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MULTIPLATE IN-LINE SLIP CLUTCHES

> FUNCTION:
Multiplate slip clutches control torque for intermittent, continuous, or overload slip. It will drive in both directions, slip when the torque setting is reached, and resume driving as the load is reduced. These clutches are excellent as continuous or intermittent drag brakes, protection against overloads, for “soft starts,” slip at the end of a stroke, as friction hinges, for screwing on container caps, etc.

> CONSTRUCTION:
The clutch consists of two assemblies: a cartridge and a housing (see cutaway above). The cartridge is set-screwed or keyed to the input shaft. The housing is either set-screwed or keyed to the output shaft or, as shown, is attached to the output gear or pulley with a bronze bearing to allow relative motion between the input shaft and the output gear/pulley. Torque is transmitted from the flats on the hub to the mating flats on the inner plates, through the friction pads to the outer plates, through the torque pins to the housing and the output gear/pulley. The torque level is controlled by compressing the springs with the adjusting nut. For a fixed torque clutch, a collar is attached to the hub in a fixed position instead of the adjusting nut. In operation, either the input shaft or the housing can be the input member, with the other member being driven.

> CAPACITY:
The clutch capacity as noted in the catalog is based on continuous operation at 50 rpm for over 25 million cycles. Torque, rpm, duty cycle and life are interdependent. A reduction of any of these will allow an increase in any other. Running at 25 rpm will allow twice the torque, or running for only 10% of the cycle will allow higher rpm, etc. The limit is based on heat buildup measured in watts:

**English Unit Watts** = Torque (inch pounds) x rpm x 0.0118 x % Duty Cycle

**Metric Unit Watts** = Torque (N • m) x rpm x 0.104 x % Duty Cycle

For typical applications, see examples on page 13-4
IN-LINE SLIP CLUTCHES

MULTIPLATE DESIGN

- **MATERIAL:**
  - Fig. 1 - Housing - Zinc Plated Steel
  - Plates - Brass
  - Friction Materials - Proprietary (Nonasbestos)
  - Fig. 2 - Housing - Aluminum
  - Plates - Brass
  - Friction Materials - Proprietary (Nonasbestos)

- **FEATURES:**
  - Fully adjustable within rating limits
  - Low stick / slip ratio
  - Continuous slip within dissipation limit
  - Available with bronze bearing in hub end so that gear, pulley, etc. can be mounted on hub “D1”
  - Available with other bores as special order

### METRIC COMPONENT

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<th>D1 Hub Dia. ± 0.05</th>
<th>l1 Hub Length</th>
<th>Bore Depth Hub End</th>
<th>Cart. End</th>
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* See Technical Applications page.
EXAMPLES OF IN-LINE SLIP CLUTCH APPLICATIONS

**UNLIMITED APPLICATIONS:**
- Intermittent motion
- Torque limiting
- Indexing
- Hinging
- Phase adjustment
- Many more

*The ingenuity of engineering has led to applications with labelers, indexing, film transport, instrumentation, business machines, computer peripherals, packaging, mailing, plotters, paper feeds and many more. We supply stock clutches or we work with you to develop units for your specific applications.*

**TYPICAL MULTIPLATE SLIP CLUTCH APPLICATIONS:**

**TIMING BELT ON HOUSING**
Timing belt drives housing. Torque transmitted through adjustable pressure plates to shaft. Also operates as shaft input to timing belt.

**SHAFT TO SHAFT CONTROL**
Either shaft as input. Fixed torque transmitted through pressure plates. Shafts must be journalized. Also can be adjustable torque.

**SLIP CARTRIDGE WITH GEAR**
Pressure pads transmit torque directly to gear for space saving package.

**CLUTCH WITH A MODIFIED GEAR**
Torque transmitted directly from gear through pins to adjustable pressure plates.

**KNOB WITH TORQUE PROTECTION**
Knob connected directly to housing. Fixed torque transmitted to shaft. Will slip above preset torque.

**BRAKE TO FRAME OF MACHINE**
Outer pressure plates held to machine frame. Adjustable braking pressure transmitted to shaft.

**“SINGLE” REVOLUTION CLUTCH**
Input shaft turns continuously. Output shaft turns when latch is disengaged. Single revolution, partial revolution, or multi-revolutions can be designed.

