

HB SERIES

# Hysteresis Brakes Selection Guide

This instruction was revised in April 2014.





**Validmagnetics Ltd**

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## Be Sure To Read The Warnings Below.


Please take the time to read this page thoroughly before connecting and using your hysteresis brakes, moreover, the safety precautions is divided into two levels: "DANGER" & "ATTENTION".



 <b>DANGER</b>	This symbol shows something about "would lead to death or serious injury more likely when the mistake operation takes place."
 <b>ATTENTION</b>	This symbol shows something about may "result in injury or property damage when the mistake operation takes place."

Our company strives for excellent quality control and safety, however, you should always be prepared in case of unexpected break down. Please fully consider mechanical safety measures to deal with the following problem .

 <b>DANGER</b>	Make sure protective cover is installed properly.
	It is dangerous if body place such as hands or fingers are touching the uncovered rotator outside. In order to avoid the bodily contact, please ensure that protective cover with good ventilation is installed. Moreover, you should set a interlocked safety device, to ensure the rotator stop rolls instantly when the cover is opened, should be set.

 <b>DANGER</b>	Please do not use under the inflammable and explosive environment.
	Sparks are produced very likely inside the operating surface so that it should never be used in the inflammable and explosive environment. Besides, sealing up of brake is a must when it is operated in the place with flammable objects nearby such as cotton. Kinetic power may be reduced in such circumstance.

 <b>ATTENTION</b>	Please confirm the surrounding environment is proper.
	Please do not use it under the environment of dusty, hot, dewing and moist. In addition, it can't be installed in the place susceptible to be shocked and impacted, to avoid the probability of product damage, performance degradation or wrong operations.

 <b>ATTENTION</b>	Please don't hanging products with wires directly before application, and stretching wire to avoid damage during application.
	It may cause human injuries when the wire disconnected and the brake falls. You should hold product tightly in the process of installation or disassembling.

- **Do not repair at third party other than the manufacturer or authorized agents, otherwise the warranty will be void . If you have any questions, please contact us.**

## Overview

Hysteresis Brakes produce torque strictly through a magnetic air gap without the use of magnetic particles or friction components. This method of braking provides far superior operating characteristics (smoother torque, longer life, superior repeatability, high degree of controllability, and less maintenance and down time) which make them the preferred choice for precise tension control during the processing of nearing any material, web or strand.

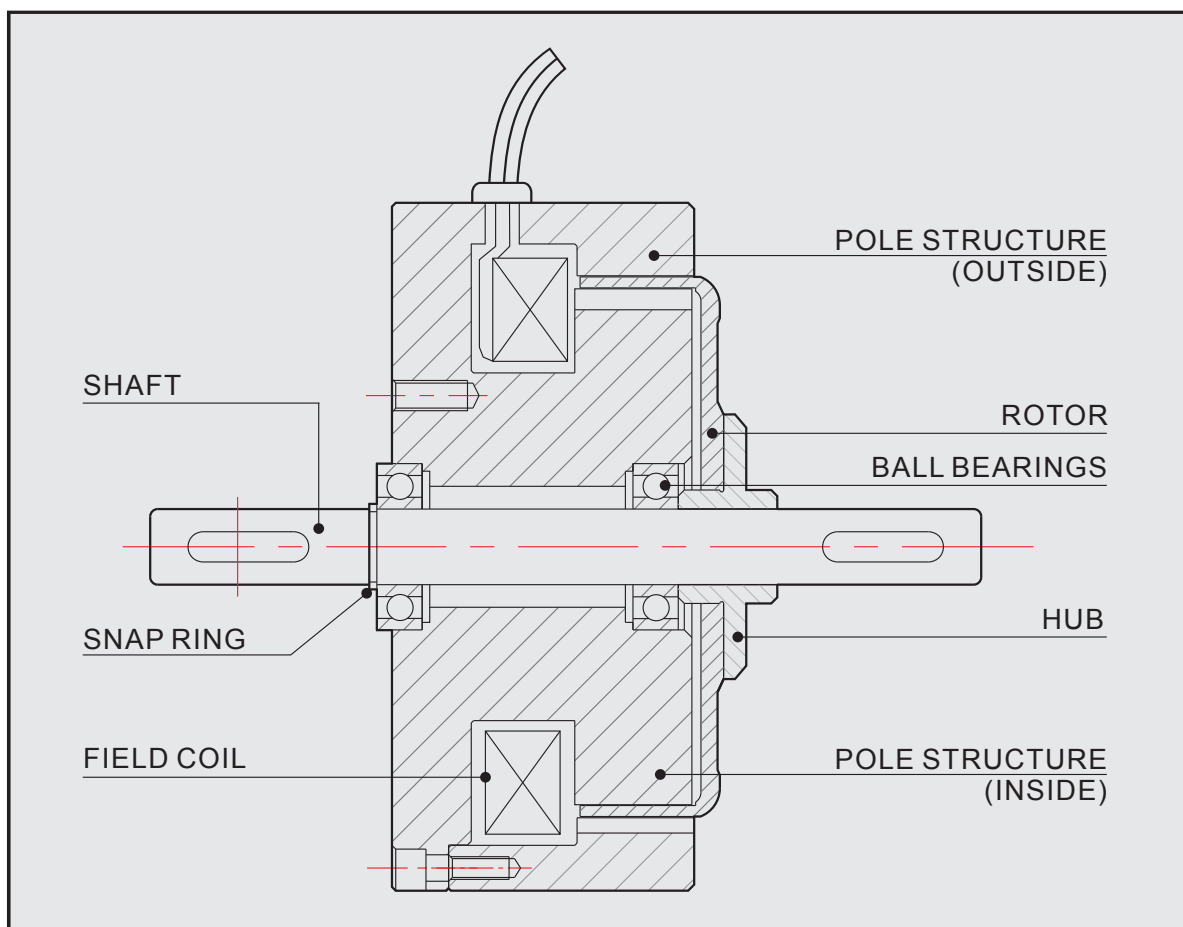
## Structural Characteristics



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 and shaft can spin freely on its 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.


## Operating Principles



The Hysteresis Brake provides torque by the use of two basic components—a reticulated pole structure and a specialty 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 the field coil is applied to the pole structure, the air gap becomes a flux field and the rotor is magnetically restrained, providing a braking action between the pole structure and rotor.


## The Cross-section Of Hysteresis Brakes





 <b>DANGER</b>	Please switch off the power of brake and ensure the rotating object is in steady state.
	Improper operation may likely cause the electric shock or personal injury in the process of rotating of the brake. Please cut off electric supply before installing, dismantling or debugging and ensure the brake is in steady state. Take care your fingers and other parts of the body aren't pinched by equipment at this moment.



 <b>DANGER</b>	Please check the tightness of fastening bolt to avoid looseness.
The fracture of bolt possibly resulting in human injury if it is too loose. It is suggested to choose the right one according to international standard of bolt fastening torque, and measures should be taken to prevent loosening by fixed glue and spring washer. Remember: Check all parts of the fastening situation before the start of preparatory work!	


 <b>DANGER</b>	Be sure the wires are connected well.
	Poor connection can cause electric shock. Make sure that both electrical and mechanical connections are correct.and the insulation protection is set.

 <b>DANGER</b>	Please use surge absorber parallel to field coil while cutting off DC power supply.
The high surge voltage generated may has bad effect on nearby equipment when the electricity was turned off. So, please use surge absorber such as diode, varistor, protective resistor as protection.	

 <b>DANGER</b>	Please choose suitable electric wires matched with the current capacity.
	The insulation layer of wires with low current capability may be melt down to cause electric leakage, shock or fire. Please refer to Chapters 7 "Specification" for the current rate of products

- Be sure to use flexible coupling to connect bearing axle.
- Pay attention to the belt's tension and never apply initial tension more than necessary for pulley coupling.
- Field coils voltage polarity is not specified. ( + / - )

 <b>DANGER</b>	Don't touch product in the operation!
	It's dangerous if body place such as hands or fingers are touching the uncovered rotator outside. In order to avoid the bodily contact, please ensure that protective cover with good ventilation is installed. Moreover, a safety mechanism should be set to stop the rotating elements immediately when the cover is opened.



