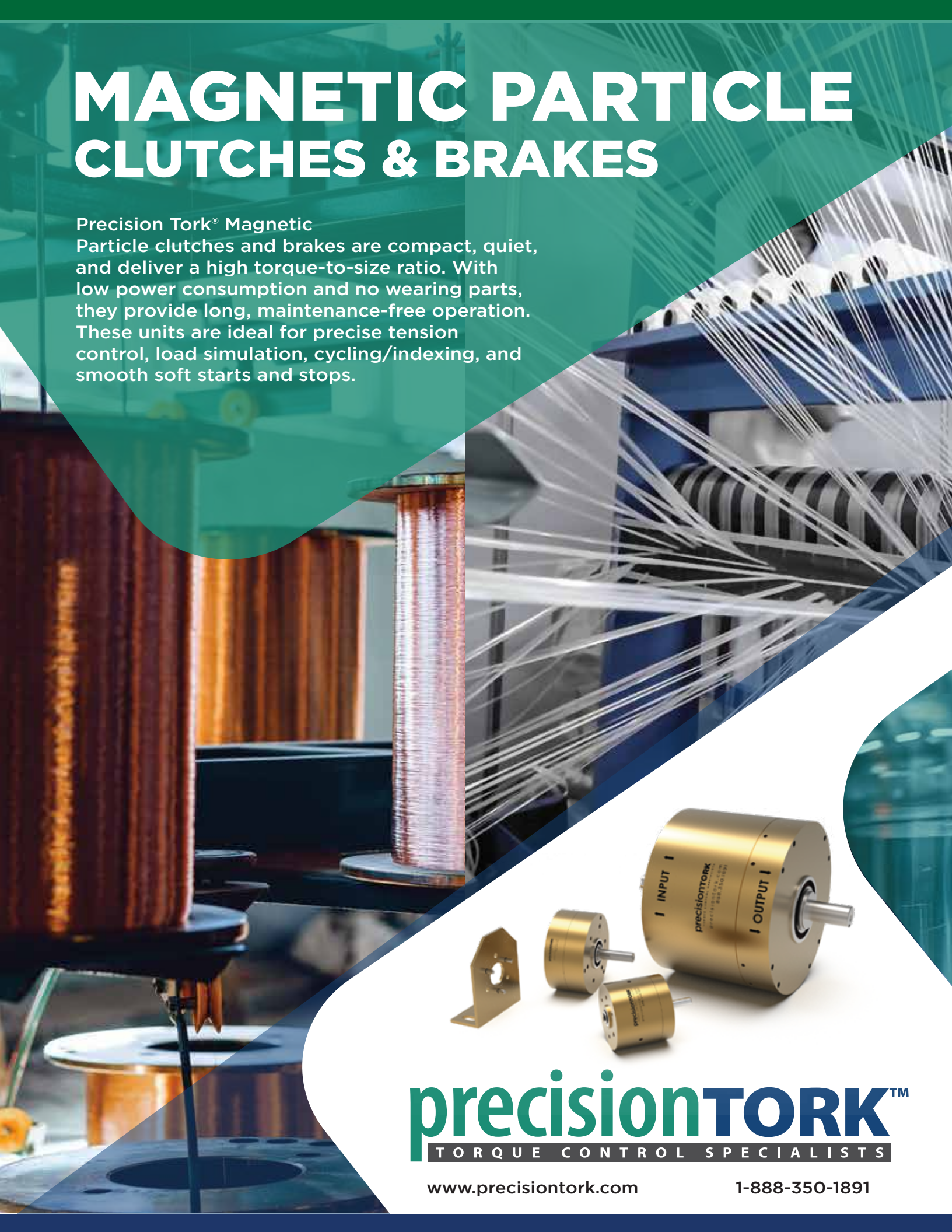
MAGNETIC PARTICLE CLUTCHES & BRAKES

Precision Tork® Magnetic Particle clutches and brakes are compact, quiet, and deliver a high torque-to-size ratio. With low power consumption and no wearing parts, they provide long, maintenance-free operation. These units are ideal for precise tension control, load simulation, cycling/indexing, and smooth soft starts and stops.



