

BHB SERIES

BLOWER COOLED HYSTERESIS BRAKES

FEATURES

- Ideal for low-torque/high-speed applications with exceptional power ratings
- Torque: 3 N·m to 24 N·m
- Speed: up to 20,000 rpm
- Power: up to 7000 W
- Included blowers eliminate the need for additional air supply equipment
- Includes air deflectors to guide exhaust air away from the motor under test
- Magtrol hysteresis braking technology provides precise torque control independent of shaft speed
- EMC susceptibility conforms to European standards
- All metric dimensioning
- Base mounting standard
- Designed for use with Magtrol's PT Series T-slot Base Plate mounting system
- A variety of accessories and system options to choose from to create a simple and cost-effective test system.

DESCRIPTION

When torque control/torque measurement must be performed at the highest possible power, Magtrol BHB Series Hysteresis Brakes are ideal. This design allows for continuous power ratings up to 6000 watts (7000 watts intermittent). Use of pre-loaded bearings in the BHB Series Hysteresis Brakes allows operation at speeds of up to 20,000 rpm for extended durations.

BHB Brakes are conveniently base mounted. Base mounting, with integral barrier type terminal strip, provides easy mounting and wiring.



Fig.1 : BHB-6 Blower Cooled Hysteresis Brake

APPLICATIONS

Magtrol's BHB Series Blower Cooled Hysteresis Brakes can function in either torque measurement or torque control applications. When mounted to a PT Series T-slot Base Plate, a cost-effective, basic motor test rig can be easily configured. For this purpose, Magtrol offers several accessories and system options to choose from. The simplest test bench may include one or two BHB Brakes and an AMF Adjustable Motor Fixture mounted onto a PT Base Plate. Adding a TM Series In-Line Torque Transducer, couplings, FRS Free-Run Speed Sensor, 3411 Torque Display or DSP7000 Controller greatly expands the system's motor testing capabilities.

Other accessories available from Magtrol include: power supplies, pipe fittings, jack shafts and risers.

In addition to motor test applications, BHB Series Blower Cooled Hysteresis Brakes can be used for the following:

- Durability/reliability verification
- Brush run-in
- Carburetor tuning
- High-speed tension control

