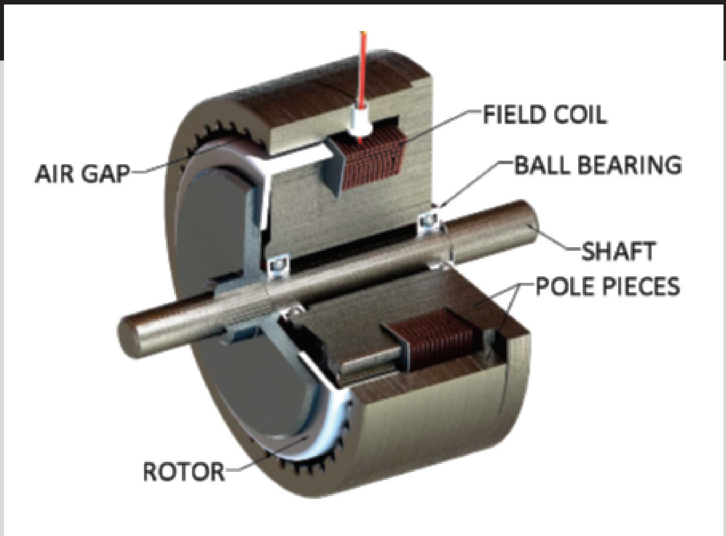
MAGNETIC TECHNOLOGIES LTD.

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. In a Permanent Magnet Hysteresis Brake, the field coil is replaced by magnets which provide the precise field strength necessary to produce rated torque without the need of electrical excitation. Physical realignment of the pole structure will result in changes in 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.

TECHNICAL DATA SERIES M

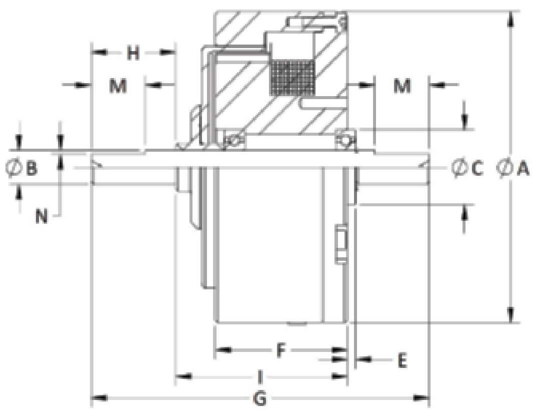
MODEL	Torque at working current (Nm)	Working current I1 (mA)	Resistance at 25°C +/-10% (Ohm)	Voltage VDC @ I1	rpm max 25°C +/-10%	Power dissipation (Watt)		Residual Torque without current (Nm)	Rotor inertia (kgcm 2)	Weight (kg)
						intermittent	continuous			
EB-3M-2DS	0.02	155	171	25	20000	20	5	3.53E-04	0.0043	0.10
EB-10M-2DS	0.10	143	180	24	20000	35	8	7.06E-04	0.0435	0.24
EB-20M-2DS	0.15	232	120	24	20000	50	12	7.77E-04	0.0458	0.32
EB-50M-2DS	0.38	270	95	24	15000	90	23	1.55E-03	0.167	0.76
EB-140M-2DS	1.20	270	95	24	12000	300	75	5.42E-03	1.00	1.85
EB-250M-2DS	2.10	289	96	24	10000	450	110	7.77E-03	3.45	3.50
EB-450M-2DS	3.60	473	50	24	8000	670	160	1.51E-02	7.50	5.60
EB-750M-2DS	5.80	410	60	23	6000	1000	200	5.00E-02	14.50	10.20
EB-1750M-2DS	14.50	535	52	26	6000	1200	350	9.18E-02	62.50	24.50
EB-3500M-2DS	29.00	1070	26	26	6000	2400	600	1.36E-01	125.00	49.75