**CONSTANT TORQUE – SUPPLY OR REWIND SPOOL**
Slip clutch mounted directly to spool will give constant torque. Mounted directly to constant diameter cylinder will give constant tension. Many variations available to control wire supply system.
MAGNETIC PARTICLE SLIP CLUTCHES

DESIGN:
The magnetic particle slip clutch uses a sealed, steel outer housing and permanent magnets arranged alternately (north and south poles) around a central hub.

The space between the housing and the magnets is filled with a ferromagnetic compound (hysteresis particles). The particles align themselves along the flux pattern between the steel housing and the magnets, creating a magnetic coupling between them. (See Fig. 1)

The torque rating is determined by the number of particles added. The clutches can be manufactured in the range from 2.82 to 39.55 N • cm. Because the coupling is magnetic, torque value remains stable over time, temperature and speed value.

APPLICATIONS:
One of the applications is for paper feeding devices on scanners, copy machines and fax machines. Paper is an abrasive material. Pages often stick together and usually the thickness of the paper is different. The paper feeding device uses a powered roller to “urge” the top sheet off an infeed stack toward the interface between a second pair of rollers just beyond the urging mechanism. On the second pair, one of the rollers is powered; the second is unpowered, spring-loaded against the first and rides on a shaft linked to the chassis through the magnetic particle clutch. With no paper in the feeder mechanism, the clutch slips; when a single page is drawn between rollers, friction between the rollers and the paper remains high enough to maintain slippage and paper passes through the mechanism normally.

If two or more pages are drawn in, the coefficient of friction between the pages is not high enough to drive the unpowered roller. The slip clutch now acts as a drag brake holding back the lower roller. The roller stalls, preventing all but the top page from continuing through the feed device.

![Fig. 1 Reversible Magnetic Particle Slip Clutch](image-url)
MAGNETIC PARTICLE SLIP CLUTCHES

I. ZERO MAINTENANCE
II. CONSTANT TORQUE LEVELS

➤ MATERIAL:
   Shell - Steel
   End Caps - Plastic

➤ FEATURES:
   Requires no power
   Uses permanent magnets and magnetic particles
   Long operational life
   Sealed from contamination

➤ SPECIFICATIONS:
   d Tolerances:
      Fig. 1: +0.1/0
      Fig. 2: +0.022/0
      *D1 Tolerance: 0/-0.033 (h8)

   **Optional torques available only by special order.

   When the slip clutch is to be subjected to any radial or axial thrust, use of the ball bearing design is required.
   Units should be used on horizontal shafts only.

### METRIC COMPONENT

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<th>D1 Hub Dia.</th>
<th>D2</th>
<th>l</th>
<th>J1 End Lgth.</th>
<th>L Total Lgth.</th>
<th>Max. Allowable Speed rpm</th>
<th>Torque Nominal Static N·m</th>
<th>Torque Opt. Range** N·m</th>
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MAGNETIC PARTICLE SLIP CLUTCHES WITH SHAFT

ZERO MAINTENANCE
CONSTANT TORQUE LEVELS
INTEGRAL SHAFT

▶ MATERIAL:
Shell - Steel
End Caps - Plastic
Shafts - Steel

▶ FEATURES:
Requires no power
Uses permanent magnets and magnetic particles
Long operational life

*Optional torques available only by special order.

NOTE:
When the slip clutch is to be subjected to any radial or axial thrust, use of the ball bearing design is required.
Units should be used on horizontal shafts only.
SPRING-WRAPPED SLIP CLUTCHES

FEATURES:
- Long life under continuous slip conditions
- Unidirectional or bidirectional operation
- Same or different clockwise and counterclockwise torques
- Precise and stable limit torque calibration (range: 0.007 to 4.24 N • m)
- Same torque at breakaway as at high slip velocities
- Mounting provisions for gear, sprocket or pulley
- Corrosion-resistant materials

APPLICATIONS:
- Tension control of film or tape drives
- Transmission overload protection

SPECIAL DESIGNS:
The standard line of slip elements provides a wide selection of limit torques, sizes and coupling arrangements. In addition, our engineers will modify designs to meet your specific requirements in such areas as:
- Configuration
- Driving arrangement
- Limit torques from a fraction of a N • cm to many N • m's
- Calibration of torque to a tolerance of ±5%
- Different limit torques for the two directions of rotation
- Spring windup and limit torque combination. The spring action of the slip element is useful for tensioning of tape and prevention of slack loops.