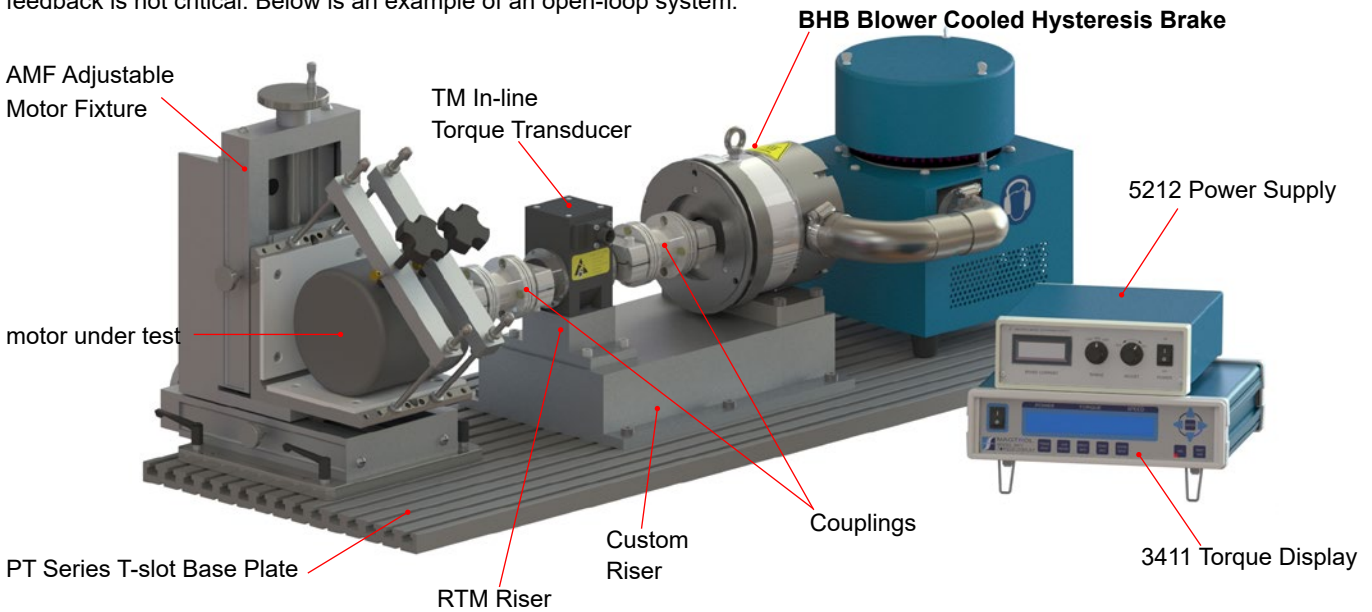
SYSTEM CONFIGURATIONS

BHB Series Hysteresis Brakes are versatile enough to be specified for use in simple open-loop systems or more complex closed-loop systems.

OPEN-LOOP SYSTEMS

A characteristic of the open-loop system is that it does not use feedback to determine if its input has achieved the desired goal. This means that the system does not react to the output of the processes that it is controlling.

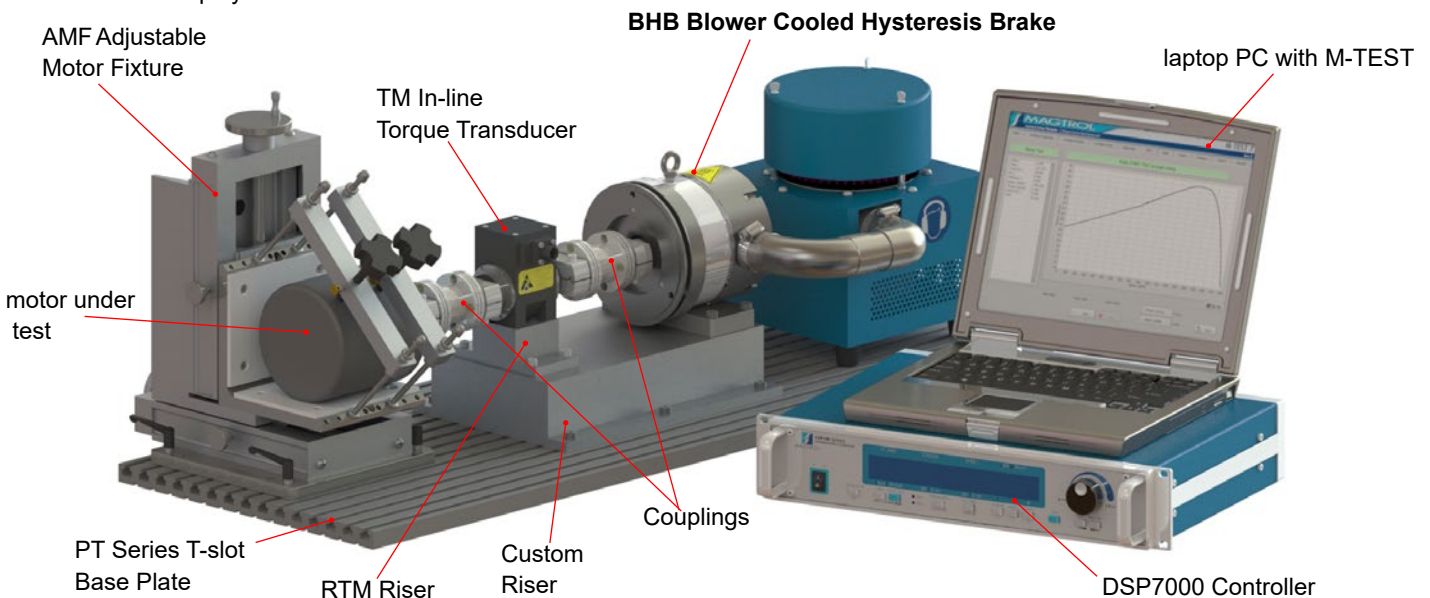
An open-loop controller is often used in simple test setups because of its simplicity and low cost, especially in systems where feedback is not critical. Below is an example of an open-loop system.