 <b>DANGER</b>	Never exceed the maximum speed allowed!
The product may be broken and bursted from serve vibration if rotating speed exceeds the allowable rating speed and it is dangerous. Please install the protective cover and refer to Chapter 7 "Specification" for rating speed limit.	

## 4.1 Run-in Operation

Hysteresis brakes do not need run-in operation as they are non-contact type.

## 4.2 Continuous-running

Because surface temperature of the hysteresis brake rises fast sometimes, which should be kept below 80°C at work according to use-condition. When the surface temperature is above 80°C please relax the use-condition prevent the brake from overheating . However, surface temperature can only be as a reference, so you'd better use the products within the given kinetic power. (Surface temperature must be based on ambient temperature of 30°C, please the product within the ambient temperature range between 0°C to 40°C.)


 <b>ATTENTION</b>	Please use thermometer to measure the temperature!
	Don't touch directly by hand to avoid burns. Turn off the power source, and make sure the rotating elements are stopped still, and measure with thermometer.

## 4.3 Residual Torque



Hysteresis brakes can't produce residual torque if the operating speed exceeds 40-50rpm while disconnecting excitation. But if the excitation is disconnected without rotation, the brake may produce pulsatile residual torque which equal to 5-10% of the torque before disconnecting excitation. The following is the solution for eliminating residual torque:

- Shut off the current when the opposite rotating speed of pole structure and rotor is above 40-50r/min, or reduce the current gradually when the opposite rotating speed is relatively low.

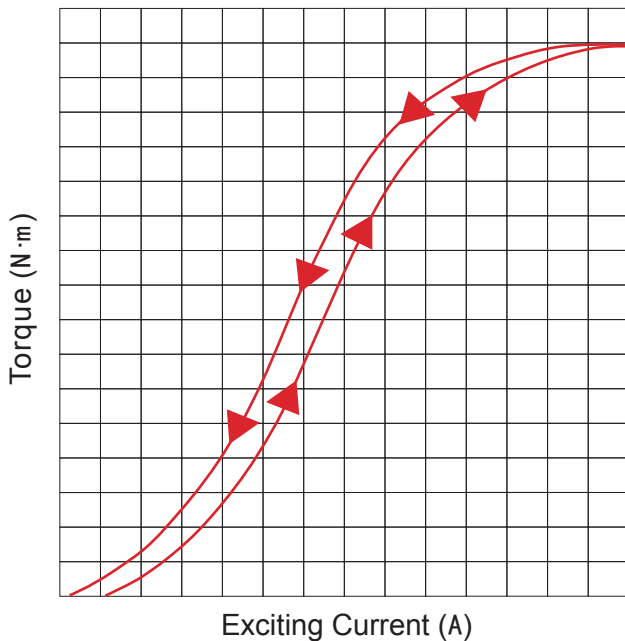
The residual torque won't take effect when restarting by current which equal to 60-70% of the current before disconnecting excitation.

 <b>DANGER</b>	Use the products within the max torque limit!
<p>In addition to degradation of performance, the use of ultra-range can cause mechanical damage and bring on body's injuries. So make sure use the products within the given max torque limit. It must be noted that a torque over the rating may occur even if used at the rated current, and therefore check the current-torque characteristic, and adjust the exciting current.</p>	

- As shown in the figure below, the relationship is positive correlation between exciting current and torque, so you can adjust the torque according to the current easily.
- Please set proper torque value according to actual condition.

 <b>DANGER</b>	Use the products within the given rated kinetic power range!
	<p>Fire accident can arise because of work face is heating and rising its temperature if the kinetic power exceed the rated value. In addition, the use of ultra-range can not achieve anticipated performance, so use the products within the given rated kinetic power range!</p>

### The curve graph of the corresponding relation between torque & exciting current



- The exciting current and the output torque becomes the proportional relationship basically, the transmission torque can be controlled within the range of 5-100% of the rated value, the low current can control the comparatively large output torque.
- Its transmission torque can maintain invariable basically no matter how changeable the slipping speed will be.
- Also it can slip continuously under allowable slipping power except the bearing have no other attrition.
- Non-contact torque transmission, smooth operation, speed range, maintenance-free, long service life.
- The curve graph of the corresponding relation between torque & exciting current of an item is referenced on the specification in product boxes.

### The Formula Of Kinetic Power

$$P = M \cdot n \cdot 9.55 = F \cdot V$$

P: Kinetic Power(Watts)

n: Actual slip frequency(rpm)



M: Transmission torque (N·m)

F: Tension(Newton)


V: Belt running speed(m/s)

Power is consumed and converted to heat by doing work during the operation. Rated kinetic power of the product must within given range, if not, the product may be damaged because of overheating.

## Maintenance



 <b>DANGER</b>	Please switch off the power of brake and ensure the rotating object is in its state of rest.
	Improper operation may cause the electric shock or personal injury very likely in the process of rotating of the brake. Please cut off electric supply before installing, dismantling or debugging and ensure the brake is in its state of rest. Take care your fingers and other parts of the body aren't pinched by equipment at this moment.

- Hysteresis brakes which belong to non-contact type are different from other brakes, so they do not need to be adjusted because of time changing. They should place in work environment of cleanness, avoiding the usage and saving machines under the condition of dusty, heat, many wet.
- Check the coupling mounting bolts and others for looseness.

 <b>ATTENTION</b>	Treatment should be in accordance with the standard for industrial waste disposal.
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## Trouble-Shootings

Faults	Causes	Treatment
<ul style="list-style-type: none"> <li>• No torque or torque is very low.</li> </ul>	<ul style="list-style-type: none"> <li>• The field coil break or the specified field current is not switch on.</li> </ul>	<ul style="list-style-type: none"> <li>• Exchange the product.</li> </ul>
<ul style="list-style-type: none"> <li>• Torque generated as usual when the electricity is off.</li> <li>• The pulsatile torque is produced in the low-torque section.</li> </ul>	<ul style="list-style-type: none"> <li>• Residual torque is large.</li> <li>• Bearing problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Eliminate residual torque. (refer to 4.3 on page 6 )</li> <li>• Exchange the bearing or product.</li> </ul>
<ul style="list-style-type: none"> <li>• The surface temperature is above 80°C.</li> </ul>	<ul style="list-style-type: none"> <li>• Over-load operation.</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease the load.</li> </ul>
<ul style="list-style-type: none"> <li>• The rotation of rotor is not smooth or impeded.</li> </ul>	<ul style="list-style-type: none"> <li>• Bearing problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Exchange the product.</li> </ul>

 <b>ATTENTION</b>	Please use thermometer to measure the temperature!
	Don't touch directly by hand to avoid burns. Turn off the power source, and make sure the rotating elements are stopped still, and measure with thermometer.