precisionTORK™

TORQUE CONTROL SPECIALISTS

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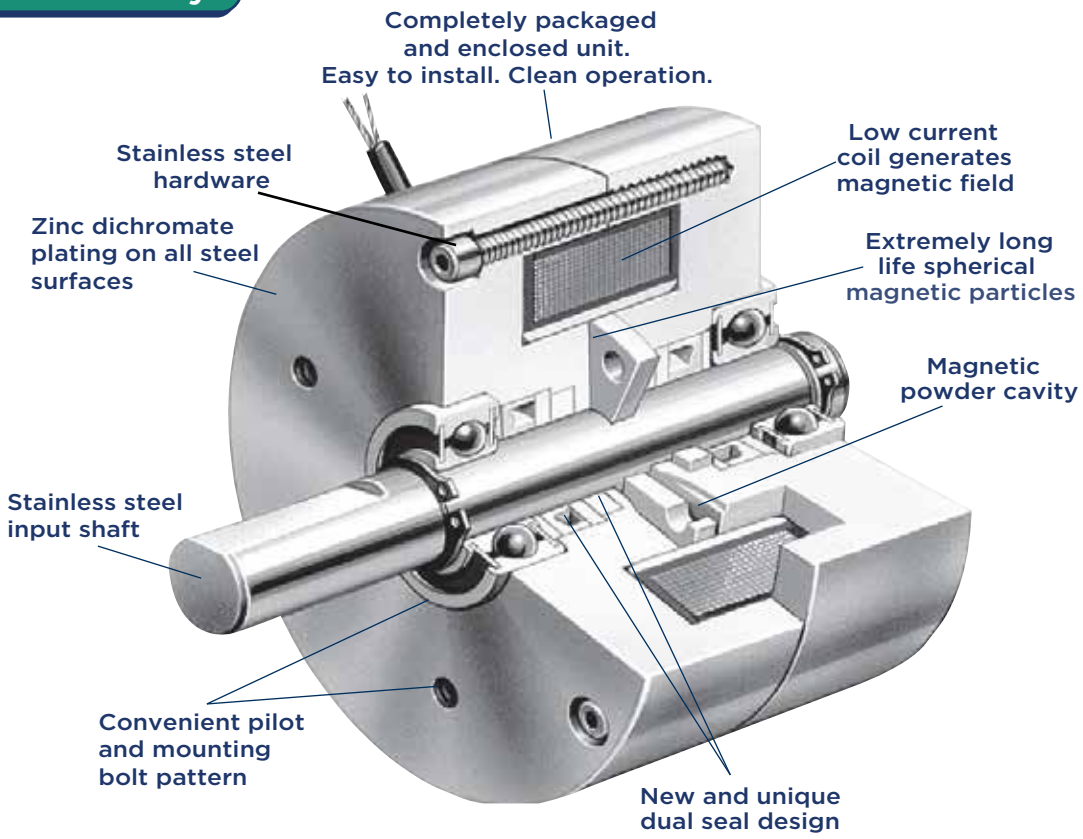
The Inside Story



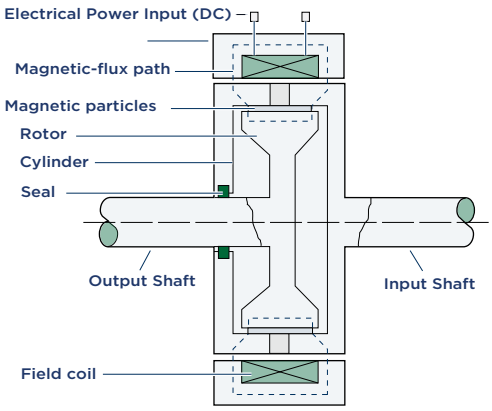
Features and Benefits

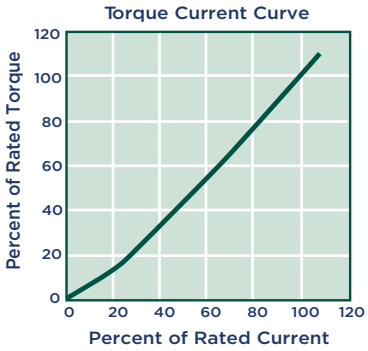
Torque independent of Slip Speed

Torque is transmitted through precisely formed magnetic particle chains controlled by an electromagnetic field. Because torque depends only on input current not slip speed it remains completely stable and is infinitely adjustable from zero to full rated torque.