CLOSED-LOOP SYSTEMS

A characteristic of the closed-loop system is that it uses feedback to determine if its input has achieved the desired goal. This means that the system reacts to the output of the processes that it is controlling.

A closed-loop controller is often used because of its ability to repeatedly return to a desired controlled point. Below is an example of a closed-loop system.

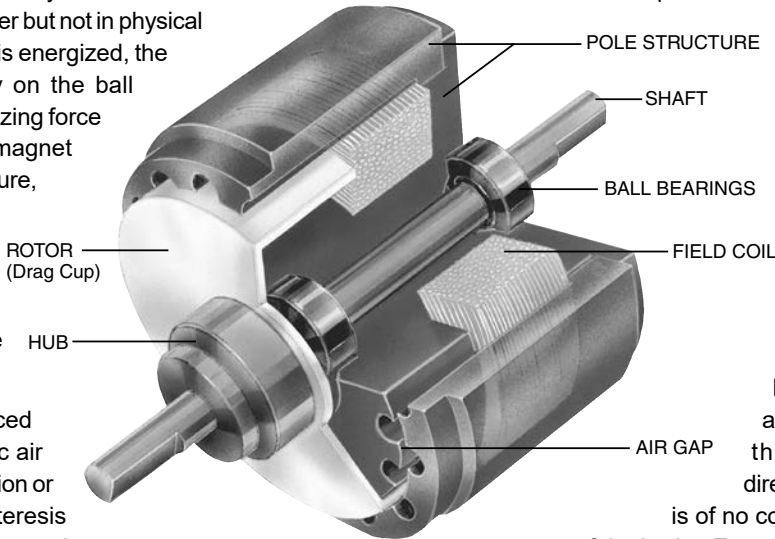


PRINCIPLES OF HYSTERESIS

OVERVIEW

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

Because torque is produced strictly through a magnetic air gap, without the use of friction or shear forces, Magtrol Hysteresis Brakes provide absolutely smooth, infinitely controllable torque loads, independent of speed, and they operate quietly without any physical contact of interactive members. As a result, with the exception of shaft bearings, no wear components exist.



CONTROL

In an electrically operated 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 rated torque is possible. Additional torque in the range of 15-25% above rated torque may be available on some brakes.

The amount of braking torque transmitted by the brake is proportional to the amount of current flowing through the field coil. The direction of current flow (polarity) is of no consequence to the operation of the brake. For optimum torque stability, a DC supply with current regulation is recommended. This will help to minimize torque drift attributable to changes in coil temperature and in-line voltage, which can result in changes in coil current, and consequently, in torque.

ADVANTAGES OF HYSTERESIS DEVICES

LONG, MAINTENANCE-FREE LIFE

Magtrol 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.

LIFE CYCLE COST ADVANTAGES

While the initial cost of hysteresis devices may be the same or slightly more than that of their counterparts, the high cost of replacing, repairing and maintaining friction and magnetic particle devices often makes hysteresis devices the most cost-effective means of tension and torque control available.

EXCELLENT ENVIRONMENTAL STABILITY

Magtrol hysteresis devices can withstand significant variation in temperature and other operating conditions. In addition, because they have no particles or contacting active parts, Hysteresis Brakes are extremely clean. Magtrol devices are used in food and drug packaging operations, in clean rooms, and environmental test chambers.

OPERATIONAL SMOOTHNESS

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

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. Magtrol devices will repeat their performance precisely, to ensure the highest level of process control.