***Do not repair at third party other than the manufacturer or authorized agents, otherwise the warranty will be void . If you have any questions, please contact us.***  
***In the warranty period under normal conditions and the use of the fault, according to the terms of the warranty, to produce the warranty cards and purchasing invoice, free maintenance.***

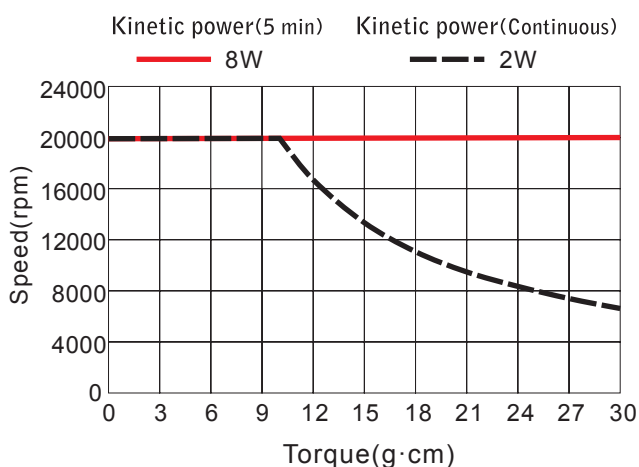


Model	Maximum Torque Range	Rated Current	Voltage	Resistance at 25°C±10%	Weight	Kinetic Power		External Inertia	Max Rated Speed
						Without Air Supply			
	<i>kg·cm</i>	<i>mA</i>	<i>VDC</i>	$\Omega$	<i>kg</i>	5 minutes	Continuous	<i>kg·cm<sup>2</sup></i>	<i>rpm</i>
HB-300	0.03	135	24	180	0.12	8	2	$3.3 \times 10^{-4}$	20000
HB-201	0.2	192	24	125	0.15	25	6	$1.5 \times 10^{-3}$	20000
HB-301	0.3	208	24	115	0.17	30	8	$6.8 \times 10^{-3}$	20000
HB-501	0.5	208	24	115	0.21	30	8	$6.8 \times 10^{-3}$	20000
HB-102	1	200	24	120	0.39	55	15	$4.6 \times 10^{-2}$	20000
HB-202	2	203	24	118	0.51	75	20	$6.8 \times 10^{-2}$	15000
HB-302	3	393	24	61	1.35	120	35	$1.8 \times 10^{-1}$	15000
HB-502	5	393	24	61	1.35	120	35	$1.8 \times 10^{-1}$	15000
HB-103	10	250	24	96	1.8	350	80	$1.1 \times 10^0$	15000
HB-114	11	1200	24	16	20.6	1200	350	$5.60 \times 10^1$	10000
HB-203	20	315	24	76	3.5	460	115	$3.2 \times 10^0$	10000
HB-303	30	750	24	32	5.2	680	165	$6.8 \times 10^0$	10000
HB-503	50	750	24	32	9.6	1000	200	$1.3 \times 10^1$	10000
HB-603	60	1500	24	18	9.6	1400	225	$1.4 \times 10^1$	10000
HB-124	120	1200	24	20	18.5	1200	350	$6.2 \times 10^1$	6000

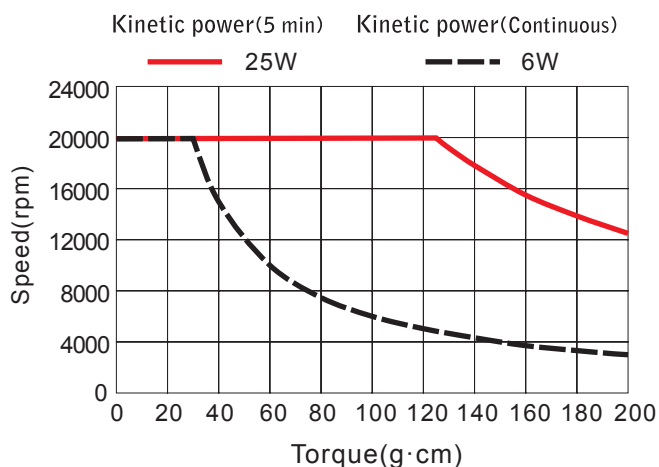
### Scope of application:

- Working temperature: 0°C--40°C
- Operating humidity: 30%--95%
- Service life: 10000h (Continuous work, 25°C, 65%, Rated torque)