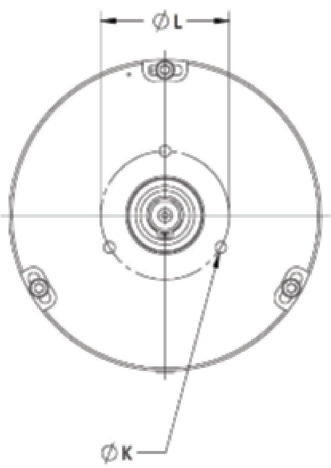
TECHNICAL DATA SERIES E

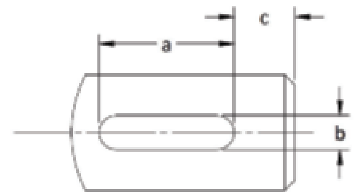
MODEL	Torque at working current (OZ-IN)	Working current I1 (mA)	Resistance at 77°F +/-10% (Ohm)	Voltage VDC @ I1	rpm max 77°F +/-10%	Power dissipation (Watt)		Residual Torque without current (OZ-IN)	Rotor inertia (LB-IN-SEC2)	Weight (LB)
						intermittent	continuous			
EB-2.5E-2DS	2.50	146	171	25	20000	20	5	0.05	3.80E-06	0.24
EB-10E-2DS	10.00	133	180	24	20000	45	12	0.10	3.30E-05	0.49
EB-16E-2DS	16.00	192	125	24	20000	75	20	0.10	5.60E-05	0.65
EB-38E-2DS	38.00	250	105	26	15000	90	25	0.20	8.60E-05	1.06
EB-50E-2DS	50.00	253	95	24	15000	90	23	0.20	1.48E-04	1.72
EB-140E-2DS	140.00	253	95	24	12000	300	75	0.70	9.10E-04	4.06
EB-250E-2DS	250.00	270	96	26	10000	450	110	1.00	2.75E-03	7.73
EB-450E-2DS	450.00	442	50	22	8000	670	160	2.00	6.55E-03	12.90
EB-750E-2DS	750.00	383	60	23	7000	1000	200	7.00	1.28E-02	28.30
EB-840E-2DS	840.00	600	40	24	6000	1340	300	4.00	1.31E-02	26.30
EB-1750E-2DS	1750.00	500	52	26	6000	1200	350	13.00	5.28E-02	54.00
EB-3500E-2DS	3500.00	1000	26	26	6000	2400	600	19.20	1.06E-01	110.00

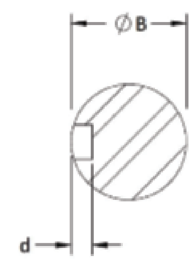
DIMENSIONAL DATA SERIES M

MODEL	Ø A (mm)	Ø B (mm) h6	Ø C (mm) h6	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	K (mm)	Ø L (mm)	M (mm)	N (mm)
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 BELOW	
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 12	100.0		
EB-3500M-2DS	226.0	25.00	—	—	152.4	312.0	50.0	214.0	MTG PLATE 216 X 130(T=12)			