BROAD SPEED RANGE

Magtrol hysteresis devices offer the highest slip speed range of all electric torque control devices. Depending on size, kinetic power requirements and bearing loads, many Magtrol 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.

SPECIFICATIONS

BRAKE RATINGS

BRAKE MODEL	INCLUDED BLOWER		MIN. TORQUE AT RATED CURRENT		RATED CURRENT	MAXIMUM SPEED	KINETIC POWER ^{a)}			
	MODEL	VOLTAGE VAC	N·m	oz·in	mA	rpm	5 MINUTES		CONTINUOUS	
							W with air	W w/o air	W with air	W w/o air
BHB-3B	BL-001	120	3	425	750	20,000	1,500	800	935	160
BHB-3BA	BL-001A	240	3	425	750	20,000	1,500	800	935	160
BHB-6B	BL-001	120	6	850	1,500	20,000	3,400	1,000	3,000	225
BHB-6BA	BL-001A	240	6	850	1,500	20,000	3,400	1,000	3,000	225
BHB-12B	BL-001	120	12	1,700	1,200	12,000	3,500	2,200	3,000	250
BHB-12BA	BL-001A	240	12	1,700	1,200	12,000	3,500	2,200	3,000	250
BHB-24B	BL-002	120	24	3,400	2,400	12,000	7,000	4,000	6,000	450
BHB-24BA	BL-002A	240	24	3,400	2,400	12,000	7,000	4,000	6,000	450

BRAKE MODEL	DRAG TORQUE DE-ENERGIZED @ 1,000 rpm		VOLTAGE ^{b)}	NOMINAL POWER	RESISTANCE AT 25°C ± 10%	EXTERNAL INERTIA		WEIGHT WITH BLOWER	
	N·m	oz·in	VDC	W	Ω	kg·cm ²	lb·in·s ²	kg	lb
BHB-3B	1.51 x 10 ⁻²	2.14	24.8	18.56	33.0	6.89 x 10 ⁰	6.10 x 10 ⁻³	17	37.48
BHB-3BA	1.51 x 10 ⁻²	2.14	24.8	18.56	33.0	6.89 x 10 ⁰	6.10 x 10 ⁻³	17	37.48
BHB-6B	2.82 x 10 ⁻²	4.00	24.0	37.13	16.5	13.80 x 10 ⁰	1.22 x 10 ⁻²	21	46.29
BHB-6BA	2.82 x 10 ⁻²	4.00	24.0	37.13	16.5	13.80 x 10 ⁰	1.22 x 10 ⁻²	21	46.29
BHB-12B	9.18 x 10 ⁻²	13.00	24.0	28.80	20.0	5.60 x 10 ¹	5.00 x 10 ⁻²	35	46.30
BHB-12BA	9.18 x 10 ⁻²	13.00	24.0	28.80	20.0	5.60 x 10 ¹	5.00 x 10 ⁻²	35	46.30
BHB-24B	14.00 x 10 ⁻²	19.30	24.0	57.60	10.0	1.12 x 10 ²	9.90 x 10 ⁻²	68	150.00
BHB-24BA	14.00 x 10 ⁻²	19.30	24.0	57.60	10.0	1.12 x 10 ²	9.90 x 10 ⁻²	68	150.00

a) Kinetic power ratings are maximum values based on limiting coil and/or bearing temperature to approximately 100 °C, and should not be exceeded. Actual values in service may vary ±50% depending on mounting, ventilation, ambient temperature, etc.

b) Other coil voltages are available.

* Angular Acceleration values are available upon request

** To prevent damage to the power supply from inductive kickback, connect a diode rated at greater than or equal to the power supply's output voltage and current across the brake leads. Connect the cathode to the positive lead and the anode to the negative lead.