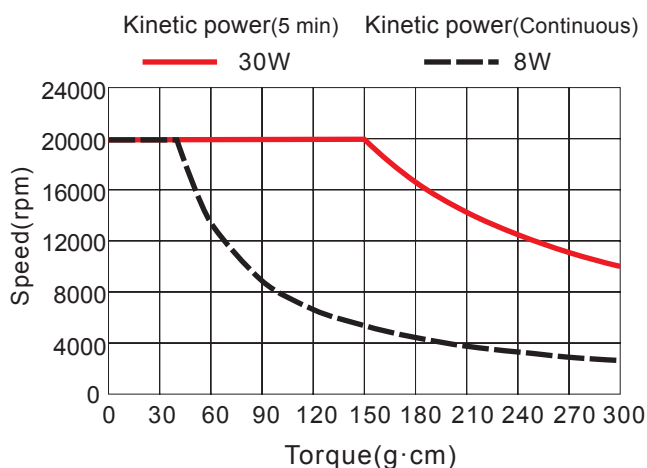
## HB-300



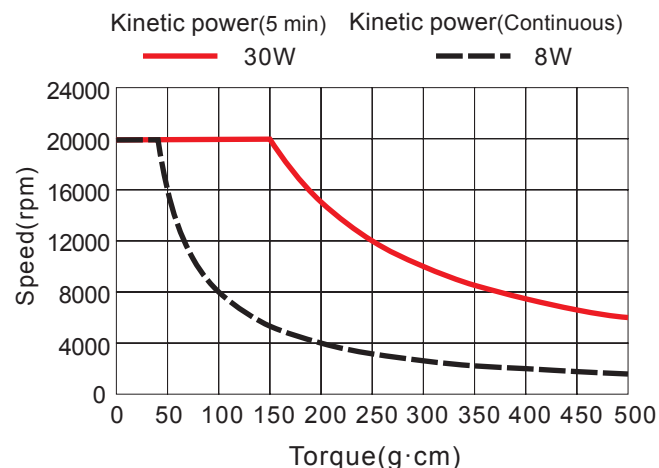
## HB-201



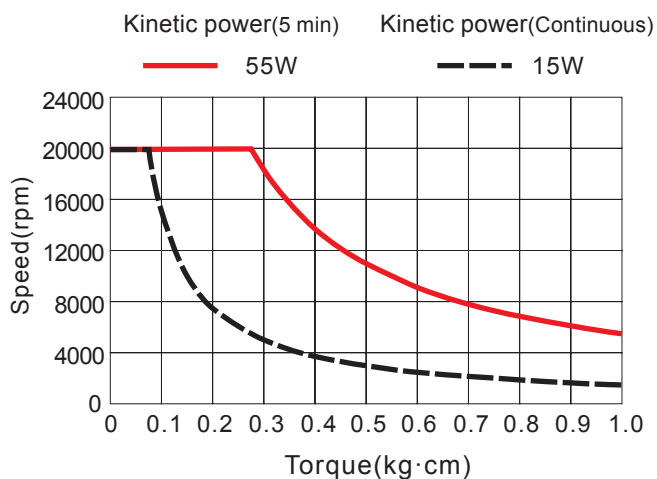
## HB-301



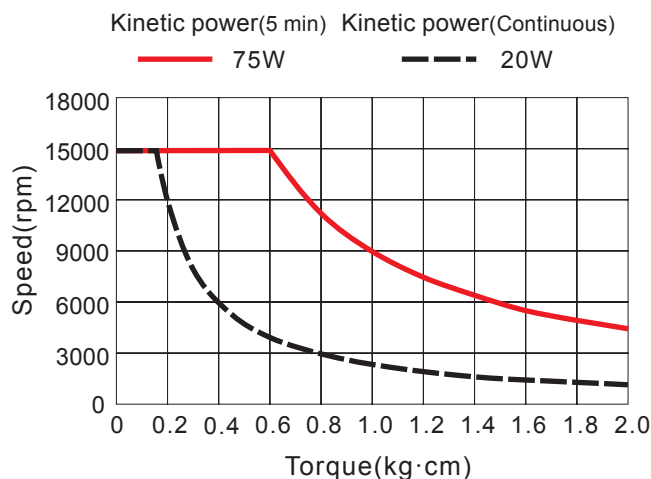
## HB-501



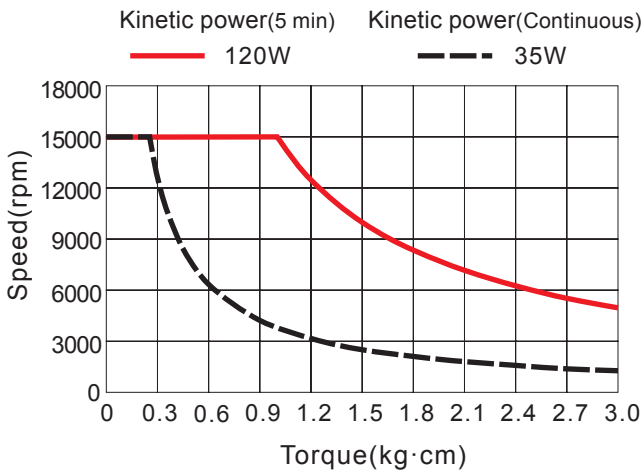
## HB-102



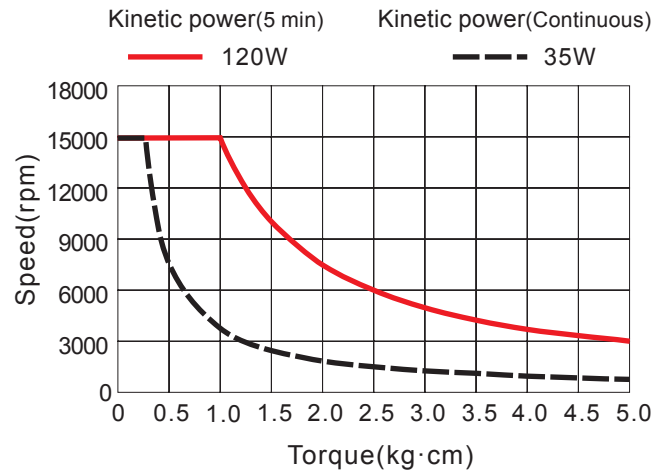
## HB-202



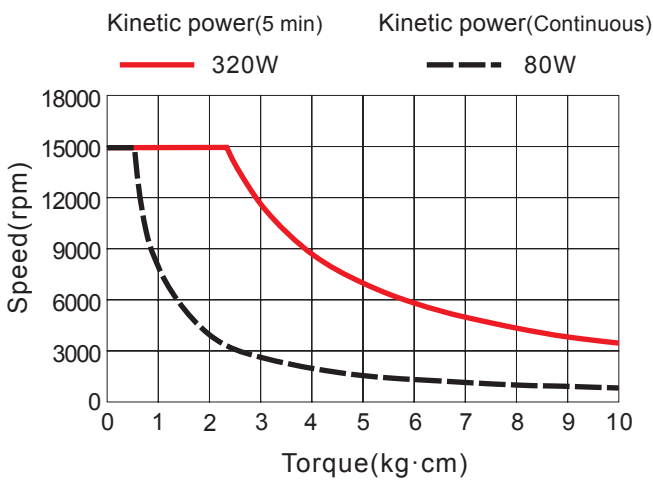
## HB-302



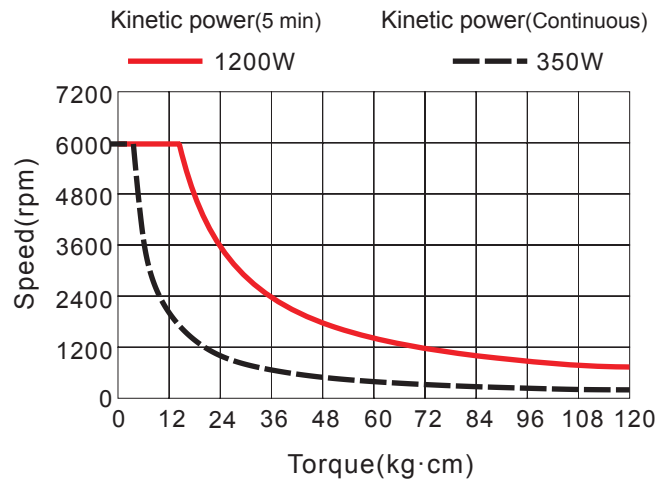
## HB-502



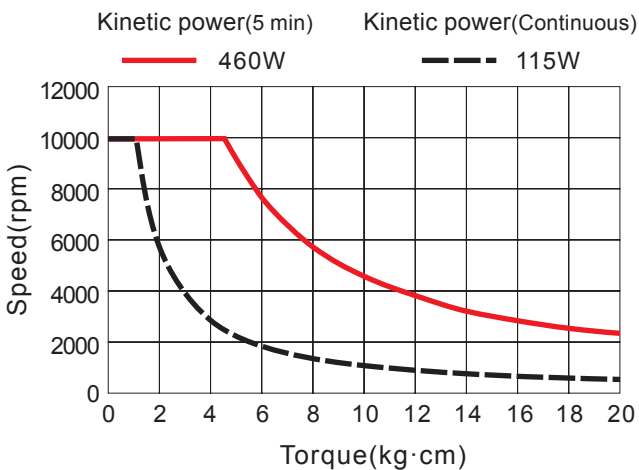
## HB-103



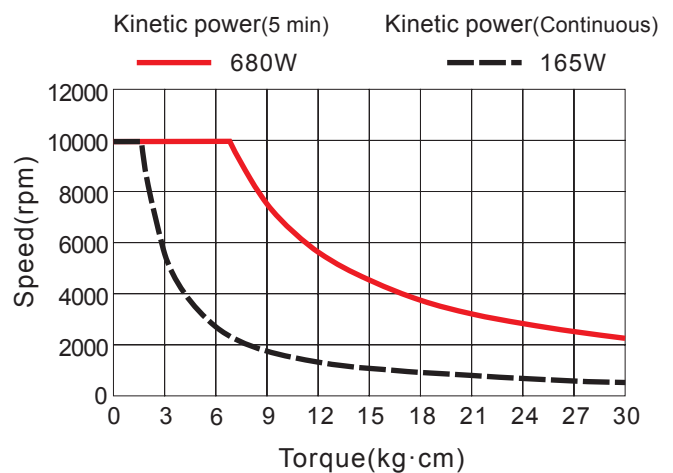
## HB-114



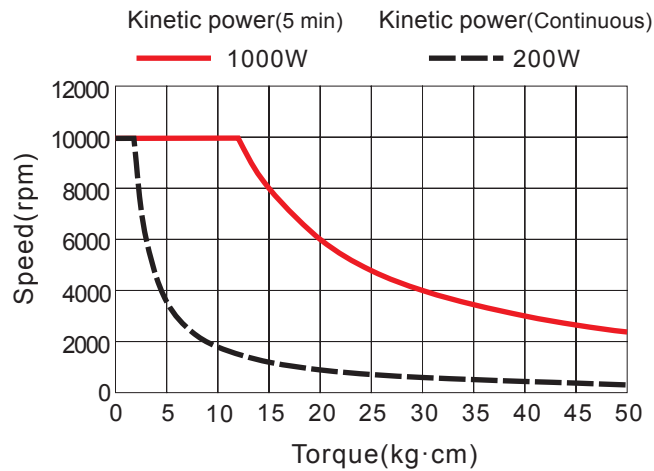
## HB-203



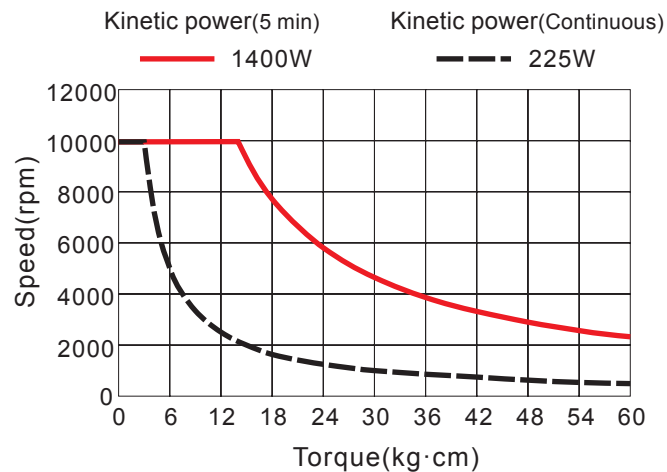
## HB-303



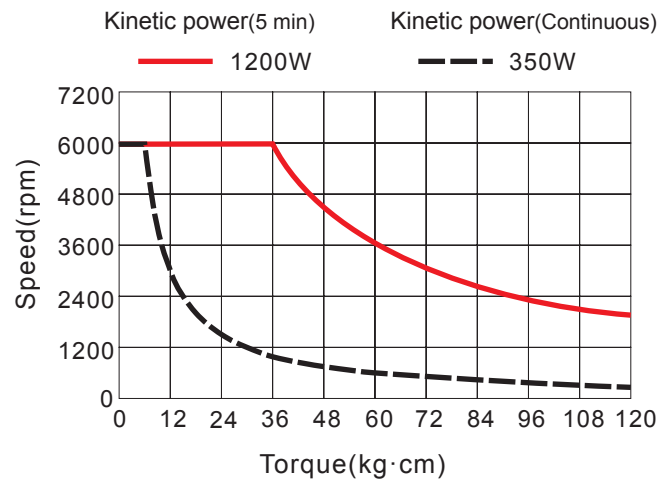
## HB-503



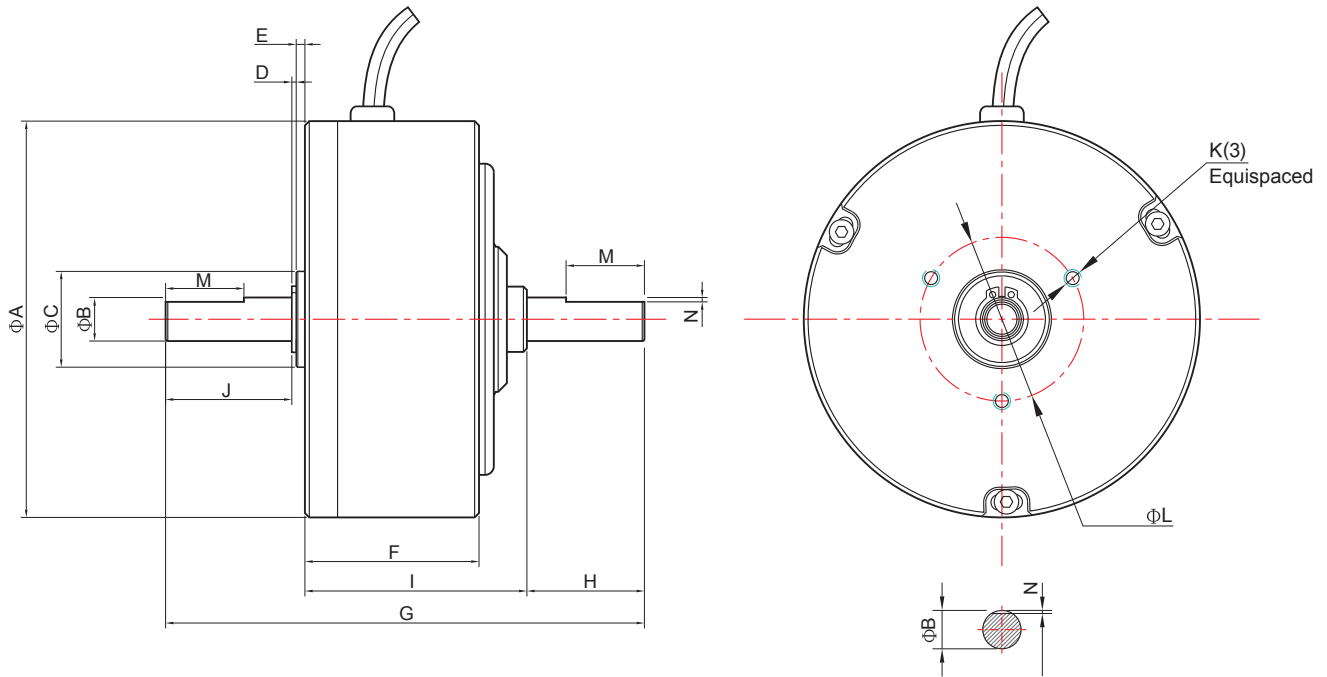
## HB-603



## HB-124



## Double-output Hysteresis Brakes(Type A)



The Section Of Output Shaft

### Dimensions

Unit(mm)