Precise Engagement

Precision Tork magnetic particle clutches and brakes engage with exceptional speed and accuracy. The particles respond virtually instantaneously to the electromagnetic field, delivering smooth, jerk-free torque transmission every time.





Fast Response

Engagement can be programmed from extremely gradual to nearly instantaneous. The only limit to cycle frequency and torque control is the capability of the external control circuitry.

Smooth, Quick Operation

Torque is delivered with perfect smoothness and zero ripple or pulsation. Operation is exceptionally quiet, making these units ideal for applications where noise and vibration must be minimized.

Efficient, Compact Design

High Torque to size ratio and low consumption of electric power.

Selection

Sizing

To size a Precision Tork magnetic particle clutch or brake, determine the required torque and slip watts, then select the appropriate model from the charts.

RPM

RPM is needed to calculate slip watts. For load simulation, torque limiting, and similar applications, operating RPM must be known. For web handling, RPM can be calculated using these formulas:

$$\text{Slip RPM*} = \frac{12 \times \text{Velocity (feet per min.)}}{\pi \times \text{Full Roll Dia. ** (in.)}}$$

*In rewind applications the motor RPM should be higher (10%) than the fastest spool RPM.

**In applications with the web running over a pulley or in a nip roll application use the pulley diameter as the roll diameter.

Thermal Energy (slip watts)

Magnetic particle clutches and brakes generate heat when slipping. This heat is expressed as thermal energy in slip watts and must be considered during sizing.Tension control applications (unwind or rewind) are continuous slip applications. Starting and stopping applications generate heat only during the acceleration or deceleration phases when the unit is slipping.

• **Continuous Slip Applications** (e.g., tension control) Slip watts are calculated using the following formula:

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

• **Cycling / Intermittent Applications** In cycling, indexing, or start-stop applications, heat is generated intermittently. Slip watts are calculated using the following formula:

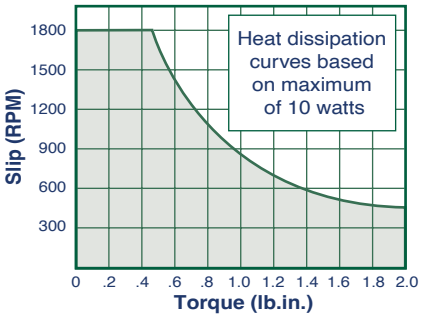
$$\text{Watts} = 2.67 \times \text{Inertia (lb.in}^2\text{)} \times \left(\frac{\text{RPM}^2}{10{,}000}\right) \times F \frac{\text{cycle}}{\text{min.}}$$

Duty Cycle

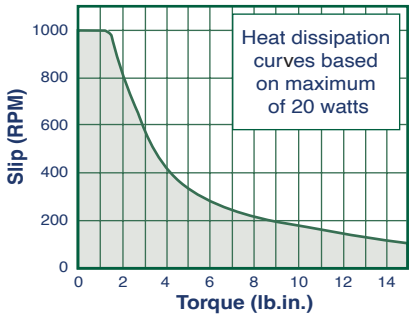
The average heat input (slip watts) must remain below the clutch or brake's rated heat dissipation capacity. For applications with intermittent slip, use the average speed across the full duty cycle when calculating thermal energy (slip watts).