ENVIRONMENTAL REQUIREMENTS

Operating Temperature	-40 °C to +85 °C
Relative Humidity	up to 90% without condensation

ELECTRICAL CHARACTERISTICS

Max. Compliance Voltage	36 VDC
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ADDITIONAL MECHANICAL CHARACTERISTICS

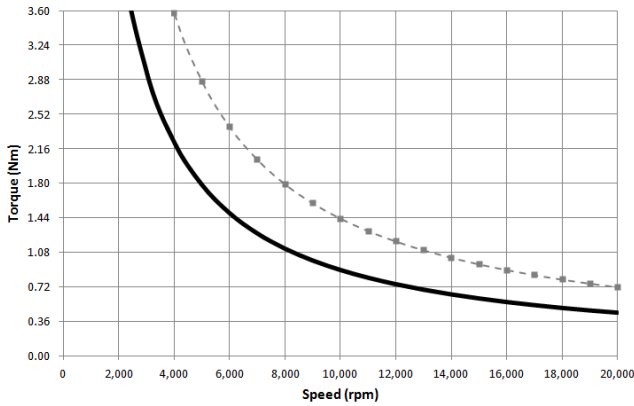
Shaft Ends	smooth
Balancing Quality	G6.3 in accordance with ISO 1940-1



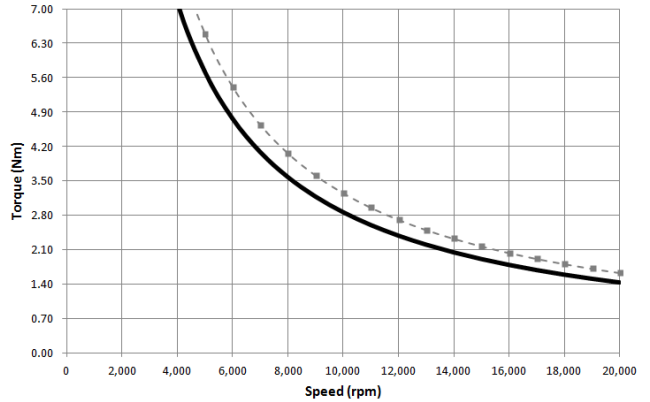
Typical sound pressure at 1 meter: 110 db
Warning: High sound levels can cause permanent hearing loss. Use hearing protection while this product is in use.

