

Compact design spring-actuated brakes

MODEL BXW



Compact design spring-actuated brakes

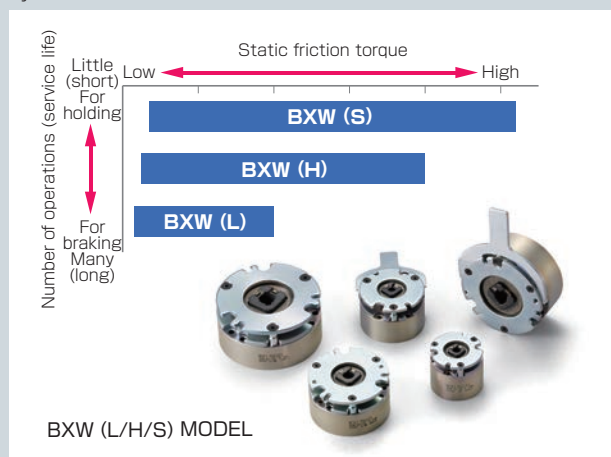
These are electromagnetic brakes that are actuated by the force of a spring when electricity is not flowing. They provide excellent performance in emergency braking when power goes out, holding stopped positions for long periods of time, preventing machinery from coasting down, and the like.

Four types are available: three types with the same dimensions but different load torques and one type with specifications and dimensions matched to compact servo motors. Select the one that best matches your application and life cycle.

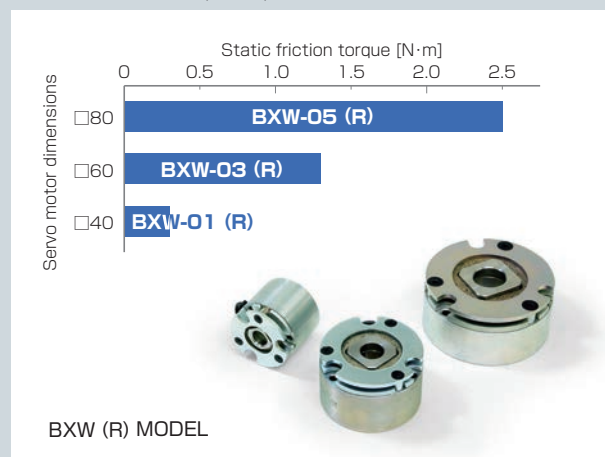
Adapted to the RoHS

Three types with the same dimensions but different load torques and one type matched to compact servo motors

Optimum selection can be made according to usage and life cycle.

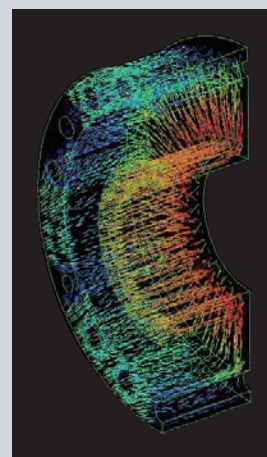
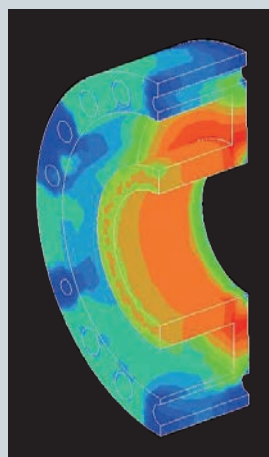
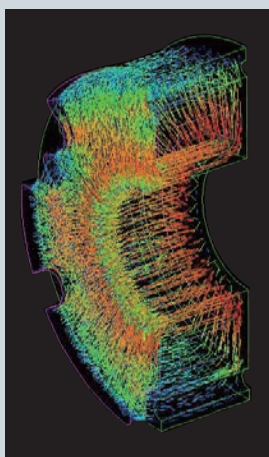
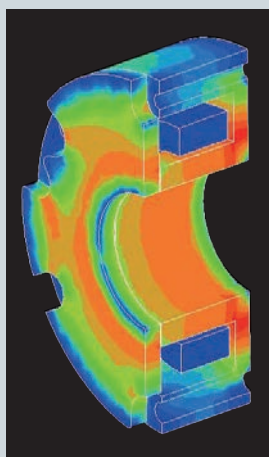


These have dedicated designs matched for specifications and dimensions for □40, □60, and □80 small servo motors.



Optimum design by 3D-CAD and FEM

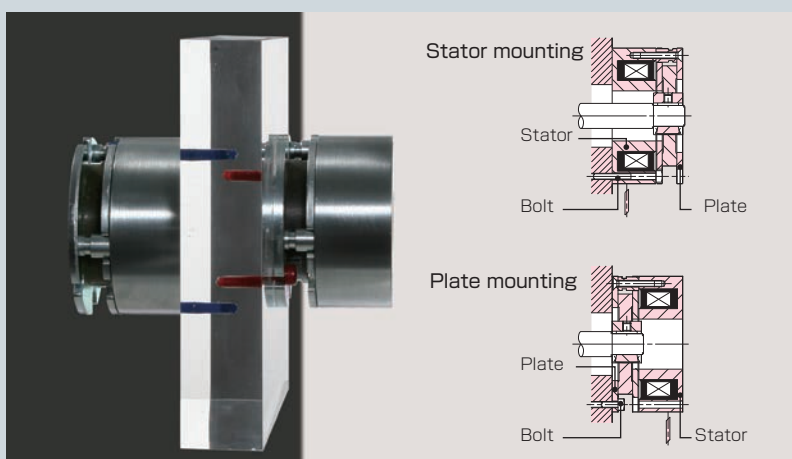
It was the best designed using a finite element method (FEM) for magnetic field analysis of the electromagnetic brake.



It corresponds to the diverse needs

* It is a correspondence in BXW (L/H/S).

The stator (a heat source) can be mounted facing either inwards or outwards.



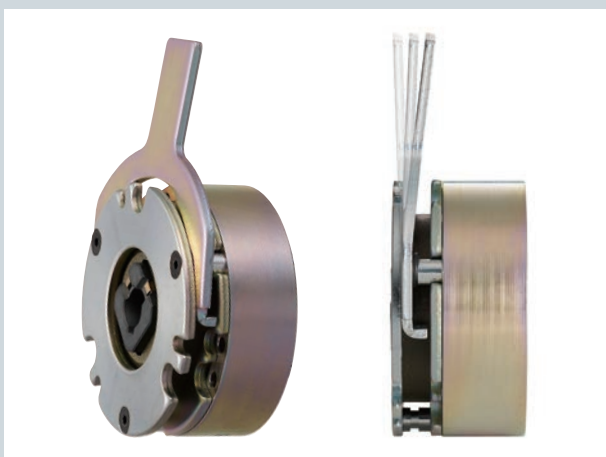
The anti-noise spring reduces a clattering sound generated by fine vibration during rotations.