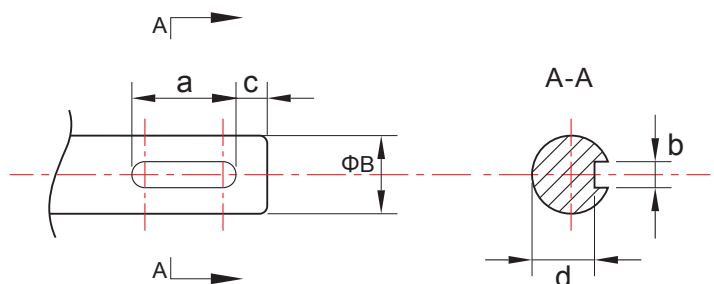
TYPE	ΦA	ΦB	ΦC	D	E	F	G	H	I	J	K	ΦL	M	N
HB-300A	35	2	6	0.4	-	20	46	13	23	13	M3×4	20	-	-
HB-201A	35	3	8	0.5	-	22	50	10.7	25.8	13	M3×5	20	8	0.3
HB-301A	42	4	11	0.5	-	23	58	14	28.5	15	M3×5	26	10	0.4
HB-501A	42	4	11	0.5	-	23	58	14	28.5	15	M3×5	26	10	0.4
HB-102A	53	6	15	0.6	2	26	68	16.3	31.3	17.8	M3×6	30	10	0.4
HB-202A	58	6	15	0.8	2	27	75	20	32	20	M4×6	30	12	0.5
HB-302A	69	8	22	1	2.5	35	95	25.5	41	25	M4×8	40	15	0.8
HB-502A	69	8	22	1	2.5	35	95	25.5	41	25	M4×8	40	15	0.8
HB-103A	91	10	22	1	2	40	110	27	51	29	M4×9	38	18	1
HB-203A	115	12	28	1	4	51	132	31.5	64.5	31	M5×10	70	Keyway	
HB-303A	138	15	32	1.5	3.5	53	152	39	68.5	39.5	M5×10	80		
HB-503A	157	17	35	1.5	4.2	72.3	176	38.5	93.8	38	M6×10	90		
HB-124A	226	25	52	1.3	6	76.5	213	50	106.9	50	M6×12	100		

● The structure of type HB-603A & HB-114 is different from others, please see it on the next page.