*Stock units are calibrated with equal clockwise and counterclockwise slip torques corresponding to the tabulated Upper Limit Torques. Other torques are readily available from full, down to 1/8 of the Upper Limit Torque for each model. Torque values are independent of each other for clockwise and counterclockwise rotation, and may be specified the same or different for the two directions.

**All clutches in this series have a pilot diameter “D3” and three tapped holes “T1” for mounting a gear, sprocket or pulley on the input hub. Screw penetration into the clutch housing must not exceed the depth specified in column “T1”.
Concentricity of pilot diameter “D3” to bore “d” is 0.025 T.I.R. max.

All slip clutches are designed for long life under continuous slip conditions. The useful life of these elements is a function of the transmitted torque and slip speed.
## METRIC COMPONENT

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<th>Catalog Number</th>
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<th>l₂</th>
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<th>l₃</th>
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* or ** See Preceding Page
SPRING-WRAPPED SLIP COUPLINGS

FEATURES:
- Long life under continuous slip conditions
- Unidirectional or bidirectional operation
- Same or different clockwise and counterclockwise torques
- Precise and stable limit torque calibration (0.0035 to 1.695 N • m)
- Same torque at breakaway as at high slip velocities
- Corrosion-resistant materials

APPLICATIONS:
- Tension control of film or tape drives
- Friction loads for testing components
- Transmission overload protection

RECOMMENDED MOUNTING PROCEDURE:
Coupling is slipped over one shaft and applicable screws tightened. Second shaft is inserted into other end of coupling. Pull loose end of coupling back about 0.5 mm and tighten applicable screws.

The slip coupling serves as a torque limiter as well as a coupling for two colinear shafts. This coupling is equipped with hubs at both ends for pinning to the two shafts. When the load exceeds the limit torque of a slip coupling, the two shafts rotate relative to each other at the full limit torque. The standard coupling is designed to operate with 3° angular or linear misalignments of up to 0.25 mm between the two shafts. The mounting hole diameters of the slip couplings can differ for the two ends, so that different diameters of "in-line" shafts can be coupled together.

* Stock units are calibrated with equal clockwise and counterclockwise slip torques corresponding to the tabulated Upper Limit Torques. Other torques are readily available from full, down to 1/8 of the Upper Limit Torque for each model. Torque values are independent of each other for clockwise and counterclockwise rotation, and may be specified the same or different for the directions.

This series of slip couplings is designed for long life under continuous slip conditions. The useful life of these elements is a function of the transmitted torque and slip speed.
**SPRING-WRAPPED SLIP COUPLINGS**

Covered by U.S. Patents and Patents pending.

PHONE: 516.328.3300 • FAX: 516.326.8827 • WWW.SDP-SI.COM

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### METRIC COMPONENT

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<th>Catalog Number</th>
<th>$d_1$ Bore + 0.025 0</th>
<th>$d_2$ Bore + 0.025 0</th>
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<th>$L$ ± 0.8</th>
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<th>$l$</th>
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</table>

* See Preceding Page.
MAGNETIC CLUTCHES & COUPLINGS

APPLICATIONS – EXAMPLES

UNWIND TENSION CONTROL
Brake mounted on shaft of unwind spool or bobbin.

Information required: (Example)
- Full diameter = 150 mm
- Empty core diameter = 75 mm
- Average tension = 5 N
- Velocity (meters per min.) = 50 m/min.

How to size:
Avg. radius = \( \frac{\text{Full roll dia.} + \text{Empty dia.}}{4} \)
= \( \frac{150 + 75}{4} = 56.25 \text{ mm} = 0.056 \text{ m} \)
Avg. torque (N • m) = avg. tension (N) x avg. radius (m)
= 5 x 0.056 = 0.28 N • m

1. Select Catalog Number S90MCCMMTL0806 based on 0.28 N • m
2. Check Operating Curve
   - Max. rpm occurs at the min. radius
   - Max. rpm = Velocity / (Empty dia. \( \times \pi \))
   = \( \frac{50 \text{ m/min.}}{(0.075 \text{ m}) \times \pi} \)
   = 212 rpm
   - 0.28 N • m at 212 rpm is okay.