KEYWAY DATA

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

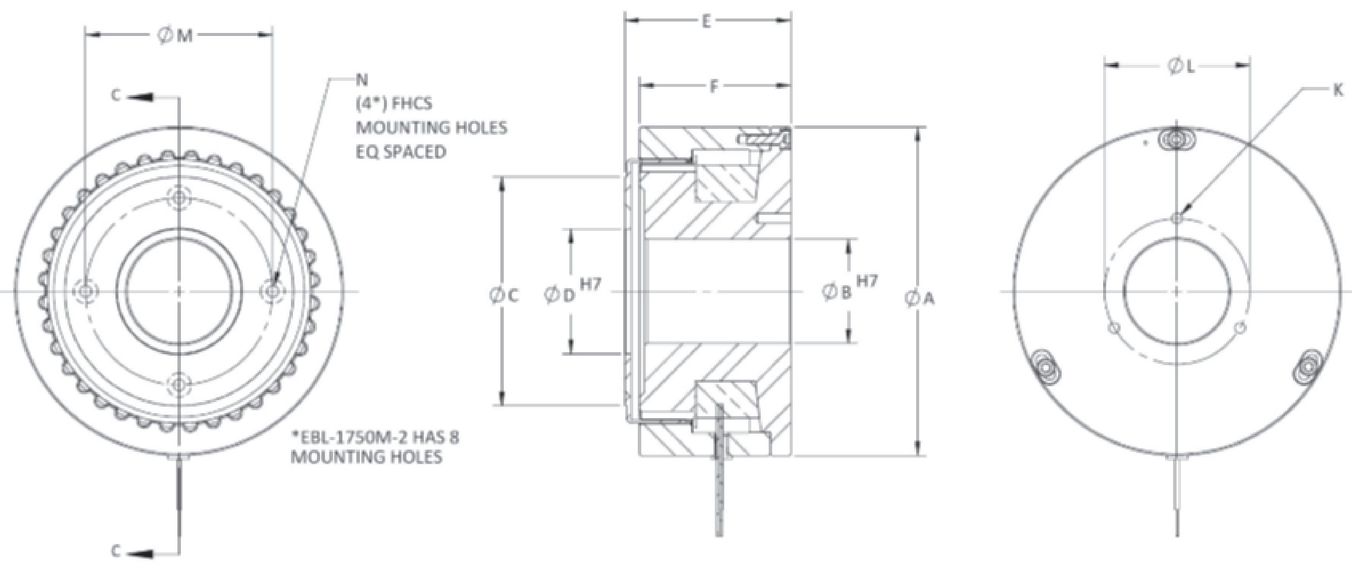
DIMENSIONAL DATA SERIES E

MODEL	Ø A (in)	Ø B (in) h6	Ø C (in) h6	E (in)	F (in)	G (in)	H (in)	I (in)	K (in)	Ø L (in)	M (in)	N (in)
EB- 2.5E-2DS	1.25	0.1250	0.375	0.04	0.73	1.56	0.29	0.94	#4-40 X 0.16	0.750	—	—
EB- 10E-2DS	1.80	0.1875	0.500	0.12	0.81	2.12	0.50	1.00	#4-40 X 0.19	0.687	0.38	0.03
EB- 16E-2DS	1.97	0.1875	0.500	0.11	0.81	2.11	0.51	0.95	#4-40 X 0.19	0.750	0.38	0.03
EB-38E-2DS	2.16	0.2500	0.625	0.13	1.25	3.00	0.56	1.69	#6-32 X 0.25	0.906	0.38	0.03
EB- 50E-2DS	2.36	0.2500	0.625	0.13	1.56	3.00	0.56	1.69	#6-32 X 0.25	0.906	0.38	0.03
EB- 140E-2DS	3.62	0.3750	0.875	0.17	1.54	3.97	1.00	2.00	#8-32 X 0.37	1.500	0.63	0.06
EB- 250E-2DS	4.43	0.5000	1.125	0.19	1.98	4.72	1.06	2.53	#10-32 X 0.50	1.750	0.625	0.060
EB- 450E-2DS	5.41	0.5000	1.125	0.19	2.06	5.16	1.06	2.87	#10-32 X 0.38	1.750	0.630	0.060
EB- 750E-2DS	6.22	0.6250	1.375	0.20	2.87	6.93	1.50	3.74	1/4-20 X 0.44	2.750	0.750	0.060
EB-840E-2DS	5.49	0.5000	—	—	4.13	7.75	1.00	—	—	—	0.625	0.060
EB-1750E-2DS	8.90	1.0000	2.000	0.31	3.00	8.31	2.04	4.18	1/4-20 X 0.50	3.000	#807 WOODRUFF KEY-WAY (2 PLS)	
EB-3500E-2DS	8.90	1.0000	—	—	6.00	12.46	2.04	—	—	—		

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").