### Keyway

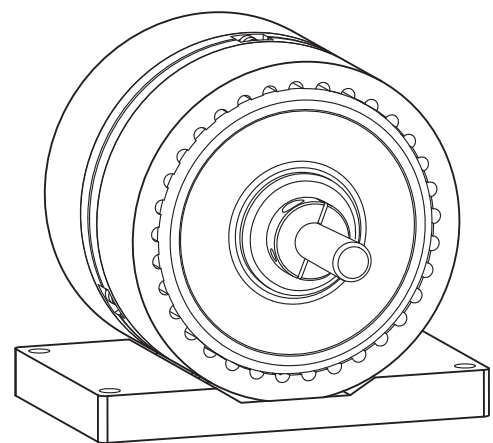
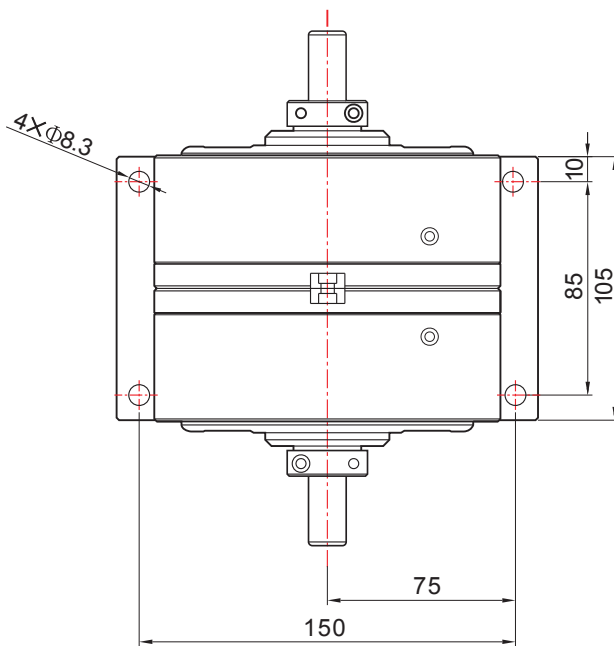
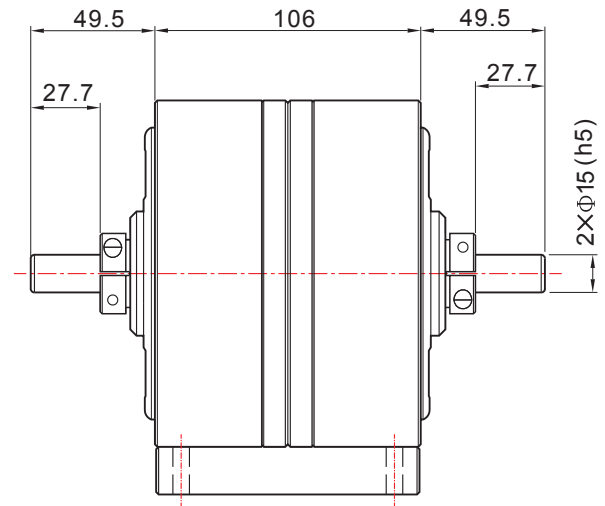
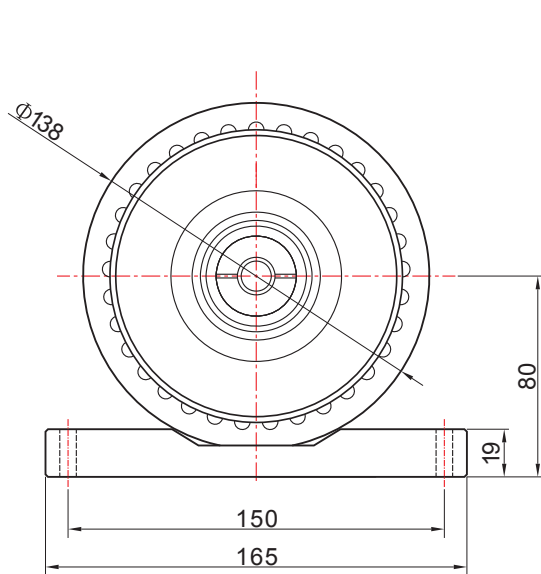
Unit (mm)

TYPE	a	b	c	d	ΦB(h6)
HB-203A	20	4.0	5.0	9.5	12
HB-303A	20	5.0	6.0	12	15
HB-503A	20	5.0	6.0	14	17
HB-124A	25	8.0	12.5	21	25



Double-output Hysteresis Brakes(Type A)

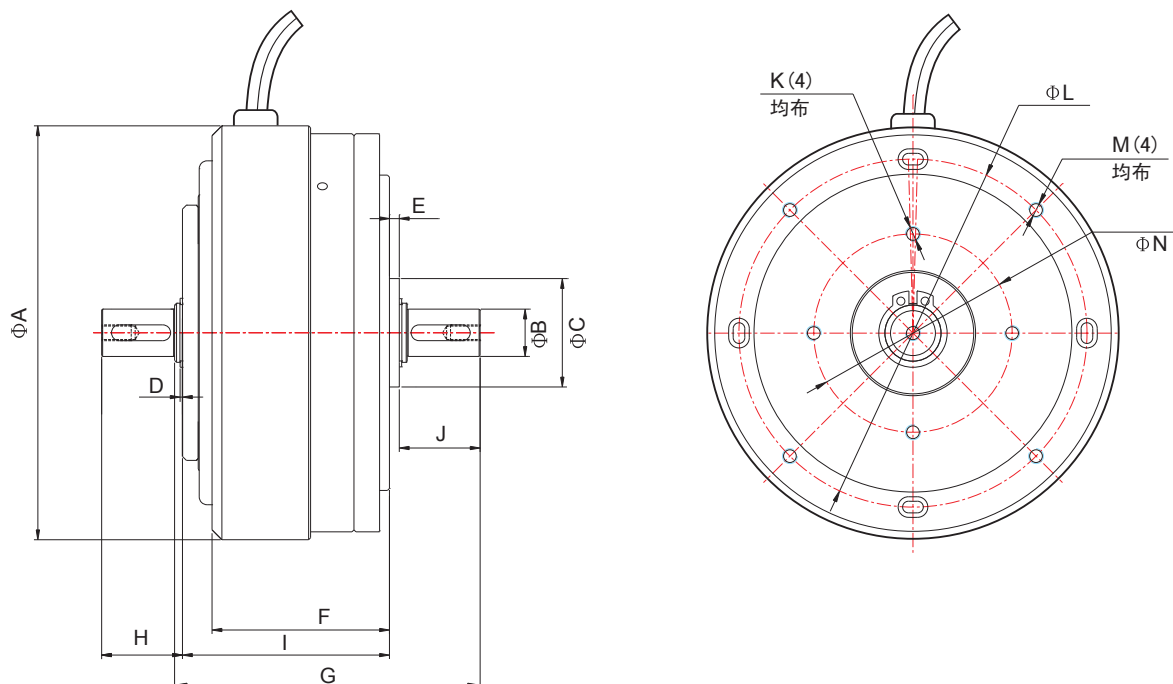
Type HB-603A Reference Dimension  
Unit (mm)



## Double-output Hysteresis Brakes(Type A)

### Type HB-114A Reference Dimension

Unit (mm)



### Dimensions

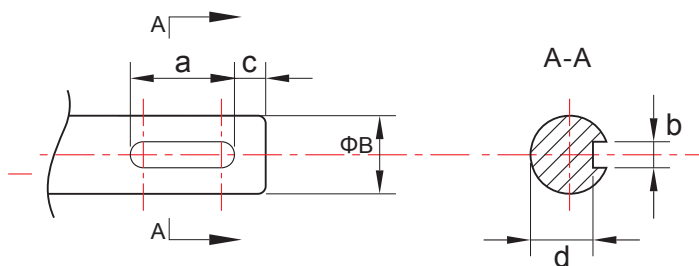
Unit(mm)

型号	$\Phi A$	$\Phi B$	$\Phi C$	D	E	F	G	H	I	J	K	$\Phi L$	M	$\Phi N$
HB-114A	210	24	55	1.2	5	90	192	41	105	41	M8*16	186	M8*13	106

### Keyway

Unit (mm)