Option of enhancement

* It is a correspondence in BXW (L/H/S).

Manual release levers are available. (Made to order)



Dust covers are available. (Sold separately)



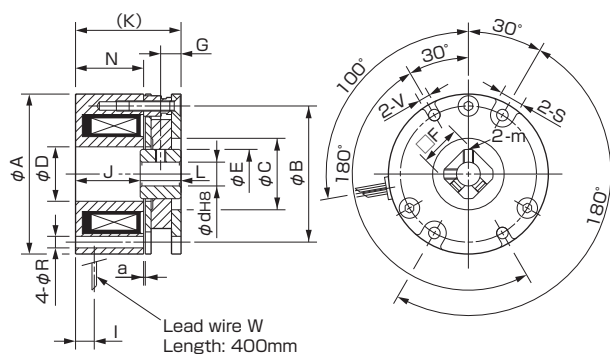
BXW (L) Model Braking use

Specifications

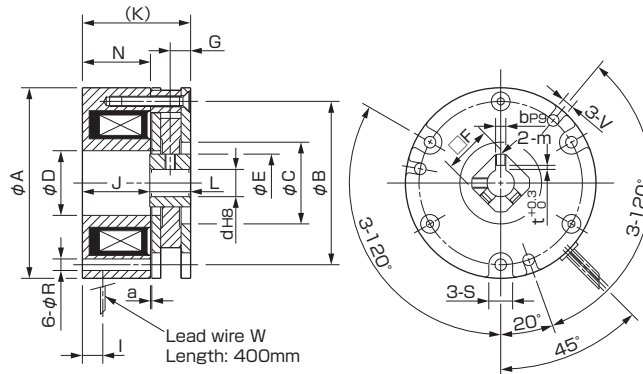
Model	Size	Static friction torque T _s [N·m]	Coil (at 20°C)				Heat-resistance class	Max. rotation speed [min ⁻¹]	Rotating part moment of inertia J [kg·m ²]	Allowable braking energy rate P _{bat} [W]	Total braking energy E _t [J]	Armature pull in time t _a [s]	Armature release time t _r [s]	Mass [kg]
			Voltage [V]	Wattage [W]	Current [A]	Resistance [Ω]								
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								
			45	5.0	0.111	405								
			90	5.0	0.056	1622								
			180	5.0	0.028	6486								
BXW-02-10L	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								
			45	6.6	0.147	307								
			90	6.6	0.073	1228								
			180	6.6	0.037	4912								
BXW-03-10L	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								
			45	8.2	0.182	247								
			90	8.2	0.091	988								
			180	8.2	0.046	3954								
BXW-04-10L	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								
			45	10.0	0.222	203								
			90	10.0	0.111	810								
			180	10.0	0.056	3241								
BXW-05-10L	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								
			45	13.0	0.289	156								
			90	13.0	0.144	623								
			180	13.0	0.072	2492								

* Models with 12V and 180V voltage specifications are made to order. * For the armature pull in time and release time in the case of alternating-current side switching.

Dimensions



Size 01, 02



Size 03, 04, 05

Model	Size	Radial dimensions [mm]											Axial direction dimensions [mm]								Bore dimensions [mm]		
		A	B	C	D	E	S	V	R	F	W	m	G	I	J	K	L	N	a	d	b	t	
BXW-01-10L	01	37	32	18	13.5	12.0	6	3	3	10	AWG26	M3	4.5	5.0	22.5	32	9	22.5	0.10	5	6	-	-
BXW-02-10L	02	47	40	21	16.0	14.5	7	3.4	3.4	12	AWG26	M3	6.0	5.5	19.2	32	12	20.0	0.10	6	7	-	-
BXW-03-10L	03	56	48	24	19.0	17.0	7	3.4	3.4	14	AWG26	M3	6.0	6.0	19.9	32	12	20.0	0.15	8	-	-	
BXW-04-10L	04	65	58	35	24.0	22.0	7	3.4	3.4	18	AWG22	M4	7.0	7.0	19.9	34	14	21.0	0.15	10	3	1.2	
BXW-05-10L	05	75	66	36	28.0	26.5	9	4.5	4.5	22	AWG22	M4	7.0	7.0	22.1	36	14	21.5	0.15	12	4	1.5	

How to Place an Order

BXW-01-10L-24V-5

Size _____ Bore diameter (Dimensional symbol d)
 Release lever _____ Voltage (Refer to the specifications table)
 10: Not included
 12: Included
 Application
 L: Braking use H: Holding and braking use S: Holding use

