

AHB SERIES

COMPRESSED-AIR-COOLED HYSTERESIS BRAKES

MAGTROL offers 5 main types of Hysteresis Brakes to absorb a load: Pure Hysteresis (**HB Series**), Compressed-Air-Cooled (**AHB Series**), Blower-Cooled (**BHB Series**), Base Mounted (**CHB Series**) & Torque Powder (**TPB Series**). Each type of Brakes has advantages and limitations. With over 50 standard models to choose from, Magtrol Sales professionals are readily available to assist in selecting the better brake to meet your application needs.

FEATURES

- Ideal for low-torque/high-speed applications with exceptional power ratings.
- Torque: 0.3...24 N·m
- Speed: ≤ 35 000 rpm
- Power: ≤ 5 300 W
- Compressed-Air Cooling offers excellent heat dissipation.
- Allowable input air pressure of up 95 PSI eliminates the need for a regulator.
- 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.



Fig. 1: AHB-3 | Compressed-Air-Cooled Hysteresis Brakes

- 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 AHB Series Hysteresis Brakes are ideal. Passages running through the brakes enables compressed air cooling, providing excellent heat dissipation. This design allows for continuous power ratings up to 3000 W (5 300 W intermittent). Use of pre-loaded bear-

ings in the AHB Series Hysteresis Brakes allows operation at speeds of up to 35000 rpm for extended durations.

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

APPLICATIONS

Magtrol's AHB Series Compressed-Air-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 AHB Brakes and an AMF (Adjustable Motor Fixture) mounted onto a PT Series (Base Plate). Adding a TS or TM Series (In-Line Torque Transducer), couplings, FRS (Free-Run Speed Sensor), MODEL3411 (Torque Display) or DSP7000 (Dynamometer Controller) greatly expands the system's motor testing capabilities.

Other accessories available from Magtrol include: power supplies, air filters, pressure gauge kits, air lines, pipe fittings, jack shafts and risers.

In addition to motor test applications, AHB Series Compressed-Air-Cooled Hysteresis Brakes can be used for the following:

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

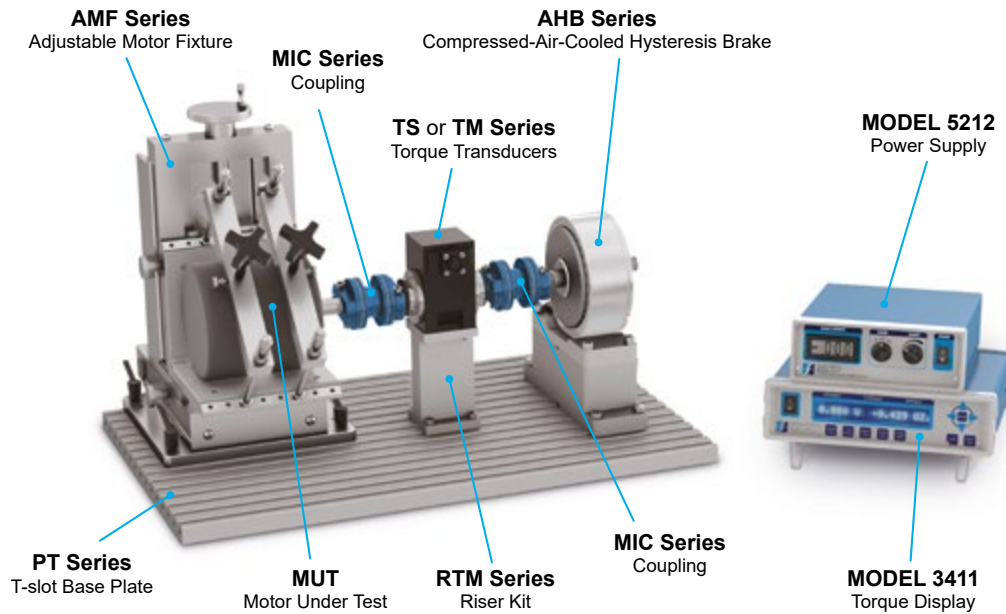
SYSTEM CONFIGURATIONS

AHB 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.