POWER ABSORPTION CURVES

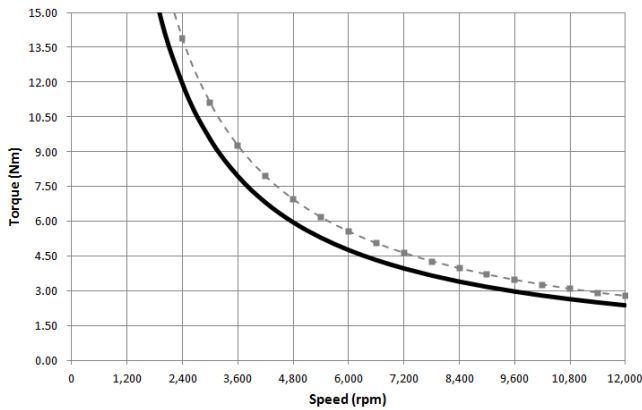
BHB-3B / BHB-3BA



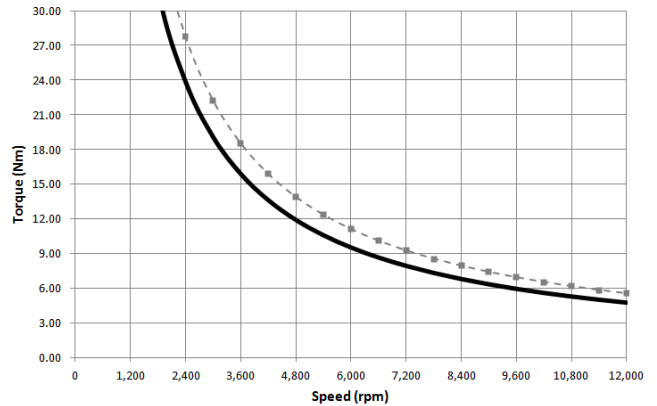
BHB-6B / BHB-6BA



BHB-12B / BHB-12BA



BHB-12B / BHB-12BA



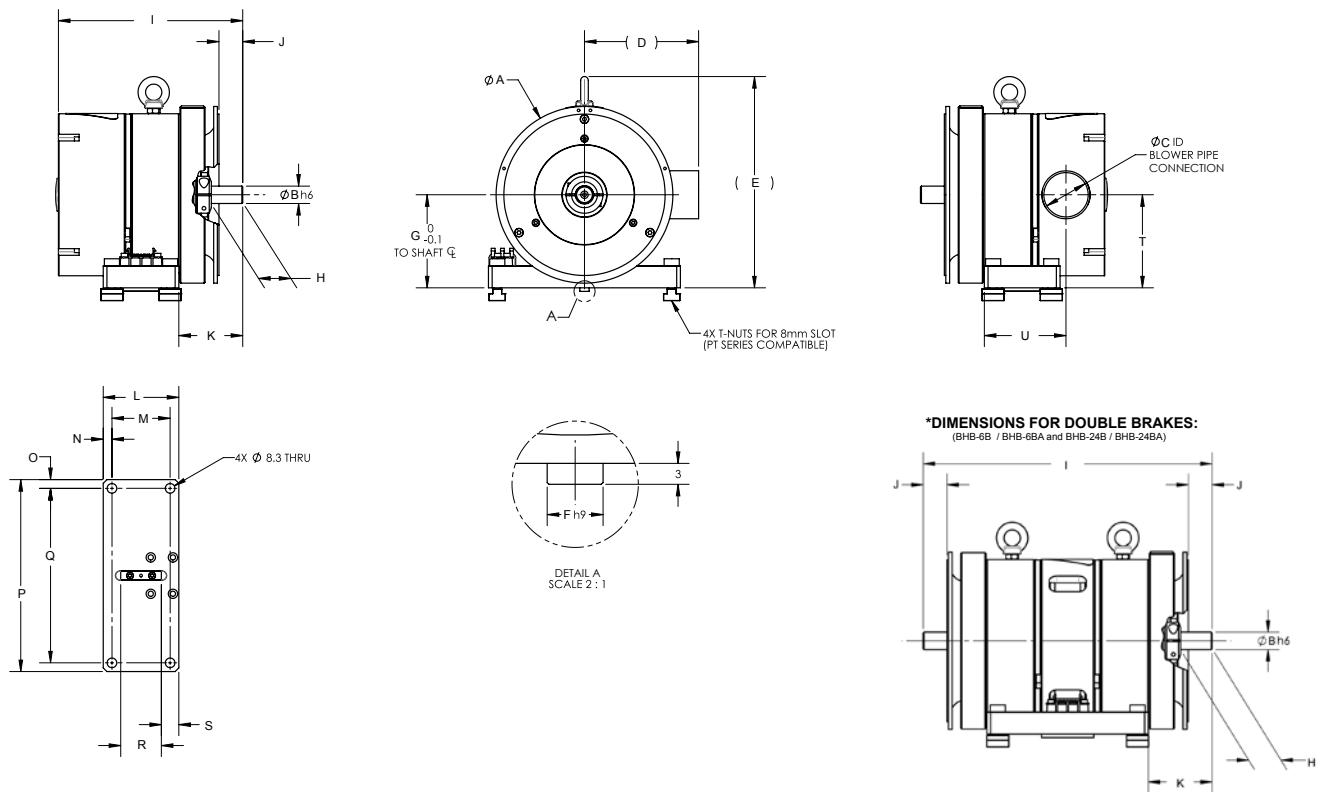
The power absorption curves represent the maximum power (heat) that the brake can dissipate over time.