NIP ROLL OR PULLEY TENSION CONTROL

Information required: (Example)
- Pulley diameter or nip roll = 76 mm
- Tension = 10 N
- Velocity = 100 m/min.

How to size:
Torque (N • m) = Tension x Radius
= 10 N \( \times \) \( \frac{(0.076 \text{ m})}{2} \) = 0.38 N • m

1. Select Catalog Number S90MCCMMTL0806 based on 0.38 N • m
2. Check Operating Curve
   - Max. rpm = \( \frac{100 \text{ m/min.}}{(0.076 \text{ m} \times \pi)} \) = 419 rpm
   - 419 rpm is too high for continuous duty on the S90MCCMMTL0806 unit.
3. Select Catalog Number S90MCCMMTL1612

Film Tensioning - Constant tensioning supplied by hysteresis unit.

Clutch
Motor
Bobbin

Motor
Brake

Film Unwind - Tension provided by hysteresis units.
MAGNETIC CLUTCHES & COUPLINGS

APPLICATIONS – EXAMPLES

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 A

CYCLING

Bottle Capping - Constant torque provided by a hysteresis clutch.

Information required: (Example)
- **Slip rpm** = 350 rpm
- **Torque** = 1 N • m
- **Duty cycle** (% slip time of total cycle time) = 25%

How to size:
1. Select Catalog Number **S90MCCMML1612** based on 1 N • m
2. Check Operating Curve
   - 350 rpm is high, but as the duty cycle is only 25%, the Catalog Number **S90MCCMML1612** is okay.

OVERLOAD PROTECTION TORQUE LIMITING SOFT START (Motor Horsepower Method)

**Torque Limiting** - Hysteresis clutch provides overload protection.

Information required: (Example)
- **Motor HP** = 0.07 kw (1/10 HP)
- **Motor rpm** = 900 rpm

How to size:
- Torque (N • m) = (Motor HP x 9550) / Motor rpm
  - = (0.07 kw x 9550) / 900 = 0.74 N • m

**Material Handling** - Hysteresis clutch can provide overload protection and soft start.

1. Select Catalog Number **S90MCCMML1628** based on 0.74 N • m
2. Check Operating Curve
   - 0.75 N • m is at the upper limit of safe continuous operation, but is okay.
MAGNETIC CLUTCHES & COUPLINGS

ADVANTAGES:
- No electricity
- No breakaway torque
- Constant torque independent of shaft (rotor) speed
- No contacting or wearing parts
- No friction elements – same smooth torque year after year
- No magnetic particles to leak or contaminate end product
- Operable in some of the most difficult environments
- Brake (with shaft) and clutch (with hollow shaft) available
- Custom designs available

APPLICATIONS:
Fig. 1 As a Coupling
This is for load protection or torque limiting. The coupling style unit is directly connected to a motor and turns at the same speed as the motor until the torque is reached. At this point it will slip and still generate the max. torque.

Fig. 2 As a Clutch
The unit is connected to a motor by a timing belt or gear. The housing is driven and the shaft is the output end.

Fig. 3 As a Payout Brake
Brake is stationary and the reel or material is fitted to the output shaft. The tension on the material will vary with the diameter.

HOW THEY OPERATE:
For Maximum Torque
All important internal clearances are ground to tolerances of less than .001 in. (0.025 mm). Magnet assemblies surround hysteresis assembly. When like poles face each other, they produce maximum magnetic saturation of the hysteresis disc, forcing lines of flux to travel circumferentially through the hysteresis disc.

For Minimum Torque
When opposite poles face each other they produce minimum saturation of the hysteresis disc. The lines of flux travel through the hysteresis disc.

Combinations of adjustment angles between the two extremes give infinite adjustability. Because there are no contacting surfaces, the setting can be maintained indefinitely.
HOW TO USE THE CURVES:
Find the slip rpm on the X-axis and the torque on the Y-axis. Notice the areas that represent safe, continuous duty; intermittent duty, such as five minutes on, five minutes off; and the area which is not recommended. Operating above that line for any period of time will cause overheating and possible damage to the unit.
MAGNETIC CLUTCHES & COUPLINGS

0.0003...0.014 N•m TORQUE RANGE
NONELECTRIC
NO WEARING PARTS
NO FRICTION

>MATERIAL:
Housing and Shaft - Stainless Steel

The projections shown are per ISO convention.