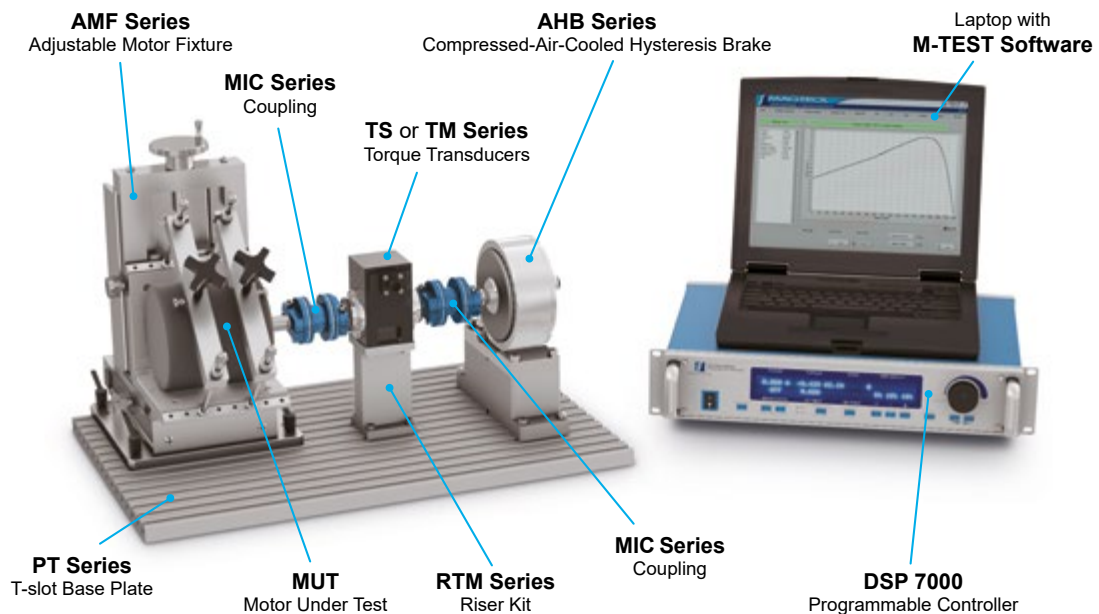
An open-loop controller is often used in simple test setups because of its simplicity and low cost, especially in systems where feedback is not critical. Below is an example of an open-loop system.



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.

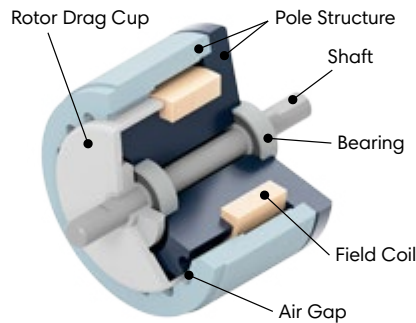
A closed-loop controller is often used because of its ability to repeatedly return to a desired controlled point. Below is an example of a closed-loop system.



PRINCIPLES OF HYSTERESIS

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.



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. Adjustment 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.

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.

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.

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.

M-TEST - MOTOR TESTING SOFTWARE



Magtrol's M-TEST is a motor testing software for Windows®-based data acquisition. Used with a Magtrol DSP7000 Controller, M-TEST Software provides the control of any Magtrol Brake and runs test sequences in a

manner best suited to the overall accuracy and efficiency of the Magtrol Motor Test System. The data that is generated by M-TEST can be stored, displayed, printed in tabular or graphic formats, and can be easily imported into a spreadsheet.

Written in LabVIEW™, M-TEST has the flexibility to test a majority of motor types in a variety of ways. Because of LabVIEW's versatility, obtaining data from other sources (e.g. thermocouples), controlling motor power and providing audio/visual indicators is relatively easy. Magtrol's M-TEST is ideal for simulating loads, cycling the unit under test and motor ramping. Because it is easy to gather data and duplicate tests, the software is ideal for use in engineering labs. Tests can be programmed to run on their own and saved for future use allowing for valuable time savings in production testing and incoming/outgoing inspection.

SPECIFICATIONS

MODEL	MIN. TORQUE AT RATED CURRENT	RATED CURRENT	MAXIMUM SPEED	KINETIC POWER ^{a)}			
				WITH AIR		WITHOUT AIR	
				5 min.	Continuous	5 min.	Continuous
	N·m	mA	rpm	W	W	W	W
AHB-0.3 ^{c)}	0.30	300	25 000	500	500	90	25
AHB-0.75 ^{c)}	0.65	400	35 000	1 200	1 200	250	55
AHB-1	1.00	400	25 000	1 200	1 200	250	55
AHB-1.5	1.50	400	25 000	1 300	1 300	450	70
AHB-3	3.00	750	20 000	1 800	1 800	800	160
AHB-3.3 ^{b)}	3.30	800	25 000	2 000	1 400	800	140
AHB-5	5.00	380	15 000	2 500	1 000	1 300	120
AHB-6	6.00	1 500	20 000	3 000	3 000	1 400	225
AHB-12	12.00	1 200	12 000	2 800	1 800	2 200	250
AHB-24	24.00	2 400	12 000	5 300	3 000	4 000	450