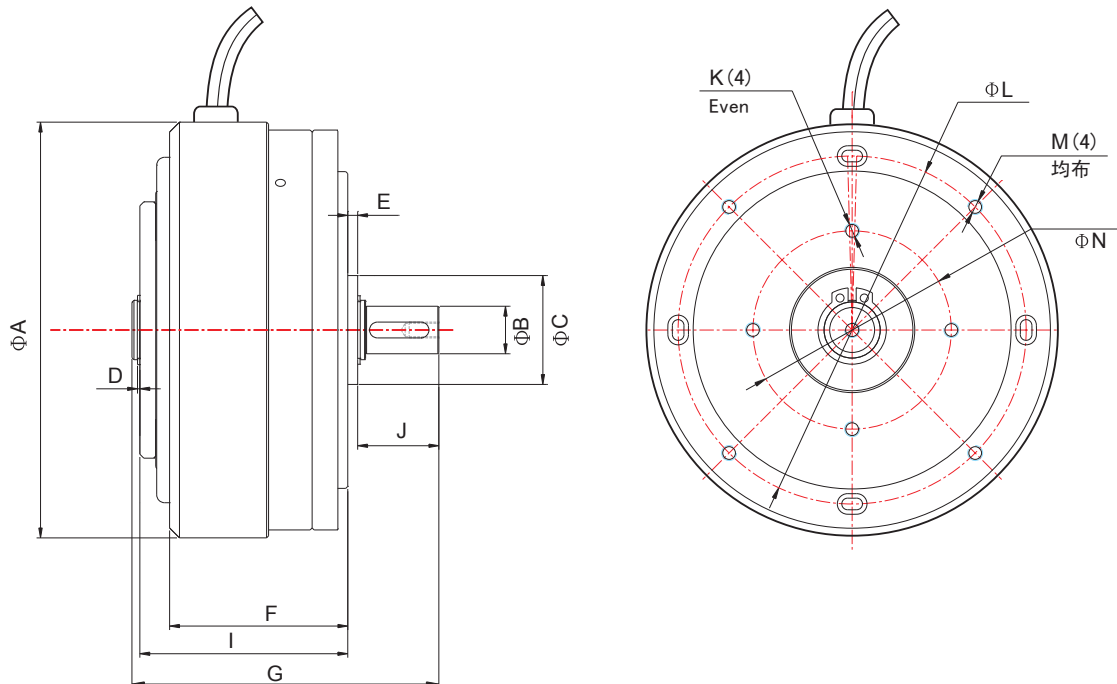
Model	a	b	c	d	$\Phi B(h6)$
HB-114A	30	8.0	5.0	20	24



## Single-output Hysteresis Brakes (Type B)

### Type HB-114B Reference Dimension

Unit (mm)



### Dimensions

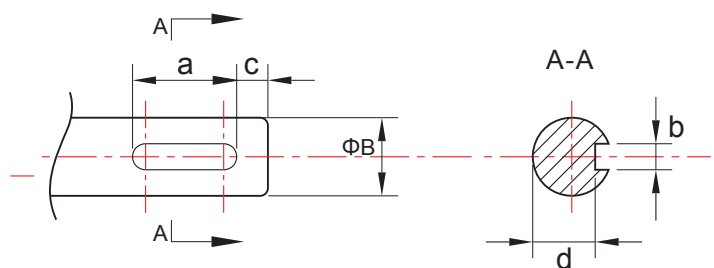
Unit(mm)

Model	ΦA	ΦB	ΦC	D	E	F	G	H	I	J	K	ΦL	M	ΦN
HB-114B	210	24	55	1.2	5	90	155	-	105	41	M8*16	186	M8*13	106

### Keyway

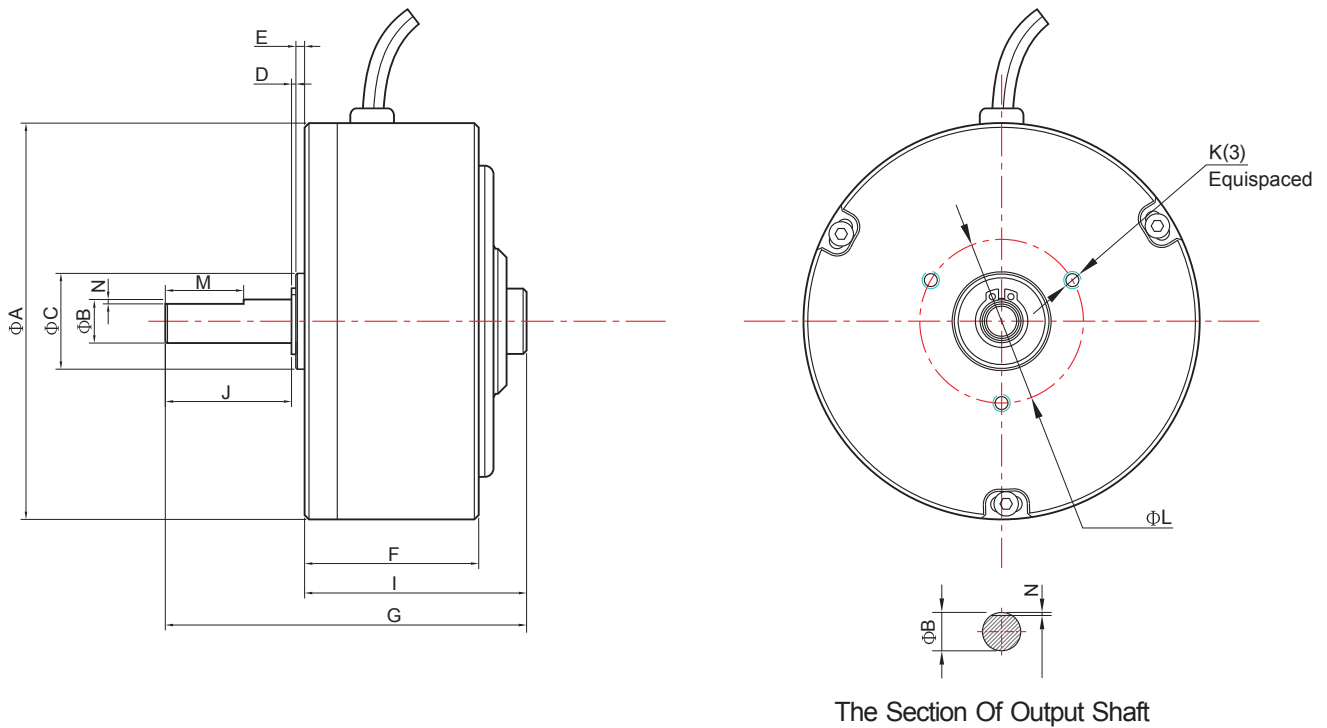
Unit (mm)

Model	a	b	c	d	ΦB(h6)
HB-114B	30	8.0	5.0	20	24





## Single-output Hysteresis Brakes (Type B of Left)



### Dimensions

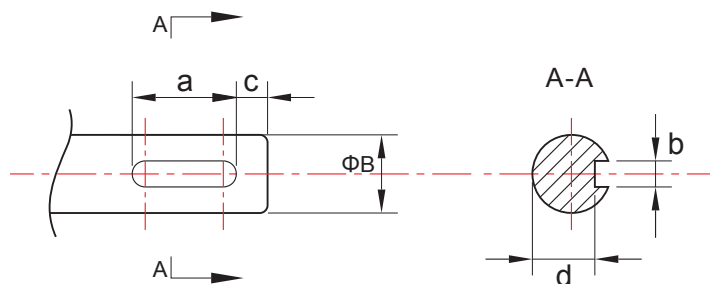
Unit (mm)

Model	ΦA	ΦB	ΦC	D	E	F	G	H	I	J	K	ΦL	M	N
HB-300B	35	2	6	0.4	-	20	38	-	24.3	13.3	M3×4	20	-	-
HB-201B	35	3	8	0.5	-	22	42	-	26.5	15	M3×5	20	8	0.3
HB-301B	42	4	11	0.5	-	23	45	-	28.5	16	M3×5	26	10	0.4
HB-501B	42	4	11	0.5	-	23	45	-	28.5	16	M3×5	26	10	0.4
HB-102B	53	6	14	1.2	2	26	52	-	31.5	17.3	M3×6	30	10	0.4
HB-202B	58	6	15	0.8	2	27	55	-	32	20	M4×6	30	12	0.5
HB-302B	69	8	22	1	2.5	35	70	-	41.6	25	M4×8	40	15	0.8
HB-502B	69	8	22	1	2.5	35	70	-	41.6	25	M4×8	40	15	0.8
HB-103B	91	10	22	1	2	40	83	-	51	29	M4×9	38	18	0.8
HB-203B	115	12	28	1	4	51	100.5	-	64.5	31	M5×10	70	(Below table) Keyway	
HB-303B	138	15	32	1.5	3.5	53	114	-	68.5	40.5	M5×10	80		
HB-503B	157	17	35	1.5	4.2	72.3	140	-	96.3	38	M6×10	90		

