Authorized Distributors

collective trade links pvt. ltd.

17, Aryan Corporate Park, Nr. Thaltej Railway Crossing,
Thaltej, Ahmedabad-380054.
Phone: +91-79-26474700 – 50
Email: sales@collectivebearings.com

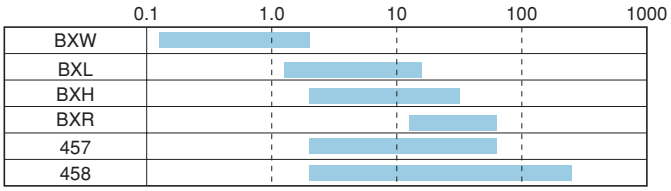
Web: www.collectivebearings.com

LinkedIn: http://www.linkedin.com/company/collective-bearings

Non-excited operation type brakes

■BXW model: For both braking and holding
■BXL model: For braking
■BXH model: For holding
■BXR model: For holding
(Available by special order)
■457 model: For braking
(Available by special order)
■458 model: For both Braking and holding

Brake torque [N·m]



Selection

1 First, select the model of the spring actuated type brakes in accordance with thedrive system and the intended use. For a drive system, select the appropriatemodel by considering the adaptability for general-purpose motor, geared motor, servo motor and stepping motor. For a device of general industrial machinery, select the appropriate model in accordance with the intended use, for braking or holding (emergency braking included).

2 After selecting the model of brakes, narrow the selection even more by specifying the mounting method, stator mounting or flange mounting.

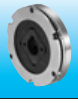
3 If torque adjustability, a release lever or dust covers (dust prevention) are required, select the appropriate model according to the characteristics.

4 After selecting the model of brake, determine the type from the dimension specification table and bore diameter table.

5 After the type of brake is determined, reconfirm if the rated torque, maximum rpm, dimension, bore diameter, amount of work (operation frequency and allowable amount of work) or exciting voltage corresponds to the use conditions.

Model list

●…Adjustment ○…Suitable depending on applications
△…Option correspondenc

Spring actuated type brakes							
Model		BXW	BXL	BXH	BXR	457	458
Appearance							
Descriptive page		P103～106	P107～109	P111～113	P115～116	P117～118	P119～122
Adaptability	General-purpose motor	●	●	○	○	●	●
	Geared motor	●	●	○	○	●	●
	Stepping motor	●	○	●	●	○	○
	Servo motor	●	○	●	●	○	○
	General industrial machinery	●	●	●	●	●	●
Characteristic	Braking	●	●			●	●
	Holding	●		●	●	○	●
	Panic braking	○	○	○	○	○	○
	Slim type				●		
	Torque adjustability						●
	Release lever	△	△	△			●
	Dust cover						●
	Quietness		△	△			
Method of fixation	Stator mounting	●	●	●	●		
	Flange mounting	●				●	●
Environmental responsiveness		●	●	●	○		
Available by special order					●	●	

● Non-excited brake for braking purpose

It stops the motion condition of rotating body or moving body in the active condition of the brake. Non-excited brakes operate when electricity is off.

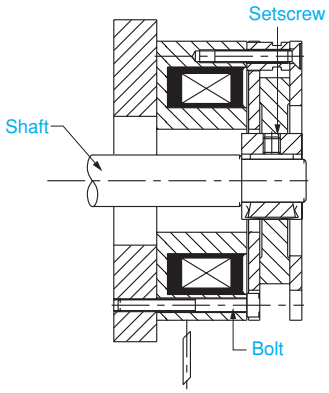
● Non-excited brake for holding purpose

It sustains the actual static condition of rotating body or moving body to maintain. As well as the brake for braking purpose, the brake operates when electricity is off.

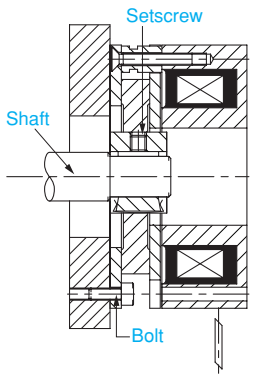
● Mounting types for non-excited brakes

There are three types of mounting, stator mounting and plate (flange) mounting as below, and the type available for both. Select the appropriate brake type in accordance with the use conditions. Due to the magnetic coil used for the brake operation, the stator generates heat by applying current. The stator mounting type has the advantage that the heat of the magnetic coil is released through the mounting surface. The plate (flange) mounted type has the rotor hub which rotates together with the rotating shaft of the machine or device, on the mounting surface side, therefore the advantage is that the length measurement of the rotating shaft for the mounting surface can be shortened.

■Stator mounting type

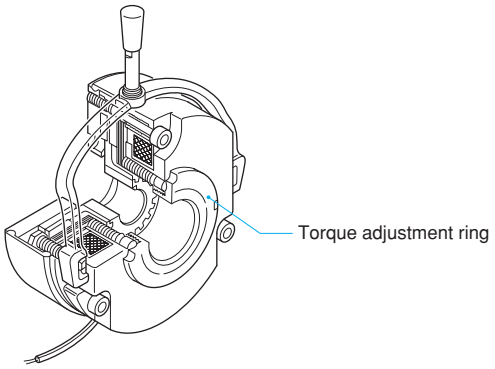


■Plate (flange) mounting type



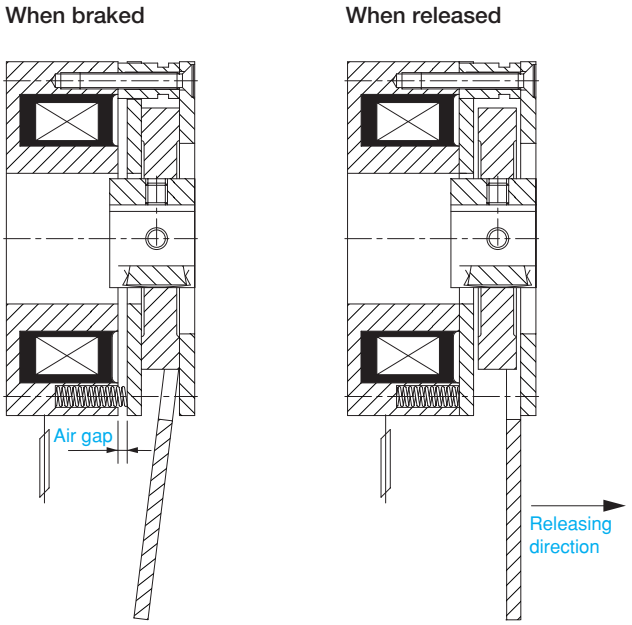
● Torque adjustability

Brake torque adjustment can be performed with the high-performance 458 model. By adjusting torque, fine control of the stop position or stop distance of the machine or device can be performed. The impact of braking can also be reduced. Torque adjustment can be done easily by turning the torque adjustment ring.



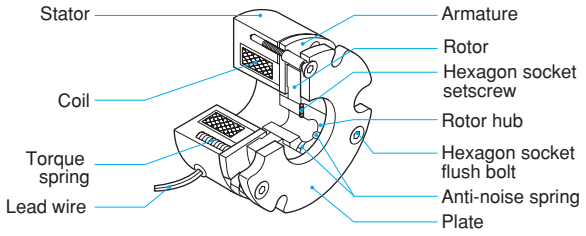
● Release lever

Non-excited brakes operate without energization. By using a release lever when electricity is off, the brake of the rotating shaft of the machine or device can be released. By using the brake release lever one can position rotating shaft or release the brake in case of an emergency.

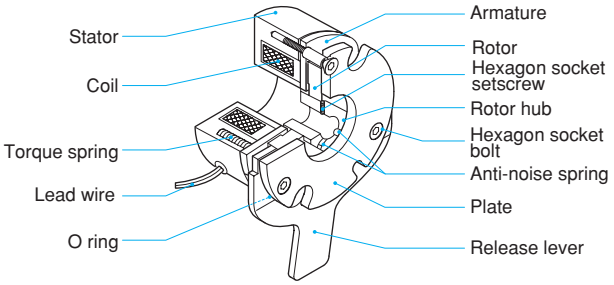


Basic Structure

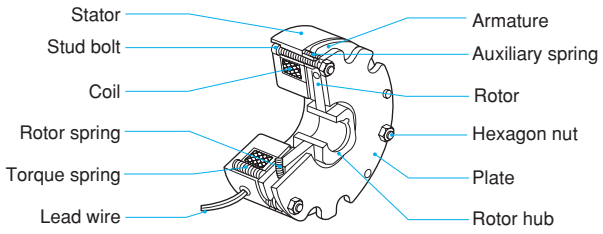
BXW model
BXW model without a lease lever



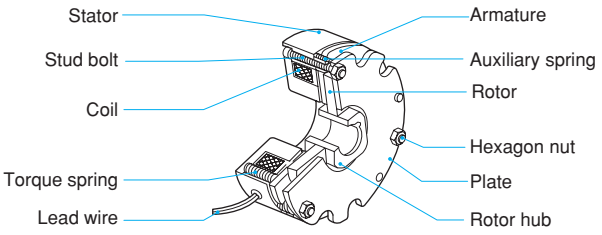
BXW model
BXW model with a lease lever



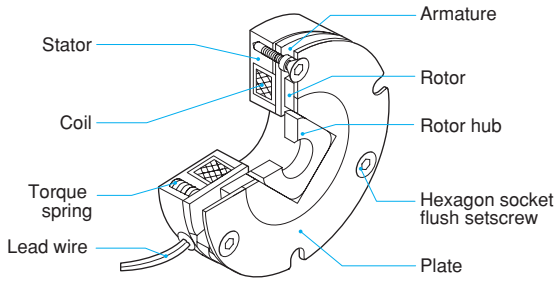
BXL model



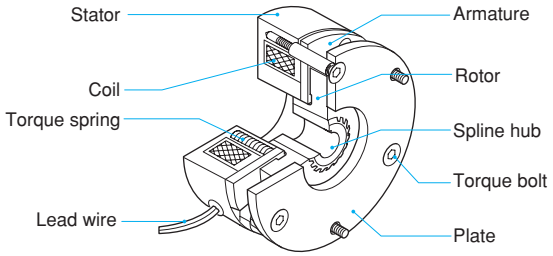
BXH model



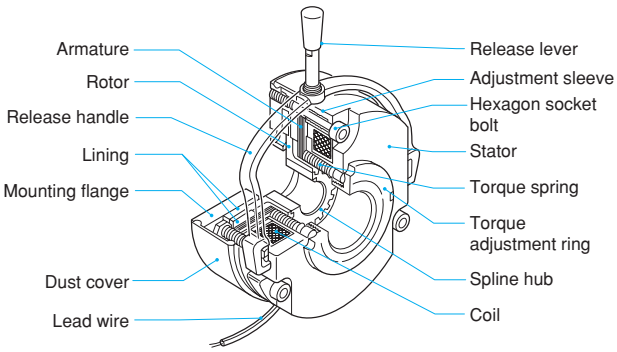
BXR model



457 model



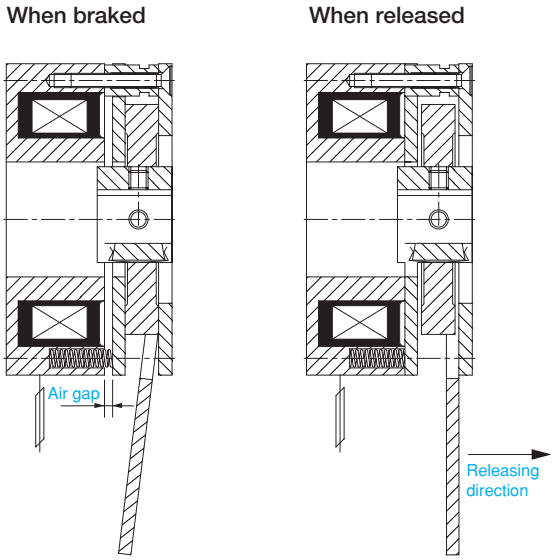
458 model



Principle of operation

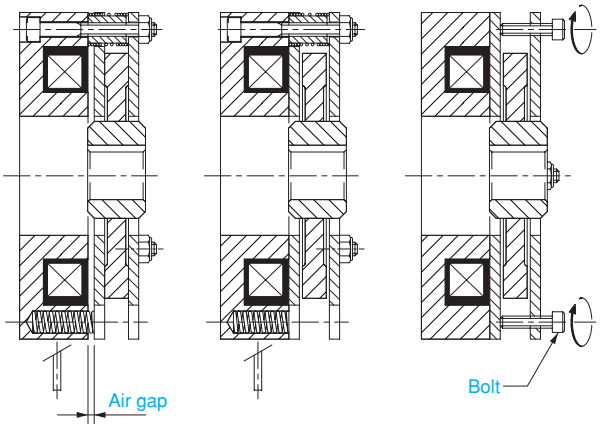
● BXW model (with a release lever)

The rotor is mounted on the shaft through the rotor hub, and the stator or plate is fixed on the wall surface. When the coil is not energized, the armature compression springs sandwich the rotor between the armature and plate. The friction force betweent the rotor armature hub and plate does not allow for shaft rotation. At this time, a certain amount of air gap is kept between the stator and armature. When applying current through the coil, the magnetic flux is generated, and the magnetic circuit is formed between the stator and armature. The stator surpasses the torque spring compression force to suction the armature. At the same time, the rotor becomes free and the shaft is released. If there is a release lever, it is possible to move the armature to the stator side manually under condition of no energization. By using the release lever, the rotor becomes free and the shaft is released. The lever returns to the original position by releasing.



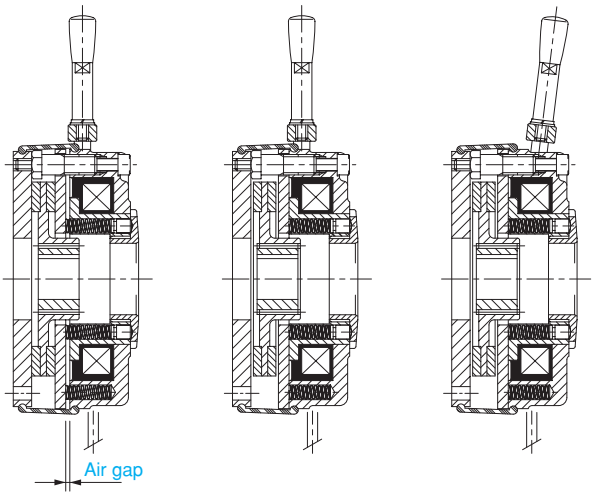
● BXL • BXH • BXR model

The rotor is mounted on the shaft through the rotor hub, and the stator or plate is fixed on the wall surface. When the coil is not energized, the armature compression springs sandwich the rotor between the armature and plate. The friction force betweent the rotor armature hub and plate does not allow for shaft rotation. At this time, a certain amount of air gap is kept between the stator and armature. When applying current through the coil, the stator surpasses the torque spring compression force to suction the armature. At the same time, the rotor becomes free and the shaft is released. If there is no energization such as electrical power failure, the armature can be pushed to the stator side by tightening the bolt. At the same time, the rotor becomes free and the shaft is released.