MODEL	DRAG TORQUE DE-ENERGIZED at 1000 rpm	NOMINAL POWER	RESISTANCE at 25°C ± 10%	EXTERNAL INERTIA	WEIGHT	
	N·m	W	Ω	kg·cm ²	kg	lb
AHB-0.3 ^{c)}	5.00 x 10 ⁻³	8.10	90.0	1.830 x 10 ⁻¹	1.56	3.50
AHB-0.75 ^{c)}	N/A	9.60	60.0	9.130 x 10 ⁻¹	2.50	5.40
AHB-1	5.42 x 10 ⁻³	9.60	60.0	8.760 x 10 ⁻¹	2.00	4.40
AHB-1.5	7.77 x 10 ⁻³	10.24	64.0	2.750 x 10 ⁰	4.20	9.30
AHB-3	1.51 x 10 ⁻²	18.60	33.0	6.890 x 10 ⁰	6.50	14.30
AHB-3.3 ^{b)}	N/A	20.48	32.0	5.584 x 10 ⁻⁴	8.50	18.74
AHB-5	5.00 x 10 ⁻²	8.70	60.0	1.310 x 10 ¹	12.40	27.34
AHB-6	2.82 x 10 ⁻²	37.10	16.5	1.380 x 10 ¹	12.70	28.00
AHB-12	9.18 x 10 ⁻²	28.80	20.0	5.600 x 10 ¹	24.00	53.00
AHB-24	1.36 x 10 ⁻¹	57.60	10.0	1.120 x 10 ²	47.00	103.60

- 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) The AHB-3.3 has a lower inertia and higher speed than the AHB-3.
- c) Designed with utilizing angular contact bearings, the AHB-0.3 & AHB-0.75 were designed for severe application. These applications include, but are not limited to, high vibration or high radial and/or axial loading.

NOTE: Angular Acceleration values are available upon request.

CAUTION: 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.

AIR REQUIREMENTS

MODEL	AIR SUPPLY PRESSURE			AIR VOLUME/ CONSUMPTION		SUPPLY TUBE FITTING			
	psi ^{a)}	bar	kPa	SCFM	l/min	OUTER DIAMETER	PIPE THREAD		
						mm	NPT		
AHB-0.3	90	6.21	620.5	10	283	8	1/8"		
AHB-0.75									
AHB-1									
AHB-1.5									
AHB-3				15	425	10	567	10	1/4"
AHB-3.3									
AHB-5									
AHB-6									
AHB-12									
AHB-24									

a) The air pressure to the (at the) brake will be called out 85...95 PSI. This range is thought to allow a user to directly attach to a compressor line without local regulation and filtering.

ENVIRONMENTAL REQUIREMENTS

Operating Temperature	-40... +85 °C
Relative Humidity	≤ 90% (without condensation)

ELECTRICAL CHARACTERISTICS

Max. Compliance Voltage	36VDC
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MECHANICAL CHARACTERISTICS