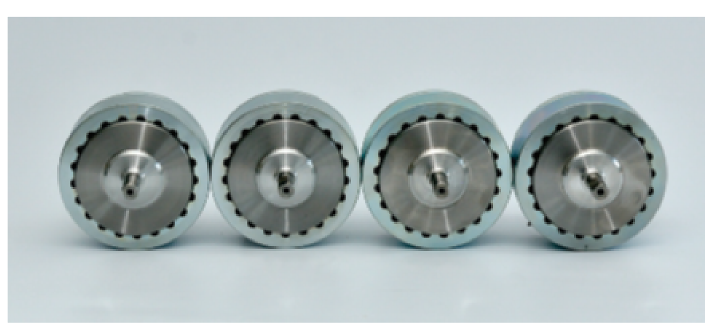


DIMENSIONAL DATA										
MODEL	Ø A (mm)	Ø B (mm)	Ø C (mm)	Ø D (mm)	E (mm)	F (mm)	K (mm)	Ø L (mm)	Ø M (mm)	N
EBL-250M-2	112.5	28.0	70.0	36.0	54.5	50.5	M5 X 10	45.0	54.0	M5 (4X)
EBL-450M-2	137.5	42.0	90.0	50.0	57.0	52.5	M5 X 10	60.0	80.0	M4 (4X)
EBL-750M-2	158.0	50.0	110.0	60.0	80.0	73.0	M6 X 12	70.0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

FOR TECHNICAL DATA, SEE SERIES M ON PAGE 2.

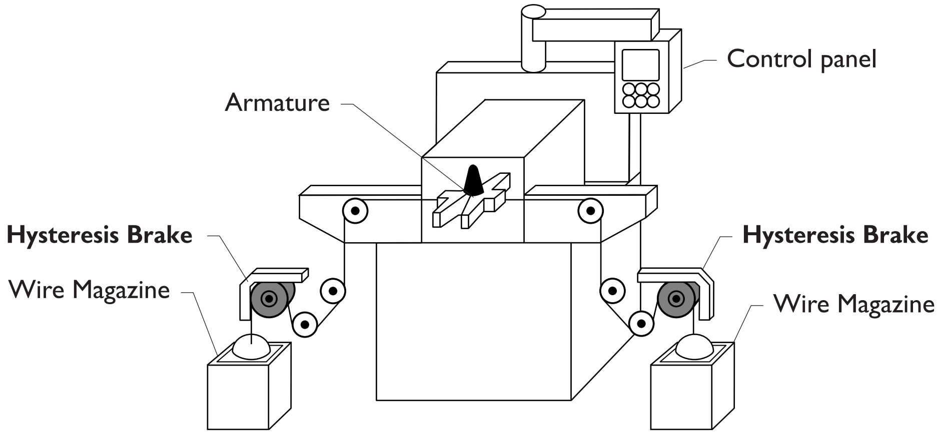
Matched Hysteresis Brakes

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 ±1.5% provided that the match point is above 50 % of the max possible torque. All other points of the curve then are within ±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.

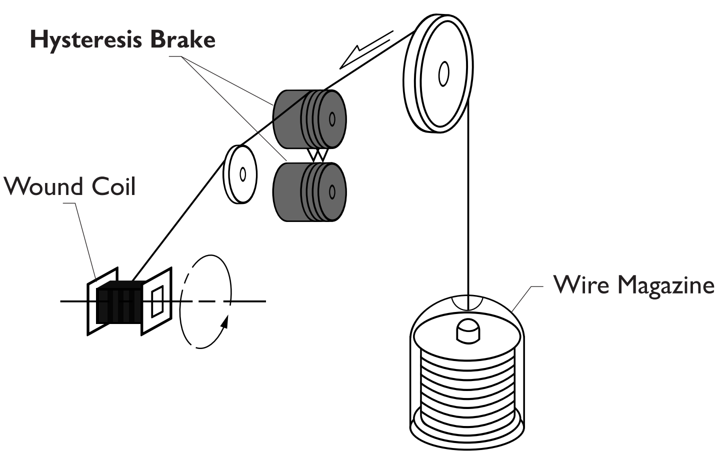


Applications with Hysteresis Brakes

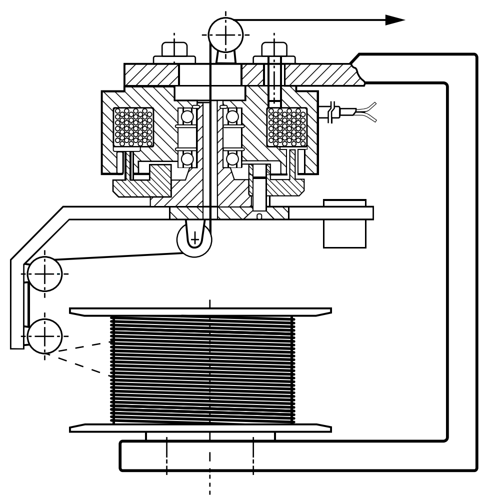
Hysteresis Brakes provide precise control of wire tension during wind, hook and cut operation of high speed automated winding machines.