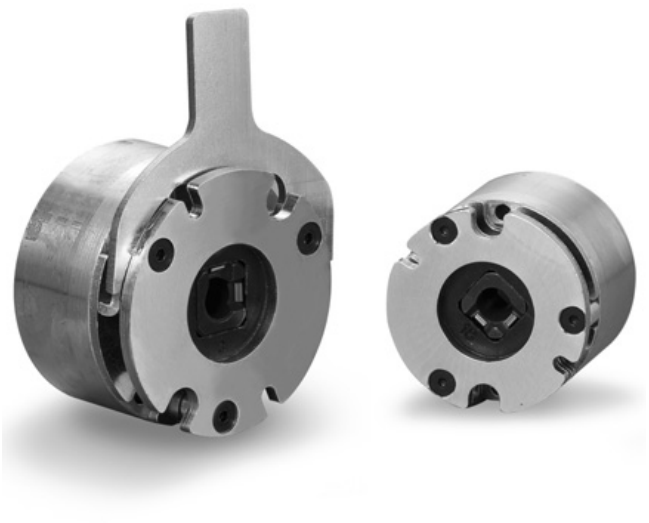


● 457 • 458 model

The rotor is mounted on the shaft through the rotor hub, and the stator or plate is fixed on the wall surface. When the coil is not energized, the armature compression springs sandwich the rotor between the armature and plate. The friction force betweent the rotor armature hub and plate does not allow for shaft rotation. At this time, a certain amount of air gap is kept between the stator and armature. When applying current through the coil, the stator surpasses the torque spring compression force to suction the armature. At the same time, the rotor becomes free and the shaft is released. For the 458 model, the armature can be pushed to the stator side by pulling the lever toward the stator side even when there is no energization such as electrical power failure. At the same time, the rotor becomes free and the shaft is released.



BXW model



■ **Choice of two types, braking or holding use (The holding type has two times the torque of braking type.)**
In the same dimensions, the L type for use in braking and H type for use in holding are available in accordance with the intended purpose.

■ **100 % of the rated torque from the initial period**
A test operation is not required. Torque satisfies rated value right from the beginning of use.

■ **Long operating time**
Due to the special friction material with high abrasion resistance, it stands long use.

■ **Low noise**
The anti-noise spring reduces a clattering sound generated by fine vibration during rotations.

■ **Internal and external mounting of stator**
A stator used as a heat source can be mounted either on the inside or outside direction in accordance with the intended use.

■ **Adapted to the RoHS**
Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead.

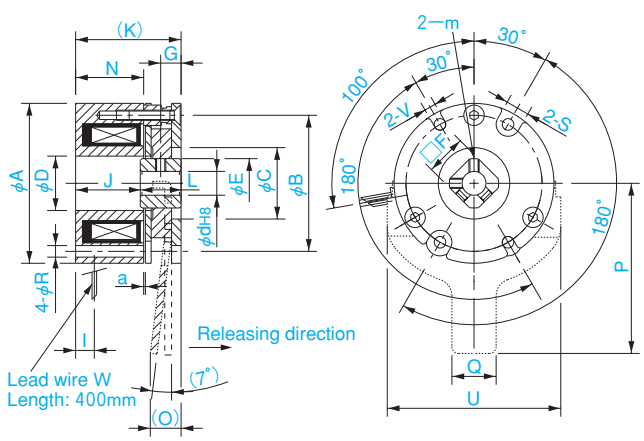
Brake type	BXW-□-□L	BXW-□-□H
Use application	For braking	For holdiing
Brake torque [N·m]	0.12～2.00	0.24～4.00
Operational temp. [℃]	−10～+40	−10～+40
Backlash	Little	Little

Specification BXW-□-□L (For braking)

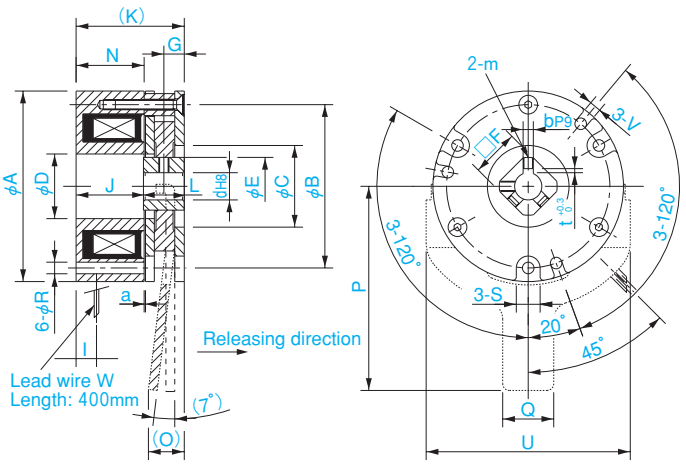
Model	Size	Static friction torque T_s [N·m]	Coil (at20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min^{-1}]	Rotating part moment of inertia J [$kg·m^2$]	Allowable braking work rate $P_{ba\ell}$ [W]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
BXW-01-10L	01	0.12	12	5.0	0.417	28.8	F	5000	0.6×10^{-6}	2.5	1.5×10^{6}	0.008	0.015	0.2
			24	5.0	0.208	115	F							
			45	5.0	0.111	405	F							
			90	5.0	0.056	1622	F							
			180	5.0	0.028	6486	F							
BXW-02-10L BXW-02-12L	02	0.25	12	6.6	0.550	21.8	F	5000	1.9×10^{-6}	5.0	3.0×10^{6}	0.008	0.015	0.3
			24	6.6	0.275	87.3	F							
			45	6.6	0.147	307	F							
			90	6.6	0.073	1228	F							
			180	6.6	0.037	4912	F							
BXW-03-10L BXW-03-12L	03	0.50	12	9.0	0.750	16.0	F	5000	3.8×10^{-6}	10.0	4.5×10^{6}	0.025	0.025	0.4
			24	9.0	0.375	64.0	F							
			45	8.2	0.182	247	F							
			90	8.2	0.091	988	F							
			180	8.2	0.046	3954	F							
BXW-04-10L BXW-04-12L	04	1.00	12	11.5	0.958	12.5	F	5000	12.0×10^{-6}	20.0	7.0×10^{6}	0.030	0.030	0.6
			24	11.5	0.479	50.1	F							
			45	10.0	0.222	203	F							
			90	10.0	0.111	810	F							
			180	10.0	0.056	3241	F							
BXW-05-10L BXW-05-12L	05	2.00	12	13.0	1.083	11.1	F	5000	23.0×10^{-6}	30.0	12.0×10^{6}	0.035	0.035	0.8
			24	13.0	0.542	44.3	F							
			45	13.0	0.289	156	F							
			90	13.0	0.144	623	F							
			180	13.0	0.072	2492	F							

※The indicated values of the armature suction time and release time are in the case of direct-current side switching.
※The release lever is available on request.
※The voltage specification 12V and 180V are available on request.

Dimensions



Size #01, #02



Size #03, #04, #05

Unit [mm]

Size	Radial dimensions															Axial direction dimensions							Bore dimensions			CAD file No.
	A	B	C	D	E	S	V	R	F	W	m	O	P	Q	U	G	I	J	K	L	N	a	d	b	t	
01	37	32	18	13.5	12.0	6	3.0	3.0	10	AWG26	M3	—	—	—	—	4.5	5.0	22.5	32	9	22.5	0.10	5 6	—	—	BXW10-1
02	47	40	21	16.0	14.5	7	3.4	3.4	12	AWG26	M3	9	50	13	51	6.0	5.5	19.2	32	12	20.0	0.10	6 7	—	—	BXW10(12)-2
03	56	48	24	19.0	17.0	7	3.4	3.4	14	AWG26	M3	11	60	15	60	6.0	6.0	19.9	32	12	20.0	0.15	8	—	—	BXW10(12)-3
04	65	58	35	24.0	22.0	7	3.4	3.4	18	AWG22	M4	12	70	15	70	7.0	7.0	19.9	34	14	21.0	0.15	10	3	1.2	BXW10(12)-4
05	75	66	36	28.0	26.5	9	4.5	4.5	22	AWG22	M4	14	80	20	80	7.0	7.0	22.1	36	14	21.5	0.15	12	4	1.5	BXW10(12)-5

※There is no release lever option for the size #01.
※CAD data has 2 types of shapes; with and without a release lever. CAD file No. 12 indicates a shape with a release lever.

Specification BXW-□-□H (For holding)

Model	Size	Static friction torque T_s [N·m]	Coil (at20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min^{-1}]	Rotating part moment of inertia J [kg·m^2]	Allowable braking work rate $P_{ba\ell}$ [W]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
BXW-01-10H	01	0.24	12	5.0	0.417	28.8	F	5000	0.6×10^{-6}	0.5	0.2×10^{6}	0.010	0.010	0.2
			24	5.0	0.208	115	F							
			45	5.0	0.111	405	F							
			90	5.0	0.056	1622	F							
			180	5.0	0.028	6486	F							
BXW-02-10H BXW-02-12H	02	0.50	12	6.6	0.550	21.8	F	5000	1.9×10^{-6}	1.0	0.3×10^{6}	0.010	0.010	0.3
			24	6.6	0.275	87.3	F							
			45	6.6	0.147	307	F							
			90	6.6	0.073	1228	F							
			180	6.6	0.037	4912	F							
BXW-03-10H BXW-03-12H	03	1.00	12	9.0	0.750	16.0	F	5000	3.8×10^{-6}	2.0	0.5×10^{6}	0.035	0.020	0.4
			24	9.0	0.375	64.0	F							
			45	8.2	0.182	247	F							
			90	8.2	0.091	988	F							
			180	8.2	0.046	3954	F							
BXW-04-10H BXW-04-12H	04	2.00	12	11.5	0.958	12.5	F	5000	12.0×10^{-6}	4.0	1.0×10^{6}	0.040	0.025	0.6
			24	11.5	0.479	50.1	F							
			45	10.0	0.222	203	F							
			90	10.0	0.111	810	F							
			180	10.0	0.056	3241	F							
BXW-05-10H BXW-05-12H	05	4.00	12	13.0	1.083	11.1	F	5000	23.0×10^{-6}	6.0	2.0×10^{6}	0.045	0.030	0.8
			24	13.0	0.542	44.3	F							
			45	13.0	0.289	156	F							
			90	13.0	0.144	623	F							
			180	13.0	0.072	2492	F							

※The indicated values of the armature suction time and release time are in the case of direct-current side switching.
※The release lever is available on request.
※The voltage specification 12V and 180V are available on request.

Structural instructions

Handling instructions

Brake body

Many soft materials are used for the electromagnetic brake. Do not bang or drop. Any unreasonable force may cause flaw or deformation.

Lead wire

Do not pull the brake lead wire or bend at a sharp angle. Also, do not dangle by holding the lead wire.

Frictional surface

It is a dry-type brake that the friction surface must be used in a dry state. Make sure not to apply any water or oil to the friction surface.

Mounting instructions

- Mounting direction
  For the BXW model, the stator can be mounted either on the inside direction (stator mounting) or outside direction (plate mounting). Select the mounting direction in accordance with the intended use.
- Fixation of the rotor hub
  By avoiding contact with the armature, fix the rotor hub for the shaft with a hexagon socket setscrew. When applying a thread adhesive, make sure that the adhesive does not come into contact with the rotor hub surface.
- Bolt and screw
  Apply a slack preventive such as thread adhesive to the bolt and the screw used for the brake mounting.
- Shaft
  The tolerance of the shaft should be h7 class (JIS B 0401). Note that as the hardness of the material used for the shaft increases, the effect of the hexagon socket setscrew decreases.
- Accuracy of the brake mounting surface
  The concentricity between the inlay part and shaft (X) and the squareness between the brake mounting surface and shaft (Y) must be below the permissible value.

BXW concentricity and squareness tolerances

Size	Concentricity (X)	Squareness (Y)
	T.I.R. [mm]	T.I.R. [mm]
01	0.05	0.02
02	0.05	0.02
03	0.10	0.02
04	0.10	0.02
05	0.10	0.02

Instruction for use

Environment

Due to the dry-type brake, if any oil or water content is applied on the frictional surface, the torque decreases. If there is a possibility of contamination of oil or water, use a protective cover.

Environmental temperature

The allowable operating temperature is -10℃ ～ +40℃. If operational temperature is not within the range, contact us.

Power supply

For the BXW model, single phase of commercially available alternating current 100V or 200V can be used as full-wave or half-wave rectification. Perform the selection in accordance with the intended use. For the recommended power supply, refer to the page of "recommended power supply and protective device".

Power supply voltage variation

Extreme fluctuation of the supply voltage may cause performance degradation of the brake. Suppress the variation within ±10% of the rated voltage.

Air gap adjustment

For the BXW model, the air gap adjustment is not required. The brake gap adjustment has been done before shipping.

Protective device

When using the power supply with no protective device, connect the recommended protective device parallel to the brake.