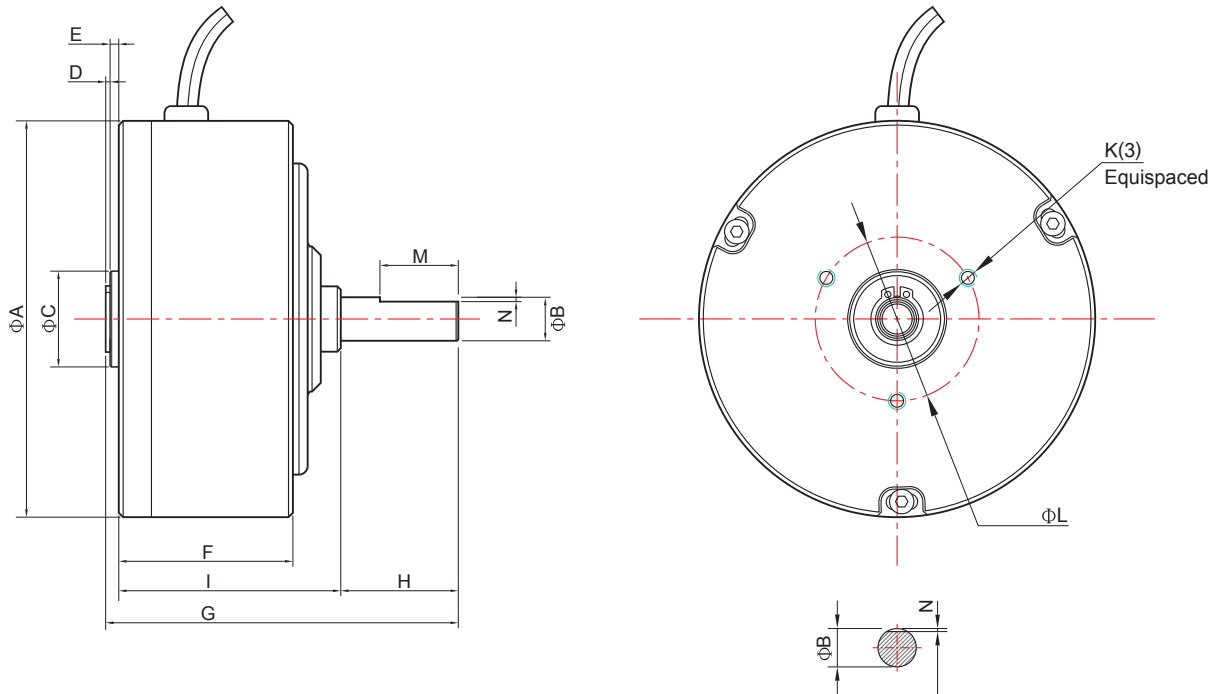
### Keyway

Unit (mm)

Model	a	b	c	d	ΦB(h6)
HB-203B	20	4.0	5.0	9.5	12
HB-303B	20	5.0	6.0	12	15
HB-503B	20	5.0	6.0	14	17



## Single-output Hysteresis Brakes(Type C of Right)



The Section Of Output Shaft

### Dimensions

Unit(mm)

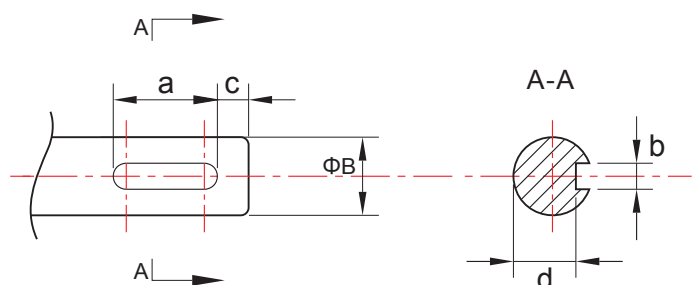
Model	ΦA	ΦB	ΦC	D	E	F	G	H	I	J	K	ΦL	M	N
HB-301C	42	4	11	0.5	-	23	45	14.5	28.5	-	M3×5	26	10	0.4
HB-501C	42	4	11	0.5	-	23	45	14.5	28.5	-	M3×5	26	10	0.4
HB-102C*	53	6	15	1.2	2	26	52	16.4	31.2	-	M3×6	30	10	0.5
HB-202C	58	6	15	0.8	2	27	56	20	32	-	M4×6	30	12	0.5
HB-302C	69	8	22	1	2.5	35	70	24.9	40.6	-	M4×8	40	15	0.8
HB-502C	69	8	22	1	2.5	35	70	24.9	40.6	-	M4×8	40	15	0.8
HB-103C	91	10	22	1	2	40	83	27.5	51	-	M4×9	38	18	0.8
HB-203C	115	12	28	1.2	4	51	100.5	29.3	64.5	-	M5×10	70	(Below Table) Keyway	
HB-303C	138	15	32	1.5	3.5	53	114	38.5	68.5	-	M5×10	80		
HB-503C	157	17	35	1.5	4.2	72.3	140	38.5	93.8	-	M6×10	90		
HB-124C	226	25	52	1.3	6	76.5	166	50	106.9	-	M6×12	100		

● HB-102C\*——Note: The output shaft of HB-102C has two models—Φ5&Φ6, the dimensions showed in the table above are parameters of type Φ6. The relation between item and parameter of type Φ5 are given as follows: B—4.6,C—14,N—0.4, other parameters remaining unchanged.

### Keyway

Unit (mm)

Model	a	b	c	d	ΦB(h6)
HB-203C	20	4.0	5.0	9.5	12
HB-303C	20	5.0	6.0	12	15
HB-503C	20	5.0	6.0	14	17
HB-124C	25	8.0	12.5	21	25



## BRAKE SELECTION

Our HB series Hysteresis Brakes cover a wide range of Torque, Speed and Mechanical Power ratings. To select the appropriate size brake for your motor testing needs, you will need to determine the Maximum Torque, Speed and Power applied to the brake.

### Maximum Torque

The HB Brake will develop braking torque at any speed point, including low speed and stall conditions ("0" rpm). It is important to consider all torque points that are to be tested, not only rated torque, but also locked rotor and breakdown torque. Brake selection should initially be based on the maximum torque requirement, subject to determining the maximum power requirements.

### Maximum Speed

This rating is to be considered independent of torque and power requirements, and is the maximum speed at which the brake can be safely run under free-run or lightly loaded conditions. It is not to be considered as the maximum speed at which full braking torque can be applied.

### Maximum Power Ratings

These ratings represent the maximum capability of the braking system to absorb and dissipate heat generated when applying a braking load to the motor under test. The power absorbed and the heat generated by the brake is a function of the Torque (T) applied to the motor under test, and the resulting Speed (n) of the motor. This is expressed in the power (P) formulas to the right.

$$\text{SI: } P (\text{watts}) = T (\text{N}\cdot\text{m}) \times n (\text{rpm}) \times (1.047 \times 10^{-1})$$

$$\text{English: } P (\text{watts}) = T (\text{lb}\cdot\text{in}) \times n (\text{rpm}) \times (1.183 \times 10^{-2})$$

$$\text{Metric: } P (\text{watts}) = T (\text{kg}\cdot\text{cm}) \times n (\text{rpm}) \times (1.027 \times 10^{-2})$$

*Our company's controllers, readouts and software calculate horsepower as defined by 1 hp = 550 lb·ft / s.*

*Using this definition:*

$$\text{hp} = P (\text{watts}) / 745.7$$

The brake's ability to dissipate heat is a function of how long a load will be applied. For this reason, the maximum power ratings given are based on continuous operation under load, as well as a maximum of 5 minutes under load.

*To safely dissipate heat and avoid brake failure, the maximum power rating is the most important consideration in selecting a brake.*

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For any enquiry, Please call our customer service hotline or visit our website.

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