- Maximum Kinetic Power Rating Curve for Less Than Five Minutes: Area under curve equals the maximum speed and torque combinations for a motor test of less than five minutes.

- Maximum Kinetic Power Rating Curve for Continuous Duty: Area under curve equals the maximum speed and torque combinations for a continuous duty motor test.

DIMENSIONS

BHB DIMENSIONS (MILLIMETERS)



BHB BRAKE MODEL	ØA	ØB	ØC	D	E	F	G	H	I	J
BHB-3B / BHB-3BA	151.9	15	1 ½"	98.1	181.7	8	80	27	158.4	20.5
BHB-6B / BHB-6BA	151.9	15	2"	98.1	181.7	8	80	27	248.2*	20.4*
BHB-12B / BHB-12BA	226.6	25	1 ½"	151.4	283.0	8	120	50	206.0	47.0
BHB-24B / BHB-24BA	226.6	25	2"	153.9	283.0	8	120	50	375.2*	47.0*

BHB BRAKE MODEL	K	L	M	N	O	P	Q	R	S	T	U
BHB-3B / BHB-3BA	54.9	65.0	50	7.5	7.5	165	150	35	15.0	80	70.2
BHB-6B / BHB-6BA	54.9	138.5	120	9.3	7.5	165	150	45	46.8	80	69.3
BHB-12B / BHB-12BA	84.2	90.0	70	10.0	10.0	270	250	35	27.5	120	96.7
BHB-24B / BHB-24BA	84.4	206.4	185	10.7	10.0	270	250	25	8.1	120	103.2

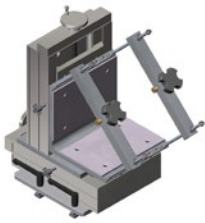
SYSTEM OPTIONS AND ACCESSORIES

PT SERIES T-SLOT BASE PLATES



Magtrol's PT Series Base Plates are used for creating a basic test rig by mounting a brake and/or TM Torque Transducer in line with the unit to be tested. Its solid, warp-resistant structure and multiple, single-sided T-slots enable modular construction that is cost-effective and easy to assemble.

AMF SERIES ADJUSTABLE MOTOR FIXTURES



Magtrol's AMF Series Adjustable Motor Fixtures are used to secure small to medium-sized motors in place while running any test. These extremely versatile fixtures also enable easy motor centering for coupling to a brake. (Couplings can be supplied upon request.) The AMF-1, -2 and -3 Fixtures feature one or two adjustable bridges, each fitted with a fluted knob clamp screw, to allow clamping anywhere along the axis of the motor. To safeguard the motor, locking thumb screws provide protection against vibration and all motor-to-fixture contact surfaces are nylon padded for scratch-free clamping.

TM SERIES IN-LINE TORQUE TRANSDUCERS



Magtrol's In-Line Torque Transducers deliver precise torque and speed measurement over a very broad range. Each model has an integrated conditioning electronic module providing 0 to ± 10 VDC torque output and an open collector speed output. All TM In-Line Transducers employ Magtrol's unique non-contact differential transformer torque measuring technology which makes them very reliable, providing high overload protection, excellent long-term stability and high noise immunity.

TM RISERS



Many times, hysteresis brakes will be used with one of Magtrol's TM Series In-Line Torque Transducers. Risers lift the appropriate TM from the PT to the shaft height of the brake. The riser is complete with attachment hardware for the TM and T-Nuts and shoulder bolts for attachment to a PT Base Plate.

JACK SHAFT RISER



For each brake there is an appropriately sized hardened jack shaft, complete with T-Nuts and shoulder bolts, that will mount to a PT Base Plate. Risers lift the appropriate Jack Shaft from the PT to the shaft height of the brake.

FRS FREE RUN SPEED SENSOR



Magtrol's FRS Free-Run Speed Sensor is designed for applications where it is necessary to acquire speed readings that are unaffected by drag load. Before connecting a motor to the dynamometer, the free-run speed can be obtained from the FRS Sensor. With its reflective sensor, the FRS does not need to be attached to the motor but only placed close to the motor shaft (as shown in the photo to the right).