Quick Selection Charts

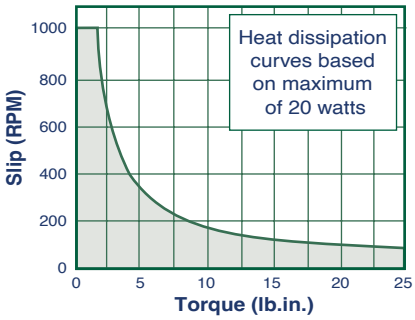
MPB2/MPC2



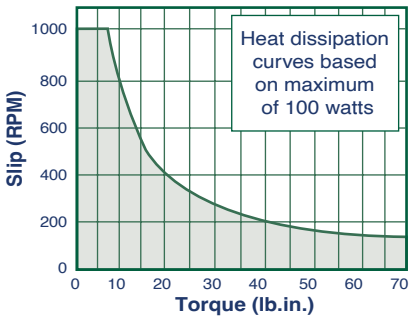
MPB15/MPC15



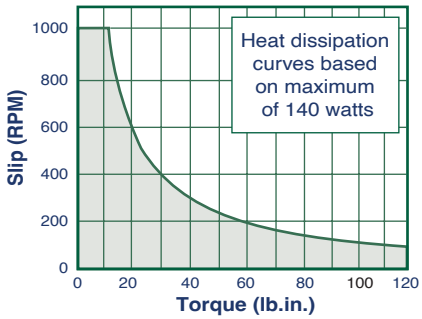
MPB25/MPC25



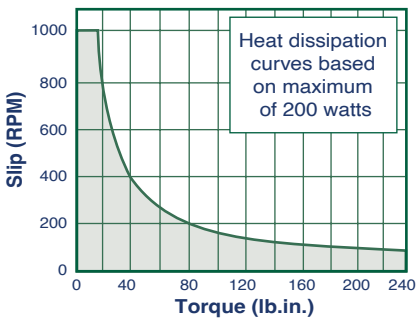
MPB70/MPC70



MPB120/MPC120



MPB240



Torque

Tension applications calculate torque as a function of roll radius and tension. Soft controlled stopping applications calculate torque as a function of inertia, speed and desired time to stop the load. Torque limiting applications calculate torque as the allowable drive through torque. Calculate the torque requirement based on formulas for the different applications:

• To calculate torque for soft controlled stop or cycling applications first determine the inertia (WR²2), and apply it to the formula below:

$$\text{Torque (lb.in)} = \frac{\text{Inertia (lb.in.}^2\text{)} \times \text{RPM}}{3{,}690 \times \text{time(s)}}$$

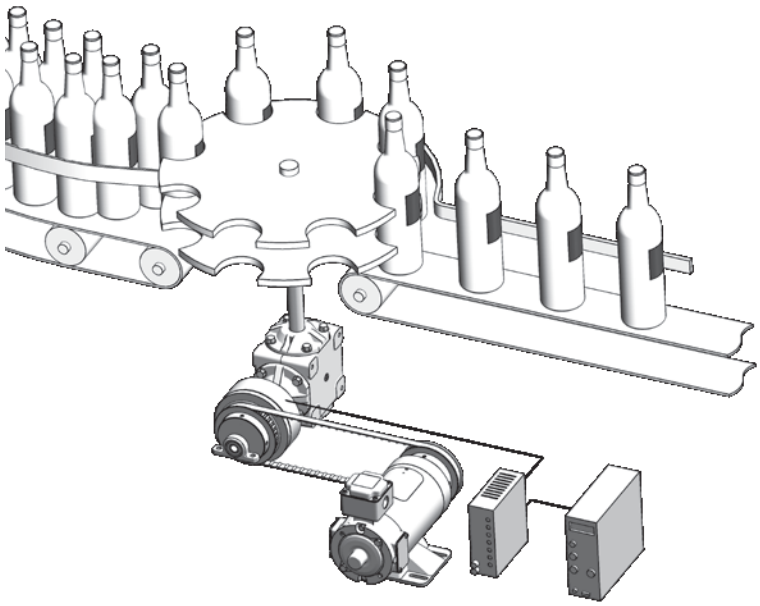
• To calculate torque for a web handling application, determine the desired tension in the web then calculate the required torque as follows:

$$\text{Torque (lb.in.)} = \frac{\text{Tension(lbs.)} \times \text{Roll Dia. (in.)}}{2}$$

Load Simulation

Precision Tork Magnetic Particle brakes provide quiet, fast, and smooth torque resistance. With low power consumption and no maintenance requirements, they excel in applications requiring precise, repeatable torque loading.

When integrated into a closed-loop system, torque can be infinitely adjusted via current control to produce any desired torque profile. These characteristics make them ideal for rehabilitation equipment, athletic training devices, life testing, and calibration systems.



Torque Control/ Torque Limiting

Precision Tork Magnetic Particle clutches proactively protect equipment and products rather than reacting to overload events. They smooth out load spikes and surges, limit torque during jam-ups, and allow precise presetting and maintenance of optimal running torque.