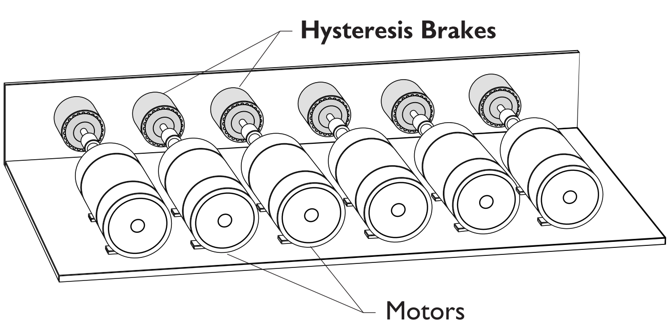
Transformer and coil winding operations employing Hysteresis Brakes in open loop control maintain precise tension during winding process.



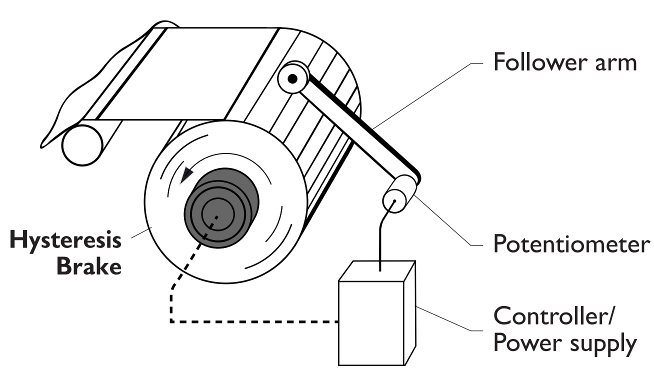
Application of a Hysteresis Brake with large bore: The brake pole case is bolted to the machine frame and a hollow shaft, with bearings is mounted in the pole. The hollow shaft, rotor and flyer form one assembly to tension the material.



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

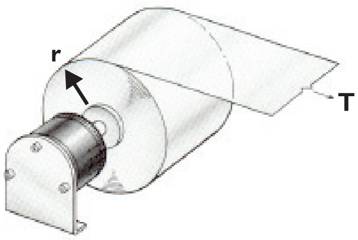


For closed loop control; using dancer arm, photo or ultrasonic sensors to provide feedback to the Hyteresis Brake.



Selection Criteria

For every application determine the TORQUE and MAXIMUM RPM.



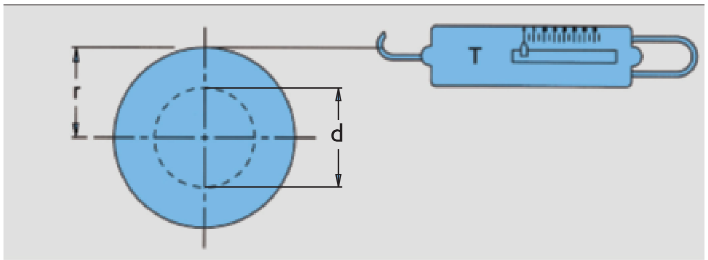
	Metric	English
Line Tension (T)	8N	1.8 lb
Full Spool Radius (r)	.15m	5.9 in
Spool Core Diameter (d)	.125m	.41 ft
Line Speed	90 m/min	295 ft/min

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 x 8N =1.2Nm or 5.9 in x 1.8 lb= 10.6 lb-in (169 oz-in)

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:

$$\text{Max RPM} = \frac{\text{Line Speed}}{\text{3.14x Core Dia (d)}} = \frac{\text{90mm / min}}{3.14 \times .125\text{m}} = \frac{\text{295 ft / min}}{3.14 \times .41 \text{ ft}} = \text{229 RPM}$$

Step 3 - Calculate Power Dissipation

Example Calculations:

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

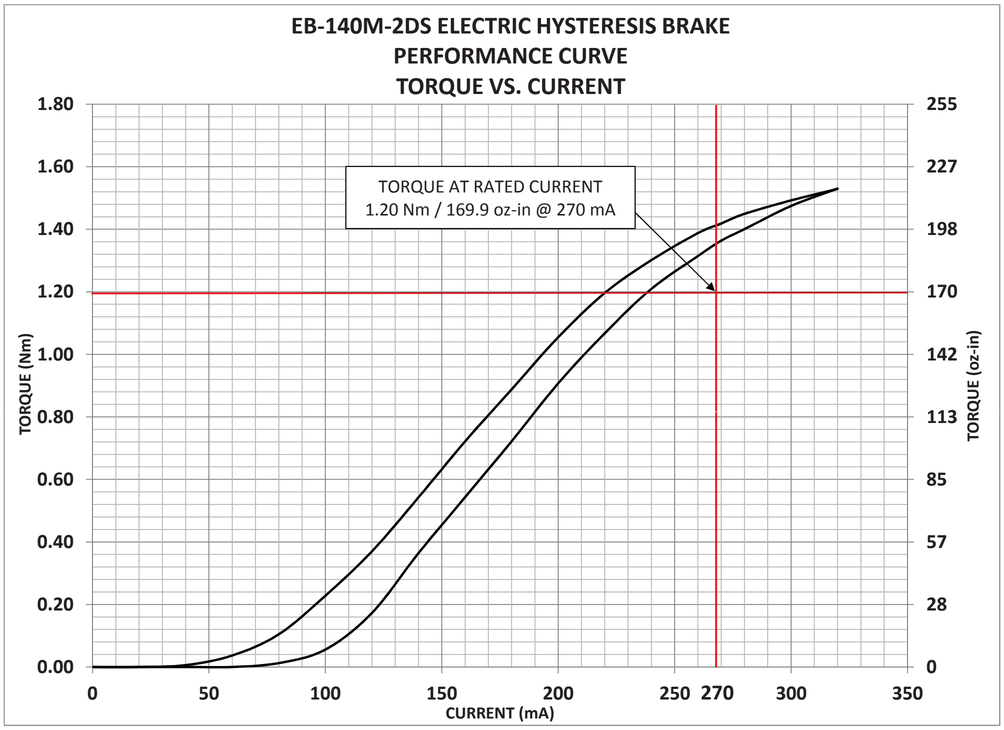
$$\text{P (watts)} = \frac{\text{T(lb-in) x RPM}}{84.36} = \frac{10.6 \times 229}{84.36} = \text{29 watts}$$

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

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)



Zuhal Oztoprak
AYPA ELECTRONICS CO. LTD.
Kumbaraci basi Sok Gursoy Apt. No. 11/13
Ortakoy, Istanbul 80840 Turkey
Phone: (90) 212-261-1440 Fax: (90) 212-259-7888
E-mail: aypaltd@superonline.com

Bill Lingard
CGB PRECISION PRODUCTS
94 Voltri Street
Mentone, Victoria 3194 Australia
Phone: (61) 3 9584 5311 Fax: (61) 3 9584 7784
E-mail: sales@cgb.com.au Website: www.cgb.com.au

K.H Han
GF KOREA CORP.
B-710, Poly-Town B/D, 775, Gojan-dong, Danwon-gu
Ansan-si Gyeonggi-do, 425-906 South Korea
Phone : (82) 31-408-3376 Fax: (82) 31-408-3302
E-mail: gf@gf.co.kr Website: www.gf.co.kr

Peter Bangham
(Catalog Only)
HUCO DYNATORK
Merchant Drive
Hertford Herts, SG13 7BL England
Phone: (44) 19 92 501 900 Fax: (44) 19 92 509 890
Email: hec.sales@huco.com Website: www.huco.com

Hans Uhing
MOBAC GMBH-KIEL
Bunsenstraße 1 Kiel Germany D-24145
Phone: (49) 431-65-0277 Fax: (49) 431-65-0511
E-mail: mobac@t-online.de
Website: www.mobac.de

W.J. Lee
SEAL TRADING INC.
(For Wire & Cable Brakes Only)
Suite 401, Nadong Singuro B/D
No 610-8, Guro-Dong, Guro-Gu
Seoul, South Korea
Phone: (82) 2-2631-3738 Fax: (82) 2-2676-2458
E-mail: sales@sealtrading.com Website: www.sealtrading.com