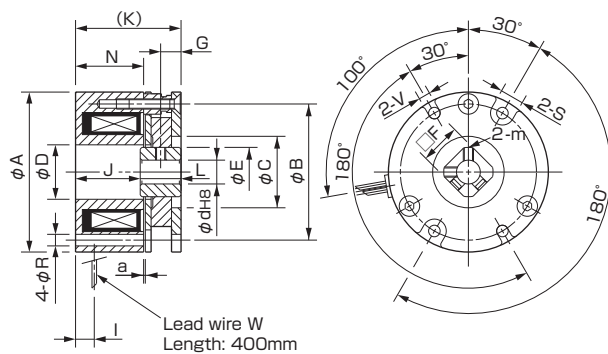
BXW (H) Model Holding and braking use

Specifications

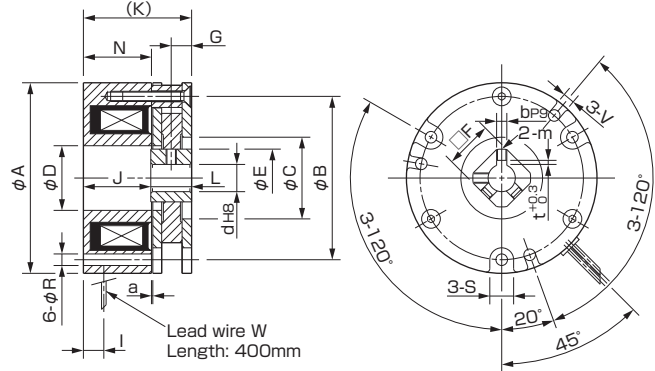
Model	Size	Static friction torque T _s [N·m]	Coil (at 20°C)				Heat-resistance class	Max. rotation speed [min ⁻¹]	Rotating part moment of inertia J [kg·m ²]	Allowable braking energy rate P _{bat} [W]	Total braking energy E _t [J]	Armature pull in time t _a [s]	Armature release time t _r [s]	Mass [kg]
			Voltage [V]	Wattage [W]	Current [A]	Resistance [Ω]								
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								
			45	5.0	0.111	405								
			90	5.0	0.056	1622								
			180	5.0	0.028	6486								
BXW-02-10H	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								
			45	6.6	0.147	307								
			90	6.6	0.073	1228								
			180	6.6	0.037	4912								
BXW-03-10H	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								
			45	8.2	0.182	247								
			90	8.2	0.091	988								
			180	8.2	0.046	3954								
BXW-04-10H	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								
			45	10.0	0.222	203								
			90	10.0	0.111	810								
			180	10.0	0.056	3241								
BXW-05-10H	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								
			45	13.0	0.289	156								
			90	13.0	0.144	623								
			180	13.0	0.072	2492								

* Models with 12V and 180V voltage specifications are made to order. * For the armature pull in time and release time in the case of alternating-current side switching.

Dimensions



Size 01, 02



Size 03, 04, 05

Model	Size	Radial dimensions [mm]											Axial direction dimensions [mm]								Bore dimensions [mm]		
		A	B	C	D	E	S	V	R	F	W	m	G	I	J	K	L	N	a	d	b	t	
BXW-01-10H	01	37	32	18	13.5	12.0	6	3	3	10	AWG26	M3	4.5	5.0	22.5	32	9	22.5	0.10	5	6	-	-
BXW-02-10H	02	47	40	21	16.0	14.5	7	3.4	3.4	12	AWG26	M3	6.0	5.5	19.2	32	12	20.0	0.10	6	7	-	-
BXW-03-10H	03	56	48	24	19.0	17.0	7	3.4	3.4	14	AWG26	M3	6.0	6.0	19.9	32	12	20.0	0.15	8	-	-	
BXW-04-10H	04	65	58	35	24.0	22.0	7	3.4	3.4	18	AWG22	M4	7.0	7.0	19.9	34	14	21.0	0.15	10	3	1.2	
BXW-05-10H	05	75	66	36	28.0	26.5	9	4.5	4.5	22	AWG22	M4	7.0	7.0	22.1	36	14	21.5	0.15	12	4	1.5	

How to Place an Order

BXW-01-10H-24V-5

Size _____ Bore diameter (Dimensional symbol d)
Release lever _____ Voltage (Refer to the specifications table)
10: Not included
12: Included
Application _____
L: Braking use H: Holding and braking use S: Holding use

SPRING-ACTUATED BRAKES

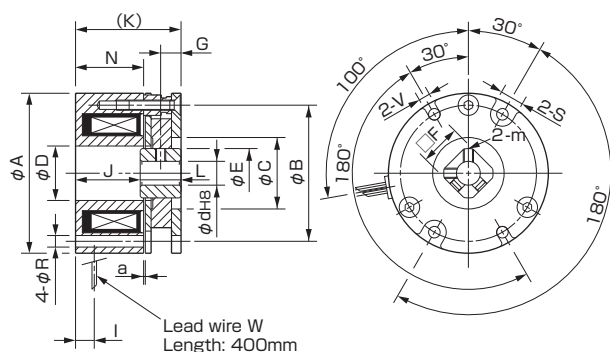
BXW (S) Model Holding use

Specifications

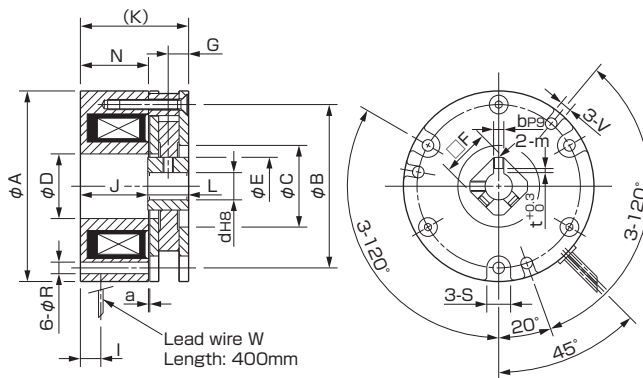
Model	Size	Static friction torque T_s [N·m]	Coil (at 20°C)				Heat-resistance class	Max. rotation speed [min ⁻¹]	Rotating part moment of inertia J [kg·m ²]	Allowable braking energy rate P_{bat} [W]	Total braking energy E_t [J]	Armature pull in time t_a [s]	Armature release time t_{ar} [s]	Mass [kg]
			Voltage [V]	Wattage [W]	Current [A]	Resistance [Ω]								
BXW-01-10S	01	0.36	24	5.0	0.208	115	F	5000	0.6×10^{-6}	-	-	0.025	0.010	0.2
BXW-02-10S	02	0.75	24	6.6	0.275	87.3	F	5000	1.9×10^{-6}	-	-	0.030	0.010	0.3
BXW-03-10S	03	1.50	24	9.0	0.375	64.0	F	5000	3.8×10^{-6}	-	-	0.035	0.020	0.4
BXW-04-10S	04	2.60	24	11.5	0.479	50.1	F	5000	12.0×10^{-6}	-	-	0.040	0.025	0.6
BXW-05-10S	05	5.20	24	13.0	0.542	44.3	F	5000	23.0×10^{-6}	-	-	0.045	0.030	0.8

* For the armature pull in time and release time in the case of alternating-current side switching.

