

Current Controlled Hysteresis Brakes



- **Electrically controlled**
- **No wearing parts**
- **Infinitely adjustable
for precise torque/
tension control**

TRANSMITTING TORQUE THROUGH AIR

Current Controlled Electric Hysteresis Brakes

Advantages

The superior design of these hysteresis devices provides several inherent advantages over magnetic-particle and friction devices. They operate on a frictionless design principle with virtually no wear. This provides such advantages as: longer expected life, superior torque repeatability, life-cycle cost advantages, broad speed range, excellent environmental stability and superior operational smoothness.

Operating principles

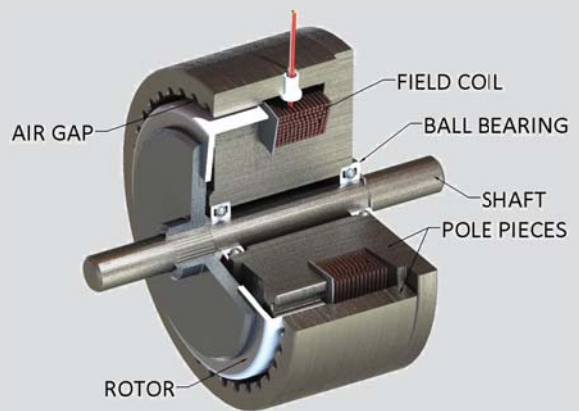
The hysteresis effect in magnetism is applied to torque control by the use of two basic components - a reticulated pole structure and a special steel rotor/shaft assembly - fitted together but not in physical contact. Until the pole structure is energized, the drag cup can spin freely on its shaft bearings. When a magnetizing force from a field coil is applied to the pole structure, the air gap becomes a flux field and the rotor is magnetically restrained, providing a braking or clutching action between the pole structure and rotor.

Control

In a Current Controlled Electric Hysteresis Brake, adjustment and control of torque is provided by a field coil. This allows for complete control of torque by adjusting DC current to the field coil. Adjustability from a minimum value (bearing drag) to a maximum value of 15 - 35% above rated torque is possible. These brakes utilize the same operating principle as our permanent magnet hysteresis brakes, however the magnets are replaced with a field coil which provides the precise magnetic field strength necessary to provide the rated torque.

Longer expected life

Hysteresis Brakes produce torque strictly through a magnetic air gap, making them distinctly different from mechanical-friction and magnetic particle devices. Because hysteresis devices do not depend on friction or shear forces to produce torque, they do not suffer the problems of wear, particle aging, and seal leakage. As a result, hysteresis devices typically have life expectancies many times that of friction and magnetic particle devices.



Superior torque repeatability

Because torque is generated magnetically without any contacting parts or particles, Hysteresis Brakes provide superior torque repeatability. Friction and magnetic particle devices are usually subject to wear and aging with resultant loss of repeatability. Hysteresis devices will repeat their performance precisely, to ensure the highest level of process control.