Giuseppe Raimondo
SORATEC DI ZUMKEHR WALTRAUD
(For Wire & Cable Brakes Only)
Via Galimberti, 25 Lurago Marinone (CO) 22070 Italy
Phone: (39) 031-352-4278 Fax: (39) 031-352-4278
Mobile: (39) 0335-834-6327
E-mail: raimondo@saratec.com Website: www.soratec.com

John S. Wootton
TECHNICAL & GENERAL DISTRIBUTION
Techco House, 93 Milner Road, P O Box 3941
Randburg 2125 South Africa
Phone: (27) 11-886-4122 Fax: (27) 11-886-7280
E-mail: john@techco.co.za sales@techco.co.za
Website: www.techco.co.za

Yoshiro Kawamato
TOHO INTERNATIONAL INC.
Orix Honmachi Building 17F
1-4-1, Nishihonmachi, Nishi-ku, Osaka 550-0005 Japan
Phone: (81) 6-6543-4561 Fax: (81) 6-6543-4565
E-mail: import @toho-intl.co.jp
Website: www.toho-intl.co.jp

Suelin Pereira
CANCUN CONSULT LTDA.
Rua Jose Oscar Street
15-Vila Pagano, Valinhos SP, 13277-260 Brazil
Phone: (55) 19 3829 6007 Fax: (55) 19 3829 6005
E-mail: vendas@cancunconsult.com
Website: www.cancunconsult.com

Ricardo Coronel
DISTRIBUIDORA MEJICORO, S.A. de C.V.
Av. Coatepec No. 520 B 34, San Bartolome Coatepec
52770 Huixquilucan Estado de Mexico
Phone: (52) 55-529-50-093 Fax: (52) 55-529-53-432
E-mail: ricardo.coronel@mejicoro.com
Website: www.mejicoro.com

Itzhak Hadar
HIT - HADAR ITZHAK TECHNOLOGIES
11 Hachita Street
Zichron-Yaacov 30900 Israel
Phone: (972) 463 99 769 Fax: (972) 463 97 249
Email: iz-hadar@netvision.net.il

Lee Kee Teck
K T RESOURCES PTE. LTD
Blk 2023, Bukit Batok Industrial Park A, #01-98, Bukit Batok Street 23
Singapore 659528
Phone: (65) 65-621-387 Fax: (65) 65-621-989
E-mail: alkotech@singnet.com.sg

Xavier Carceller
REPRESENTACIONES CARCELLER, S.L.U.
C/ Corunya, 31 1° local 3, Barcelona, E- 08026, Spain
Mobile: (34) 666 56 3758
Phone: (34) 93 270 01 26 Fax (34) 93 270 06 98
E-mail: carceller@repcarceller.com
Website: www.repcarceller.com

Dixon Chen
SEN-HAN ENTERPRISES CORP LTD.
6F-5 No, 171, Sec. 2 Chang-An East Road
Taipei, Taiwan R.O.C.
Phone: (886) 22-751-0653 Fax: (886) 22-721-0658
E-mail: senhan@ms18.hinet.net Website: www.senhan.com

John Mestitz
TECHNA INTERNATIONAL LTD.
1 Metro Centre, Dwight Road
Watford, Hertfordshire WD18 9HG U.K.
Phone: (44) 1923-222-227 Fax: (44) 1923-219-700
E-mail: sales@techna.co.uk Website: www.techna.co.uk

Anton Terhorst
TEXPOL, B.V.
P.O. Box 407 Oldenzaal 7570 AK The Netherlands
Phone: (49) 5922-994-430 Mobile: (31) 654-756-365
E-mail: terhorst.ton@hotmail.com

MAGNETIC TECHNOLOGIES LTD.
43 Town Forest Road, P O Box 257
Oxford, MA USA 01540-0257
Phone: (01) 508-987-3303 Fax: (01) 508-987-2875
E-mail: sales@magnetictech.com
Website: www.magnetictech.com

MAGNETIC TECHNOLOGIES LTD.