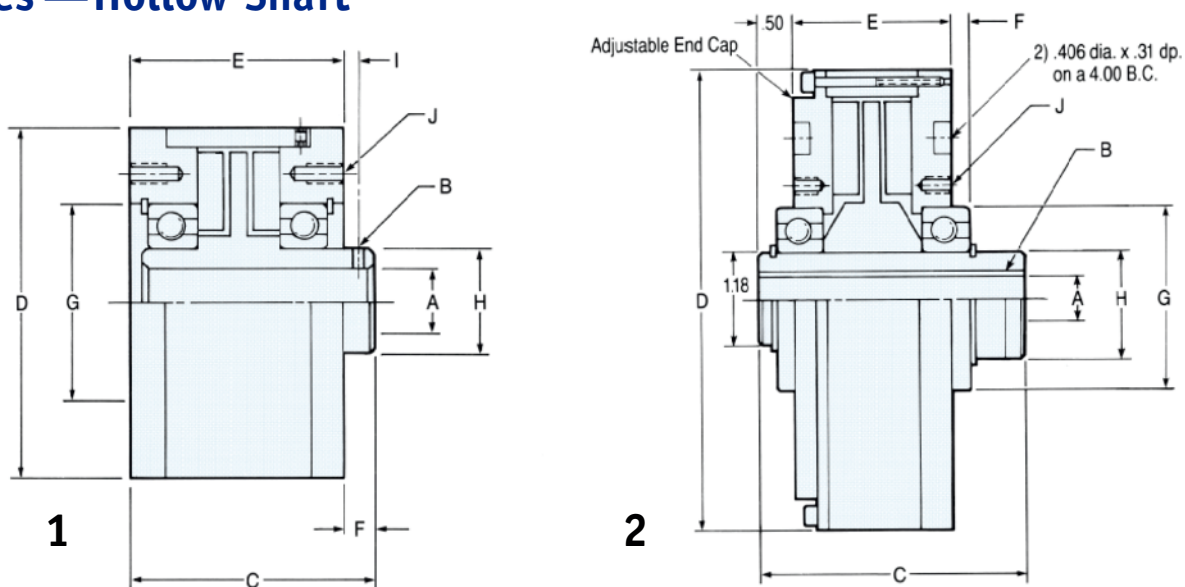
Imperial Models (Dimensions in inches)

Model	Design	Drwg.	A	B**	C	D	E	F	G*	H	I	J
HC01-1	Hysteresis	1	—	Flat .169	1.378	1.024	.83	.55	.392 x .037	.196/.197	—	3) M3 x 4.5 dp on .610
HC2-14	Hysteresis	1	.251 .250	3/32 Roll pin	1.61	1.88	1.36	.25	.8750 x .08	.375	.141	3) 6-32 x 5/16 dp on 1.25 B.C.
HC4-58	Hysteresis	1	.625 .626	3/16 Sq. key	2.30	3.23	2.02	.28	1.850 x .10	.98	—	3) 10-32 x 3/8 dp on 2.375 B.C.
HC4-12	Hysteresis	1	.500 .501	1/8 Sq. key	2.30	3.23	2.02	.28	1.850 x .10	.98	—	3) 10-32 x 3/8 dp on 2.375 B.C.
HC5-58	Hysteresis	1	.625 .626	3/16 Sq. key	2.89	4.65	2.47	.42	2.441 x .12	1.38	—	3) 10-32 x .50 dp on 3.000 B.C.
HC5-12	Hysteresis	1	.500 .501	1/8 Sq. key	2.89	4.65	2.47	.42	2.441 x .12	1.38	—	3) 10-32 x .50 dp on 3.000 B.C.
HC6-58	Hysteresis	2	.625 .626	3/16 Sq. key	3.18	6.00	2.03	.25	2.441	1.18	—	3) 1/4-20 x 5/16 dp on 2.875 B.C.
HC6-34	Hysteresis	2	.750 .751	3/16 Sq. key	3.18	6.00	2.03	.25	2.441	1.18	—	3) 1/4-20 x 5/16 dp on 2.875 B.C.