Broad speed range

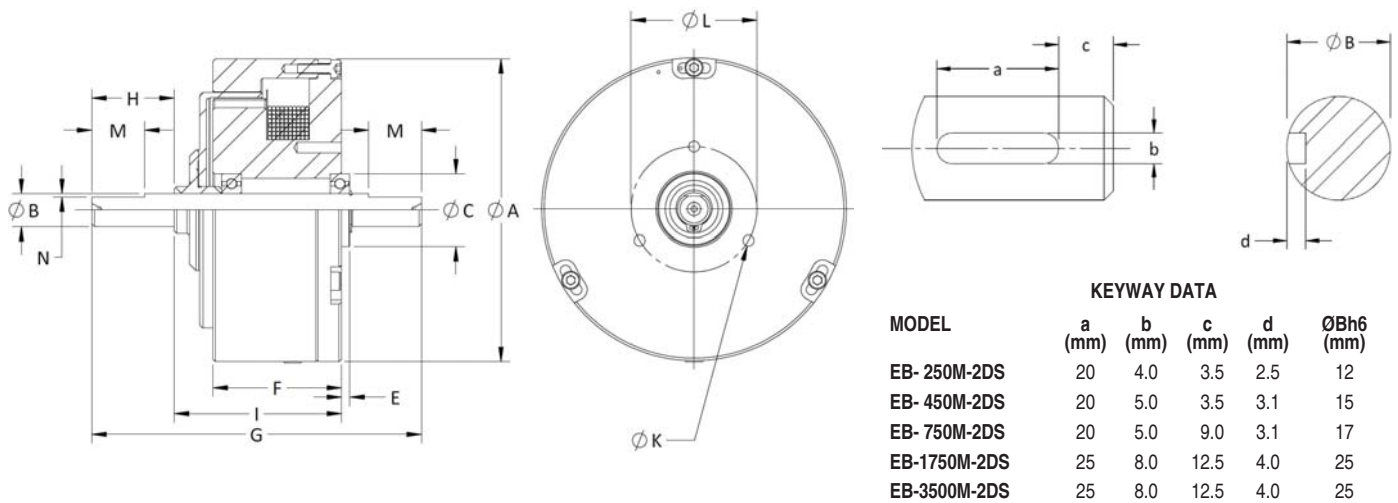
Hysteresis devices offer the highest slip speed range of all electric torque control devices. Depending on size, kinetic power requirements and bearing loads, many Hysteresis Brakes can be operated at speeds in excess of 10,000 rpm. In addition, full torque is available even at zero slip speed and torque remains absolutely smooth at any slip speed.

Operational smoothness

Because they do not depend on mechanical friction or particles in shear, Hysteresis Brakes are absolutely smooth at any slip ratio. This feature is often critical in wire drawing, packaging, and many other converting applications.

Current Controlled Electric Hysteresis Brakes with Double Ended Shafts

Used for torque loading and power absorption in test benches, actuators, etc., as well as tension control with wire, cable, ropes, threads, paper and foils at take-up and payoff equipment. Can be used as start coupling for rpm speed up control and as overload protection or braking against backlash. These brakes are noiseless, frictionless and wear free in their operation. Torque is independent from rpm speed. Torque is infinitely adjustable within each brake's range of operation.



DIMENSIONAL DATA SERIES M (all dimensions mm)

MODEL	Ø A	Ø B h6	Ø C h6	E	F	G	H	I	K	Ø L	M	N
EB- 3M-2DS	31.8	3.00	10.00	2.0	18.6	42.2	8.0	24.0	M2.5 x 4	19.0	—	—
EB- 10M-2DS	45.7	5.00	14.00	2.4	20.7	52.6	12.1	25.4	M2.5 x 5	19.0	9.5	0.7
EB- 20M-2DS	50.0	5.00	14.00	1.7	23.5	55.8	13.0	27.3	M3 x 6	21.0	9.5	0.7
EB- 50M-2DS	60.0	7.00	17.00	2.0	39.9	76.5	15.0	42.8	M4 x 8	25.0	10.0	0.7
EB- 140M-2DS	92.0	10.00	22.00	2.5	39.0	100.0	25.0	50.8	M4 x 9	38.0	16.0	1.1
EB- 250M-2DS	112.5	12.00	28.00	4.0	50.8	123.1	27.0	64.3	M5 x 10	45.0	KEYWAY SEE ABOVE	
EB- 450M-2DS	137.5	15.00	32.00	3.5	52.4	132.1	27.0	73.0	M5 x 10	60.0		
EB- 750M-2DS	158.0	17.00	35.00	4.5	73.0	176.3	38.0	95.0	M6 x 12	70.0		
EB-1750M-2DS	226.0	25.00	52.00	6.0	76.2	213.0	50.0	107.0	M6 x 19	100.0		
EB-3500M-2DS	226.0	25.00	—	—	152.4	312.0	50.0	214.0	MTG PLATE 216 X 130(T=12)			