### METRIC COMPONENT

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>B Shaft</th>
<th>A Shaft Length</th>
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ØB
Ø10 BOTH ENDS

M3-0.5 TAP 4.5 DEEP
3X EQ. SP. ON 15.5 B.C.
BOTH ENDS

Catalog Number:
S90MCCM5130213
S90MCCM5130225
S90MCCM5130713
S90MCCM5130725
S90MCCM5131413
S90MCCM5131425

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MAGNETIC CLUTCHES & COUPLINGS

0.007…2.83 N • m TORQUE RANGE
NONELECTRIC
NO WEARING PARTS
NO FRICTION
HOLLOW BORE

> MATERIAL:

- Housing - Aluminum, Black Anodized Finish
- Dial - Steel, Black Oxide Finish

The projections shown are per ISO convention.

METRIC COMPONENT

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0.007…2.83 N • m TORQUE RANGE
NONELECTRIC
NO WEARING PARTS
NO FRICTION
HOLLOW BORE

> MATERIAL:

- Housing - Aluminum, Black Anodized Finish
- Dial - Steel, Black Oxide Finish

The projections shown are per ISO convention.
MAGNETIC CLUTCHES & COUPLINGS

0.33...7.9 N·m TORQUE RANGE
NONELECTRIC
NO WEARING PARTS
NO FRICTION
HOLLOW BORE

MATERIAL:
- Housing - Aluminum, Black Anodized Finish
- Dial - Steel, Black Oxide Finish

The projections shown are per ISO convention.

### METRIC COMPONENT

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Keyway Dimensions

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</tr>
<tr>
<td>H</td>
<td>+0.25/0</td>
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ROLLER CLUTCHES

FOR 4 mm TO 35 mm HARDENED SHAFTS
UNIDIRECTIONAL DRIVE

› MATERIAL:
- Roller Cup - Case-Hardened Steel
- Needle Bearing - 52100 Hardened Chrome Steel
- Springs - Stainless Steel
- Cage - Nylon 66 (or Equivalent)

› FEATURES:
Ideal for indexing, backstopping or overrunning operations.
Free rolling one way, drives in opposite direction.
Lightweight, low profile.
High indexing frequency, up to 4CPS.
Operating temperature, grease +10°C to +70°C.
Minimum backlash.

› SHAFT REQUIREMENTS:
Shaft surface hardness must be HRC 58 min.

› HOUSING RECOMMENDATION:
Recommended tolerances for Housing Bore according to N7 for Steel, R7 for Aluminum.

What It Does…
Transmits torque load in one direction.
Overruns freely in opposite direction.
Either shaft or housing can be driving member.

How It Works…
Rollers wedge between shaft and outer race. Positive wedging forces prevent slipping. Springs position rollers for instantaneous lockup.

### METRIC COMPONENT

<table>
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<th>D Dia.</th>
<th>S Face Width 0.2</th>
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ROLLER CLUTCHES WITH BEARING SUPPORT

SINTERED BEARING SUPPORT
UNDIRECTIONAL DRIVE

› MATERIAL:
  Roller Cup - Case-Hardened Steel
  Needle Bearing - 52100 Hardened Chrome Steel
  Springs - Stainless Steel
  Cage - Plastic
  Bearing Support - Sintered Bronze Bearings

› SHAFT REQUIREMENTS:
  Shaft surface hardness must be HRC 58 min.

› HOUSING RECOMMENDATION:
  Recommended tolerances for Housing Bore are N6 for Steel, R6 for Aluminum. Tolerances for Housing Bore of N7 for Steel and R7 for Aluminum can be used if only 50% of the torque is used.

**METRIC COMPONENT**

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</table>

* Continued on the next page

* During operation of the above items:
  
  \[ F_{\text{max.}} = \text{Load Speed Limit (N/min.)} \]
  
  \[ F_R = \text{Load Limit (N)} \]
  
  \[ n = \text{Speed Limit (housing or shaft) (rpm)} \]
  
  \[ F_R \cdot n = F_{\text{max.}} \]

\[ \Delta \] Equipped with plastic springs.
ROLLER CLUTCHES WITH BEARING SUPPORT

NEEDLE BEARING SUPPORT
UNDIRECTIONAL DRIVE

> MATERIAL:
   - Roller Cup - Case-Hardened Steel
   - Needle Bearing - 52100 Hardened Chrome Steel
   - Springs - Stainless Steel
   - Cage - Plastic
   - Bearing Support - Needle Bearings

> SHAFT REQUIREMENTS:
   Shaft surface hardness must be HRC 58 min.