Metric Models (Dimensions in mm)

Model	Design	Drwg.	A	B**	C	D	E	F	G*	H	I	J
HC2-M6	Hysteresis	1	6 H8	2.5 Roll Pin	40.9	47.0	34.5	6.4	22.225 X 2.0	9.53	3.58	(3) M3 X 0.5 Thread X 7.9 deep on 31.8 bolt circle
HC4-M14	Hysteresis	1	14 H8	5 square key	58.4	82.0	51.3	7.1	47.00 X 2.5	24.90	-	(3) M5 X 0.8 Thread X 9.5 deep on 60.33 bolt circle
HC5-M17	Hysteresis	1	17 H8	5 square key	73.4	118.1	62.7	10.7	62.00 X 3.0	34.90	-	(3) M5 X 0.8 Thread X 12.7 deep on 76.20 bolt circle
HC6-M19	Hysteresis	2	19 H8	6 square key	80.8	152.4	51.6	6.4	62.00	30.00	-	(3) M6 X 1.0 Thread X 7.9 deep on 73.03 bolt circle

*Dimension G is the same on both ends of the housing   **The hollow shaft units with keyways have set screws in the hub extension
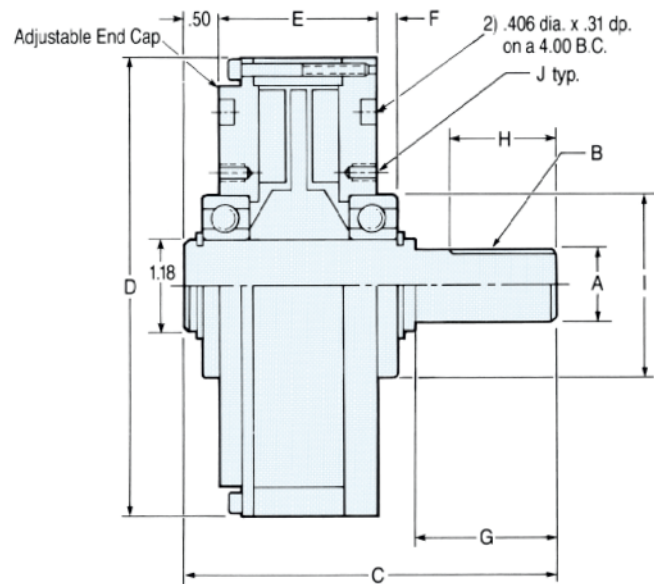
# Perma-Tork® Dimensions

Brakes — Solid Shaft
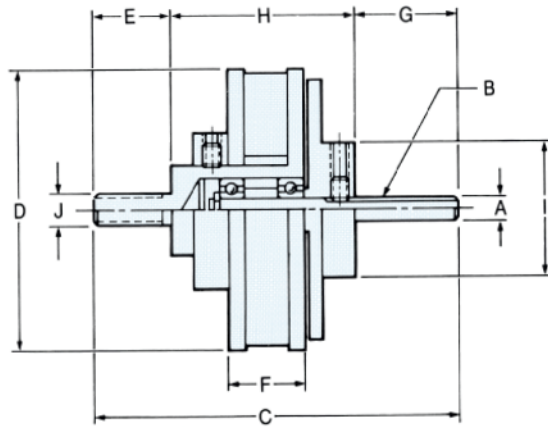
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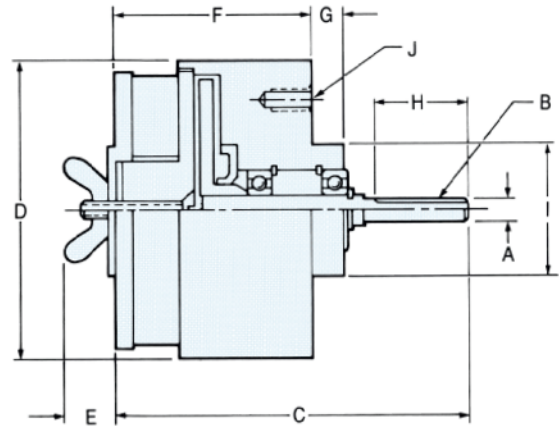
4

6

Imperial Models (Dimensions in inches)

Model	Design	Drwg.	A	B	C	D	E	F	G	H	I	J
HB-1/2	Hysteresis	3	.187 .186	Flat on shaft	2.80	2.19	.62	.64	.80	1.4	1.00	1/4-20 Mounting stud
PB-6	Magnetic Particle	4	.250 .249	Flat on shaft	2.68	2.31	.32	1.52	.25	.81	.997	10-24 x 3/8 dp. (3) on 1.75 B.C.
HB6-1	Hysteresis	6	1.00 .998	1/4 Sq. Key	4.57	6.00	2.03	.25	1.63	1.12	2.441	1/4-20 x 5/16 dp. (3) on 2.875 B.C.