This controlled torque transmission reduces stress, strain, and wear on mechanical components while improving process consistency.

Application Example:

Information Required:

Motor HP: 1 HP

Motor RPM: 700 RPM

How to Size:

Maximum Torque (lb.in.) =

$$= \frac{\text{HP} \times 63{,}000}{\text{RPM}}$$

$$= \frac{1 \times 63{,}000}{700}$$

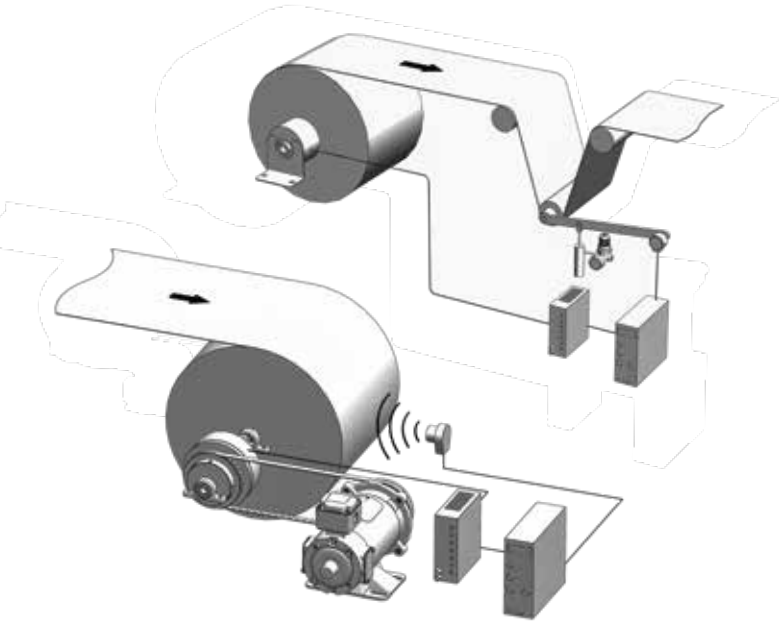
= 90 lb.in.

Select a clutch that exceeds the maximum torque requirements from the Selection Chart - MPC120.

Applications

Tensioning

Precision Tork Magnetic Particle clutches and brakes deliver smooth, controlled torque ideal for unwind and rewind tension zones. Because the torque is independent of slip speed, it remains stable despite changes in web speed. Combined with virtually instantaneous response, these units are excellent components for closed-loop tension control systems.



Particle Clutches for Rewind Applications

Application Example:

Information Required:

Core Diameter:	3 inches
Full Roll Diameter:	9 inches
Tension:	5 lbs.
Velocity:	300 fpm
Input RPM:	500 RPM*

Maximum Torque (lb.in.) =

$$\frac{\text{Tension (lbs.) x full roll diameter (in.)}}{2}$$

$$= \frac{5 \times 9}{2}$$

= 22.5 lb-in

Core RPM = $\frac{12 \times \text{Velocity (FPM)}}{\pi \times \text{(core diameter) (in)}}$

$$= \frac{12 \times 300}{\pi \times 3}$$

= 387 RPM

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

$$= \frac{12 \times 300}{\pi \times 3}$$

= 127 RPM

Slip RPM = Input RPM - Full Roll RPM

= 500 - 127

= 372.68

Thermal Energy (slip watts) =

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

= .0118 x 22.5 X 373

= 99 watts

Select a clutch that exceeds the maximum torque and thermal energy (slip watts) requirements using the Quick Selection Chart - MPC120.

*To maximize tension control and minimize heat generation, choose a drive system that results in an actual input speed as close as possible to (but not less than) 30 RPM above the core RPM.

Particle Brakes for Unwind Applications

Application Example:

Information Required:

Full Roll Diameter:	20 inches
Tension:	5 lbs.
Velocity:	400 fpm

How to Size:

Maximum Torque (lb.in.) =

$$\frac{\text{Full roll diameter (in.) x tension (lbs.)}}{2}$$

$$= \frac{20 \times 5}{2}$$

$$= \frac{100}{2}$$

= 50 lb.in.