> HOUSING RECOMMENDATIONS:
   Recommended tolerances for Housing Bore are N6 for Steel, R6 for Aluminum. Tolerances for Housing Bore of N7 for Steel and R7 for Aluminum can be used if only 50% of the torque is used.

---

### METRIC COMPONENT

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</table>

Continued from the previous page
HYSTERESIS BRAKES AND CLUTCHES

TECHNICAL INFORMATION

FEATURES:
- Torque proportional to input current
- Torque virtually independent of slip speed
- Smooth stable, noise-free operation
- Long-life no-wearing components
- Maintenance-free
- Infinitely adjustable

APPLICATIONS:
- Tensioning of wire, cable, films, paper, etc.
- Positioning of fuel flow controls, film processors
- Braking for motors and dereeling
- Load simulation for motor testing, fuse testing, etc.

OPTIONS:
- Nonstandard coil voltages
- Special mounting configurations
- Modified shafts

HYSTERESIS clutches provide an efficient, smooth, electrically controllable link between a motor and a load. While presenting integral ball bearing supported input and output shafts, the clutch features a field (electromagnet) assembly that is prevented from rotating by fixing to a bulkhead. When the coil is energized, the input and output shafts are coupled by magnetic fluxes, thus driving the load. The torque transmitted is proportional to the current supplied to the device.

TORQUE AS A FUNCTION OF INPUT CURRENT:

When a field setting is approached from zero current, it will produce less torque than if approached from prior current because of residual magnetism. Accurate and repeatable torque outputs are delivered when the setting is approached from the same direction.
HYSTERESIS BRAKES AND CLUTCHES

TECHNICAL INFORMATION

APPLICATION EXAMPLE:
To select a brake to tension a 7-inch (178 mm) diameter pay-off reel in a system requiring total (web or strand) tension of 2 lbs. (8.9 N) and a process speed of 600 FPM.

**BRAKE TORQUE** \( (T) = \text{Force (F) \times Radius (D/2)} \)

\[ T \] = 2 lbs. (8.9 N) \times 3.5 in. (88.9 mm) = 7 lb. in. (791 Nmm)

or \[ T \] = 32 oz. \times 3.5 in. (88.9 mm) = 112 oz. in.

**SLIP SPEED** \( (\text{rpm}) = \frac{\text{linear velocity (V) (in/min) or linear velocity (V) (mm/min) / circumference (in.) or linear velocity (V) (mm/min) / circumference (mm)}}{\pi \times D} \)

\[ \text{rpm} = \frac{600 \text{ ft/min} \times 12}{\pi \times 7 \text{ in.}} \] or \[ \text{rpm} = \frac{(183 \text{ m/min} \times 1000)}{\pi \times 178 \text{ mm}} \]

\[ \text{rpm} = 327 \]

**ENERGY** \( (W) \) = Energy Dissipation requirement is calculated using basic horsepower formula \( X 746 \) watts/HP

\[ W = \frac{\text{T (lb. in.) \times \text{rpm}}}{63025} \times 746 \] or \[ W = \frac{\text{T (Nmm) \times \text{rpm}}}{7145221} \times 746 \]

**Example:**

\[ W = \frac{7 \text{ lb. in.} \times 327 \text{ rpm}}{63025} \times 746 = 27 \text{ watts} \] or \[ \frac{791 \text{ Nmm} \times 327 \text{ rpm}}{7145221} \times 746 = 27 \text{ watts} \]

Quick Check: The curves to the left can be used as a quick check to verify the kinetic power calculation. Simply locate the required torque on the vertical axis, move horizontally until you intersect the appropriate speed line, and then read vertically (up or down) to obtain the resulting watts or horsepower.

Selection: From the data on the following pages it can be seen that an S90HYB-120024 Hysteresis Brake which has a rated torque of 120 oz. in. (847 Nmm), a maximum speed capability of 12000 rpm, and an energy dissipation capability of 75 watts continuous, would be the proper selection for this application.