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



Typical sound pressure at 1 meter: **110 db**

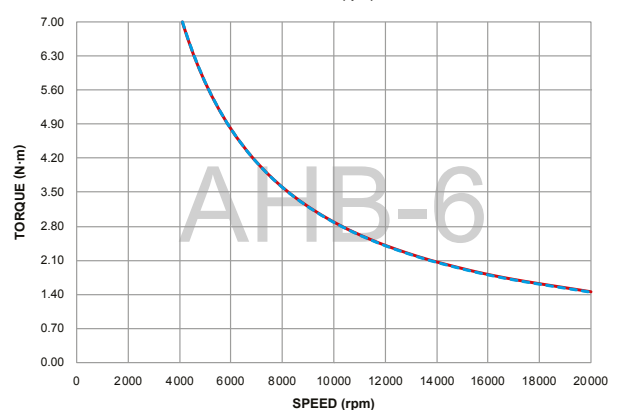
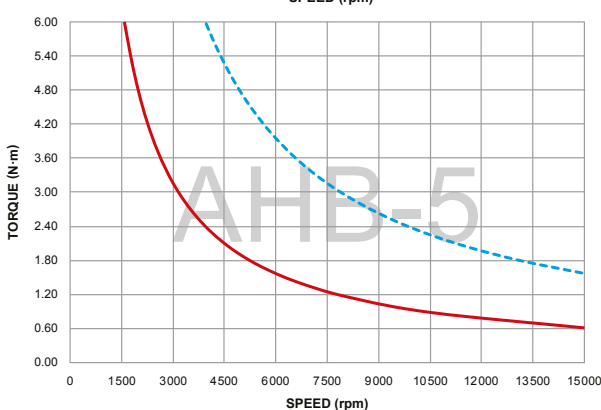
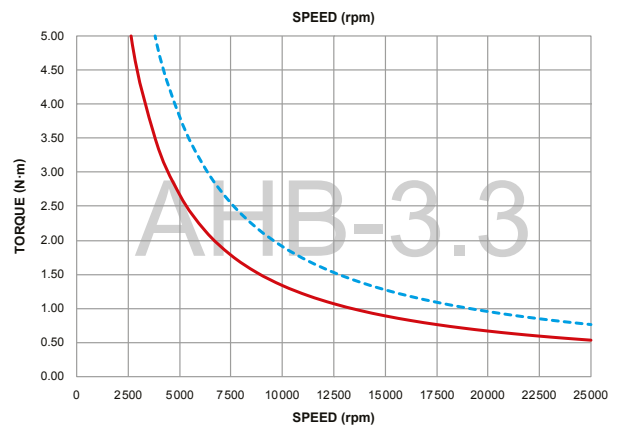
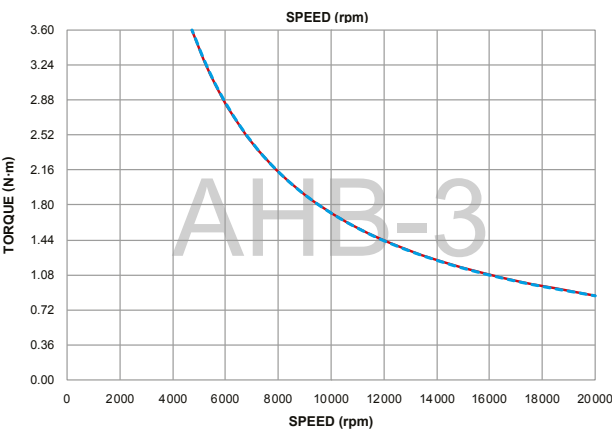
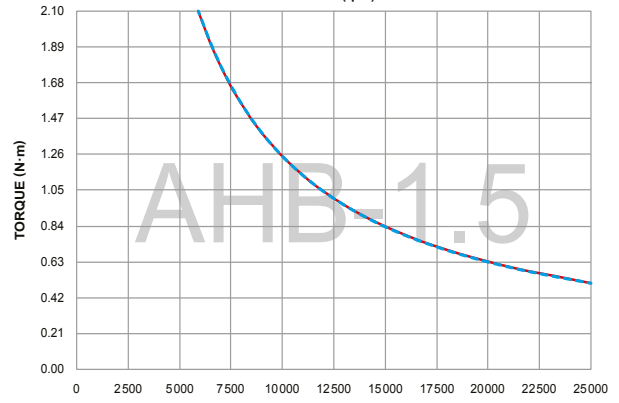
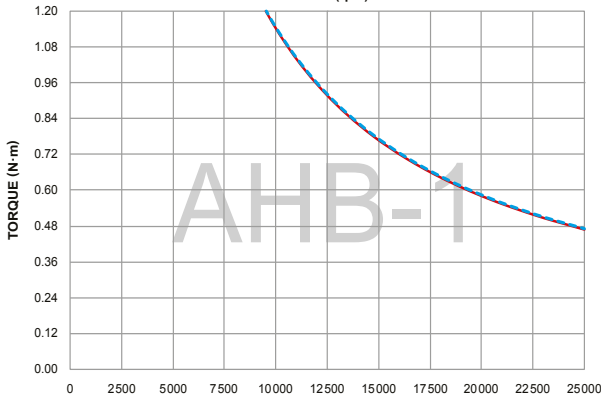
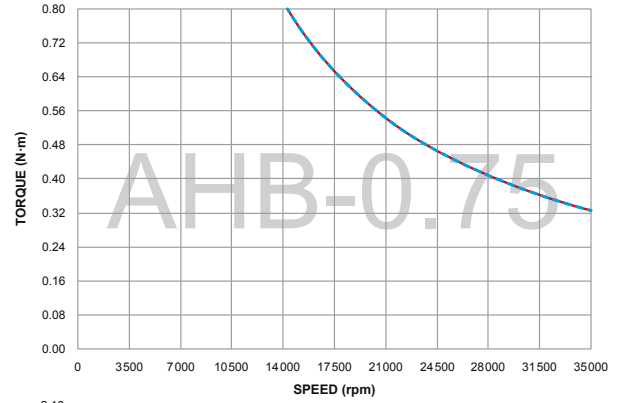
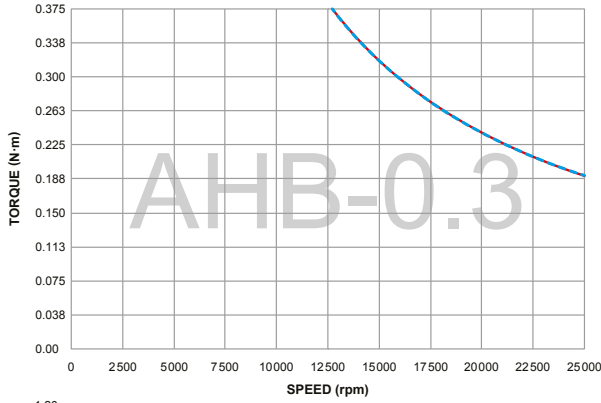
WARNING: High sound levels can cause permanent hearing loss. Use hearing protection while this product is in use.