Slip RPM = $\frac{\text{Velocity (fpm) x 12}}{\text{Full roll diameter x}\pi}$

$$= \frac{400 \times 12}{20 \times \pi}$$

= 76 RPM

Thermal Engery (Slip Watts) =

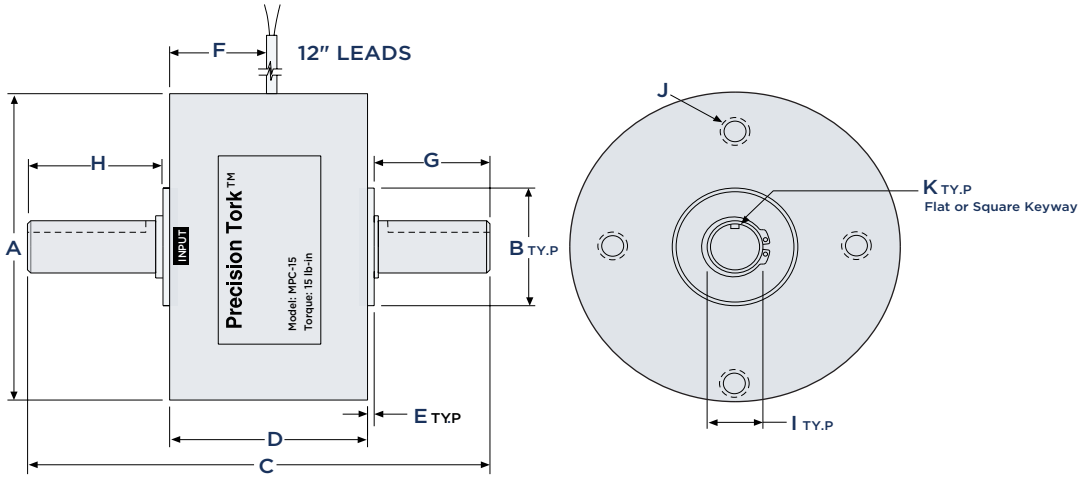
.0118 x Torque (lb.in.) x Slip RPM

= .0118 X 50 X 76

= 45 Watts

Select a brake that exceeds the maximum torque and thermal energy requirements from Quick Selection Chart - MPB07

Clutches



Dimensions

Model	A	B	C	D	E	F	G(Output)	H(Input)	I	J	K5
MPC2-1	2.11	0.750/0.749	3.73	1.85	0.06	1.16	0.88	0.88	0.2495/0.2489	(3) #6-32 x 0.50 on 1.350 BC	Flat
MPC15-1	2.96	1.125/1.124	4.93	2.80	0.07	1.69	1.00	1.00	0.4998/0.4992	(3) #8-32 x 0.50 on 2.000 BC	2 Flats at 90°
MPC15-2	2.96	1.125/1.124	5.08	2.80	0.07	1.69	1.22	0.92	0.3748/0.3742	(3) #8-32 x 0.50 on 2.000 BC	2 Flats at 90°
MPC25-1	2.96	1.125/1.124	4.93	2.80	0.07	1.69	0.995	1.00	0.4998/0.4992	(3) #8-32 x 0.50 on 2.000 BC	2 Flats at 90°
MPC25-2	2.96	1.125/1.124	5.08	2.80	0.07	1.69	1.22	0.92	0.3748/0.3742	(3) #8-32 x 0.50 on 2.000 BC	2 Flats at 90°
MPC70-1	4.58	1.625/1.624	6.55	3.67	0.10	2.08	1.35	1.35	0.7497/0.7492	(4) #10-32 x 0.63 on 4.228 BC	0.188 Keyway
MPC120-1	5.25	1.625/1.624	7.02	4.00	0.10	2.40	1.50	1.35	0.7497/0.7492	(4) #1/4-20 x 0.75 on 4.812 BC	0.188 Keyway
MPC240-1	6.23	2.4415/2.4405	8.35	4.83	.10	2.62	1.66	1.66	.7495/.7485	(4) #1/4-20 X 0.65 on 5.875 BC	0.188 Keyway