Stator mounting

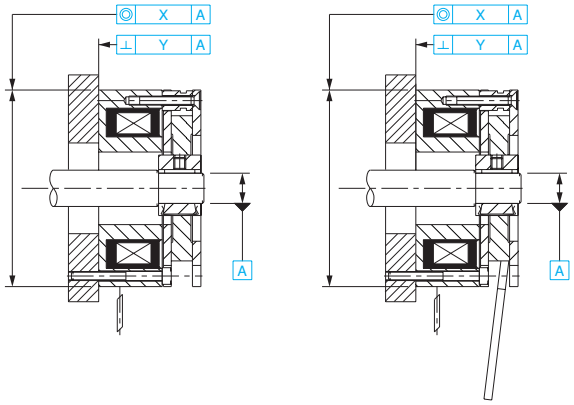
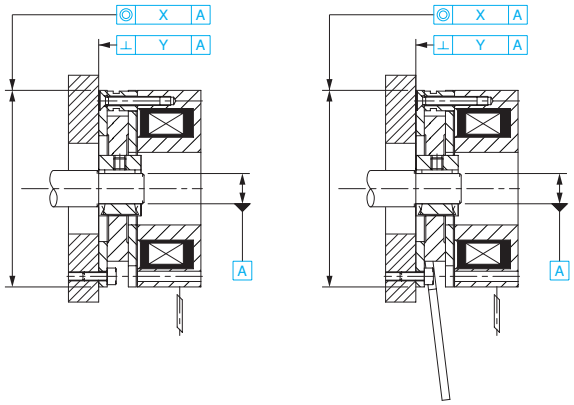


Plate mounting



Recommended power supply and protective device

Model	Rectification method	Frequency [Hz]	AC input voltage [V]	DC output voltage*1 [V]	Recommended protective device *3 (varistor)
BE-05	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K
BEM-2F	Single-phase full-wave	50/60	AC100	DC90	NVD07SCD220 or TNR7V221K
	Single-phase full-wave	50/60	AC200	DC180	NVD07SCD470 or TNR7V471K
BEM-2H	Single-phase half-wave	50/60	AC100	DC45	NVD07SCD220 or TNR7V221K
	Single-phase half-wave	50/60	AC200	DC90	NVD07SCD470 or TNR7V471K
BEM-4H	Single-phase half-wave	50/60	AC400	DC180	NVD10SCD820 or TNR10V821K

※ *1 indicates the value when applying current to the brake coil.
※ *2 power supply used for DC24V can be used for the DC power supply that requires no rectifier such as a battery.
※ *3 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ There is no attachment of protective device for the BXW model.

Ordering Information

BXW-[01]-[10][H]-[24V] [5]

- 01: Size
- 10: With/without release lever — Without: 10 With: 12
- H: Intended purpose — For braking: L For holding: H
- 24V: Voltage (specification table)
- 5: Bore diameter (Dimensional sign d)

※ The release lever specification and the voltage specification 12V and 180V are available by special order.
※ Contact us for the bore diameter d other than the measurement table or the voltage other than the specification table.

BXL model

For braking only
The BXL model is a compact brake exclusively for braking.

High reliability
The magnet circuit is designed by the finite element method, featuring high reliability.

Long operating time
The high abrasion resistant friction material (non asbestos) provides for long life operation.

Stable braking
Torque fluctuations are small. Load is braked instantaneously even in trouble.

Low noise
The rotor spring reduces a rasping high-frequency friction sound during braking. A quiet braking sound is ensured.

Adapted to the RoHS
Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead can be selected as option.

Use application		For braking
Brake torque	[N·m]	2～22
Operational temp.	[℃]	−10～+40
Backlash		Little

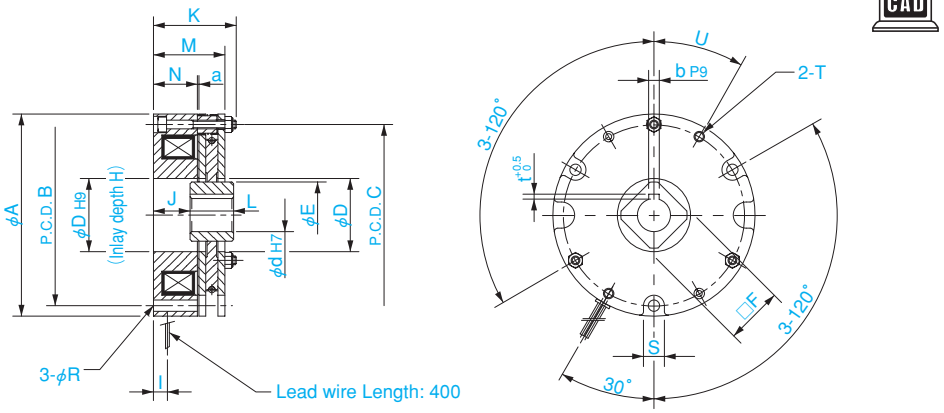
Specification

Model	Size	Static friction torque T_s [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min⁻¹]	Rotating part moment of inertia J [kg·m²]	Allowable braking work rate $P_{ba\ell}$ [W]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
BXL-06-10	06	2	DC24	15	0.63	38.4	F	5000	3.75×10^{-5}	58.3	2.0×10^{7}	0.035	0.020	0.9
			DC45	12	0.27	169	F							
			DC90	12	0.13	677	F							
BXL-08-10	08	4	DC24	23	0.94	25.6	F	5000	6.25×10^{-5}	91.7	3.5×10^{7}	0.040	0.020	1.3
			DC45	18	0.41	110	F							
			DC90	18	0.21	440	F							
BXL-10-10	10	8	DC24	27	1.14	21.1	F	4000	13.75×10^{-5}	108.3	6.2×10^{7}	0.050	0.025	2.3
			DC45	25	0.54	83.0	F							
			DC90	25	0.27	331	F							
BXL-12-10	12	16	DC24	35	1.46	16.2	F	3600	33.75×10^{-5}	133.3	9.0×10^{7}	0.070	0.030	3.4
			DC90	30	0.33	271	F							
BXL-16-10	16	22	DC24	39	1.64	14.6	F	3000	7.35×10^{-4}	183.3	11.4×10^{7}	0.100	0.035	5.4
			DC90	39	0.43	207	F							

※ The indicated values of the armature suction time and release time are in the case of direct-current side switching.
※ For the armature suction time and release time in the case of alternating-current side switching (half-wave rectification) , refer to the page of operating characteristics.

Dimension

CAD



Unit [mm]

Model	A	B	C	D	E	F	H	I	J	K	L	M	N	R	S	T	U	a	d	b	t	CAD file No.
BXL-06-10	83	73	73	28	26.5	22	3	10	20.5	39.5	14	33.6	20	4.5	9	2-M5	30°	0.15	11	4	1.5	BXL1
BXL-08-10	96	86	86	35	32	25	3	12	20	41	17	35	20.8	5.5	10	2-M5	30°	0.15	14	5	2	BXL2
BXL-10-10	116	104	104	42	38	30	3	9.5	21	47.5	25	41	25.3	6.5	12	2-M6	30°	0.2	19	6	2.5	BXL3
BXL-12-10	138	124	124	50	45	35	4	12	19	49.8	30	43.5	23.3	6.5	12	2-M6	30°	0.2	24	8	3	BXL4
BXL-16-10	158	142	143	59	55	45	4	14	22.5	57.5	35	51	27.7	9	15	2-M8	40°	0.25	28	8	3	BXL5

Structural instructions

● Handling instructions

■Brake body

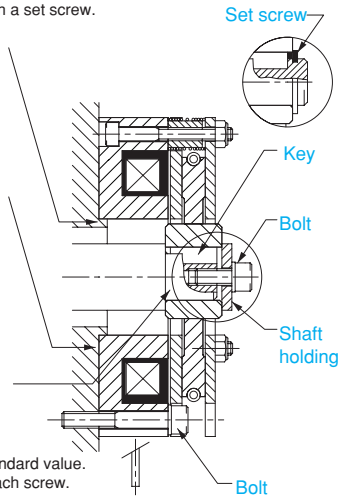
Many soft materials are used for the electromagnetic brake. Do not bang or drop. Unreasonable force may cause flaw or deformation.

■Lead wire

Do not pull the brake lead wire or bend at a sharp angle. Also, do not dangle by holding the lead wire.

● Mounting instructions

- **Fixation of the rotor hub**
  Fix the rotor hub for the shaft with a set screw.
- **Concentricity between the inlay part and shaft***
  BXL-06 Below 0.4 T.I.R
  BXL-08 Below 0.4 T.I.R
  BXL-10 Below 0.4 T.I.R
  BXL-12 Below 0.6 T.I.R
  BXL-16 Below 0.6 T.I.R
- **Squareness of the stator mounting surface***
  BXL-06 Below 0.04 T.I.R
  BXL-08 Below 0.05 T.I.R
  BXL-10 Below 0.05 T.I.R
  BXL-12 Below 0.06 T.I.R
  BXL-16 Below 0.07 T.I.R
- **Shaft tolerance h6 class or js6 class**
  (JIS B 0401)



※The * mark indicates the shaft standard value.
※Slack preventive is required for each screw.

● Instruction for use

■Environment

Due to the dry-type brake, if any oil or water content is applied on the frictional surface, the torque decreases. If there is a possibility of contamination of oil or water content, use a protective cover.

■Power supply voltage variation

Extreme fluctuation of the supply voltage may cause performance degradation of the brake. Suppress the variation within ±10% of the rated voltage.

■Environmental temperature

The allowable operating temperature is -10℃～ +40℃ (non freezing or condensing). If the operational temperature is not within the range, contact us.

■Manual release

For the BXL model, the brake force can be manually released. Tighten the screws alternately for the two or three tap bores on the plate, and push the armature. The screw tip hits the armature and releases by approximately 90 degree of rotation. Additional tightening of the screw beyond 90 degrees of ratation will damage the brake.

■Air gap adjustment

For the BXL model, the air gap adjustment is not required. The brake gap adjustment has been done before shipping. No gap adjustment is required in the initial use. Do not turn the adjustment nut.

■Initial torque

Torque may below the indicated value in initial use. In such case, perform a test operation to condition the friction surface.

● Recommended power supply and protective device

■Recommended power supply

Model	Rectification method	Frequency [Hz]	AC input voltage [V]	DC output voltage *1 [V]	Recommended protective device (varistor) *3	Applicable brake size
BE-05	Single-phase full-wave	50/60	AC100/200	DC24 *2	NVD07SCD082 or TNR7V820K	06
BE-10	Single-phase full-wave	50/60	AC100/200	DC24 *2	NVD07SCD082 or TNR7V820K	08,10,12,16
BEW-2H	Single-phase half-wave	50/60	AC100	DC45	NVD07SCD220 or TNR7V221K	06,08,10
			AC200	DC90	NVD07SCD470 or TNR7V471K	06,08,10,12,16
BEM-2H	Single-phase half-wave	50/60	AC100	DC45	NVD07SCD220 or TNR7V221K	06,08,10
			AC200	DC90	NVD07SCD470 or TNR7V471K	06,08,10,12,16

※ *1 indicates the value when applying current to the brake coil.
※ *2 The power supply used for DC24V can also be used for the DC power supply that requires no rectifier such as battery.
※ *3 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ Refer to the page of power supply for detailed specification.

■Protective device

When switching is performed on the direct-current side, connect the protective device parallel to the brake. Depending on the protective device, the operation time maybe longer. In such case, the above-referenced varistor is recommended to use. For the attached varistor, refer to the right-hand table.

■Attached varistor list

Brake voltage	Attached varistor
DC24V	NVD07SCD082 or equivalent
DC45V	No attached varistor
DC90V	No attached varistor

Ordering Information

BXL-06-10G 24V 11DIN

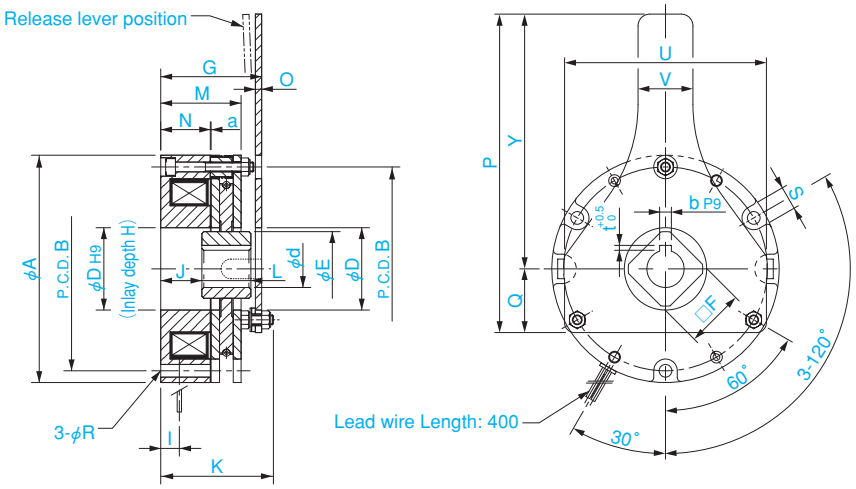
- 06: Size
- 10: Option number
  Standard: 10
  (Refer to page 109 for other option numbers.)
- 24V: Voltage (specification table)
- 11: Bore diameter (Dimensional sign d)

※Contact us for the bore diameter d other than the measurement table or the voltage other than the specification table.

Option

● Release lever (Available by special order)

Besides the manual release tap of the standard product, a manual release lever is available as an optional extra. For the dimensions of the brake with a release lever, refer to the dimensional table below. Other specification values are the same as the standard specification.



■Dimension

Unit [mm]

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Y	U	V	S	a	d	b	t	CAD file No.
BXL-06-12	83	73	73	28	26.5	22	42.8	3	10	20.5	49.5	14	33.7	20	2.6	88	24	4.5	64	73	16	9	0.15	11	4	1.5	—
BXL-08-12	96	86	86	35	32	25	44.4	3	12	20	51	17	35	20.8	2.9	122	27	5.5	95	85	20	10	0.15	14	5	2	—
BXL-10-12	116	104	104	42	38	30	51.5	3	9.5	21	57.5	25	41	25.3	3.2	162.5	32.5	6.5	130	103	28	12	0.2	19	6	2.5	—
BXL-12-12	138	124	124	50	45	35	55.7	4	12	19	64.8	30	43.5	23.3	5	200	40	6.5	160	121	36	12	0.2	24	8	3	—
BXL-16-12	158	142	143	59	55	45	64.2	4	14	22.5	72.5	35	51	27.7	6	230	44	9	186	140	36	15	0.25	28	8	3	—

● Silent mechanism (Available by special order)

■Attenuation mechanism for the chatter during rotation

Option number: S1

- Anti-noise spring for the rotor hub

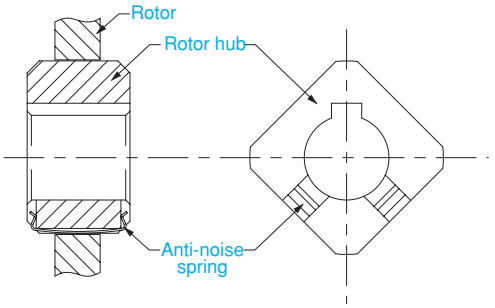
  As indicated on the right figure, there is a minute amount of backlash between the rotor and rotor hub. In the application where micro-vibration of the drive shaft such as a single-phase motor tends to occur, chatter caused by the backlash may be generated. The anti-noise spring reduces the chatter.