TECHNICAL DATA SERIES M

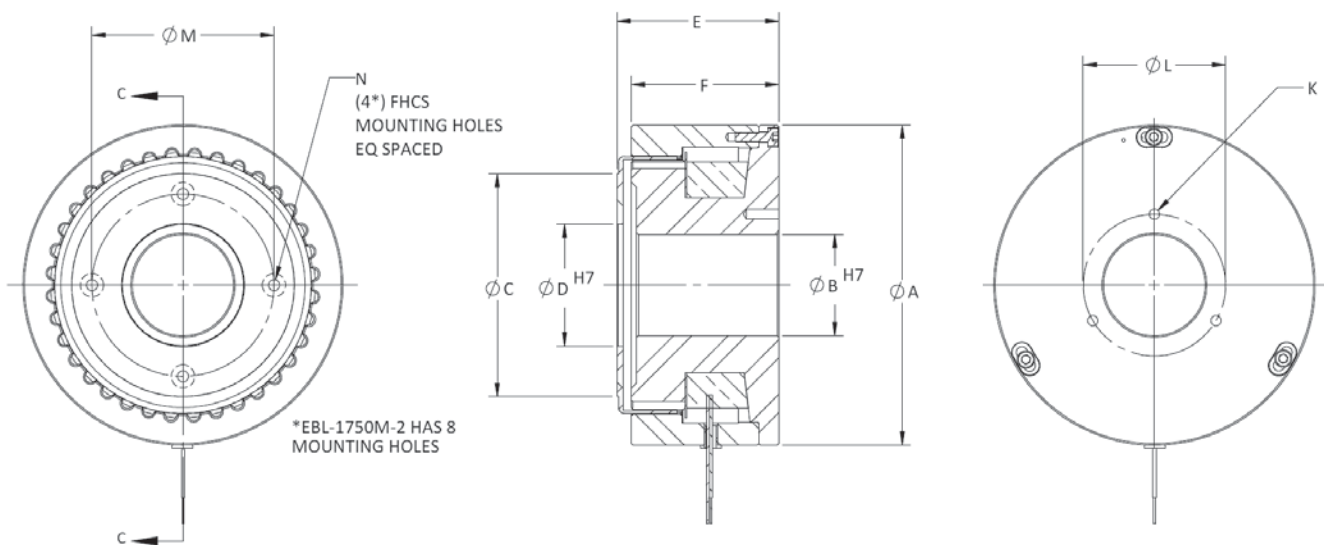
MODEL	Torque at working current (Nm)	Working current I1 (mA)	Resistance at 25°C +/-10% (Ohm)	Voltage VDC @ I1	RPM max.	Power dissipation (Watts)		Residual Torque w/o current (Nm)	Rotor inertia (kgcm ²)	Weight (kg)
						intermittent	continuous			
EB-3M-2DS	0.024	155	171	27	20000	20	5	3.53E-04	0.0043	0.1
EB-10M-2DS	0.10	143	180	26	20000	35	8	7.06E-04	0.0435	0.24
EB-20M-2DS	0.15	232	120	28	20000	50	12	7.77E-04	0.0458	0.32
EB-50M-2DS	0.38	270	95	26	15000	90	23	1.55E-03	0.167	0.76
EB-140M-2DS	1.20	270	95	26	12000	300	75	5.42E-03	1.0	1.85
EB-250M-2DS	2.10	289	96	28	10000	450	110	7.77E-03	3.45	3.5
EB-450M-2DS	3.60	473	50	24	8000	670	160	1.51E-02	7.5	5.6
EB-750M-2DS	5.80	410	60	25	6000	1000	200	5.00E-02	14.5	10.2
EB-1750M-2DS	14.50	535	52	28	6000	1200	350	9.18E-02	62.5	24.5
EB-3500M-2DS	29.00	1070	26	28	6000	2400	600	1.36E-01	125.0	49.75

Large Bore Hysteresis Brakes without Bearings



Hysteresis Brakes with a large bore are mainly used for tension control at flyer payoff operation equipment, at helical wrapping operation, and braiding applications. These brakes are supplied without bearings and are also available as a “matched” design upon request. The bearings must be provided by the machine designer.

The pole/case assembly and the rotor are shipped as separate items and it is the responsibility of the machine designer to ensure proper alignment and concentricity of the mating brake parts in the final assembly. The mounting structure for these parts must be such that concentricity between the rotor OD (outside diameter) and the case ID (inside diameter), which forms the outer segment of the air gap, does not exceed 0.015 mm (0.0006”). Additionally, the run-out of the rotor face should not exceed 0.025 mm (0.001”).