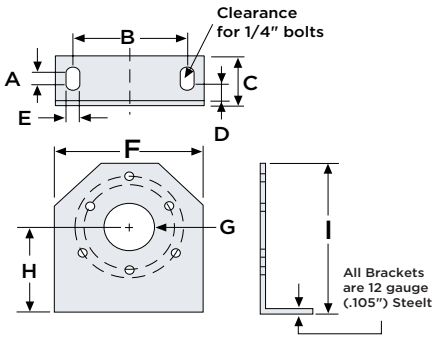
Specifications

Model Number	Max. Drag Torque 0 Excit. (lb-in)	Rated Torque (lb-in)	Rated Voltage (VDC)	Resistance (Ohms)	Rated Current (Amps)	Response Zero Force (Millisec)	Response With Force (Millisec)	Inertia of Output Shaft (lb-in)	Max. Heat Dissipation (watts)	Max. Speed Recom. (RPM)	Weight (lbs)
MPC2	0.40	2	24	92	0.261	8	4	0.001	10	1,800	2
	0.40	2	90	1552	0.058	8	4	0.001	10	1,800	2
MPC15	0.40	15	24	80	0.302	25	9	0.013	20	1,000	5.5
	0.40	15	90	1501	0.060	25	9	0.013	20	1,000	5.5
MPC25	0.40	25	24	45	0.533	25	9	0.013	20	1,000	5.5
	0.40	25	90	430	0.533	25	9	0.013	20	1,000	5.5
MPC70	1.00	70	24	35	0.677	70	17	0.073	100	1,000	16
	1.00	70	90	613	0.147	70	17	0.073	100	1,000	16
MPC120	2.00	120	24	33	0.742	90	25	0.370	140	1,000	22
	2.00	120	90	475	0.190	90	25	0.370	140	1,000	22
MPC240	2.00	240	24	19.5	1.200	150	45	1.330	200	1,000	37

Optional Mounting Bracket (for mounting MPB Brakes and MPC Clutches)

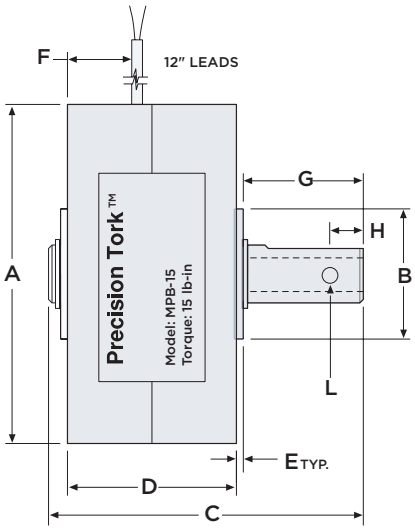
Model	Fits Size	A	B	C	D	E	F	G	H	I
MPB-2B	2	0.270	1.750	1.155	0.390	0.280	2.500	0.755	1.500	3.000
MPB-15B	15, 25	0.270	2.500	1.155	0.390	0.280	3.500	1.13	2.000	4.000
MPB-70B	70	0.270	4.875	1.155	0.390	0.280	6.000	1.63	3.500	6.000
MPB-120B	120	0.270	4.875	1.155	0.390	0.280	6.000	1.63	3.500	6.250
MPB-240B	240	0.270	4.875	1.155	0.390	0.280	6.500	2.245	4.000	7.500

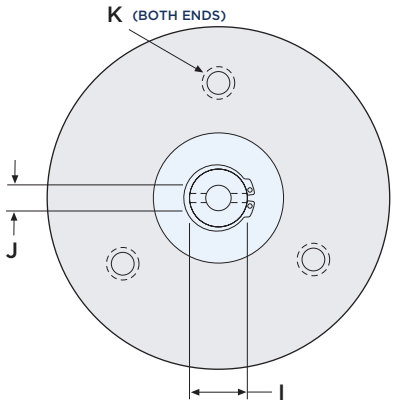
All dimensions are nominal unless otherwise noted.