■Attenuation mechanism for the armature operation sound

Option number: S2

- Attenuation mechanism for the armature suction sound

  When applying current through the brake, the magnetic circuit is formed and the armature is suctioned to the stator by the magnetic force. When the armature hits the stator pole face, the hitting sound is produced. The sound is reduced by applying a shock absorber to the stator pole part.



● Option number list

Option contents	No silent mechanism	With anti-noise spring
No release lever	10	10S1
With release lever	12	12S1

※ The option 10 is the standard specification.
※ The option S2 includes the anti-noise spring of S1 as well as suction sound attenuation mechanism.

BXL-06-12S1 G 24V 11DIN

Option number

Memo

BXH model

For holding only
The BXH model is a compact brake for holding and emergency braking only.

High torque
Same dimensions as the BXL model with double torque.

100 % of the rated torque from the initial period
No running-in required. Rated toque is available from startup.

High reliability
The magnet circuit is designed by the finite element method featuring high reliability.

Adapted to the RoHS
Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead.

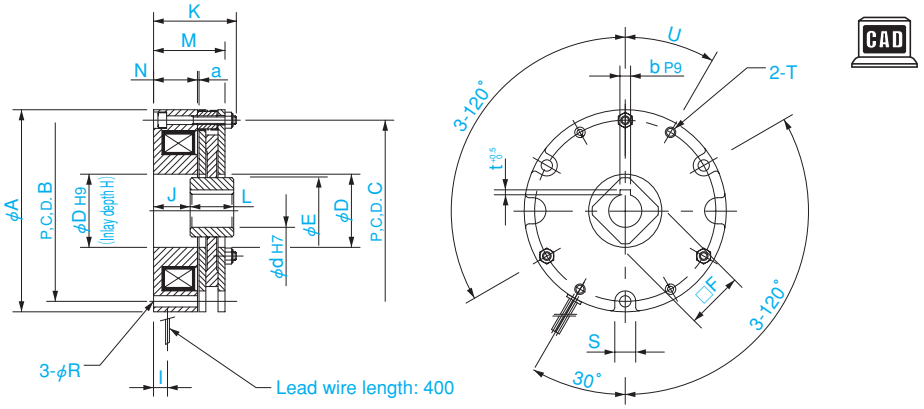
Use application	For holding
Brake torque [N·m]	4～44
Operational temp. [℃]	−10～+40
Backlash	Little

Specification

Model	Size	Static friction torque T_S [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min⁻¹]	Rotating part moment of inertia J [kg·m²]	Allowable braking work rate $E_{ba\ell}$ [J]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
BXH-06-10	06	4	DC24	15	0.63	38.4	F	5000	3.25×10^{-5}	700	2.0×10^{6}	0.040	0.020	0.9
			DC45	12	0.27	169	F							
			DC90	12	0.13	677	F							
BXH-08-10	08	8	DC24	23	0.94	25.6	F	5000	5.75×10^{-5}	1100	3.5×10^{6}	0.045	0.020	1.3
			DC45	18	0.41	110	F							
			DC90	18	0.21	440	F							
BXH-10-10	10	16	DC24	27	1.14	21.1	F	4000	1.30×10^{-4}	1300	6.2×10^{6}	0.070	0.025	2.3
			DC45	25	0.54	83	F							
			DC90	25	0.27	331	F							
BXH-12-10	12	32	DC24	35	1.46	16.2	F	3600	3.20×10^{-4}	1600	9.0×10^{6}	0.090	0.025	3.4
			DC90	30	0.33	271	F							
BXH-16-10	16	44	DC24	39	1.64	14.6	F	3000	6.93×10^{-4}	2200	11.4×10^{6}	0.125	0.030	5.4
			DC90	39	0.43	207	F							

※ The indicated values of the armature suction time and release time are in the case of direct-current side switching.
※ For the armature suction time and release time in the case of alternating-current side switching (half-wave rectification) , refer to the page of operating characteristics.

Dimension



Unit [mm]

Model	A	B	C	D	E	F	H	I	J	K	L	M	N	R	S	T	U	a	d	b	t	CAD file No.
BXH-06-10	83	73	73	28	26.5	22	3	10	20.5	39.5	14	33.6	20	4.5	9	2-M5	30°	0.15	11	4	1.5	BXH1
BXH-08-10	96	86	86	35	32	25	3	12	20	41	17	35	20.8	5.5	10	2-M5	30°	0.15	14	5	2	BXH2
BXH-10-10	116	104	104	42	38	30	3	9.5	21	47.5	25	41	25.3	6.5	12	2-M6	30°	0.2	19	6	2.5	BXH3
BXH-12-10	138	124	124	50	45	35	4	12	19	49.8	30	43.5	23.3	6.5	12	2-M6	30°	0.2	24	8	3	BXH4
BXH-16-10	158	142	143	59	55	45	4	14	22.5	57.5	35	51	27.7	9	15	2-M8	40°	0.25	28	8	3	BXH5

Structural instructions

Handling instructions

Brake body

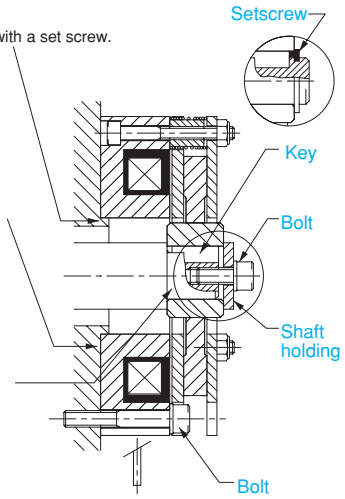
Many soft materials are used for the electromagnetic brake. Do not bang or drop. Unreasonable force may cause flaw or deformation.

Lead wire

Do not pull the brake lead wire or bend at a sharp angle. Also, do not dangle by holding the lead wire.

Mounting instructions

- **Fixation of the rotor hub**
  Fix the rotor hub for the shaft with a set screw.
- **Concentricity between the inlay part and shaft***
  BXH-06 Below 0.4 T.I.R
  BXH-08 Below 0.4 T.I.R
  BXH-10 Below 0.4 T.I.R
  BXH-12 Below 0.6 T.I.R
  BXH-16 Below 0.6 T.I.R
- **Squareness of the stator mounting surface***
  BXH-06 Below 0.04 T.I.R
  BXH-08 Below 0.05 T.I.R
  BXH-10 Below 0.05 T.I.R
  BXH-12 Below 0.06 T.I.R
  BXH-16 Below 0.07 T.I.R
- **Shaft tolerance h6 class or js6 class**
  (JIS B 0401)



※The * mark indicates the shaft standard value.
※Slack preventive is required for each screw.

Instruction for use

For holding only

This brake is used exclusively for holding. Do not use this brake for a normal braking except for emergency braking during electrical power failure.

Environment

Due to the dry-type brake, if any oil or water content is applied on the frictional surface, the torque decreases. If there is a possibility of contamination of oil or water content, use a protective cover.

Power supply voltage variation

Extreme fluctuation of the supply voltage may cause performance degradation of the brake. Suppress the variation within ±10% of the rated voltage.

Environmental temperature

The allowable operating temperature is -10℃～ +40℃ (non freezing or condensing). If the operational temperature is not within the range, contact us.

Manual release

For the BXH model, the brake force can be manually released. Tighten the screws alternately for the two or three tap bores on the plate, and push the armature. The screw tip hits the armature and releases by approximately 90 degree of rotation. Additional tightening of the screw beyond 90 degrees of rotation will damage the brake.

Air gap adjustment

For the BXH model, the air gap adjustment is not required. The brake gap adjustment has been done before shipping. No gap adjustment is required in the initial use. Do not turn the adjustment nut.

Recommended power supply and protective device

Recommended power supply

Model	Rectification method	Frequency [Hz]	AC input voltage [V]	DC output voltage *1 [V]	Recommended protective device (varistor) *3	Applicable brake size
BE-05	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K	06
BE-10	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K	08,10,12,16
BEW-2H	Single-phase half-wave	50/60	AC100	DC45	NVD07SCD220 or TNR7V221K	06,08,10
			AC200	DC90	NVD07SCD470 or TNR7V471K	06,08,10,12,16
BEM-2H	Single-phase half-wave	50/60	AC100	DC45	NVD07SCD220 or TNR7V221K	06,08,10
			AC200	DC90	NVD07SCD470 or TNR7V471K	06,08,10,12,16

※ *1 indicates the value when applying current to the brake coil.
※ *2 The power supply used for DC24V can also be used for the DC power supply that requires no rectifier such as battery.
※ *3 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ Refer to the page of power supply for detailed specification.

Protective device

When switching is performed on the direct-current side, connect the protective device parallel to the brake. Depending on the protective device, the operating time maybe longer. In such case, the above-referenced varistor is recommended to use. For the attached varistor, refer to the right-hand table.

Attached varistor list

Brake voltage	Attached varistor
DC24V	NVD07SCD082 or equivalent
DC45V	No attached varistor
DC90V	No attached varistor

Ordering Information

BXH-06 - 10 G 24V 11 DIN

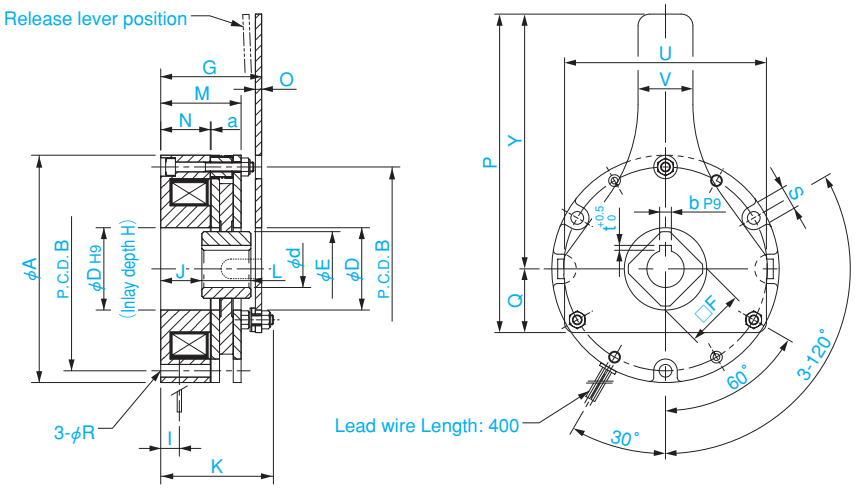
- Size: 06
- Option number: 10
  Standard: 10
  (Refer to page 113 for other option numbers.)
- Voltage (specification table): 24V
- Bore diameter (Dimensional sign d): 11

※Contact us for the bore diameter d other than the measurement table or the voltage other than the specification table.

Option

Release leverl (Available by special order)

Besides the manual release tap of the standard product, a manual release lever is available as an optional extra. For the dimensions of the brake with a release lever, refer to the dimensional table below. Other specification values are the same as the standard specification.



Dimension

Unit [mm]

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Y	U	V	S	a	d	b	t	CAD file No.
BXH-06-12	83	73	73	28	26.5	22	42.8	3	10	20.5	49.5	14	33.7	20	2.6	88	24	4.5	64	73	16	9	0.15	11	4	1.5	—
BXH-08-12	96	86	86	35	32	25	44.4	3	12	20	51	17	35	20.8	2.9	122	27	5.5	95	85	20	10	0.15	14	5	2	—
BXH-10-12	116	104	104	42	38	30	51.5	3	9.5	21	57.5	25	41	25.3	3.2	162.5	32.5	6.5	130	103	28	12	0.2	19	6	2.5	—
BXH-12-12	138	124	124	50	45	35	57.6	4	12	19	64.8	30	45.4	23.3	5	200	40	6.5	160	121	36	12	0.2	24	8	3	—
BXH-16-12	158	142	143	59	55	45	66.5	4	14	22.5	75.5	35	53.3	27.7	6	230	44	9	186	140	36	15	0.25	28	8	3	—

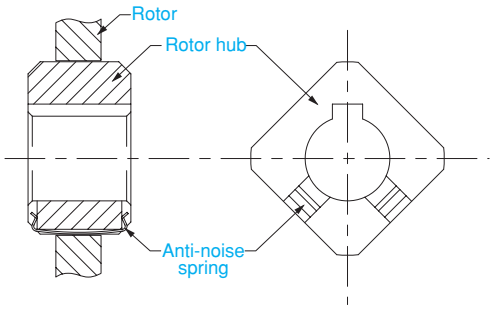
Silent mechanism (Available by special order)

Attenuation mechanism for the chatter during rotation

Option number: S1

- Anti-noise spring for the rotor hub

  As indicated on the right figure, there is a minute amount of backlash between the rotor and rotor hub. In the application where micro-vibration of the drive shaft such as a single-phase motor tends to occur, the chatter caused by the backlash may be generated. The anti-noise spring reduces the chatter.



Attenuation mechanism for the armature operation sound

Option number: S2

- Attenuation mechanism for the armature suction sound

  When applying current through the brake, the magnetic circuit is formed and the armature is suctioned to the stator by the magnetic force. When the armature hits the stator pole face, the hitting sound is produced. The sound is reduced by applying a shock absorber to the stator pole part.

Option number list

Option contents	No silent mechanism	With anti-noise spring
No release lever	10	10S1
With release lever	12	12S1

※ The option 10 is the standard specification.

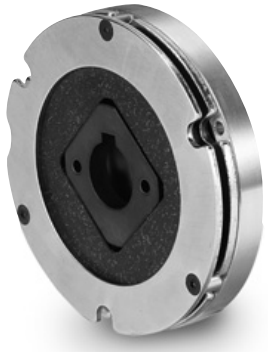
BXH-06-12S1 G 24V 11DIN

Option number

Memo

BXR model

Available by special order



Slim type
The low profile figure with 2/3 of thickness compared with the conventional company product saves the mounting space.

Energy conservation
The low-capacity design saves energy. Heat generation of coil caused by temperature rise is also reduced.

For holding only
The BXR model is a compact and lightweight brake for holding and emergency braking only.

100 % of the rated torque from the initial period
No run in period is required. Rated torque is available from startup.