POWER ABSORPTION CURVES

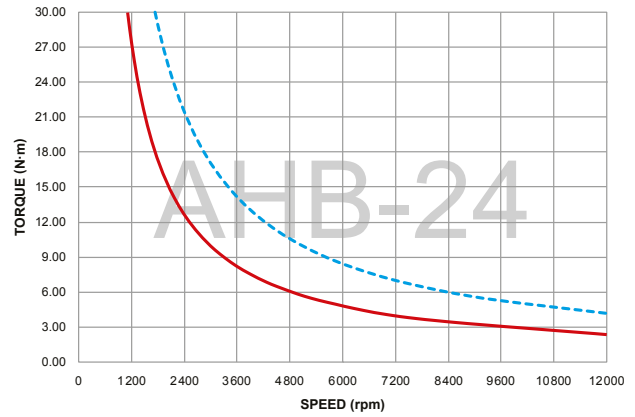
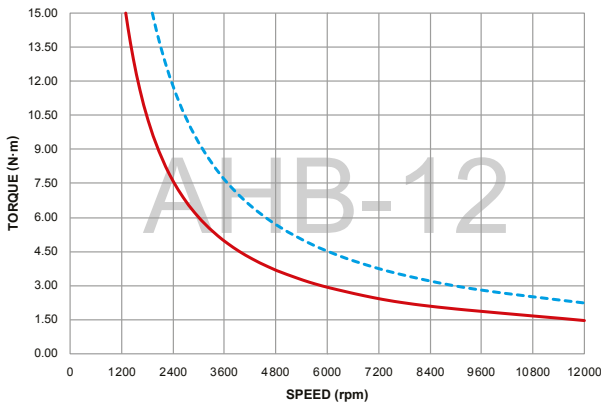
The power absorption curves represent the maximum power (heat) that the hysteresis brake can dissipate over time.

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

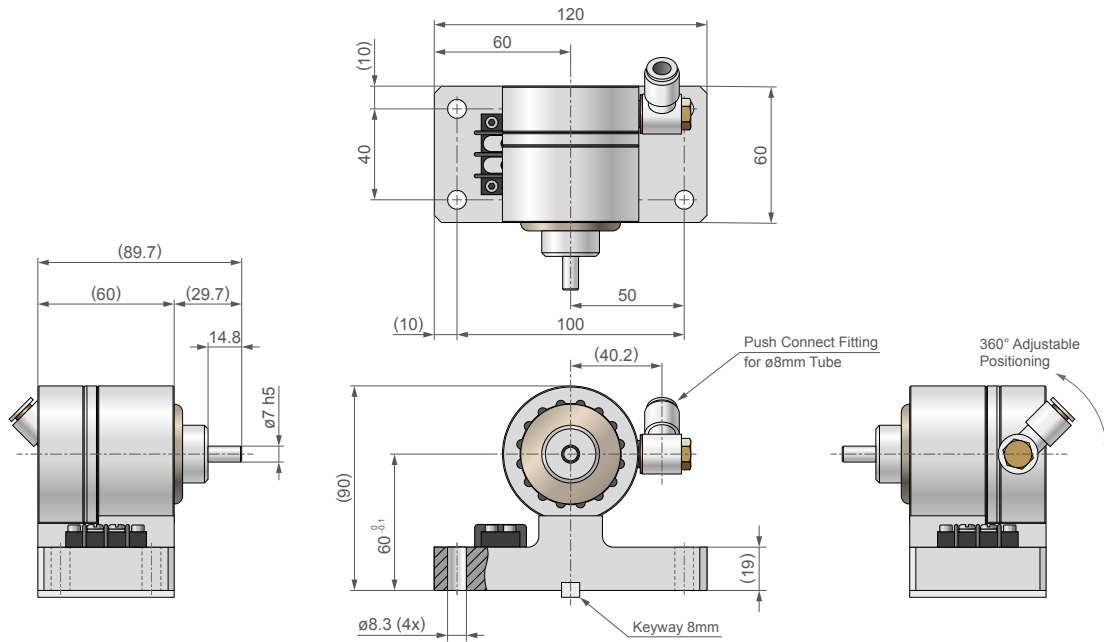
- - - Maximum Kinetic Power Rating Curve for **Less Than Five Minutes**: Area under curve equals the maximum speed and torque combinations for a motor test of less than five minutes.