The raw speed data is then transmitted to either a Magtrol 3411 Torque Display or DSP7000 Dynamometer Controller where it is converted and displayed in rpm

AIR FILTER KIT

In order to ensure optimal life, the compressed air supply used to cool AHB Series Hysteresis Brakes must be free of contamination, including water, oil, rust scale, dust, etc. For optimal performance, Magtrol recommends the use of a 5 micron coalescing filter. Air filter kits purchased from Magtrol include the filter and a mounting bracket for attaching the air filter to a PT Base Plate.



PRESSURE GAUGE KIT

To ensure proper air volume Magtrol offers a pressure gauge kit, including "T" connector and tube (as shown), to be used in-line with the air supply line.



POWER SUPPLIES

Hysteresis Brakes provide torque that is proportional to the current applied. During normal operation, the coil resistance of a Brake will change with temperature. To eliminate the resulting torque drift, Magtrol recommends using a current-regulated power supply, such as the Model 5212, BPM Series or the Lambda ZUP36-6. Refer to the note about power supplies under "Accessory Ordering Information" for more details.

ALSO AVAILABLE

- Connection Cables: brake to controller; power supply to brake; controller to power supply
- Couplings: brake to in-line torque transducer
- Air Supply Lines: 8 mm and 10 mm outside diameter; sold by the meter
- Pipe Fittings

ORDERING INFORMATION

SYSTEM OPTIONS

CATEGORY	DESCRIPTION	MODEL/PART #
TORQUE MEASUREMENT	In-Line Torque Transducers	TM/TMHS/TMB Series
SPEED MEASUREMENT	Free-Run Speed Sensor	FRS
MOUNTING	T-slot Base Plate - available in lengths from 400 mm to 1500 mm	PT Series
	Couplings	Contact Magtrol
ADJUSTABLE MOTOR FIXTURES	Motor fixture for motors up to 4 inches in diameter	AMF-1
	Motor fixture for motors up to 6 inches in diameter	AMF-2
	Motor fixture for motors up to 8 ¼ inches in diameter	AMF-3
CONTROLLERS & DISPLAYS	High Speed Programmable Dynamometer Controller	DSP7000
	Torque Display	3411
BRAKE POWER SUPPLIES	Current-regulated Power Supply	5212
	Regulated DC Power Supply - 0-36 volts/6 amps; high accuracy; digital display	Lambda ZUP36-6
	BPM Series Brake Power Module	BPM Series
CONNECTION CABLES	Connect DSP7000 Controller to brake	88M085-0150 (1.5 m)
		88M085-0200 (2 m)
		88M085-0500 (5 m)
		88M085-1000 (10 m)
	Connect 5212 Power Supply to brake	88M407-0150 (1.5 m)
		88M407-0500 (5 m)
Connect ZUP36-6 Power Supply to brake	88M175-0200 (2 m)	
	88M175-0500 (5 m)	
Connect DSP7000 Controller to ZUP36-6 Power Supply	88M176-0100 (1 m)	
	88M176-0200 (2 m)	
Connect TM Torque Transducer to DSP7000	ER 113/01 (5 m)	
	ER 113/02 (10 m)	
	ER 113/03 (20 m)	
TM RISERS	Lift the appropriate TM from the PT to the shaft height of the brake.	RTM-1-060 RTM-1-070 RTM-1-080 RTM-1-100 RTM-1-120 RTM-2-120
JACK SHAFT RISER	Lift the appropriate Jack Shaft from the PT to the shaft height of the brake.	JS-1-060 JS-1-070 JS-1-080 JS-1-100 JS-1-120 JS-2-120 JS-10-080 JS-10-120 JS-20-120
MISC	Air Supply Lines	Contact Magtrol
	Pipe Fittings	Contact Magtrol