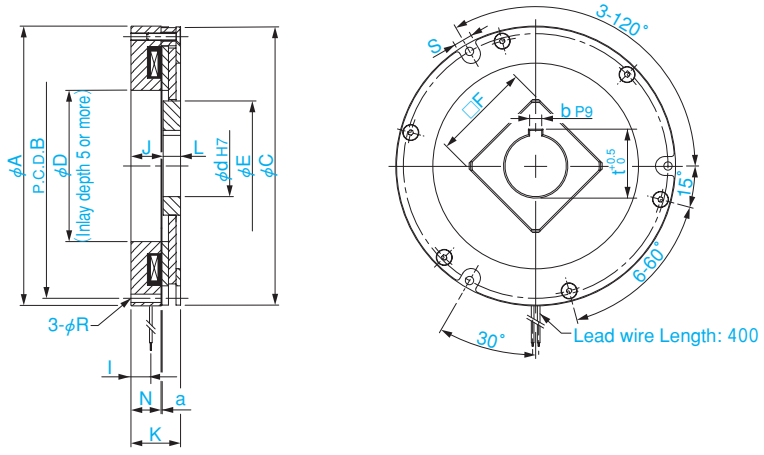
Use application		For holding
Brake torque	[N·m]	16～55
Operational temp.	[℃]	−10～+40
Backlash		Little

Specification

Model	Size	Static friction torque T_s [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min^{-1}]	Rotating part moment of inertia J [kg·m^2]	Allowable braking work rate $E_{ba\ell}$ [J]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
BXR-10-10	10	16	DC24	22	0.90	26.8	F	5000	1.35×10^{-4}	1500	2.2×10^{6}	0.110	0.070	1.3
BXR-16-10	16	55	DC24	21	0.88	27.4	F	3600	8.75×10^{-4}	2000	1.5×10^{6}	0.220	0.100	3.6

※The indicated values of the armature suction time and release time are in the case of direct-current side switching.

Dimension



Unit [mm]

Model	A	B	C	D	E	F	I	J	L	N	K	R	S	a	d	b	t	CAD file No.
BXR-10-10	123.5	115	122	62	55	45	7.4	15	9	13.7	24.2	4.5	9.5	0.1	24	8	27	—
BXR-16-10	185	175	184	100	86	65	12	21.4	11.5	19.9	32.7	5.5	12.5	0.1	28	8	31	—

Structural instructions

Handling instructions

Brake body

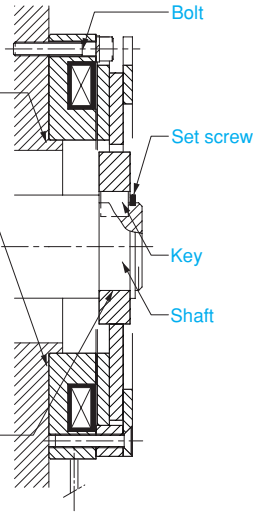
Many soft materials are used for the electromagnetic brake. Do not bang or drop. Unreasonable force may cause flaw or deformation.

Lead wire

Do not pull the brake lead wire or bend at a sharp angle. Also, do not dangle by holding the lead wire.

Mounting instructions

- **Fixation of the rotor hub**
  Fix the rotor hub for the shaft with a set screw.
- **Concentricity between the inlay part and shaft***
  BXR-10 Below 0.4 T.I.R
  BXR-16 Below 0.6 T.I.R
- **Squareness of the stator mounting surface***
  BXR-10 Below 0.05 T.I.R
  BXR-16 Below 0.07 T.I.R
- **Shaft tolerance h6 class or js6 class**
  (JIS B 0401)



※The * mark indicates the shaft standard value.
※Slack preventive is required for each screw.

Instruction for use

For holding only

This brake is used exclusively for holding. Do not use the brake for a normal braking except for an emergency braking during electrical power failure.

Environment

Due to the dry-type brake, if any oil or water content is applied on the frictional surface, the torque decreases. If there is a possibility of contamination of oil or water content, use a protective cover.

Power supply voltage variation

Extreme fluctuation of the supply voltage may cause performance degradation of the brake. Suppress the variation within ±10% of the rated voltage.

Environmental temperature

The allowable operating temperature is -10℃～ +40℃ (non freezing or condensing). If the operational temperature is not within the range, contact us.

Air gap adjustment

For the BXR model, the air gap adjustment is not required. The brake gap adjustment has been done before shipping.

Recommended power supply and protective device

Recommended power supply

Model	Rectification method	Frequency [Hz]	AC input voltage [V]	DC output voltage *1 [V]	Recommended protective device (varistor) *3	Applicable brake size
BE-10	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K	10,16

※ *1 indicates the value when applying current to the brake coil.
※ *2 The power supply used for DC24V can also be used for the DC power supply that requires no rectifier such as battery.
※ *3 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ Refer to the page of power supply for detailed specification.

Protective device

When switching is performed on the direct-current side, connect the protective device parallel to the brake. Depending on the protective device, the operating time maybe longer. In such case, the above-referenced varistor is recommended to use. For the attached varistor, refer to the right-hand table.

Attached varistor list

Brake voltage	Attached varistor
DC24V	NVD07SCD082 or equivalent

Ordering Information

BXR-10-10 24V 24 DIN

Size — Bore diameter (Dimensional sign d)

※Contact us for the bore diameter d other than the measurement table or the voltage other than the specification table.

457 model Available by special order

For braking only

The 457 model is a compact and lightweight brake for braking only.

External mounting method for stator

The external stator system reduces the effect of heat generated by the coil.

Adapted to the RoHS

Adapted to the Restriction of Hazardous Substances that bans the use of 6 substances such as mercury or lead.

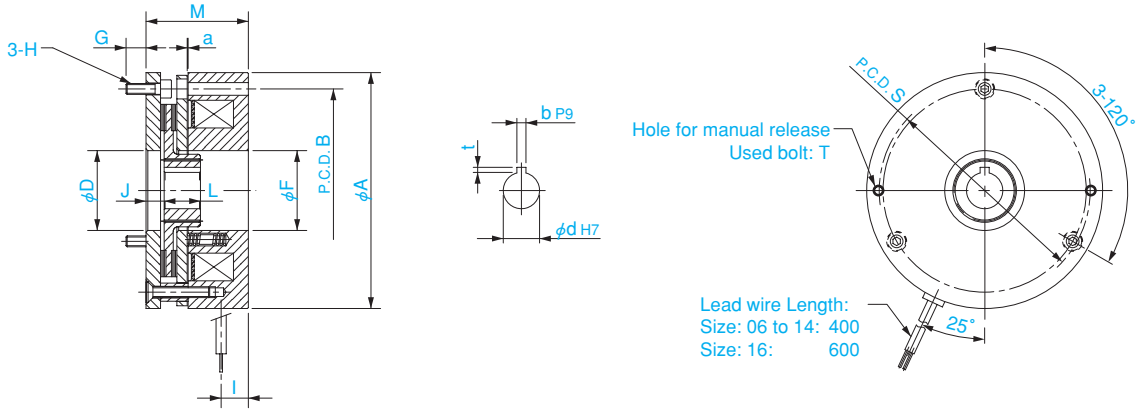
Use application		For braking
Brake torque	[N·m]	4～80
Operational temp.	[℃]	−10～+40
Backlash		Little

Specification

Model	Size	Static friction torque T_s [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min^{-1}]	Rotating part moment of inertia J [$kg^2 \cdot m^2$]	Allowable braking work rate $P_{ba\ell}$ [W]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
457-06-13	06	4	24	20	0.83	28.8	F	3000	1.3×10^{-5}	66	3.4×10^{6}	0.037	0.029	1.1
457-08-13	08	8	24	28	1.17	20.6	F	3000	4.5×10^{-5}	104	6.3×10^{6}	0.042	0.060	1.9
457-10-13	10	16	24	30	1.25	19.2	F	3000	2.0×10^{-4}	133	1.1×10^{7}	0.100	0.035	3.8
457-12-13	12	32	24	40	1.67	14.4	F	3000	4.5×10^{-4}	200	2.1×10^{7}	0.135	0.045	5.7
457-14-13	14	60	24	50	2.08	11.5	F	3000	6.3×10^{-4}	233	2.3×10^{7}	0.240	0.050	8.6
457-16-13	16	80	24	55	2.29	10.5	F	3000	15.0×10^{-4}	270	3.9×10^{7}	0.275	0.071	12

※The indicated values of the armature suction time and release time are in the case of direct-current side switching.

Dimension



Unit [mm]

Model	A	B	D	F	G	H	I	J	L	M	S	T	a	d	b	t Nor. dim.	t Tolerance	CAD file No.
457-06-13	84	72	31	31	6	M4	13	7.5	18	41.3	77	M4X30	0.2	11	4	1.8	+0.1 0	—
														15	5	2.3		
457-08-13	102	90	42	41.5	9	M5	16	8.5	20	49.8	93.5	M5X35	0.2	14	5	2.3		—
														20	6	2.8		
457-10-13	130	112	44	44	12	M6	15	10	20	56.4	117	M5X40	0.2	15	5	2.3		—
														20	6	2.8		
457-12-13	150	132	52	52	12	M6	18	10	25	62.4	136.3	M5X45	0.3	20	6	2.8	+0.2 0	—
														25	8	3.3		
457-14-13	165	145	60	60	14	M8	20	13	30	77.3	150	M6X55	0.3	25	8	3.3		—
														30	8	3.3		
457-16-13	190	170	70	70	14	M8	25	13.3	30	83.5	174.5	M6X60	0.3	30	8	3.3		—
														38	10	3.3		

Structural instructions

Handling instructions

Brake body

Many soft materials are used for the electromagnetic brake. Do not bang or drop. The unreasonable force may cause flaw or deformation.

Lead wire

Do not pull the brake lead wire or bend at a sharp angle. Also, do not dangle by holding the lead wire.

Mounting instructions

- **Fixation of the spline hub**
  Fix the rotor hub for the shaft with a set screw.
- **Concentricity between the inlay part and shaft***

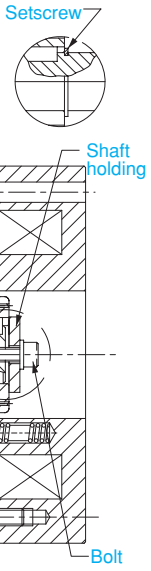
457-06	Below 0.4 T.I.R
457-08	Below 0.4 T.I.R
457-10	Below 0.4 T.I.R
457-12	Below 0.6 T.I.R
457-14	Below 0.6 T.I.R
457-16	Below 0.6 T.I.R

- **Squareness of the stator mounting surface***

457-06	Below 0.04 T.I.R
457-08	Below 0.05 T.I.R
457-10	Below 0.05 T.I.R
457-12	Below 0.06 T.I.R
457-14	Below 0.06 T.I.R
457-16	Below 0.07 T.I.R

- **Shaft tolerance h6 class or js6 class**
  (JIS B 0401)

※The * mark indicates the shaft standard value.
※Slack preventive is required for each screw.



Instruction for use

Environment

Due to the dry-type brake, if any oil or water content is applied on the frictional surface, the torque decreases. If there is a possibility of contamination of oil or water content, use a protective cover.

Power supply voltage variation

Extreme fluctuation of the supply voltage may cause performance degradation of the brake. Suppress the variation within ±10% of the rated voltage.

Environmental temperature

The allowable operating temperature is -10℃～ +40℃ (non freezing or condensing). If the operational temperature is not within the range, contact us.

Air gap adjustment

For the 457 model, the air gap adjustment is not required. The brake gap adjustment has been done before shipping.

Initial torque

Torque may below the indicated value in initial use. In such case, perform a test operation to condition the friction surface.

Recommended power supply and protective device

Recommended power supply

Model	Rectification method	Frequency [Hz]	AC input voltage [V]	DC output voltage *1 [V]	Recommended protective device (varistor) *3	Applicable brake size
BE-05	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K	06
BE-10	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K	08,10,12
BE-20	Single-phase full-wave	50/60	AC100/200	DC24*2	NVD07SCD082 or TNR7V820K	14,16

※ *1 indicates the value when applying current to the brake coil.
※ *2 The power supply used for DC24V can also be used for the DC power supply that requires no rectifier such as battery.
※ *3 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ Refer to the page of power supply for detailed specification.

Protective device

When switching is performed on the direct-current side, connect the protective device parallel to the brake. Depending on the protective device, the operating time maybe longer. In such case, the above-referenced varistor is recommended to use. For the attached varistor, refer to the right-hand table.

Attached varistor list

Brake voltage	Attached varistor
DC24V	NVD07SCD082 or equivalent

Ordering Information

457-06-13 24V 11DIN

Size — Bore diameter (Dimensional sign d)

※Contact us for the bore diameter d other than the measurement table or the voltage other than the specification table.

458 model

High performance non-excited brake model

For both braking and holding

The 458 model is a high-torque brake with longer operating time used for both braking and holding.

Quiet control sound

By adopting the Pulley's unique armature, disturbing friction sound of high frequency is decreased.

Adjustable torque

The braking torque can be adjusted in a wide range by turning the torque adjustment ring. Minimum torque is assured by a double braking construction.

Manual release

The brake force will be released by pulling the manual release lever in a braking or holding state.

Dustproof cover

By attaching a rubber dust cover, it responds to an adverse environment.