DIMENSIONAL DATA (all dimensions mm)

MODEL	Ø A	Ø B	Ø C	Ø D	E	F	K	Ø L	Ø M	N
EBL-250M-2	112.5	28.0	70.0	36.0	54.5	50.5	M5 X 10	45.0	54.0	M5 (4X)
EBL-450M-2	137.5	42.0	90.0	50.0	57.0	52.5	M5 X 10	60.0	80.0	M4 (4X)
EBL-750M-2	158.0	50.0	110.0	60.0	80.0	73.0	M6 X 12	70.0	90.0	M5 (4X)
EBL-1750M-2	226.0	80.0	160.0	120.0	83.0	76.5	M6 X 19	100.0	140.0	M5 (8X)

FOR TECHNICAL DATA, SEE SERIES M ON PAGE 2.

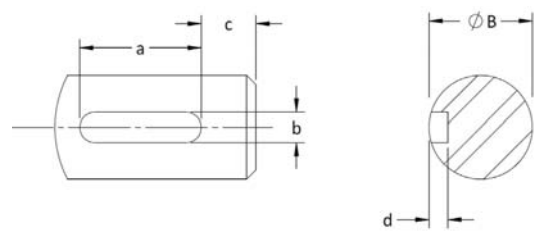
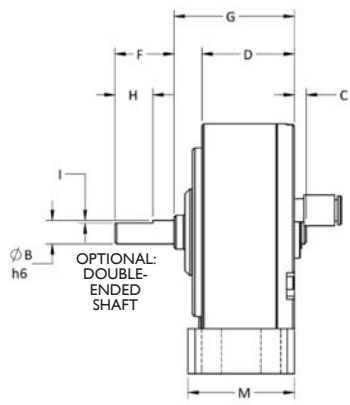
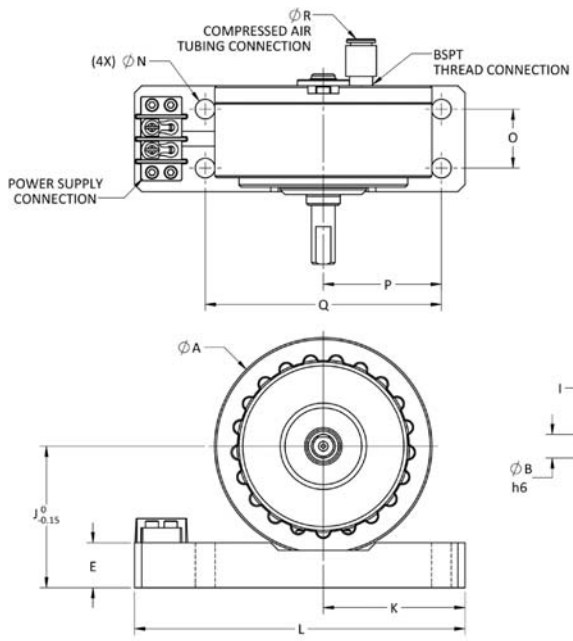
Matched Hysteresis Brakes

These units are developed to ensure that every brake of a given model designation will be matched at a pre-determined torque and current point to every other brake of the same model designation. By possibility of a special adjustment each brake will be matched at the selected match point to within $\pm 1.5\%$ provided that the match point is above 50 % of the max possible torque. All other points of the curve then are within $\pm 4\%$ deviation from each other. The use of matched hysteresis brakes is, for example, an advantage for a multi-tension control system for multi-spool payoff frames.



Air Cooled Hysteresis Brakes

AEB air cooled electric hysteresis brakes are used for applications which would exceed the power rating for our standard electric hysteresis brakes. These units offer excellent heat dissipation when compressed air is delivered via the included tubing connection. Units feature a mounting base plate & terminal strip wiring connection for simple integration into your application.