Note: In a clutch application, slip speed is the difference in rotational speed between the input and output members of the clutch assembly. In the above example, tensioning was being accomplished with a clutch inserted between a take-up reel and a motor driving at 500 rpm. The actual slip used to compute the energy dissipation requirements would be 500 rpm (clutch input speed) - 327 rpm (clutch output speed = 173 rpm). This difference in speed would obviously impact the result for energy dissipation.
POWER-OFF SERVO BRAKES

SIMPLE INSTALLATION
ECONOMICAL COST
ENERGY EFFICIENT

> COIL DATA:
Voltage: 24V DC

---

**METRIC COMPONENT**

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<tr>
<th>Catalog Number</th>
<th>Static Torque N•m</th>
<th>Max. Watts</th>
<th>C Bore</th>
<th>F Case Inside Dia.</th>
<th>A Dia.</th>
<th>G</th>
<th>J</th>
<th>B1 OAL Short Hub</th>
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**Keyway Dimensions**

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**Continued on the next page**
## COIL DATA:

Voltage: 24V DC

![Diagram of a brake component](image)

The projections shown are per ISO convention.

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### METRIC COMPONENT

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Static Torque N•m</th>
<th>Max. Watts</th>
<th>C Bore</th>
<th>F Case Inside Dia.</th>
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### Keyway Dimensions

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<tr>
<td>12</td>
<td>4</td>
<td>13.8</td>
</tr>
<tr>
<td>16</td>
<td>5</td>
<td>18.3</td>
</tr>
</tbody>
</table>

### Thread X2

<table>
<thead>
<tr>
<th>ØA</th>
<th>ØF</th>
<th>ØG BOLT CIRCLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 mm MIN.</td>
<td></td>
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</tbody>
</table>

### Thread Nom. Resistance Ohms

<table>
<thead>
<tr>
<th>Thread</th>
<th>Nom. Resistance Ohms</th>
<th>Armature Engagement msec</th>
<th>Armature Disengagement msec</th>
<th>Rotor Inertia kgf • m • sec²</th>
<th>Energy Dissipation N • m/min</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>S90SB9M26A...</td>
<td>M4 33</td>
<td>80</td>
<td>20</td>
<td>0.13 x 10⁵</td>
<td>1898</td>
<td>0.5</td>
</tr>
<tr>
<td>S90SB9M28A...</td>
<td>M4 36</td>
<td>50</td>
<td>40</td>
<td>0.12 x 10⁵</td>
<td>2440</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Continued from the previous page
POWER-ON FLANGE-MOUNTED BRAKES

ANTI-BACKLASH WHEN ENERGIZED
ZERO DRAG WHEN DE-ENERGIZED

> COIL DATA:
Voltage: 24V DC

Other voltages available on special order.

The projections shown are per ISO convention.

**METRIC COMPONENT**

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Static Torque * N m</th>
<th>Max. Wattage</th>
<th>Armature Inertia * kgf m • sec²</th>
<th>Energy Dissipation N m • min</th>
<th>Armature Engagement msec</th>
<th>Disengagement msec</th>
<th>P Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>S90BF9M11A06</td>
<td>0.565</td>
<td>5</td>
<td>0.39 x 10⁻⁶</td>
<td>237.3</td>
<td>5</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>S90BF9M11A08</td>
<td>4.519</td>
<td>8.5</td>
<td>0.38 x 10⁻⁵</td>
<td>1898.4</td>
<td>12</td>
<td>32</td>
<td>8</td>
</tr>
<tr>
<td>S90BF9M22A08</td>
<td>9.039</td>
<td>9.5</td>
<td>0.93 x 10⁻⁵</td>
<td>3525.6</td>
<td>15</td>
<td>35</td>
<td>10</td>
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</tbody>
</table>

**CATALOG NUMBER**

<table>
<thead>
<tr>
<th>(Ref.)</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>S90BF9M11A06</td>
<td>0.1</td>
</tr>
<tr>
<td>S90BF9M11A08</td>
<td>0.4</td>
</tr>
<tr>
<td>S90BF9M22A08</td>
<td>0.4</td>
</tr>
<tr>
<td>S90BF9M22A10</td>
<td>0.4</td>
</tr>
<tr>
<td>S90BF9M26A10</td>
<td>0.5</td>
</tr>
<tr>
<td>S90BF9M26A12</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Typical torque after burnishing; units shipped burnished.
**Length equals K including the working gap at installation.