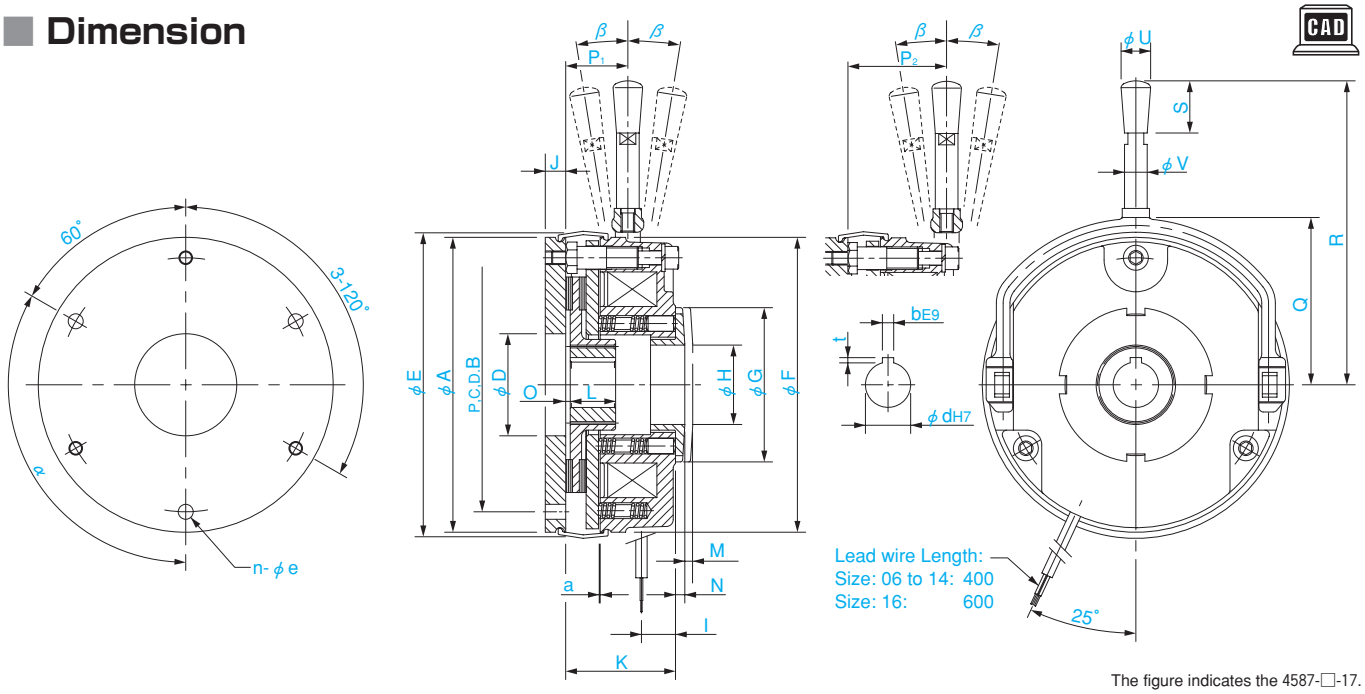
Use application		For both braking and holding
Brake torque	[N·m]	4～400
Operational temp.	[℃]	−10～+40
Backlash		Little

Specification

Model	Size	Static friction torque T_S [N·m]	Coil (at 20℃) Voltage [V]	Wattage [W]	Amperage [A]	Resistance [Ω]	Heat-resistance class	Max. rotation speed [min^{-1}]	Rotating part moment of inertia J [$kg·m^2$]	Allowable braking work rate $P_{ba\ell}$ [W]	Total braking work E_T [J]	Armature suction time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
458-06	06	4	24	20	1.20	20.0	F	3000	1.5×10^{-5}	66	3.4×10^{7}	0.045	0.015	1.0
			96	20	0.21	461	F							
			190	20	0.11	1805	F							
458-08	08	8	24	25	1.04	23.0	F	3000	6.1×10^{-5}	104	6.3×10^{7}	0.057	0.015	1.4
			96	25	0.26	368	F							
			190	25	0.13	1444	F							
458-10	10	16	24	30	1.25	19.2	F	3000	2.0×10^{-4}	133	7.9×10^{7}	0.076	0.028	2.5
			96	31	0.32	297	F							
			190	30	0.16	1203	F							
458-12	12	32	24	40	1.67	14.4	F	3000	4.5×10^{-4}	200	2.1×10^{8}	0.115	0.028	4.0
			96	40	0.42	230	F							
			190	40	0.21	903	F							
458-14	14	60	24	50	2.09	11.5	F	3000	6.3×10^{-4}	233	2.3×10^{8}	0.210	0.017	5.6
			96	50	0.52	184	F							
			190	50	0.26	722	F							
458-16	16	80	24	55	2.29	10.5	F	3000	1.5×10^{-3}	270	2.9×10^{8}	0.220	0.027	8.4
			96	55	0.57	168	F							
			190	60	0.32	602	F							
458-18	18	150	24	85	3.57	6.8	F	1500	2.9×10^{-3}	333	4.6×10^{8}	0.270	0.033	12.6
			96	85	0.89	108	F							
			190	85	0.45	425	F							
458-20	20	260	24	100	4.14	5.8	F	1500	7.3×10^{-3}	422	7.0×10^{8}	0.340	0.065	19.5
			96	100	1.04	92	F							
			190	110	0.58	328	F							
458-25	25	400	24	110	4.62	5.2	F	1500	2.0×10^{-2}	500	1.1×10^{9}	0.390	0.110	31.0
			96	110	1.14	84	F							
			190	110	0.58	328	F							

※ The indicated values of the armature suction time and release time are in the case of direct-current side switching.
※ The mass indicates the value of the stator set (accessory number: 10). It is different depending on the accessory. Contact us for further information.

Dimension



The figure indicates the 4587-□-17.

Unit [mm]

Model	A	B	D	E	F	G	H	I	J	K	L	M	N	O	P1	P2	Q	R	S	U	V	a	n	e	α	β	d	b	t	CAD file No.
458-06	87	72	31	91	87	52	24	15.3	6	36.3	18	3.95	3	1	15.8	32.8	54.5	107	23	13	8	0.2	3	4.5	120°	12°	11	4	$1.5^{+0.3}_{0}$	—
458-08	105	90	41	109	105	60	26	14	7	42.8	20	1.5	3.2	1.5	16.3	41.3	63	118	23	13	8	0.2	3	5.5	120°	10°	15	5	$2^{+0.5}_{0}$	458-1
458-10	130	112	45	134	130	68	35	15	9	48.4	20	3.5	4.1	2	27.4	42.4	73.8	134	23	13	10	0.2	3	6.6	120°	9°	15 20	5	$2^{+0.5}_{0}$	458-2
458-12	150	132	52	155	150	82	40	18	9	54.9	25	5.5	4.1	2	29.4	47.4	85	163.5	23	13	10	0.3	3	6.6	120°	10°	20 25	5 7	$2^{+0.5}_{0}$ $3^{+0.5}_{0}$	458-3
458-14	165	145	55	169	165	92	52	19	11	65.5	30	6	5	2	33	50	98	195.5	32	24	12	0.3	3	9	120°	9°	25 30	7	$3^{+0.5}_{0}$	458-4
458-16	190	170	70	195	190	102	52	24	11	72.5	30	5	5	2.25	37.5	53.5	113	240	32	24	12	0.3	3	9	120°	10°	30	7	$3^{+0.5}_{0}$	458-5
458-18	217	196	77	222	217	116	62	28	11	83.1	35	9	5.9	2.75	41.1	59.1	124	279	32	24	14	0.4	＊4	9	＊	9°	40	10	$3.5^{+0.5}_{0}$	458-6
458-20	254	230	90	259	254	135	72	35	11	97.6	40	10	6.4	3.5	47.6	68.6	146	319	32	24	14	0.4	＊4	11	＊	10°	40 45	10 12	$3.5^{+0.5}_{0}$	—
458-25	302	278	120	307	302	165	85	44.8	12.5	105.7	50	10	8.3	4.5	57.5	88.7	170	445	32	24	16	0.5	6	11	60°	10°	50 60	12 15	$3.5^{+0.5}_{0}$ $5^{+0.5}_{0}$	—

※ For the mounting bore of the size 18 and 20 with * mark, α is the up-down and left-light symmetrical position of 30°.
※ The manual release lever can be mounted at a position closer to the stator when installed in the reverse orientation.

Accessory number

Accessory No.	Mounting flange	Manual release lever	Dust cover
10			
11			●
12		●	
13	●		
14	●	●	
15	●		●
16		●	●
17	●	●	●

●mark: attached

Ordering Information

458-06-10 24V 11 JIS

- 458-06: Size
- 10: Accessory number (Accessory number table)
- 24V: Voltage (specification table)
- 11: Bore diameter (Dimensional sign d)

※ Contact us for the bore diameter d other than the measurement table or the voltage other than the specification table.

Structural instructions

Handling instructions

Brake body

Many soft materials are used for the electromagnetic brake. Do not bang or drop. Unreasonable force may cause flaw or deformation.

Lead wire

Do not pull the brake lead wire or bend at a sharp angle. Also, do not dangle by holding the lead wire.

Mounting instructions

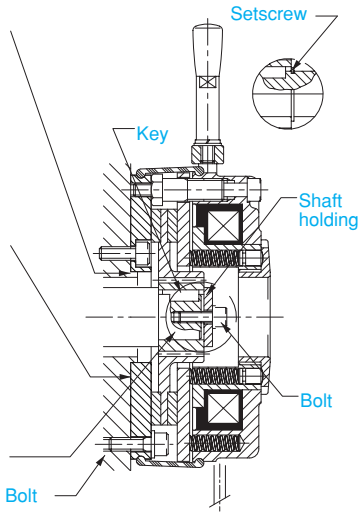
- **Fixation of the spline hub**
  Fix the rotor hub for the shaft with a set screw.
- **Concentricity between the inlay part and shaft***

458-06	Below 0.4 T.I.R
458-08	Below 0.4 T.I.R
458-10	Below 0.4 T.I.R
458-12	Below 0.6 T.I.R
458-14	Below 0.6 T.I.R
458-16	Below 0.6 T.I.R
458-18	Below 0.8 T.I.R
458-20	Below 0.8 T.I.R
458-25	Below 0.8 T.I.R

- **Squareness of the stator mounting surface***

458-06	Below 0.04 T.I.R
458-08	Below 0.05 T.I.R
458-10	Below 0.05 T.I.R
458-12	Below 0.06 T.I.R
458-14	Below 0.06 T.I.R
458-16	Below 0.07 T.I.R
458-18	Below 0.07 T.I.R
458-20	Below 0.08 T.I.R
458-25	Below 0.08 T.I.R

- **Shaft tolerance h6 class or js6 class**



※The * mark indicates the shaft standard value.
※Slack preventive is required for each screw.

Instruction for use

Environment

Due to the dry-type brake, if any oil or water content is applied on the frictional surface, the torque decreases. If there is a possibility of attachment of oil or water content, use a protective cover.

Power supply voltage variation

Extreme fluctuation of the supply voltage may cause performance degradation of the brake. Suppress the variation within ±10% of the rated voltage.

Environmental temperature

The allowable operating temperature is -10℃～ +40℃ (non freezing or condensing). If the operational temperature is not within the range, contact us.

Torque adjustment

For the 458 model, the air gap adjustment is possible. The indicated torque is the value when the adjustment ring is fastened (before shipment). To dampen the torque, turn the torque adjustment ring counterclockwise.

Initial torque

Torque may below the indicated value in initial use. In such case, perform a test operation to condition the friction surface.

Manual release

For the 458 model, the brake force can be manually released. (Accessory number: 12, 14, 16 and 17) Do not apply excessive force to the release lever. Make sure that the lever is released before mounting or operation.

● Recommended power supply and protective device

■Recommended power supply

Model	Rectification method	Frequency [Hz]	AC input voltage [V]	DC output voltage*1 [V]	Recommended protective device (varistor) *3	Applicable brake size
BE-05	Single-phase full-wave	50/60	100/200	DC24 *2	NVD07SCD082 or TNR7V820K	06
BE-10	Single-phase full-wave	50/60	100/200	DC24 *2	NVD07SCD082 or TNR7V820K	08,10,12
BE-20	Single-phase full-wave	50/60	100/200	DC24 *2	NVD07SCD082 or TNR7V820K	14,16,18
BE-40	Single-phase full-wave	50/60	100/200	DC24 *2	NVD14SCD082 or TNR14V820K	20,25
BEW-2F	Single-phase full-wave	50/60	100	DC90 *4	NVD07SCD220 or TNR7V221K	06,08,10,12,14,16
BEW-1F	Single-phase full-wave	50/60	100	DC90 *4	NVD14SCD220 or TNR14V221K	18,20,25
BEW-2H	Single-phase half-wave	50/60	200	DC90 *4	NVD07SCD470 or TNR7V471K	06,08,10,12,14,16
BEW-4W	Single-phase half-wave	50/60	200	DC90 *4	NVD14SCD470 or TNR14V471K	18,20,25
BEM-2H	Single-phase half-wave	50/60	200	DC90 *4	NVD07SCD470 or TNR7V471K	06,08,10,12,14,16
BEW-2F	Single-phase full-wave	50/60	200	DC180 *5	NVD07SCD470 or TNR7V471K	06,08,10,12,16
BEW-1F	Single-phase full-wave	50/60	200	DC180 *5	NVD14SCD470 or TNR14V471K	18,20,25
BEW-4H	Single-phase half-wave	50/60	400	DC180 *5	NVD14SCD820 or TNR14V821K	06,08,10,12,14,16,18,20,25

※ *1 indicates the value when applying current to the brake coil.
※ *2 The power supply used for DC24V can also be used for the DC power supply that requires no rectifier such as battery.
※ *3 The protective device NVD□SCD□ is manufactured by KOA, and TNR□V□K is manufactured by Nippon Chemi-Con Corporation.
※ *4 For the rated voltage DC96V of the 458 model, apply the power supply of the above output voltage DC90V.
※ *5 For the rated voltage DC190V of the 458 model, apply the power supply of the above output voltage DC180V.
※ Refer to the page of power supply for detailed specification.

■Protective device

When switching is performed on the direct-current side, connect the protective device parallel to the brake. Depending on the protective device, the operating time may become longer. In such case, the above-referenced varistor is recommended to use.

Besides, the varistor is attached to each brake as indicated in the right-hand table. For the DC96V and DC190V specifications, the varistor for full-wave rectification is attached. In the case of half-wave rectification, refer to the recommended protective device described above.

■Attached varistor list

Brake voltage	Size	Attached varistor
DC24V	06,08,10,12,14,16	NVD07SCD082 or equivalent
	18,20,25	NVD14SCD082 or equivalent
DC96V	06,08,10,12,14,16	NVD07SCD220 or equivalent
	18,20,25	NVD14SCD220 or equivalent
DC190V	06,08,10,12,14,16	NVD07SCD470 or equivalent
	18,20,25	NVD14SCD470 or equivalent

※ The attached varistor is selected under condition of full-wave rectification.

Particular case correspondence

Example of particular contents

For the request other than the standard product or optional product, we will utilize our capacity and experiences and design the product to meet the requirements. Contact us if there is a demand for a special specification as follows.
Also note that the following specifications may not be responded depending on the use condition, constraint dimension, brake size or mounting constraint.

Particular torque (other than the specification table)

By changing the torque, the total frictional work (operating life) or responsiveness will change. Please contact us with other than standard design requirements.

Particular bore diameter for rotor hub

For a non-standard bore other than those listed in our dimensionsal tables please contact us for assistance.

Particular voltage

The voltage other than DC24V, DC45V and DC90V (including a current-fed brake).

Hexagon socket set screw for rotor hub

If a hexagon socket set screw is required as a fixation method of rotor hub.

Ordering Information

The custom-designed item (particular case correspondence) is accepted as an order by exchanging the delivery specification document according to the designated form described below.

□-□-□-A-□

- Model size serial number
- Option number or accessory number
- Size
- Non-excited brake model

Application example

Silent correspondence brake

Feature

The suction and release sounds during brake actuation are reduced. It can be used in the environment where a silent structure is required for the device or machine.
Application example: Medical equipment, multilevel parking garage,etc.

