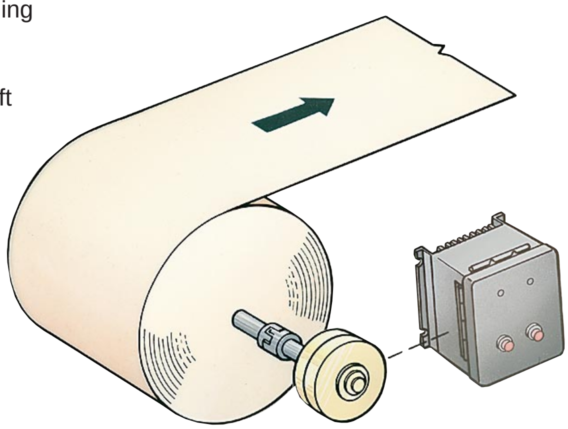
Applications

Warner Electric Precision Tork magnetic particle clutches and brakes are the ideal solution for controlling and maintaining torque. If the application is tensioning, load simulation, torque limiting, or soft starts and stops the magnetic particle unit is the preferred torque controlling device.

Typical Applications

- Wire Processing (winding, hooking, cutting)
- Paper/Foil/Film Processing
- Labeling Applications
- Textile Processing
- Material Processing
- Load profile simulation on:
  - Exercise Equipment
  - Flight Simulators
  - Healthcare Equipment
- Life testing on:
  - Motors
  - Gears
  - Pulleys
  - Belts
  - Chains
  - Many other Rotating Devices
- Conveyors
- Bottle Capping

Controlled Acceleration/Deceleration



Controlled soft stop

Particle brakes and the MCS-153 control provide soft stopping of large rotating loads. By controlling the input current, the load is decelerated in a controlled manner without torque spikes, shock, or vibration.

Application Example:

Information Required:

RPM:	1,000
Time to Stop:	3 seconds
Inertia*:	400 lb.in.^{2}

*If inertia is not known see page 3 to calculate.

How to Size:

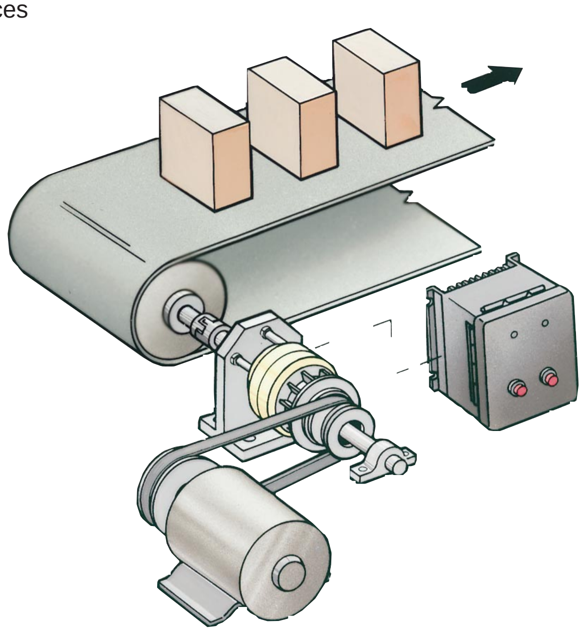
Maximum Torque (lb.in.) =

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

$$= \frac{400 \times 1{,}000}{3{,}690 \times 3}$$

$$= 36 \text{ lb-in}$$

Select a brake that exceeds the maximum torque requirements from the Specification Chart – MPB70.



Controlled soft start

Particle clutches and the MCS-153 control provide soft controlled acceleration to prevent tipping or shock during start up.