MODEL	KEYWAY DATA				ØBh6 (mm)
	a (mm)	b (mm)	c (mm)	d (mm)	
AEB- 250M-2	20	4.0	3.5	2.5	12
AEB- 450M-2	20	5.0	3.5	3.1	15
AEB- 750M-2	20	5.0	9.0	3.1	17
AEB-1750M-2	25	8.0	12.5	4.0	25
AEB-3500M-2DS	25	8.0	12.5	4.0	25

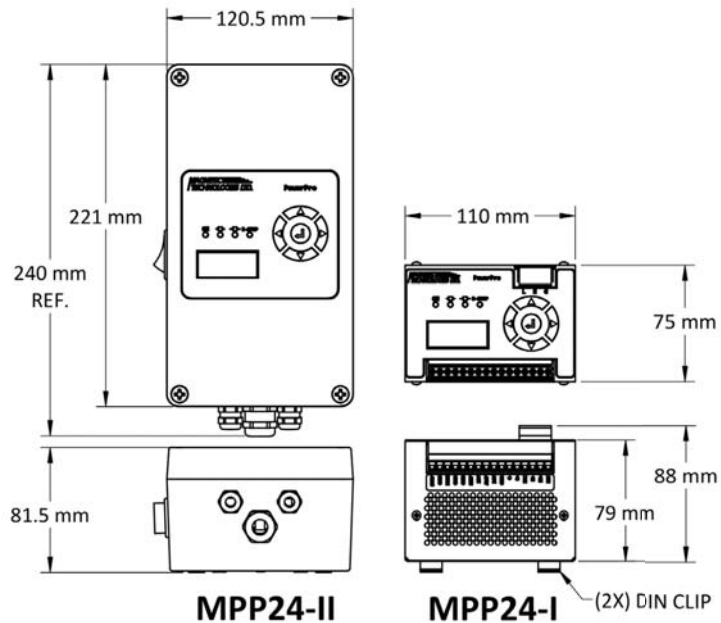
DIMENSIONAL DATA (all dimensions mm)

MODEL	Ø A	Ø B h6	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	BSPT
AEB- 140M-2	92.0	10.00	5.0	39.0	19	25	50.8	16	1	60	60.0	140	45	8.3	25	50	100	8	1/8
AEB- 250M-2	112.5	12.00	6.5	50.5	19	27	64.3			70	85.0	170	50	8.3	30	75	150	8	1/8
AEB- 450M-2	137.5	15.00	6.0	52.4	19	27	73.0	See		80	82.5	165	65	8.3	50	75	150	10	1/4
AEB- 750M-2	158.0	17.00	7.0	73.0	25	38	95.0	Keyway Data		100	110.0	220	75	8.3	55	100	200	10	1/4
AEB-1750M-2	226.0	25.00	9.5	76.2	25	50	106.0			120	135.0	270	80	8.3	55	125	250	10	3/8
AEB-3500M-2DS	226.0	25.00	-	152.4	25	50	214.0			120	135.0	270	143	8.3	125	125	250	10	3/8

TECHNICAL DATA

MODEL	Torque at working current (Nm)	Working current I1 (mA)	Resistance at 25°C +/-10% (Ohm)	Voltage VDC @ I1	RPM max.	Power dissipation (Watts)				Residual Torque w/o current (Nm)	Air Supply Max. (PSI)	Air Consumption (CFM)
						intermittent		continuous				
						w/ Air	w/o Air	w/ Air	w/o Air			
AEB-140M-2	1.20	270	95	26	12000	1200	300	1200	75	5.42E-03	90	10
AEB-250M-2	2.10	289	96	28	10000	1300	450	1300	110	7.77E-03	90	10
AEB-450M-2	3.60	473	50	24	8000	1800	670	1800	160	1.51E-02	90	15
AEB-750M-2	5.80	410	60	25	6000	2500	1000	2000	200	5.00E-02	90	15
AEB-1750M-2	14.50	535	52	28	6000	2800	1200	2200	350	9.18E-02	90	20
AEB-3500M-2DS	29.00	1070	26	28	6000	5300	2400	3000	600	1.36E-01	90	20

PowerPro™ - Programmable Power Supply



PowerPro™ is a programmable constant current power supply designed for use with our range of Electric Hysteresis Brakes.