Non-excited brake with a special release lever

Feature

The release lever is exclusively designed in accordance with the structure of device or machine. It can be used for the drive positioning or emergency brake releasing under condition of no power.
Application example: Electrical car, elevator machine, etc.

● Current-fed brake

■Feature

The current-fed brake can perform an overexcitation control by using the incoming current during motor start-up to quicken the operating time. It has a longer operating time, also has a capability of suppressing an increase in temperature.
Application example: hoist, winch, etc.

● Flange-integrated brake

BXF model

■Feature

The BXF model is composed of an integrated combination of a brake mounting flange of device or machine and brake stator. The number of components of the device or entire machine can be reduced. Space can be also saved.
Application example: rotating equipment

● Single-sided braking method

BXN model

■Feature

The BXN model has one friction surface (one surface). No friciton is generated during drive rotation (brake release).

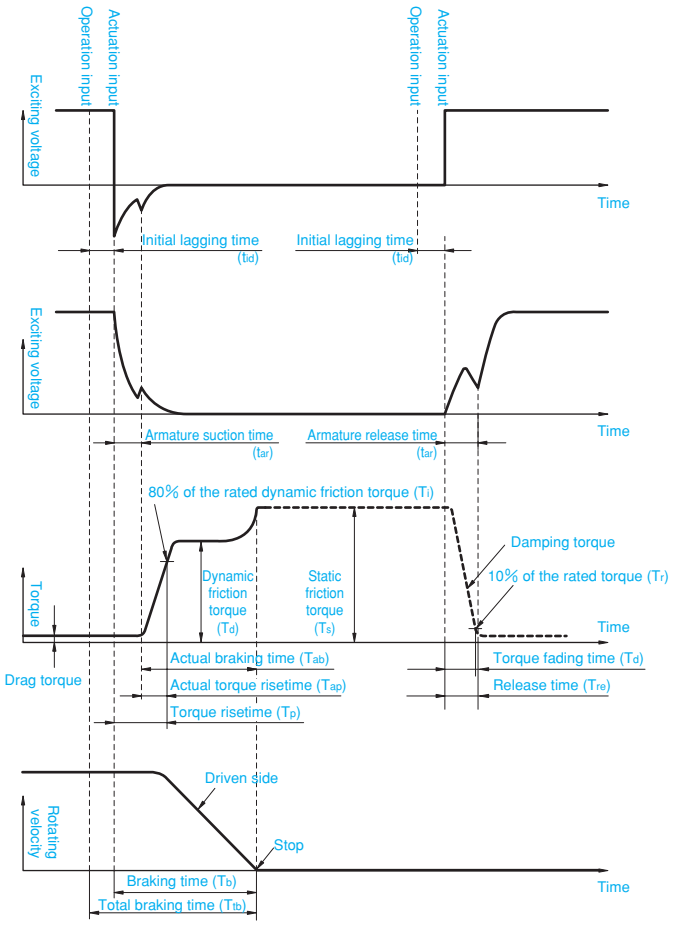
● Overexcitation power supply BEW-2FH (Full-wave/Half-wave power supply)

■Feature

Double-overexcitation control with a combination of full-wave and half-wave rectifications can be performed. To quicken the responsiveness of the brake or to prolong the total amount of work (operating life) is possible.
For the detailed specification, refer to the section of power supply.

Operating characteristics

Operating time



t_{ar}: Armature release time

Time from when the current is shut off till when the armature returns to the position before suction and torque is generated.

t_{ap}: Actual torque risetime

Time from when torque is generated till when it becomes 80% of the rated torque.

t_p: Torque risetime

Time from when the current is applied till when it becomes 80% of the rated torque.

t_a: Armature suction time

Time from when the current is applied till when the armature is suctioned and the torque is damped.

t_{id}: Initial lagging time

Time from when the operation input is on till when the actuating input or releasing input is on for the brake body.

BXW-L model (for braking) Unit [s]

Voltage	Size	Switching	t_{ar}	t_a
12V	01	DC side	0.015	0.008
24V	02		0.015	0.008
45V	03		0.025	0.025
90V	04		0.030	0.030
180V	05		0.035	0.035

BXW-H model (for holding) Unit [s]

Voltage	Size	Switching	t_{ar}	t_a
12V	01	DC side	0.010	0.010
24V	02		0.010	0.010
45V	03		0.020	0.035
90V	04		0.025	0.040
180V	05		0.030	0.045

BXL model (for braking) Unit [s]

Voltage	Size	Switching	t_{ar}	t_{ap}	t_p	t_a
24V 45V 90V	06	DC side	0.020	0.015	0.035	0.035
	08		0.020	0.015	0.035	0.040
	10		0.025	0.020	0.045	0.050
	12		0.030	0.025	0.055	0.070
	16		0.035	0.030	0.065	0.100
45V 90V	06	AC side	0.110	0.035	0.145	0.035
	08		0.110	0.040	0.150	0.040
	10		0.150	0.060	0.210	0.050
	12		0.180	0.095	0.275	0.070
	16		0.180	0.100	0.280	0.100

BXH model (for holding) Unit [s]

Voltage	Size	Switching	t_{ar}	t_a
24V 45V 90V	06	DC side	0.020	0.040
	08		0.020	0.045
	10		0.025	0.070
	12		0.025	0.090
	16		0.030	0.125
45V 90V	06	AC side	0.070	0.040
	08		0.080	0.045
	10		0.090	0.070
	12		0.120	0.090
	16		0.140	0.125

458 model Unit [s]

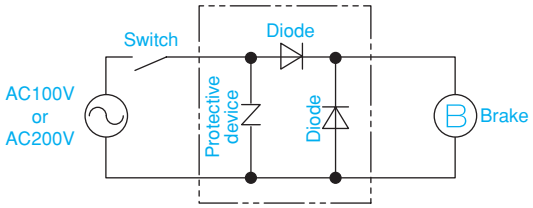
Voltage	Size	Switching	t_{ar}	t_{ap}	t_p	t_a
24V 96V 190V	06	DC side	0.015	0.013	0.028	0.045
	08		0.015	0.016	0.031	0.057
	10		0.028	0.019	0.047	0.076
	12		0.028	0.025	0.053	0.115
	14		0.017	0.025	0.042	0.210
	16		0.027	0.030	0.057	0.220
	18		0.033	0.045	0.078	0.270
	20		0.065	0.100	0.165	0.340
	25		0.110	0.120	0.230	0.390

Control circuit

● For each 45V, 90V, 96V and 180V specifications of the model BXW, BXL, BXH, 457 and 457 (Single-phase half-wave rectification)

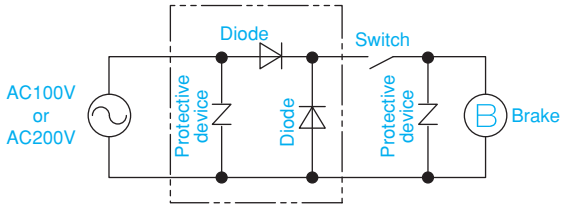
■Alternating-current side switching

● It is a generalized method. Connection is easy.



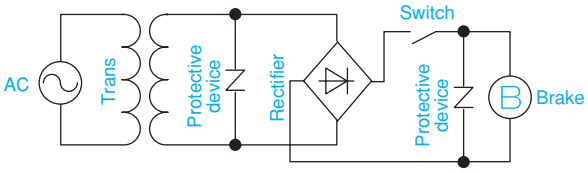
■Direct-current side switching

● Faster operating characteristics than the alternating-current side switching can be obtained.



● For each 12V and 24V specification of the model BXW, BXL, BXH, BXR, 457 and 458 (Single-phase full-wave rectification)

■Direct-current side switching



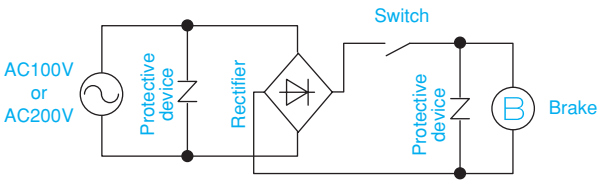
■Protective device

When switching is performed on the direct-current side, connect the protective device parallel to the brake. Depending on the protective device the operation time maybe longer. In such case, the above-referenced varistor is recommended. Select the appropriate varistor from the table below in accordance with the brake size and AC voltage before rectification. In addition, the varistor is attached to the 24V specification of the model, BXL and BXH, and the model BXR, 457 and 458. Refer to the attached varistor list of each model.

Brake size	Voltage before rectification [V]	Recommended varistor model
01～18	AC30 or less	NVD07SCD082 or equivalent
	More than AC30, AC110 or less	NVD07SCD220 or equivalent
	More than AC110, AC220 or less	NVD07SCD470 or equivalent
20～25	AC30 or less	NVD14SCD082 or equivalent
	More than AC30, AC110 or less	NVD14SCD220 or equivalent
	More than AC110, AC220 or less	NVD14SCD470 or equivalent

● For each 90V, 96V, 180V and 190V specifications of the model BXW, 457 and 458 (Single-phase full-wave rectification)

■Direct-current side switching



Selection

● Study of brake for braking load

1 Study of toque required for braking load

For selecting the appropriate brake size, to evaluate the torque T required for braking and select the brake size above the torque are necessary.

❶If the load conditions are not clear

Assume that the motor is correctly selected. By using the following formula from the motor output, estimate the torque as a measure.

$$T_M = \frac{9550 \times P}{n_r} \times \eta \ [N \cdot m]$$

P : Motor output [kW]
n_r : Rotating velocity of the brake shaft [min^{-1}]
η : Transmission efficiency from the motor to brake

❷If the load conditions are clear

If the load conditions are clear, evaluate the torque required for braking by the formula below.

$$T = \left(\frac{J \times n}{9.55 \times t_{ab}} \pm T_\ell \right) \times K [N \cdot m]$$

J : Total amount of inertia moment on the load side [kg・m^2]
n : Rotating velocity [min^{-1}]
t_{ab} : Actual braking time [s]
T_ℓ : Load torque [N・m]
K : Safety factor (refer to the table below)

In the formula, the load torque T_ℓ is indicated by a plus-minus (+/-) sign. If the load torque works on the direction of enhancing the brake, the sign of the load torque T_ℓ is - (minus), and if it works on the direction of counteracting, it is + (plus). The actual braking time tab is the time required from when the braking torque is generated till when the braking is completed. If it is not clear in the selecting stages, estimate the value by considering the operating life.

Load condition	Factor
Low-inertia/low-frequency constant load	1.5
General use of a standard inertia	2
Large inertia/high-frequency load fluctuations	3

2 Provisional selection of size

Select the brake size in order that the torque T evaluated by the above formula satisfies the following formula.

$T_b > T$ (or T_M)

T_b: Brake torque [N・m]

※Consider the brake torque as Ts=Tb.

3 Study of work

If the torque required for braking is small in full measure, the size selection can be performed only by the study of torque T described above. When considering the effect of heat generated while braking, confirm if the specifications meet the requirements for the operation frequency and total number of operations (operating life) per unit time is necessary.

The amount of work E_b required for a single braking is evaluated by the formula below.

$$E_b = \frac{J \times n^2}{182} \times \frac{T_b}{T_b \pm T_\ell} \ [J]$$

The sign of the load torque T_ℓ is + (plus) if the load torque works on the direction of enhancing the brake. If the load torque works on the direction of counteracting, the sign is - (minus).

❶Confirmation of the available operation frequency per minute.

By using the following formula, evaluate the available operation frequency per minute to confirm if the demanded operating frequency is small in full measure.

$$S = \frac{60 \times P_{ba\ell}}{E_b} \ [Operations/min]$$

$P_{ba\ell}$: Allowable braking work rate [W]
E_b : Work required for a single braking [J]

❷Confirmation of the total number of operations (operating life)

By using the following formula, evaluate the total number of operations (operating life) to confirm if the demanded life meets the requirements.

$$L = \frac{E_T}{E_b} \ [Operations]$$

E_T: Total braking work [J]

4 Study of braking time

If there is a limit to the time required for load decelerating and stopping, by using the formula below to confirm if the total braking time meets the requirements.

$$t_{tb} = t_{id} + t_{ar} + t_{ab}$$

t_{ar}: Armature release time [s]
t_{id}: Initial lagging time [s]

The braking time T_{ab} is the time from when the braking torque is generated till when the braking is completed. By the formula below, evaluate the braking time T_{ab}.

$$t_{ab} = \frac{J \times n}{9.55 \times (T_b \pm T_\ell)} \ [s]$$

The sign of the load torque T_ℓ is + (plus) if the load torque works on the direction of enhancing the brake. If the load torque works on the direction of counteracting, the sign is - (minus).

5 Study of stopping accuracy

If confirmation of the stopping accuracy is required, evaluate the stopping angle (rotation) by the formula below.

$$\theta = 6 \times n \times \left(t_{id} + t_{ar} + \frac{1}{2} t_{ab} \right) \ [^\circ]$$

t_{ar} : Armature release time [s]
t_{id} : Initial lagging time [s]

By the formula below, empirically evaluate the variation in stopping position i.e. stopping accuracy $\Delta\theta$ to use as a measure.

$$\Delta\theta = \pm 0.15 \times \theta \ [^\circ]$$

● Study of brake for holding load

1 Study of torque required for holding load

The torque T required for holding load during stationary state is evaluated by the formula below.

$$T = T_{\ell max} \times K \ [N \cdot m]$$

$T_{\ell max}$: Maximum load torque [N·m]
K : Safety factor (refer to the table below)

Load condition	Factor
Low-inertia/low-frequency constant load	1.5
General use of a standard inertia	2
Large inertia/high-frequency load fluctuations	3

2 Provisional selection of size

Select the brake size in order that the torque T evaluated by the above formula satisfies the following formula.

$$Ts > T \ [N \cdot m]$$

Ts: Static friction torque of the brake [N·m]

3 Study of work

For the brake used for holding purpose, braking is limited to a time of emergency. By the formula below, evaluate the single braking work E_b required for emergency braking to confirm if the result is below the allowable braking work $E_{ba\ell}$ of the selected brake.

$$E_b = \frac{J \times n^2}{182} \times \frac{T_b}{T_b \pm T_\ell} \ [J]$$

J : Total moment of inertia on the load side [kg・m²]
n : Rotating velocity [min⁻¹]
T_b : Brake torque [N·m]
$T_{\ell max}$: Maximum load torque [N·m]

The sign of the maximum load torque $T_{\ell max}$ is + (plus) if the load works on the direction of enhancing the brake. If the load works on the direction of counteracting, the sign is - (minus).

$$E_b \ll E_{ba\ell} \ [J]$$

4 Study of operation number

By the formula below, evaluate the total braking number L (operating life) for emergency braking to confirm if the result meets the required specifications.