Application Example:

Information Required:

RPM:	500
Time to Start:	4 sec.
Inertia*:	50 lb.in.^{2}

*If inertia is not known see page 3 to calculate

How to Size:

Maximum Torque (lb.in.) =

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

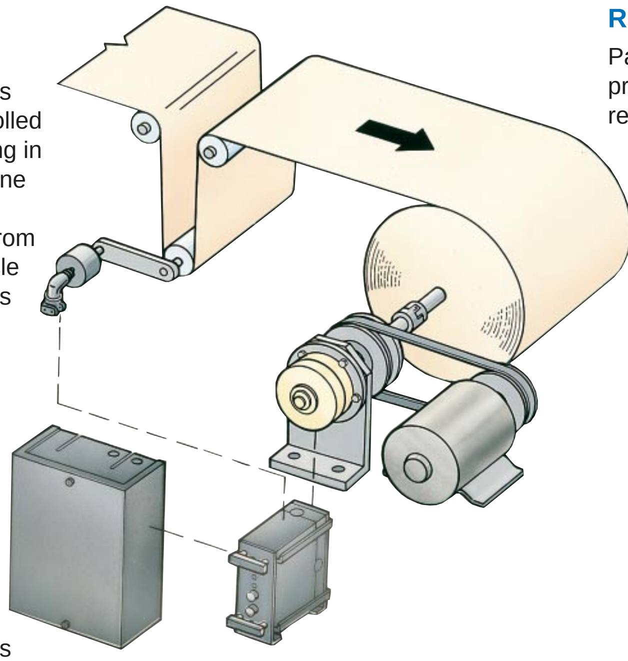
$$= \frac{50 \times 500}{3{,}690 \times 4}$$

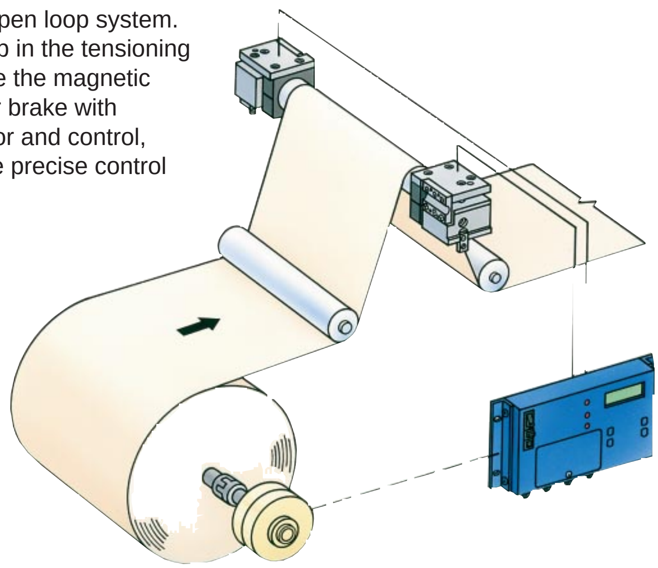
$$= 1.7 \text{ lb.in.}$$

Select a clutch that exceeds the maximum torque requirements from the Specification Chart – MPC2.

Tensioning

Magnetic Particle clutches and brakes offer smooth controlled torque for tensioning in both the unwind zone and rewind zone. Torque produced from the magnetic particle clutches and brakes is independent of slip speed, offering a distinct advantage over competing technologies. Since torque can be varied infinitely by varying the input current, the magnetic particle clutches and brakes are ideal in an open loop system. To close the loop in the tensioning system, combine the magnetic particle clutch or brake with a Warner® sensor and control, resulting in more precise control of tension.





Unwind stand under load cell control

Particle brakes and the TCS-240 load cell control with precision load cell sensors provide closed loop tension control.

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.

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

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

= 76 RPM

Thermal Energy (Slip Watts) =

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

= .0118 x 50 x 76

= 45 Watts

Select a brake that exceeds the maximum torque and thermal energy requirements from Quick Selection Chart – MPB70.