Features:

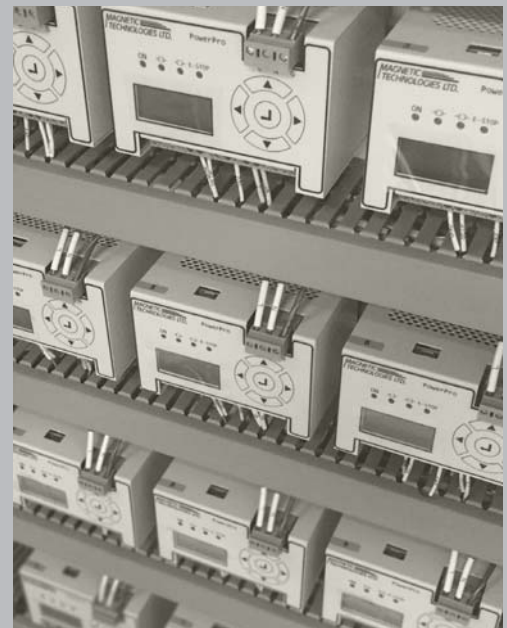
- Real time display of brake current, torque, & payoff spool diameter.
- Support for multiple brakes in parallel (up to max. of 2 Amps)
- Support for open-loop & closed-loop tension control.
- *Emergency stop & brake free* contacts included.
- HMI networking capability.

Operating Modes:

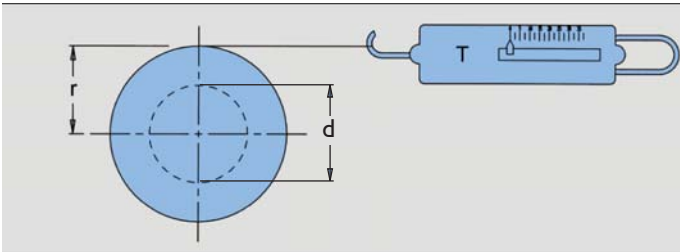
- Constant Torque
- 0-10VDC input
- Ultrasonic Probe input (*Open-loop tension control*)
- Strain Gage (*Closed-loop tension control*)

TECHNICAL DATA

Input	90 - 264 VAC, 47 - 63 Hz
Output Voltage	0 - 60 VDC
Output Power	80W Max.
Output Current	0-2A, 0-1A, 0-500mA, 0-400mA, 0-250mA, 0-200mA
Overload Protection	Short circuit (or) overload: unit switches off, attempts to switch on within short period of time
Current Ramp	Adjustable 0 - full load from 0 - 5 seconds
Operating Temp.	-15C - +40C
Control Voltage	0 - 10 VDC
Additional Fixed Voltage	24 VDC (power ultrasonic probe or other accessories)
Display	2 line x 8 character backlit LCD
Unit Display	Imperial (or) metric
Temperature Control	Thermal overload: unit switches off, will switch back on after cool-down
Power Failure Reset	Control settings are retained in non-volatile memory. When power is restored unit returns to previous operating state.
Emission	EN61000-3-2 class A, EN55022B Class B, FCC part 15 Class B
Ripple & Noise	1%
Full Load Efficiency	90%
Switching Frequency	100kHz



Selection Criteria



Step 1 - Calculate Maximum Torque

The line tension multiplied by the radius of a full spool.
Example: Full Spool Radius (r) x Line tension (T)= Torque

$$.15m \times 8N = 1.2Nm$$

Selection: In this example select Model EB-140 or larger.

Step 2 - Calculate MAX RPM

When a magnetic brake shaft is turning, mechanical energy is converted into thermal energy (watts). The amount of thermal energy (watts) is a function of RPM and TORQUE.