![ttemsa logo]

Perma-Tork® Adapter Specifications and Mounting

Stub Shaft Adapter

Bolt Circle
(3 places)
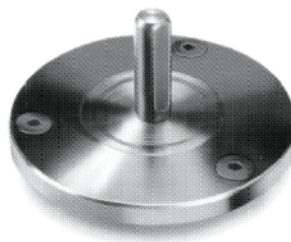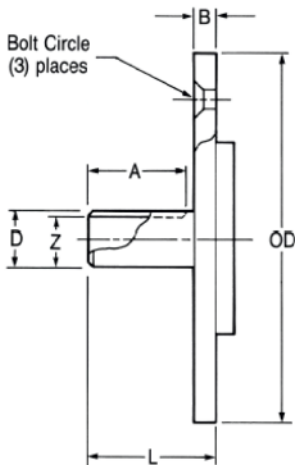
Stub shaft adapters are available for the clutch models listed in the chart below. Use the stub shaft adapter when using the clutch models in in-line applications. The stub shaft adapter is supplied with mounting screws. Simply attach stub shaft and mount clutch with a flexible coupling. See typical mounting configurations below.

Imperial Models (Dimensions in inches)

Adapter	Clutch Model	A	B	L	OD	D +0.000 -0.001	Z
2-38-3	HC2-14	0.50 Flat	0.13	0.75	1.60	0.250	0.230
4-38-3	HC4-58 HC4-12	0.88 Flat	0.19	1.19	2.9	0.375	0.355
5-38-3	HC5-58 HC5-12	0.80 X 0.125 square key	0.25	1.28	4.00	0.500	-

Metric Models (Dimensions in mm)

Adapter	Clutch Model	A	B	L	OD	D +0.000 -0.001	Z
2-6-3	HC2-M6	12.7 Flat	3.3	19.1	40.6	6 H8	5.50
4-14-3	HC4-M14	22.2 Flat	4.8	30.2	73.0	14 H8	14.50
5-17-3	HC5-M17	20.3 X 5	6.4	32.5	101.6	17 H8	10.70

Typical Mounting Configurations

Brake

Clutch Coupling
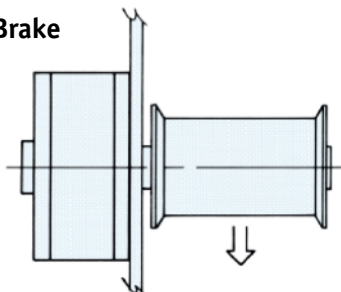
Clutch

Brake applications

Typical setup for tensioning wire, fiber, film on pay off.
Note: If there is a dramatic change in the unwound material's radius there will be a similar change in tension.
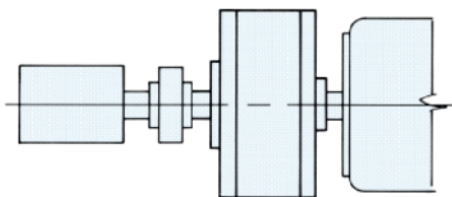
In-Line application

Typical torque limiting and jam load protection for labels, printing and capping.
Note: Use a flexible coupling and support Perma-Tork carefully at *both* ends.
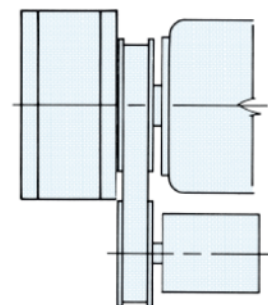
Parallel shaft or jack shaft

Typical use of "clutch" style (hollow shaft) device on NEMA motor or jack shaft.