Dimensions



Size 01, 02



Size 03, 04, 05

Model	Size	Radial dimensions [mm]											Axial direction dimensions [mm]								Bore dimensions [mm]		
		A	B	C	D	E	S	V	R	F	W	m	G	I	J	K	L	N	a	d	b	t	
BXW-01-10S	01	37	32	18	13.5	12.0	6	3	3	10	AWG26	M3	4.5	5.0	22.5	32	9	22.5	0.10	5	6	-	-
BXW-02-10S	02	47	40	21	16.0	14.5	7	3.4	3.4	12	AWG26	M3	6.0	5.5	19.2	32	12	20.0	0.10	6	7	-	-
BXW-03-10S	03	56	48	24	19.0	17.0	7	3.4	3.4	14	AWG26	M3	6.0	6.0	19.9	32	12	20.0	0.15	8	-	-	-
BXW-04-10S	04	65	58	35	24.0	22.0	7	3.4	3.4	18	AWG22	M4	7.0	7.0	19.9	34	14	21.0	0.15	10	3	1.2	1.2
BXW-05-10S	05	75	66	36	28.0	26.5	9	4.5	4.5	22	AWG22	M4	7.0	7.0	22.1	36	14	21.5	0.15	12	4	1.5	1.5

How to Place an Order

BXW-01-10S-24V-5

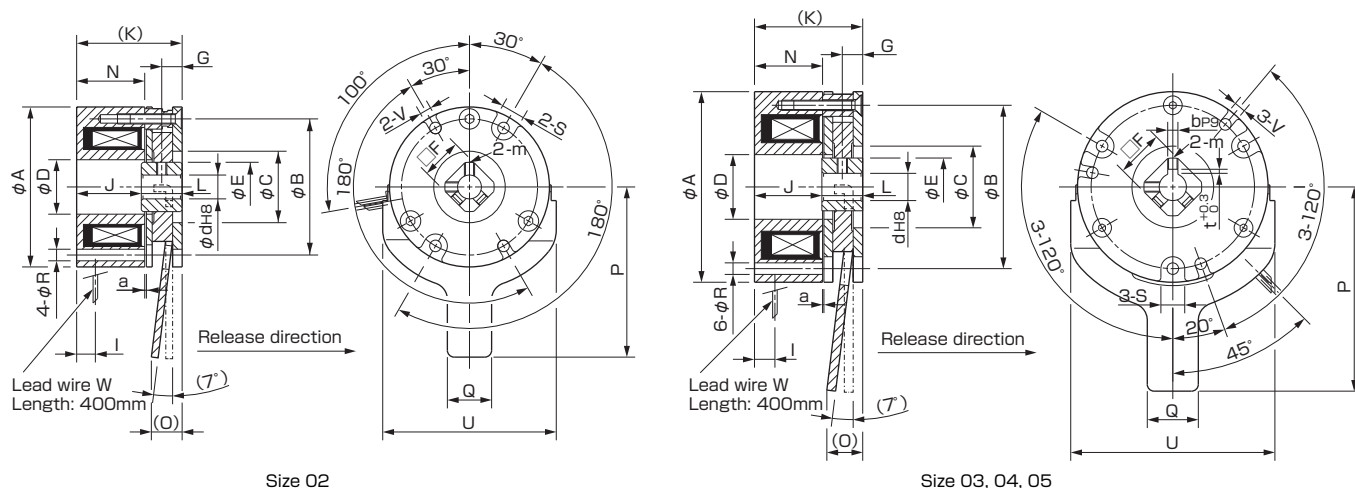
Size _____ Bore diameter (Dimensional symbol d)
 Release lever _____ Voltage (Refer to the specifications table)
 10: Not included
 12: Included Application
 L: Braking use H: Holding and braking use S: Holding use

SPRING-ACTUATED BRAKES BXW (L/H/S) MODEL

Option & Sold separately

The BXW (L/H/S) model comes with a release lever which causes the brake to release when it is not energized. Also, it can be provided with a dust cover (must be purchased separately) which prevents ingress of foreign matter in a poor environment.

Release lever (Made to order)



Model	Size	Radial dimensions [mm]											Axial direction dimensions [mm]								Lever dim. [mm]				Bore dim. [mm]		
		A	B	C	D	E	S	V	R	F	W	m	G	I	J	K	L	N	a	O	P	Q	U	d	b	t	
BXW-02-12□	02	47	40	21	16.0	14.5	7	3.4	3.4	12	AWG26	M3	6.0	5.5	19.2	32	12	20.0	0.10	9	50	13	51	6	7	-	-
BXW-03-12□	03	56	48	24	19.0	17.0	7	3.4	3.4	14	AWG26	M3	6.0	6.0	19.9	32	12	20.0	0.15	11	60	15	60	8	-	-	-
BXW-04-12□	04	65	58	35	24.0	22.0	7	3.4	3.4	18	AWG22	M4	7.0	7.0	19.9	34	14	21.0	0.15	12	70	15	70	10	3	1.2	-
BXW-05-12□	05	75	66	36	28.0	26.5	9	4.5	4.5	22	AWG22	M4	7.0	7.0	22.1	36	14	21.5	0.15	14	80	20	80	12	4	1.5	-

* See page of each model for specifications * There is no release lever option for size 01.

How to Place an Order

BXW-02-12H-24V-7

Size ——— Bore diameter (Dimensional symbol d)
 Release lever ——— Voltage (Refer to the specifications table)
 12: Included
 10: Not included
 Application
 L: Braking use H: Holding and braking use S: Holding use

Dust cover (Sold separately)



Shape No.	a	b	c
01	×	×	×
02	×	×	○
03	×	○	×
04	○	×	×
05	○	×	○
06	○	○	×

Model	ϕA [mm]	B [mm]	ϕd [mm]
BXW-01-C□	41	33	16
BXW-02-C□	51	33	21
BXW-03-C□	60	33.5	24
BXW-04-C□	69	35.5	30
BXW-05-C□	79	37.5	30

* Symbol a indicates a hole made for brakes with shafts passing through; symbol b indicates a hole made for lead wire exit when mounted on a plate; symbol c indicates a hole made for lead wire exit when mounted on a stator. * Shape No. 01 and 04 require that a hole be made separately for leads wire to exit.

Material	Ethylene propylene diene monomer (EPDM) rubber
Temperature range	-40°C to 140°C
Exterior color	Black
Applicable brake models	L type, H type, S type BXW models
Applicable specification voltage	12V DC, 24V DC, 45V DC, 90V DC, 180V DC

* This temperature range is for dust cover materials. The operating temperature for BXW models is -10°C to 40°C. * Cannot be mounted on BXW models with release levers or R type BXW models.