Rewind stand under dancer control

Particle clutches and the MCS-203 control provide accurate closed loop tension control 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.) =

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

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

= 23 lb-in

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

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

= 382 RPM

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

$$= \frac{12 \times 300}{\pi \times 9}$$

= 127 RPM

Slip RPM = Input RPM – Full Roll RPM

= 500 – 127

= 372.68

Thermal Energy (slip watts) =

= .0118 x Torque x Slip RPM

= .0118 x 22 x 373

= 99 watts

Select a clutch that exceeds the maximum torque and thermal energy requirements from the Quick Selection Chart – MPC120.

*To maximize tension control and minimize heat generated, select a drive system that will result in an actual input speed as close to, but not less than, 30 RPM greater than the core RPM. In this example, 382 + 30 = 412, would be ideal but 500 RPM was more readily available.

Torque Limiting/ Overload Protection

The magnetic particle clutches and brakes combined with a Warner® CBC control are effective means to providing protection in the case of jam ups. The magnetic particle clutch and the CBC control can provide precise adjustable torque in torque limiting applications.

Application Example

Information Required:
Motor HP: 1 HP
Motor RPM : 700 RPM

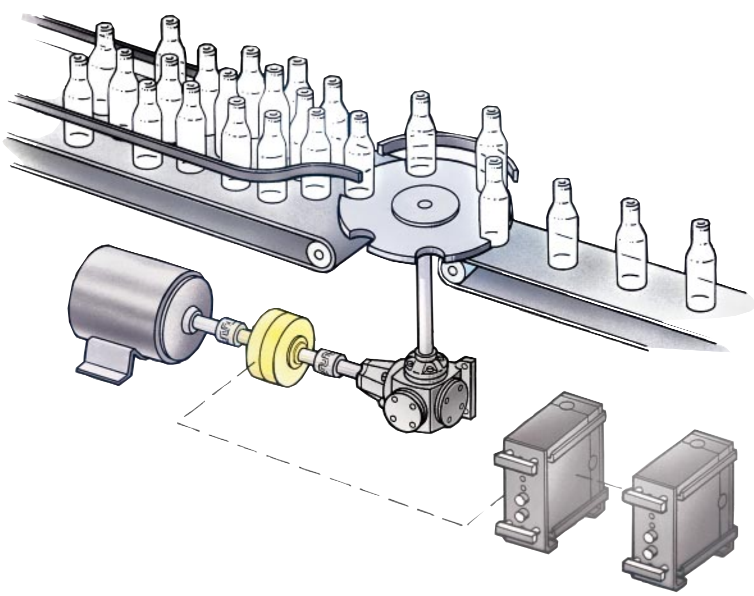
How to Size:
Maximum Torque (lb.in.) =

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

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

$$= 90 \text{ lb.in.}$$

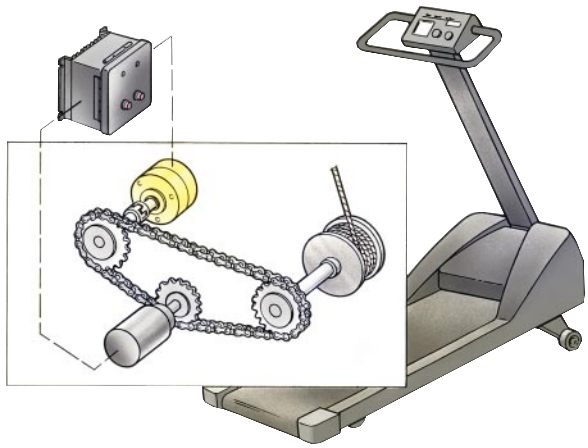
Select a clutch that exceeds the maximum torque requirements from the Selection Chart – MPC120.



Load Simulation

By combining the magnetic particle brake with a microprocessor control, virtually any load simulation can be obtained. The control is programmed with the profile or condition that is to be simulated. The control then feeds the profile to the magnetic particle brake in terms of input current. The brake reads the input current and provides load torque to simulate the condition.

If the application requires programming load profiles, adjusting load torque, or simulating friction or drag loads, the magnetic particle clutches and brakes are the ideal solution.



Exercise Equipment

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