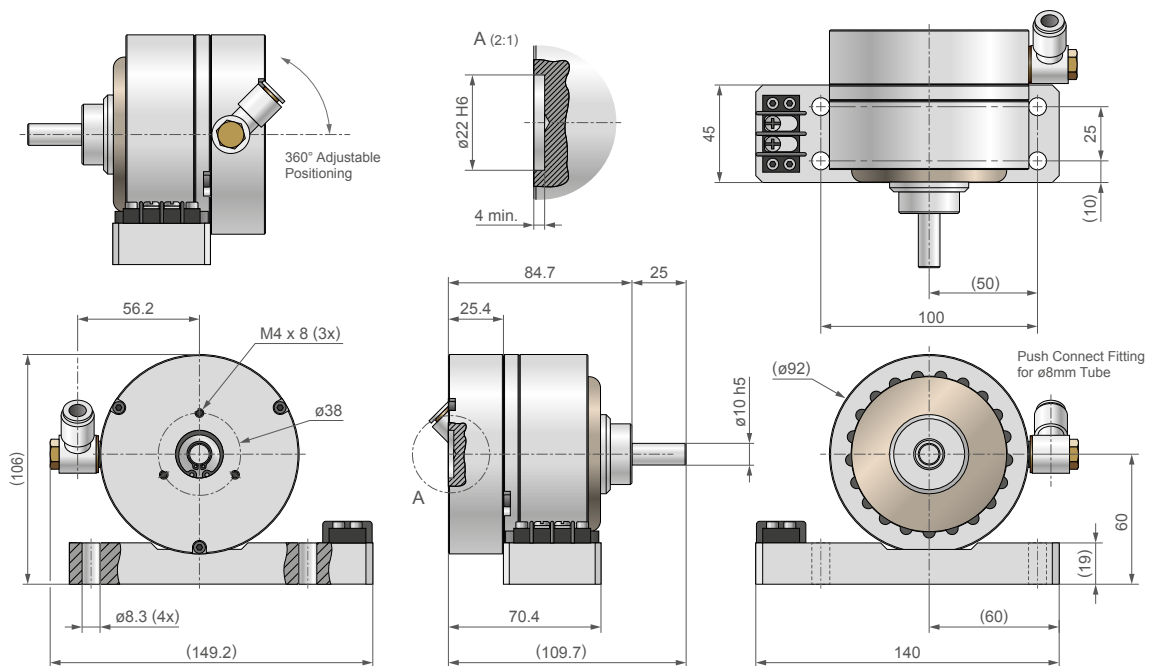
POWER ABSORPTION CURVES

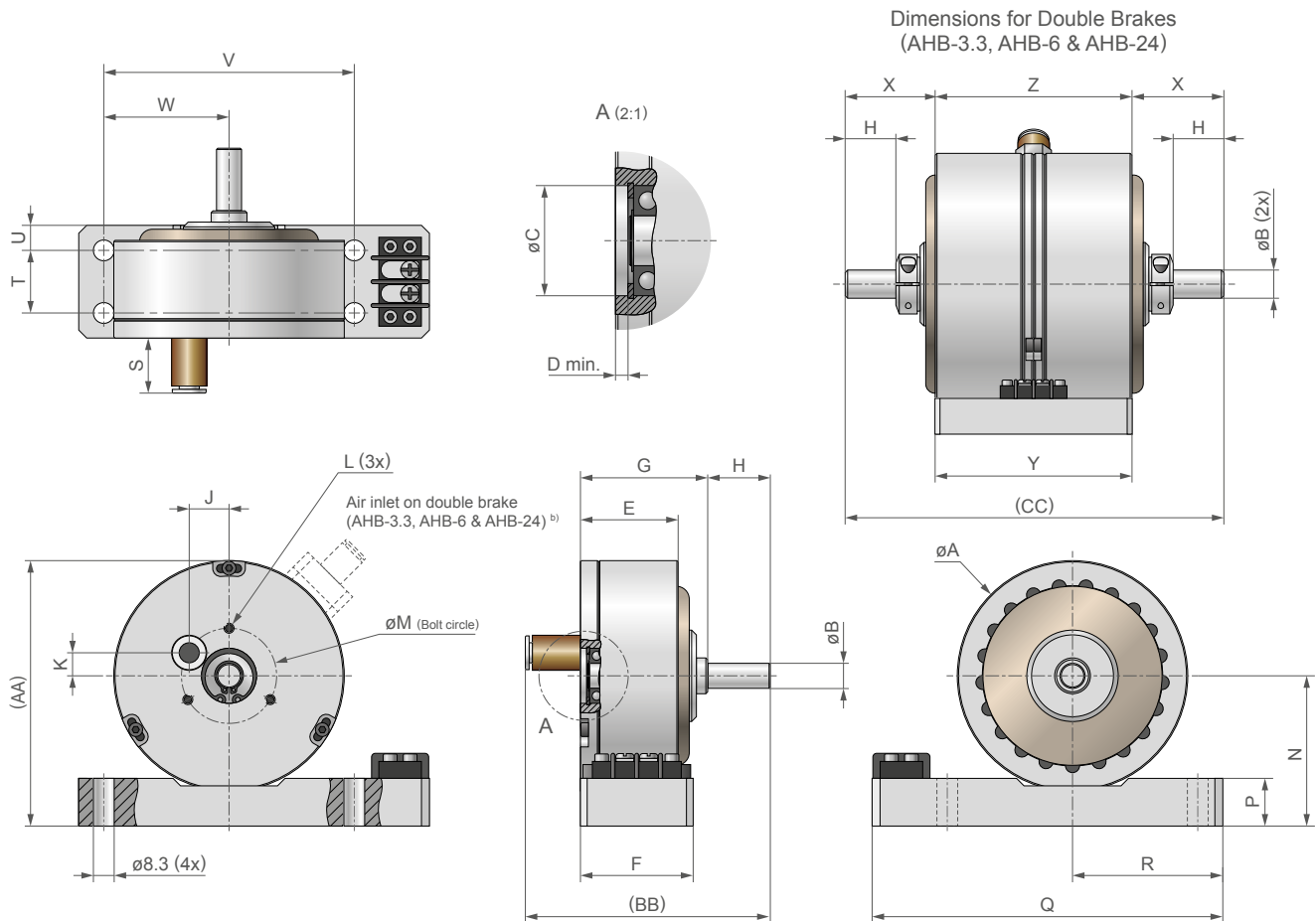


DIMENSIONS AHB-0.3



DIMENSION AHB-1.75



DIMENSIONS AHB-1 - AHB-24


MODEL	øA	øB	øC	D	E	F	G	H	J	K	L	øM
AHB-1	92.0	10 h5	22 H6	2.5	39.0	45.0	50.8	25	15.9	9.2	M4 x 8 min.	38
AHB-1.5	112.7	12 h4	28 H6	2.5	50.4	50.0	64.2	27	19.5	11.3	M5 x 10 min.	45
AHB-3	139.3	15 h5	32 H6	2.0	52.4	65.0	72.9	27	24.7	14.3	M5 x 10 min.	60
AHB-3.3	112.7	12 h6	-- a)	-- a)	100.8	100.8	-- a)	27	-- a)	-- a)	-- a)	-- a)
AHB-5	158.0	17 h4	35 H6	3.0	72.8	75.0	94.9	38	28.6	16.5	M6 x 10 min	70
AHB-6	139.3	15 h5	-- a)	-- a)	104.7	105.0	-- a)	27	-- a)	-- a)	-- a)	-- a)
AHB-12	226.0	25 h6	52 H5	3.0	76.2	80.0	105.8	50	38.5	22.2	M6 x 12 min.	100
AHB-24	226.0	25 h6	-- a)	-- a)	152.4	143.0	-- a)	50	-- a)	-- a)	-- a)	-- a)

MODEL	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC
AHB-1	60 ⁰ _{-0.15}	19	140	60.0	23	25	10.0	100	50	--	--	--	106.0	98.8	--
AHB-1.5	70 ⁰ _{-0.15}	19	170	85.0	23	30	10.0	150	75	--	--	--	126.4	114.2	--
AHB-3	80 ⁰ _{-0.15}	19	165	82.5	21	50	7.5	150	75	--	--	--	149.7	120.9	--
AHB-3.3	70 ⁰ _{-0.15}	19	170	85.0	-- a)	80	10.4	150	75	50	101	101	126.4	--	200.0
AHB-5	100 ⁰ _{-0.15}	25	220	110.0	21	55	10.0	200	100	--	--	--	179.0	153.9	--
AHB-6	80 ⁰ _{-0.15}	19	165	83.0	-- a)	85	10.0	150	75	50	105	105	149.7	--	202.3
AHB-12	120 ⁰ _{-0.20}	25	270	135.0	18	55	12.5	250	125	--	--	--	233.0	173.8	--
AHB-24	120 ⁰ _{-0.20}	25	270	135.0	-- a)	125	9.0	250	125	80	143	152	233.0	--	311.6

a) Face mount not available on the AHB-3.3, AHB-6 & AHB-24.

b) Air inlet on double brakes (AHB-3.3, AHB-6, AHB-24) is located on the top. For more information please see detailed technical drawing. (website or on request)

NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

POWER SUPPLIES

For optimum torque stability, Magtrol offers different power supplies for Brakes & Clutches:

MODEL 5212 - CURRENT REGULATED POWER SUPPLY



MODEL 5212 is a 0...1A current-regulated, 0...35VDC power supply and display designed for use with hysteresis brakes and clutches. It features a 10-turn current adjustment potentiometer and 3 selectable current ranges: 200...1000 mA. A built in panel meter displays the value of output current.