Example Calculation:

$$\text{Max RPM} = \frac{\text{Line Speed}}{3.14 \times \text{Core Dia}} = \frac{90m / \text{min}}{3.14 \times .125m} = 229 \text{ RPM}$$

Step 3 - Calculate Power Dissipation

Example Calculations:

$$P \text{ (watts)} = \frac{T(Nm) \times \text{RPM}}{9.55} = \frac{1.2 \times 229}{9.55} = 29 \text{ watts}$$

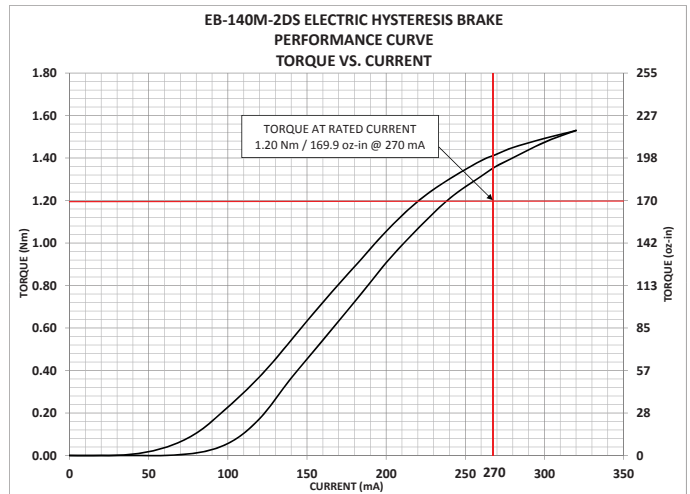
Selection: In this example P=29 watts. The Model EB-140 is rated for 75 watts continuous and 500 watts for 5 minutes.

Example

Line Tension (T)	8N
Full Spool Radius (r)	.15m
Spool Core Diameter (d)	.125m
Line Speed	90 m/min

Step 4 - Determine Operating Current

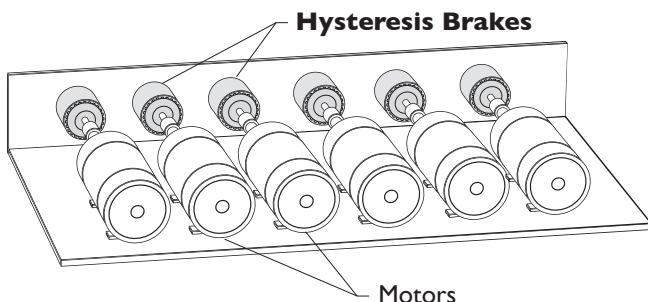
From the product data sheets examine the Performance Curve to determine the approximate operating current.



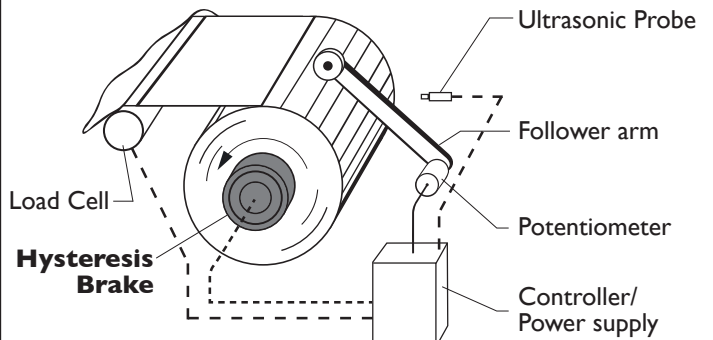
Solution: In this example the EB-140 Performance Curve is shown below. Our previously determined 1.2Nm, requires a maximum current of 270mA @ 24VDC. Typically the brakes have a 15-35% safety factor, so that the actual current will be 230mA (see chart)

Applications with Hysteresis Brakes

Hysteresis Brakes are widely used in load simulation applications for life testing on electric motors, actuators, gearboxes, and many other rotating devices and assemblies.



For closed loop control; using load cell or dancer arm, photo or ultrasonic sensors to provide feedback to the Hysteresis Brake.



Constant Tension Payoff Stands

- Custom designed, turn-key payoff stands offered in both single and multiple position configurations.
- The PowerPro tension control system allows for “set-and-forget” operation. After initial setup the system can run from a full to an empty spool without any change in tension or operator input.
- The system can detect partially full spools and adjust to accommodate itself automatically.
- Tension can also be changed on the fly, without stopping material payoff. Simply use the keypad to select the new tension value and you are done. The PowerPro will adjust to that new tension value and maintain it throughout the payoff process.
- The PowerPro can also control multiple position payoff systems by either using one spool as a reference to control all of the spools, or with a dedicated sensor and controller for each spool.



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