How to Place an Order

BXW-01-C02

Applicable brake size
 01, 02, 03, 04, 05
 Shape No.
 01, 02, 03, 04, 05, 06

SPRING-ACTUATED BRAKES

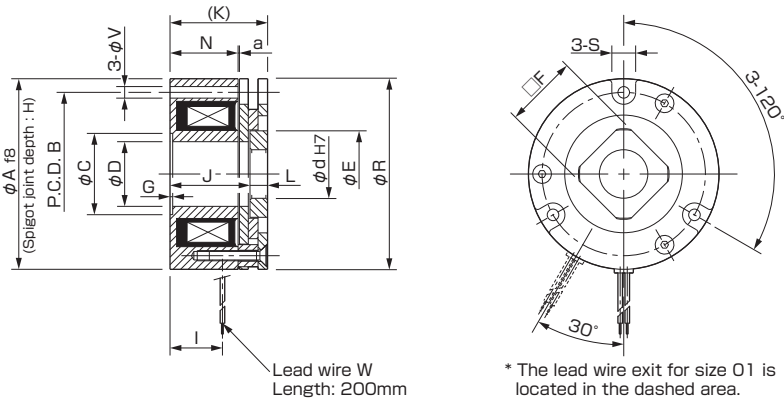
BXW (R) Model For servo motors

Specifications

Model	Size	Static friction torque Ts [N·m]	Coil (at20℃)				Heat-resistance class	Max. rotation speed [min ⁻¹]	Rotating part moment of inertia J [kg·m ²]	Allowable braking energy E _{bat} [W]	Total braking energy E _t [J]	Armature pull in time t _a [s]	Armature release time t _{ar} [s]	Mass [kg]
			Voltage [V]	Wattage [W]	Current [A]	Resistance [Ω]								
BXW-01-10R	01	0.3	24	6.1	0.254	94.4	F	6000	1.36×10 ⁻⁷	15	3000	0.035	0.020	0.1
BXW-03-10R	03	1.3	24	7.2	0.300	80.0	F	6000	1.17×10 ⁻⁶	87	17000	0.050	0.020	0.3
BXW-05-10R	05	2.5	24	8.0	0.333	72.0	F	6000	3.68×10 ⁻⁶	200	40000	0.060	0.020	0.5

* For the armature pull in time and release time in the case of alternating-current side switching.

Dimensions



Model	Size	Radial dimensions [mm]										Axial direction dimensions [mm]								Bore dim. [mm]	
		A	B	C	D	E	S	V	R	F	W	G	H	I	J	K	L	N	a	d	d max.
BXW-01-10R	01	33	26.5	16	9	14	7	3.4	32.5	12	AWG26	0.2	4	19	26	30	4	22.8	0.1	8.5	8.5
BXW-03-10R	03	48	42	26	14	23	8	3.4	47.5	19	AWG22	0.2	4	18	26	30	4	22.6	0.1	11	15
BXW-05-10R	05	64	56	28	22	31	8	4.5	63.5	25	AWG22	0.2	4	16	25.5	30	4.5	21.3	0.1	16	20

How to Place an Order

BXW-01-10R-24V-8.5

Size

Bore diameter (Dimensional symbol d)

Voltage (Refer to the specifications table)

Application R: Servo motor use

Items Checked for Design Purposes

■ Precautions for handling

■ Brakes

Most electromagnetic braking systems are made using flexible materials. Be careful when handling such parts and materials as striking or dropping them or applying excessive force could cause them to become damaged or deformed.

■ Lead wires

Be careful not to pull excessively on the brake lead wires, bend them at sharp angles, or allow them to hang too low.

■ Frictional surface

Since these are dry brakes, they must be used with the frictional surface dry. Keep water and oil off of the frictional surfaces when handling the brakes.

■ Precautions for mounting

■ Mounting orientation

BXW models can be mounted with the stator facing inwards (stator mounted) or outwards (plate mounted). Select your mounting orientation as the application dictates. Be aware, however, that the BXW (R) type is only compatible with stator centering-mark mounting. Your understanding is appreciated.

■ Affixing the rotor hub

Affix the rotor hub to the shaft with hex-socket-head set screws such that the rotor hub does not touch the armature or stator. If you are applying adhesive to the hex-socket-head set screws, be careful that the adhesive does not come out onto the rotor hub surface. Note also that since the BXW (R) type is constructed so that the rotor hub does not go through the stator, affix it by press-fitting it onto the shaft at a position that does not touch the armature (see dimension J) when they are assembled.

■ Bolts and screws

Implement screw-locking measures such as use of an adhesive threadlocking compound to bolts and screws used to install brakes.

■ Shafts

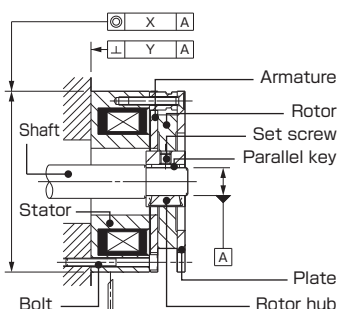
The shaft tolerance should be h7 class (JIS B 0401). Be aware that the harder the material used for the shaft, the lower the effect of the hex-socket-head set screws.

■ Accuracy of brake attachment surfaces

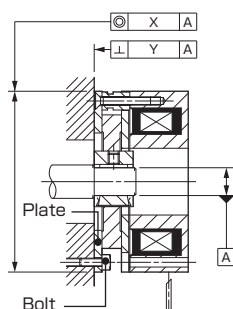
Make sure that concentricity (X) and perpendicularity (Y) do not exceed the allowable values of the table below.

Model	Size	Concentricity (X) T.I.R. [mm]	Perpendicularity (Y) T.I.R. [mm]
BXW-01, 02	01, 02	0.05	0.02
BXW-03, 04, 05	03, 04, 05	0.10	0.02

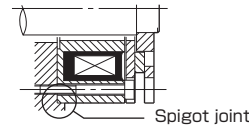
■ Stator mounted



■ Plate mounted



■ Stator mounted of BXW (R) type



■ Precautions for use

■ Environment

These brake units are dry braking systems, meaning that the torque will drop if oil residue, moisture, or other liquids get onto friction surfaces. Attach the protective cover when working in areas with oil, moisture, dust, and other particles that could affect the braking system.

■ Operating temperature

The operating temperature range is -10°C to 40°C . If you will use the product at other temperatures, consult MIKI PULLEY.

■ Power supply voltage fluctuations

Full braking performance may not be guaranteed with extreme changes in power supply voltage. Make sure to keep power supply voltage to within $\pm 10\%$ of the rated voltage value.

■ Air gap adjustment

BXW models do not require air gap adjustment. The brake air gap is adjusted when the braking system is shipped from the factory.

■ Circuit protectors

If using a power supply that is not equipped with a circuit protector for DC switching, make sure to connect the recommended circuit protector device in parallel with the brake.