The MODEL 5212 is designed as a closed-loop power supply to provide smooth application of current throughout an entire range up to a maximum set point. By utilizing regulated current, fluctuations in brake torque caused by temperature changes within the brake coil are eliminated. Braking current can be controlled manually or by an external 0...5VDC input signal.

MODEL 5251 - CURRENT REGULATED POWER SUPPLY



MODEL 5251 is an open frame, 0...1A current regulated power supply for use with Magtrol hysteresis brakes and clutches. It has a high input impedance that allows for a variety of sensors and transducers to be used. It features a selectable 0...5VDC monitor out that allows connection to a PLC, voltmeter, display or other monitoring device. This allows the user to monitor the current applied directly to the brake or clutch, if desired. With regulated current, torque drift caused by temperature changes within the brake coil is eliminated. Braking control is enabled by using either a 10-turn potentiometer or by an external 0...5VDC control signal.

MODEL 5251 is an open frame, 0...1A current regulated power supply for use with Magtrol hysteresis brakes and clutches. It has a high input impedance that allows for a variety of sensors and transducers to be used. It features a selectable 0...5VDC monitor out that allows connection to a PLC, voltmeter, display or other monitoring device. This allows the user to monitor the current applied directly to the brake or clutch, if desired. With regulated current, torque drift caused by temperature changes within the brake coil is eliminated. Braking control is enabled by using either a 10-turn potentiometer or by an external 0...5VDC control signal.

ZUP - POWER SUPPLY



The ZUP is a 0...36VDC benchtop power supply which provides current regulation of the braking torque via a turning knob. This powerful and versatile power supply can power all Magtrol brakes, with an output current up to 6A.