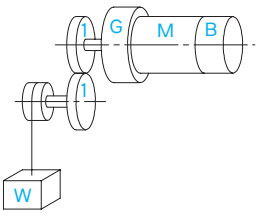
$$L = \frac{E_T}{E_b} \ [Operation]$$

E_T: Total braking work[J]

It depends on the use environment, but the emergency braking frequency should be approximately one time per minute. If the single braking work E_b becomes more than 70 % of the allowable braking work $E_{ba\ell}$, cool down the brake completely after emergency braking.

Selection Example 1

● Braking-purpose brake used for elevating operation of load



The selection of brakes for braking load as above figure is performed as follows.

Motor (brake shaft) rotating velocity	n	1800 [min^{-1}]
Load shaft rotating velocity	n_l	60 [min^{-1}]
Motor-side gear moment of inertia	J_1	1.5×10^{-2} [kg·m^2]
Load-side gear moment of inertia	J_2	1.5×10^{-2} [kg·m^2]
Load-side drum moment of inertia	J_3	4.30 [kg·m^2]
Motor with reducer moment of inertia	J_M	6×10^{-3} [kg·m^2]
Load moment of inertia	J_A	15.67 [kg·m^2]
Load-side torque	T	62.5 [N·m]
Number of braking	L	53,000 cycle or more
Operation frequency	S	0.1 [cycle/min]

※ For the number of braking and operation frequency, count each operation of lifting and lowering as one cycle.
※ Consider the number of braking as 6 [operations/h] x 8[[h/day] x 365 [day] x 3 [year]

1 Study of torque

From the above specifications, evaluate the torque required for braking and select the appropriate brake size by comparing with the dynamic friction torque of the catalog.

❶ Evaluation of the moment of inertia J_B converted to the brake shaft

By the formula below, evaluate the moment of inertia J_B [kg・m^2] converted to the brake shaft (motor shaft). In this regard, R is the rotating velocity ratio between the motor and load shaft.

$$J_B=J_M+(J_1+J_2+J_3+J_A)\times R^2\ [kg\cdot m^2]$$

$$J_B=6\times10^{-3}+(1.5\times10^{-2}+1.5\times10^{-2}+4.30+15.67)\times(60/1800)^2$$
$$\fallingdotseq 2.8\times10^{-2}[kg\cdot m^2]$$

❷ Evaluation of the load torque T_ℓ converted to the brake shaft

By the formula below, evaluate the load torque T_ℓ converted to the brake shaft (motor shaft). In this regard, η indicates the transmission efficiency, and it is 0.85 for this selection.

$$T_\ell=R\times T/\eta\ [N\cdot m]$$

$$T_\ell=60/1800\times62.5/0.85$$
$$\fallingdotseq 2.45\ [N\cdot m]$$

❸ Evaluation of the torque T required for braking

By using the formula below, evaluate the torque T [N・m] required for braking.

At this point, set the conditions as follows;

※ The actual braking time tab is 2.0 [s] as a measure.

※ The sign of the load torque T_R is - (minus) during lifting when the load works on the direction of enhancing the brake, and the sign is + (plus) during lowering when the load works on the direction of counteracting the brake.

※ For the safety factor K, select 3.0 by the use condition.

In the case of lifting

$$T_{up}=\left(\frac{J_B\times n}{9.55\times t_{ab}}-T_\ell\right)\times K$$

$$T_{up}=\left(\frac{2.8\times10^{-2}\times1800}{9.55\times2.0}-2.45\right)\times3.0$$
$$\fallingdotseq 0.57\ [N\cdot m]$$

In the case of lowering

$$T_{DOWN}=\left(\frac{J_B\times n}{9.55\times t_{ab}}+T_\ell\right)\times K$$

$$T_{DOWN}=\left(\frac{2.8\times10^{-2}\times1800}{9.55\times2.0}+2.45\right)\times3.0$$
$$\fallingdotseq 15.3\ [N\cdot m]$$

By the above results, the required torque is 15.3 [N・m]. Confirm the specification in the catalog and select the size 12 of the BXL model (dynamic friction torque 16.0 [N・m]).

2 Study of work

Confirm if the brake selected by the required torque meets the required specifications for the number of braking and brake frequency.

❶ Evaluation of the total moment of inertia J

Evaluate the total moment of inertia by adding the rotating part moment of inertia of the provisionally selected BXL-12 (catalog value 33.75x10^{-5}) to the previously evaluated moment of inertia converted to the brake shaft J_B.

$$J=2.8\times10^{-2}+33.75\times10^{-5}$$
$$\fallingdotseq 2.83\times10^{-2}[kg\cdot m^2]$$

❷ Evaluation of the amount of work E_b required for a single braking

Evaluate the work required for a single braking by using the total moment of inertia evaluated in ❶. The sign of the load torque T_ℓ is + (plus) during lifting when the load works on the direction of enhancing the brake, and the sign is - (minus) during lowering when the load works on the direction of counteracting the brake.

In the case of lifting

$$E_{bup}=\frac{J\times n^2}{182}\times\frac{T_b}{T_b+T_\ell}$$

$$E_{bup}=\frac{2.83\times10^{-2}\times1800^2}{182}\times\frac{16.0}{16.0+2.45}$$
$$\fallingdotseq 437\ [J]$$

In the case of lowering

$$E_{bDOWN}=\frac{J\times n^2}{182}\times\frac{T_b}{T_b-T_\ell}$$

$$E_{bDOWN}=\frac{2.83\times10^{-2}\times1800^2}{182}\times\frac{16.0}{16.0-2.45}$$
$$\fallingdotseq 595\ [J]$$

❸Confirmation of the available operation frequency per minute S
By substituting the previously evaluated single braking work E_b ❷ and the allowable braking work rate $P_{ba\ell}$ (catalog value 133.3W) into the formula below, evaluate the available operation frequency S per minute.

In the case of lifting

$$S_{up}=\frac{60\times P_{ba\ell}}{E_{bup}}$$

$$S_{up}=\frac{60\times 133.3}{437}$$

$$\fallingdotseq 18.3\ [\text{Operations/min}]$$

In the case of lowering

$$S_{DOWN}=\frac{60\times P_{ba\ell}}{E_{bDOWN}}$$

$$S_{DOWN}=\frac{60\times 133.3}{595}$$

$$\fallingdotseq 13.4\ [\text{Operations/min}]$$

The demanded operation frequency is much smaller than the evaluated operation frequency then it meets the requirements. In addition, the braking work rate used for the evaluation (catalog value) is the value under the ideal conditions that the demanded operation frequency should be low in full measure.

$$13.4\ [\text{Operations/min}] \gg 0.1\ [\text{Operations/min}]$$

❹Evaluation of the total number of operations (operating life)
By substituting the previously evaluated single braking work E_b ❷ and the total friction work E_T of the BXL-12 (catalog value 9.0×10^7 [J]) into the formula below, evaluate the total number of operations L.

Assuming that the work for one cycle of lifting and lowering is E_b

$$E_b=E_{bup}+E_{bDOWN}$$

$$E_b=1032\ [\text{J}]$$

The total number of operations L is;

$$L=\frac{E_T}{E_b}$$

$$L=\frac{9.0\times10^7}{1032}$$

$$\fallingdotseq 87{,}209\ [\text{cycles}]$$

The demanded total number of operations is smaller than the evaluated total number of operations (operating life) that it meets the requirements.

$$87{,}209\ [\text{cycles}] > 53{,}000\ [\text{cycles}]$$

3 Study of braking time

The total braking time t_{tb} is evaluated by the sum of the armature release time t_{ar} and the initial lagging time t_{id} (time from when the operation input is on until the actuating input is on). At this point, the actual braking time during lowering operation is expected to be larger that consideration is given only to lowering operation. The sign of the load torque T_ℓ is - (minus) since the load works on the direction of counteracting the brake.

$$t_{ab}=\frac{J\times n}{9.55\times(T_b-T_\ell)}$$

$$t_{ab}=\frac{2.83\times10^{-2}\times1800}{9.55\times(16.0-2.45)}$$

$$\fallingdotseq 0.39[\text{s}]$$

From the catalog, apply 0.03 [S] to the armature release time t_{ar} of the BXL-12. For the initial lagging time t_{id}, apply 0.025 [S] from the general relay operating time. Therefore, the total braking time t_{tb} is;

$$t_{tb}=0.025+0.030+0.39$$

$$\fallingdotseq 0.445\ [\text{s}]$$

4 Study of stopping accuracy

If there is a constraint for the stopping accuracy (stopping distance), evaluate the stopping accuracy by using the formula below.

$$\theta=6\times n\times(t_{id}+t_{ar}+1/2\times t_{ab})$$

$$=2700[^\circ]$$

By the formula below, empirically evaluate the variation in stopping position i.e. stopping accuracy $\Delta\theta$ to use as a measure.

$$\Delta\theta=\pm0.15\times\theta$$

$$=\pm405[^\circ]$$

This angle is the angle at the brake shaft so that when the stopping accuracy θ max is 2700+405=3105 [°] and the drum diameter D_d is 0.5 [m], the braking distance B_d of the load W is;

$$B_d=\theta\,\text{max}/360\times R\times2\pi\times D_d$$

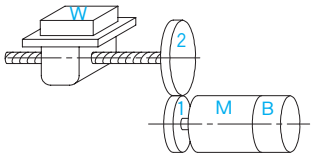
$$=(3105/360)\times(60/1800)\times2\pi\times0.5$$

$$=0.90[\text{m}]$$

If there is no problem with the braking time and stopping accuracy, the BXL-12 can be selected.

Selection Example 2

● Holding-purpose brake used for ball screw drive of load



The selection of brakes for braking load as above figure is performed as follows.

Motor (brake shaft) rotating velocity	n	1800 [min^{-1}]
Load shaft rotating velocity	n_l	900 [min^{-1}]
Motor moment of inertia	J_M	0.001 [kg·m^2]
Load mass	M	500 [kg]
Feed screw lead	P	0.01 [m]
Feed screw shaft diameter	D	0.05 [m]
Feed screw length	l	1 [m]
Feed screw friction factor	μ	0.2

1 Study of torque

From the above specifications, evaluate the torque required for braking and select the appropriate brake size by comparing with the static friction torque of the catalog.

❶Evaluation of the load torque T_ℓ converted to the brake shaft

By the formula below, evaluate the load torque T_ℓ [N・m]. In this regard, assume that no external force F [N・m] is applied and the acceleration due to gravity g [m/s^2] is 9.8 [m/s^2]. R indicates the rotating velocity ratio between the motor and load shaft, and (η) indicates the transmission efficiency, which is 0.85 for this selection.

$$T_\ell = R \times 1/2\pi \times P \times (F + \mu M_g)/\eta \quad [N \cdot m]$$

$$T_\ell = (900/1800) \times 1/2\pi \times 0.01 \times (0 + 0.2 \times 500 \times 9.8/0.85$$

$$\fallingdotseq 0.92 [N \cdot m]$$

❷Evaluation of the torque T required for holding

By using the formula below, evaluate the required torque T for holding. In this regard, the safety factor K is 2.

$$T = T_\ell \times K [N \cdot m]$$
$$T = 0.92 \times 2$$

$$\fallingdotseq 1.84 [N \cdot m]$$

By the above results, the required torque is 1.84 [N・m]. Confirm the specification in the catalog and select the size 06 of the BXH model (static friction torque 4.0 [N・m]).

2 Study of work during emergency braking

The brake selected by the required torque is designed for holding purpose that the braking operation is limited to a time of emergency. Therefore, to confirm if the single braking work E_b is below the allowable braking work $E_{ba\ell}$ is necessary.

❶Evaluation of the moment of inertia of the feed screw

Assuming that the feed screw has a round bar with 7.8 of specific gravity, 1 [m] of length and 0.05 [m] of diameter, the moment of inertia of the feed screw J_A [kg・m^2] is;

$$J_A = \frac{1}{8} \times M \times D^2$$
$$= \frac{1}{8} \times (0.025^2 \times \pi \times 1 \times 7.8 \times 1000) \times 0.05^2$$

$$\fallingdotseq 0.0048 [kg \cdot m^2]$$

❷Evaluation of the moment of inertia of the straight-line body

By the formula below, evaluate the moment of inertia J_x [kg・m^2] of the straight-line body.

$$J_X = J_A + \frac{M \cdot P^2}{4\pi^2}$$
$$= 0.0048 + \frac{500 \times 0.01^2}{4 \times \pi^2}$$

$$\fallingdotseq 6.1 \times 10^{-3} [kg \cdot m^2]$$

❸Evaluation of the total moment of inertia converted to the brake shaft

Estimate the total moment of inertia by adding the provisionally selected rotating part moment of inertia of the BXH-06 (catalog value (3.25×10^{-5}kg・m^2)) and the motor moment of inertia to the previously evaluated straight-line body moment of inertia J_x [kg・m^2] ❷. In this regard, R is the rotating velocity ratio between the motor and load shaft.

$$J = J_x \times R^2 + J_M + J_B [kg \cdot m^2]$$
$$= 6.1 \times 10^{-3} \times (\frac{1}{2})^2 + 0.001 + 3.25 \times 10^{-5}$$

$$= 2.56 \times 10^{-3} [kg \cdot m^2]$$

❹Study of work

By the formula below, evaluate the single braking work E_b required for emergency braking. In this regard, the brake torque T_b [N・m] is the catalog rated value 4.0 [N・m] and the sign of the load torque T_ℓ is + (plus) since the load works on the direction of enhancing the brake.

$$E_b = \frac{J \cdot n^2}{182} \times \frac{T_b}{T_b - T_\ell}$$
$$E_b = \frac{2.56 \times 10^{-3} \times 1800^2}{182} + \frac{4.0}{4.0 + 0.92}$$

$$\fallingdotseq 37.1 [J]$$

The evaluated braking E_b is below the allowable braking work $E_{ba\ell}$ (catalog value 700 [J]) that it meets the requirements.

$$37.1 [J] < 700 [J]$$

3 Study of operation number

The total number of braking (operating life) L for emergency braking can be evaluated by the formula below. The total braking work E_T of the BXH-06 is (2.0×10^6 [J]) from the catalog, therefore,

$$L = \frac{E_T}{E_b}$$
$$L = \frac{2.0 \times 10^6}{37.1}$$

$$\fallingdotseq 53{,}908 [operations]$$

In this specification, the BXH-06 can be selected.

Frequency of emergency braking seriously affects on the operating life that it should be approximately one time per minute.