Dimensions and Specifications

Brakes





Specifications

Model Number	Max. Drag Torque 0 Excit. (lb-in)	Rated Torque (lb-in)	Rated Voltage (VDC)	Resistance (Ohms)	Rated Current (Amps)	Response Zero Force (Millisec)	Response With Force (Millisecs)	Inertia of Output Shaft (lb-in)	Max. Heat Dissipation (watts)	Max. Speed Recom. (RPM)	Weight (lbs)
MPB2	0.40	2	24	92	0.261	8	4	0.001	10	1,800	1
	0.40	2	90	1552	0.058	8	4	0.001	10	1,800	1
MPB15	0.40	15	24	80	0.302	25	9	0.013	20	1,000	2.5
	0.40	15	90	1501	0.060	25	9	0.013	20	1,000	2.5
MPB25	0.40	25	24	45	0.533	25	9	0.013	20	1,000	2.5
MPB70	1.00	70	24	35	0.677	70	17	0.073	100	1,000	8
	1.00	70	90	613	0.147	70	17	0.073	100	1,000	8
MPB120	2.00	120	24	33	0.742	90	25	0.370	140	1,000	12.5
	2.00	120	90	475	0.190	90	25	0.370	140	1,000	12.5
MPB240	4.00	240	24	19	1.286	150	45	1.311	200	1,000	20.5
	4.00	240	90	246	0.366	150	45	1.311	200	1,000	20.5

Dimensions

Model	A	B	C	D	E	F	G	H	I (Shaft)	J (Bore)	K	L
MPB2-1	2.11	0.750/0.749	2.23	1.15	0.06	0.70	0.87	–	0.2495/0.2489	–	(3) #6-32 x 0.27 on 1.350 BC	1 Flat
MPB15-1	2.96	1.125/1.124	3.05	1.46	0.07	0.85	1.35	–	0.3748/0.3742	–	(3) #8-32 x 0.30 on 2.000 BC	2 Flats at 90°
MPB15-2	2.96	1.125/1.124	2.05	1.46	0.07	0.85	0.34	0.18	–	0.376/0.375	(3) #8-32 x 0.30 on 2.000 BC	0.127 Thru Hole
MPB15-3	2.96	1.125/1.124	2.70	1.46	0.07	0.85	0.99	–	0.4995/0.4989	–	(3) #8-32 x 0.30 on 2.000 BC	2 Flats at 90°
MPB25-1	2.96	1.125/1.124	3.05	1.46	0.07	0.85	1.35	–	0.3748/0.3742	–	(3) #8-32 x 0.30 on 2.000 BC	2 Flats at 90°
MPB25-2	2.96	1.125/1.124	2.05	1.46	0.07	0.85	0.34	0.18	–	0.376/0.375	(3) #8-32 x 0.30 on 2.000 BC	0.127 Thru Hole
MPB25-3	2.96	1.125/1.124	2.70	1.46	0.07	0.85	0.99	–	0.4995/0.4989	–	(3) #8-32 x 0.30 on 2.000 BC	2 Flats at 90°
MPB70-1	4.57	1.625/1.624	2.61	1.76	0.10	1.01	0.50	0.18	–	0.501/0.500	(4) #10-32 x 0.50 on 4.228 BC	0.127 Thru Hole
MPB70-2	4.57	1.625/1.624	3.36	1.76	0.10	1.01	1.25	–	0.7494/0.7488	–	(4) #10-32 x 0.50 on 4.228 BC	0.189 Keyway
MPB120-1	5.25	1.625/1.624	4.02	2.16	0.10	1.21	1.50	0.50	–	0.501/0.500	(4) #1/4-20 x 0.75 on 4.812 BC	0.158 Thru Hole
MPB120-2	5.25	1.625/1.624	4.02	2.16	0.10	1.21	1.50	–	0.7494/0.7488	–	(4) #1/4-20 x 0.75 on 4.812 BC	0.189 Keyway
MPB240-1	6.23	2.442/2.440	4.66	2.65	0.10	1.46	1.65	–	0.7495/0.7485	–	(4) #1/4-20 x 0.65 on 5.875 BC	0.189 Keyway
MPB240-2	6.23	2.442/2.440	3.51	2.65	0.10	1.46	0.50	–	–	0.876/0.875	(4) #1/4-20 x 0.65 on 5.875 BC	0.189 Keyway
MPB240-3	6.23	2.442/2.440	3.51	2.65	0.10	1.46	0.50	–	–	1.001/1.000	(4) #1/4-20 x 0.65 on 5.875 BC	0.251 Shallow Keyway

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