The ZUP power supply is required to power brakes with high kinetic power, which require supply currents greater than 3A (e.g. TPB400, TPB600, etc.). This unit can also be controlled with an analog input signal 0...4 V.

BPM SERIES - BRAKE POWER MODULE



The BPM Series - Brake Power Module is used to supply and control the current (up to 3A) of Magtrol Hysteresis Brakes and Clutches. This compact component (DIN rail mount) is recommended for easily controlling a wide range of brakes and clutches. The analog input of the

Brake Power Module is designed for 0...10VDC signals. At the maximum set value of 10VDC, the output current is adjustable 0...100%.

POWER SUPPLIES COMPATIBILITY

	MODEL 5212	MODEL 5251	BPM 101	BPM 103	ZUP
BRAKE MODELS					
AHB-0.3, AHB-0.75, AHB-1, AHB-1.5, AHB-3, AHB-3.3, AHB-5	X	X	X	-	-
AHB-6, AHB-12 & AHB-24	-	-	-	X	X

CONNECTION CABLE FOR POWER SUPPLIES

CONNECT AHB SERIES TO ZUP

ORDERING NUMBER 88M175- _ _ _ _

0200 : Cable length 2m
0500 : Cable length 5m

CONNECT ZUP TO DSP 7000

ORDERING NUMBER 88M176 _ _ _ _

0100 : Cable length 1m
0200 : Cable length 2m

CONNECT BPM SERIES TO DSP 7000

ORDERING NUMBER ER 404/ 0 _ X

1 : Cable length 5m
2 : Cable length 10m
3 : Cable length 20m

CONNECT AHB SERIES TO DSP 7000, MODEL 5212

ORDERING NUMBER 88M _ _ _ _ - _ _ _ _

085 : For DSP 7000^{a)}
407 : For MODEL 5212^{a)}

0150 : Cable length 1.5m
0500 : Cable length 5m
1000 : Cable length 10m

a) Since 2020, Magtrol initiated an upgrade of its device connectivity. If you want to connect an AHB brake to a device not listed in the table above (e.g. MODEL 5200, MODEL 5211, etc.), please contact our customer service team.

SYSTEM OPTIONS & ACCESSORIES

TS & TM SERIES - IN-LINE TORQUE SENSOR



Fig. 2: TM313 & TS106 In-line Torque Sensor

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...±10 VDC torque output and an open collector speed output or TTL.

TM Series Transducers are very reliable, providing high overload protection, excellent long term stability and high noise immunity. All transducer models employ our unique non-contact differential transformer torque measuring technology (no rotating component). Magtrol offers three models: basic model (TMB Series), high accuracy (TM Series) and high speed with high accuracy (TMHS Series). The integrated electronic circuit, supplied by single DC voltage, provides torque and speed signals without any additional amplifier.

TS Series Torque Sensors provide extremely accurate torque and speed measurement. In addition to its 0... ±5VDC (±10VDC) output, it also integrates a USB interface. The sensor is delivered with software allowing easy connection and data acquisition. A speed encoder provides 360... 5000 PPR* (Pulse Per Revolution) in Tach A, Tach B and Index reference Z (1 PPR). Available torque ranges 0.02... 500N·m. *depending on the model

MIC SERIES - COUPLINGS

When torque transducers, brakes and other element are mounted in a drive train, special attention must be paid to the couplings that will connect the different elements. The criteria for selecting appropriate couplings for torque measurement is as follows:

- High torsional spring rate
- Clamping quality
- Speed range
- Balancing quality
- Alignment capability



Fig. 3: MIC Series Miniature Couplings

Magtrol provides a wide range of couplings suitable for torque measurement applications and can assist you in choosing the right coupling for your transducer.

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 5µm 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.

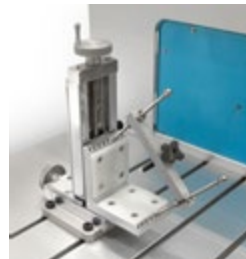
DSP 7000 - HIGH-SPEED PROGRAMMABLE DYNAMOMETER CONTROLLERS



Fig. 4: DSP 7001 | Programmable Dynamometer Controllers

Magtrol's Model DSP7000 High Speed Programmable Dynamometer Controller employs state-of-the-art Digital Signal Processing Technology to provide superior motor testing capabilities. Designed for use with any Magtrol Hysteresis, Eddy-Current or Powder Dynamometer, Magtrol In-Line Torque Transducer or auxiliary instrumentation, the DSP 7000 can provide complete PC control via the USB and GPIB (IEEE-488) interface. With up to 500 readings per second, the DSP 7000 is ideally suited for both the test lab and the production line.

AMF SERIES - 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.

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.

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 or TS 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.

ORDERING INFORMATION

Please consider the Model number listed in the tables as the ordering number (e.g. **AHB-1, AHB-1.5, AHB-3,...**)

Our sales representatives will be pleased to contact you and provide you with a customized quote.