Permanent Magnet Clutches & Brakes

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Perma-Tork® How to Order: Examples

H	C	2-	14
Hysteresis	Clutch	Size (relative)	Bore (relative)

H	B	6-	1
Hysteresis	Brake	Size (relative)	Bore (relative)
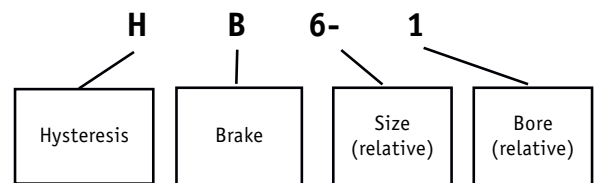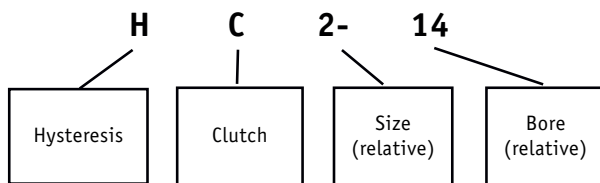
Application Example

Our application selection criteria

Mounting: brake to be mounted on a nip roll

Nip roll diameter = 2 inches

Tension = 3 lbs

Velocity = 100 feet per minute

1. Choose selection procedure from pages 6 and 7 that fits your application:

For our example, choose the nip roll tension control procedure from page 6.

2. Torque required:

Torque = 3 lb x $\dfrac{2 \text{ inches}}{2}$ = 3 lb-in

3. Heat dissipation required:

Slip watts = $\dfrac{3 \text{ lbs x 100 fpm}}{44.2}$ = 7 watts

4. Unit required:

HC-4 or PB-6 are satisfactory.

5. Mounting:

HC-4—use the bolt circle to mount brake body. The hollow shaft is the input and is attached to the nip roll.

PB-6— use bolt circle to mount brake body. The solid shaft is the input and is attached to the nip roll.

6. Ordering information required:

1. Quantity—5 pieces
2. Model—HC4-58 (.625 inch bore)

Permanent Magnet Clutches & Brakes

PRODUCT INDEX

Product Appendix

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REBUILD KITS: While magnetic particle clutches and brakes are very long lived, they may eventually require some maintenance. When this is necessary, the unit can be rebuilt in an hour or two, using a MAGPOWR repair kit. These repair kits contain a complete step by step instruction manual, a new powder charge and the appropriate bearings, seals, snap rings, and all parts generally needed to rebuild your unit. To specify a repair kit, preface the model number by RK. For example, the repair kit for a C-50 clutch is an RKC-50.

FACTORY REBUILD PROGRAM: With minimum maintenance and care, your particle clutch and/or brake should serve your needs for years. This can be accomplished simply by periodically installing a new factory repair kit, or the unit may be shipped back to the factory to be rebuilt.

When your unit is received, it is completely disassembled and the parts subject to normal wear are discarded. The main parts are thoroughly cleaned and degreased and are evaluated for future use. The unit is reassembled using all new bearings, seals and hardware, and is given the same test as a new unit. With the unit freshly repaired, it looks and operates as new, and carries a six month warranty on workmanship and parts.

NOTE: Rebuild Kits and Factory Rebuild Program are not available for all models.

MAGPOWR WARRANTY

Seller makes no other warranty of merchantability in respect to the goods sold under this agreement. Buyer affirms that he has not relied upon sellers skill or judgment to select or furnish goods for any particular purpose, and this sale is made without any warranty by seller that goods are suitable for any particular purpose.

The Seller Guarantees its products to be free from defects in material or workmanship over a period of one year from date of shipment from its factory. The Seller is not responsible for damage to apparatus through improper installation or attempts to operate it above its rated capacity or voltage, intentionally or otherwise, or damage caused by other abuse or misuse of the apparatus.

If any device is found unsatisfactory under the warranty, the buyer should notify the seller in writing and after receipt of shipping advice, buyer may return it direct to MAGPOWR, shipping charges prepaid. Such equipment will be replaced or put in operating conditions, free of all charges except transportation, and the correction of any defects by repair or replacement by the seller shall constitute fulfillment of all obligations to the purchaser.

Seller does not assume responsibility for repairs to apparatus by any person other than Seller. Any repairs or adjustments not specifically authorized in writing by Seller shall cancel this warranty and shall relieve the company for any responsibility to Purchaser.

Seller shall not be liable for special or consequential damages in case of any failure to meet the conditions of any Warranty or Shipping Schedule, nor will claims for labor, loss or profits or good will, repairs or other expenses incidental to replacement be allowed.

No other representation, guarantees of warranties, expressed or implied, are made by the Seller in connection with the manufacture and sale of any equipment, parts or products, and the warranties contained herein are made expressly in lieu of any such other warranties.

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