■ Recommended power supplies and circuit protectors

■ Recommended power supplies

Input AC power	Brake voltage	Rectification method	Recommended power supply model
AC 100V 50/60Hz	DC 24V	Single-phase, full-wave	BES-20-71-1
AC 100V 50/60Hz	DC 45V	Single-phase, half-wave	BEW-1R
AC 100V 50/60Hz	DC 90V	Single-phase, full-wave	BEW-1R
AC 200V 50/60Hz	DC 24V	Single-phase, full-wave	BES-20-71
AC 200V 50/60Hz	DC 90V	Single-phase, half-wave	BEW-2R
AC 200V 50/60Hz	DC 180V	Single-phase, full-wave	BEW-2R
AC 400V 50/60Hz	DC 180V	Single-phase, half-wave	BEW-4R

* A DC power supply such as a battery can also be used to supply the 24 V DC required for the brake voltage.

■ Recommended circuit protectors

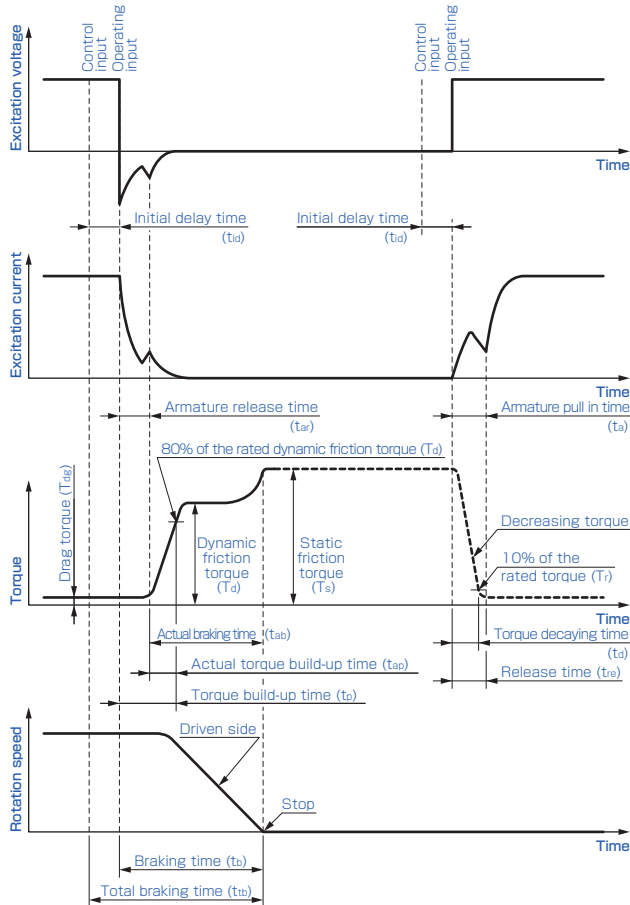
Input voltage	Brake voltage	Recommended circuit protector (varistor)
DC 24V	DC 24V	NVD07SCD082 or an equivalent
AC 100V 50/60Hz	DC 45V	NVD07SCD220 or an equivalent
AC 100V 50/60Hz	DC 90V	NVD07SCD220 or an equivalent
AC 200V 50/60Hz	DC 90V	NVD07SCD470 or an equivalent
AC 200V 50/60Hz	DC 180V	NVD07SCD470 or an equivalent
AC 400V 50/60Hz	DC 180V	NVD14SCD820 or an equivalent

* NVD □ SCD □ parts are manufactured by KOA Corporation. * DC24V indicates a product recommended with a stepdown transformer or the like. * BXW models do not come with circuit protectors.

Items Checked for Design Purposes

■ Operating characteristics

■ Operating time



tar : Armature release time

The time from when current shuts off until the armature returns to its position prior to being pulled in and torque begins to be generated

tap : Actual torque build-up time

The time from when torque first begins to be generated until it reaches 80% of rated torque

tb : Torque build-up time

The time from when current flow is shut off until torque reaches 80% of rated torque

ta : Armature pull in time

The time from when current flow first starts until the armature is pulled in and torque disappears

tid : Initial delay time

The time from start of command input to actuation input or release input to the main brake body

Size	BXW (L)		BXW (H)		BXW (S)		BXW (R)	
	tar [s]	ta [s]	tar [s]	ta [s]	tar [s]	ta [s]	tar [s]	ta [s]
01	0.015	0.008	0.010	0.010	0.010	0.025	0.020	0.035
02	0.015	0.008	0.010	0.010	0.010	0.030	-	-
03	0.025	0.025	0.020	0.035	0.020	0.035	0.020	0.050
04	0.030	0.030	0.025	0.040	0.025	0.040	-	-
05	0.035	0.035	0.030	0.045	0.030	0.045	0.020	0.060

* DC-side switching

■ Selection procedure for brakes for braking

1 Consideration of required torque to brake loads

To select the appropriate brake size, you must find the torque required for braking T , and then select a size of brake that delivers a greater torque than T .

■ Consideration of cases when load conditions are not clearly known
When load conditions are clearly known, assuming that the motor has been selected correctly for the load, a guideline for torque can be obtained from motor output using the following equation.

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

P : Motor output [kW]
 n_r : Brake shaft rotation speed [min^{-1}]
 η : Transmission efficiency from motor to brake

■ Consideration when load conditions can be clearly ascertained
When load conditions can be clearly ascertained, the torque T required for braking can be found using the following equation.

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

J : Total moment of inertia of load side [$\text{kg}\cdot\text{m}^2$]
 n : Rotation speed [min^{-1}]
 t_{ab} : Actual braking time [s]
 T_l : Load torque [N·m]
 K : Safety factor (see table below)

The sign of load torque T_l is minus when the load works in the direction that assists braking and plus when it works in the direction that hinders braking. The actual braking time t_{ab} is the time required from the start of braking torque generation until braking is complete. When this is not clearly known at the selection stage, a guideline value is used that factors in service life and the like.

Load state	Factor
Low-inertia/low-frequency constant load	1.5
Ordinary use with normal inertia	2
High-inertia/high-frequency load fluctuation	3

2 Provisional size selection

A brake of a size for which torque T found from the equations above satisfies the following equation must be selected.

$$T_b > T \text{ (or } T_M) \quad [\text{N}\cdot\text{m}]$$

T_b : Brake torque [N·m]
 * For brake torque, treat T_s as equaling T_b .
 (T_s : Static friction torque from specifications table)

3 Consideration of energy

When the load required for braking is sufficiently small, the size can be selected considering only torque T as described above. Given the effects of heat generated by braking, however, the following equation must be used to confirm that the operation frequency per unit time and the total number of operations (service life) meet the required specifications.

Use the following equation to find the energy E_b required for a single braking operation.

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

The sign of load torque T_ℓ is plus when the load works in the direction that assists braking and minus when it works in the direction that hinders braking.

■ Confirm the frequency S of operations that can be performed per minute
Find the frequency of operations that can be performed per minute using the equation at right to confirm that the desired operation frequency is sufficiently smaller than the value found.

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

$P_{ba\ell}$: Allowable braking energy rate [W]

E_b : Energy required for one braking operation [J]

■ Confirm the total number of operations (service life)

Find the total number of operations (service life) using the equation at right, and then check that it meets the desired service life.

$$L = \frac{E_T}{E_b} \text{ [times]}$$

E_T : Total braking energy [J]

4 Consideration of braking time

When there are limits on the time required to decelerate or stop the load, use the equation at right to confirm that the total braking time t_{tb} satisfies requirements.

$$t_{tb} = t_{id} + t_{ar} + t_{ab} \text{ [s]}$$

t_{ar} : Armature release time [s]

t_{id} : Initial delay time [s]

Here, actual braking time t_{ab} is the time from the start of braking torque generation to the completion of braking. Find it with the following equation.

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

The sign of load torque T_ℓ is plus when the load works in the direction that assists braking and minus when it works in the direction that hinders braking.

5 Consideration of stopping precision

To confirm stopping precision, find the stopping angle (rotation) using the following equation.

$$\theta = 6 \times n \times (t_{id} + t_{ar} + \frac{1}{2} t_{ab}) \text{ [°]}$$

t_{ar} : Armature release time [s]

t_{id} : Initial delay time [s]

The variation in stopping precision—i.e., stopping precision $\Delta\theta$ —can be found empirically with the following equation and used as a guide.

$$\Delta\theta = \pm 0.15 \times \theta \text{ [°]}$$

■ Selection procedure for brakes for holding

1 Consideration of required torque to hold loads

Use the following equation to find the torque T required to hold a load while stationary.

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

$T_{\ell\max}$: Maximum load torque [N·m]

K : Safety factor (refer to the table below)

Load state	Factor
Low inertia / small load fluctuations	1.5
Ordinary use with normal inertia	2
Hi inertia / large load fluctuations	3

2 Provisional selection of size

A brake of a size for which torque T found from the equations above satisfies the following equation must be selected.

$$T_s > T \text{ [N·m]}$$

T_s : Static friction torque of brake [N·m]

3 Consideration of energy

When considering a brake with the objective of holding loads, braking is limited to emergency braking.

Use the following equation to find the braking energy E_b for a single operation required for emergency braking. You must confirm that this result is sufficiently smaller than the allowable braking energy $E_{ba\ell}$ of the selected brake.

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

J : Total moment of inertia on load side [kg·m²]

n : Rotation speed [min⁻¹]

T_b : Brake torque [N·m]

$T_{\ell\max}$: Maximum load torque [N·m]

The sign of maximum load torque $T_{\ell\max}$ is plus when the load works in the direction that assists braking and minus when it works in the direction that hinders braking.

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

When using brakes for both holding and braking and the specification is indicated by allowable braking energy rate $P_{ba\ell}$, check under the following conditions.

$$E_b \ll 60 \times P_{ba\ell} \text{ [J]}$$

4 Consideration of number of operations

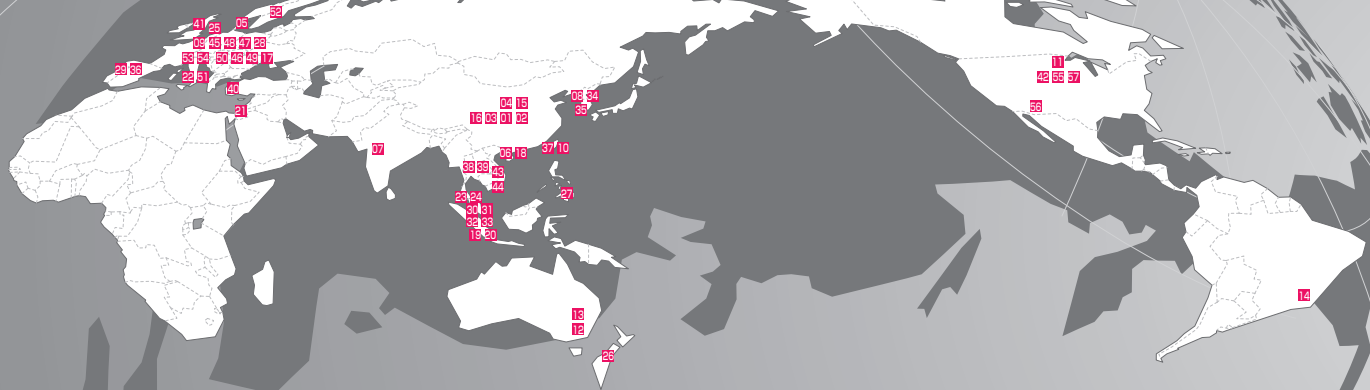
The total number of braking operations (service life) when performing emergency braking L must be found using the following equation to confirm that required specifications are satisfied.

$$L = \frac{E_T}{E_b} \text{ [times]}$$

E_T : Total braking energy [J]

Note that the frequency of emergency braking will also vary with operating environment; however, it should be about once per minute or better. When the braking energy of a single operation E_b is 70% or more of the allowable braking energy $E_{ba\ell}$, however, allow the brake to cool sufficiently after emergency braking before resuming use.

World Wide Network



GROUP COMPANIES

01 CHINA
MIKI PULLEY (TIANJIN) CO., LTD.
NO.2 LIAO HE BEI DAO, BEI CHEN
HIGH-TECHPARK TIANJIN, P.C. 300410, CHINA
TEL:86-22-2630-3111 FAX:86-22-2672-3111

05 DENMARK
ZERO-MAX A/S
HAARUP TVÆRVEJ 1, HAARUP, DK-8600 SILKEBORG,
DENMARK
TEL:45-8681-2288 FAX:45-8681-5388

09 SWITZERLAND
MIKI PULLEY (EUROPE) AG
RHEINWEG 5, 8200 SCHAFFHAUSEN, SWITZERLAND
TEL:41-52-625-2424 FAX:41-52-625-2429

02 CHINA
MIKI PULLEY (TIANJIN) CO., LTD. SHANGHAI BRANCH
RM 2603, 26/F, BUILDING A, FAR EAST INTERNATIONAL
PLAZA, NO.319 XIAN XIA RD, SHANGHAI
TEL:86-21-6249-6161 FAX:86-21-6249-9397

06 HONG KONG
MIKI PULLEY (HONG KONG) CO., LTD.
5TH FL., CCT TELECOM BLDG, 111 WO
SHING STREET, FO TAN, HONG KONG
TEL:852-2947-7508 FAX:852-2947-7518

10 TAIWAN
MIKI PULLEY (TAIWAN) CO., LTD.
2F, NO.46, KEYA RD, DAYA DISTRICT,
TAICHUNG CITY, 428, TAIWAN

08 CHINA
CENTA MP (SHANGHAI) CO., LTD.
D3-1F NO.479 CHUNDONG ROAD, XINGZHUANG
INDUSTRY PARK, SHANGHAI 201108, CHINA
TEL:86-21-54831381 FAX:86-21-54831380

07 INDIA
MIKI PULLEY (INDIA) PVT. LTD.
PLOT B-29/2, MIDC, TALOJA-410 208, DIST : RAIGAD,
NAVI MUMBAI, INDIA
TEL:91-22-2741-1922 FAX:91-22-2741-1933

11 U.S.A.
ZERO-MAX, INC.
13200 SIXTH AVENUE NORTH, PLYMOUTH, MINNESOTA
55441, U.S.A.
TEL:1-763-546-4300 FAX:1-763-546-8260

04 CHINA
ROSTA MP (SHANGHAI) CO., LTD.
ROOM 201 A BUILDING 1 NO.518 SHENWANG ROAD,
MINHANG DISTRICT, SHANGHAI CHINA
TEL:86-21-6428-9775 FAX:86-21-5428-9852

03 SOUTH KOREA
MIKI PULLEY (KOREA) CO., LTD.
302-406 IT BUCHEON TECHNO-PARK SSANGYOUNG
3CHA 36-1 SAMJEONG-DONG(397 SEOKCHEON-RO)
OJEONG-GU BUCHEON-SI KYEONGGI DO SOUTH KOREA 421-742
TEL:82-32-624-1750 FAX:82-32-624-1752

DISTRIBUTORS

12 AUSTRALIA
NAISMITH ENGINEERING & MANUFACTURING CO. PTY. LTD.
149 HEIDELBERG ROAD, NORTHCOOTE
3070 VICTORIA, AUSTRALIA
TEL:61-3-9489-9811 FAX:61-3-9482-1474

16 CHINA
TIANJIN ACE PILLAR CO., LTD.
NO.3 WEST 10 AVENUE, TIANJIN AIRPORT
INDUSTRIAL PARK, TIANJIN CHINA, 300308
TEL:86-22-2355-6000 FAX:86-22-2355-6368

20 INDONESIA
PT. HIMALAYA EVEREST JAYA,
JL. DAAN MOGOT KM. 10 NO.151 KEDAUNG KALI PESING
POBLAR JAKARTA 11710, INDONESIA
TEL:62-21-544-8955 FAX:62-21-619-4658

24 MALAYSIA
SING HUAT HARDWARE & MACHINERY(M) SDN BHD
LOT 4 JALAN SS 13/4 SUBANG JAYA INDUSTRIAL ESTATE, SUBANG
JAYA, 47500 PETALING JAYA, SELANGOR, MALAYSIA
TEL:60-3-5633-7655 FAX:60-3-5633-9700

28 POLAND
ADAMECH
KARAKOWSKA 50 STREET, BALICE, 32-083,
POLAND
TEL:48 12 630-47-62 FAX:48 12 630-47-00

32 SINGAPORE
SEIMITSU FACTORY AUTOMATION (S) PTE LTD
NO. 240 MACPHERSON ROAD, #04-06,
PINES INDUSTRIAL BUILDING, SINGAPORE 348574
TEL:65-6747-8816 FAX:65-6747-6827

36 SPAIN
RODAMIENTOS FEYC S.A.
C/PROGRES, 127-133 POL. IND. ALMEDA
03940 CORNELLA DE LLOBREGAT
TEL:34 934 740 464 FAX:34 934 745 893

40 TURKEY
POLYMAK MUHENDISLIK-AHMET COMAK
ESENSEHIR MAH. KURKULER CAD. ERYILMAZ SKI, NO.3
DUDULLU - ESENSEHIR UMRANIYE ISTANBUL, TURKEY
TEL:90-216-527 3030 FAX:90-216-527 6510

44 VIETNAM
DY DIAM TRADING CO., LTD.
288 NGUYEN THUONG HIEN STR., WARD 5,
PHU NHUAN DIST., HO CHI MINH CITY, VIETNAM
TEL:84 8 3550 1055 FAX:84 8 3550 1056

TECHNOLOGY PARTNERS

45 GERMANY
CENTA ANTRIEBE KIRSCHHEY GmbH
BERGISCHE STRASSE 7 42781 HAAEN, GERMANY
TEL:49-2129-9120 FAX:49-2129-2790

49 GERMANY
MASCHINENFABRIK MOENNINGHOFF GmbH & CO KG
BESSEMERSTRASSE 100 44793 BOCHUM
P.O.BOX 10 17 49 44717 BOCHUM, GERMANY
TEL:49-234-3335-0 FAX:49-234-3335-200

53 SWITZERLAND
BAMATEC AG
FABRIKSTRASSE POSTFACH CH 8734 ERMENSWIL,
SWITZERLAND
TEL:41-55-2868-585 FAX:41-55-2868-525

57 U.S.A.
LOVEJOY, INC.
2855 WISCONSIN AVENUE, DOWNERS GROVE, ILLINOIS
60515, U.S.A.
TEL:1-630-852-0500 FAX:1-630-852-2120

13 AUSTRALIA
R. R. FISHER & CO., LTD.
UNIT 23 BLOCK E, CARINGBAH BUSINESS PARK 1, 3,
ENDEAVOUR ROAD, CARINGBAH NSW 2229, AUSTRALIA
TEL:61-2-9540-4533 FAX:61-2-9540-4079

17 CZECH REPUBLIC
ODROLL S.r.o.
HOSTOVSKÉHO 525, 549 31 HRONOV,
CZECH REPUBLIC
TEL:420-491-483-805 FAX:420-491-483-805

21 ISRAEL
DOR DRIVE SYSTEM JAYA,
KIBBUTS EINAT 48805, P.O.B. 6, ISRAEL
TEL:972-3-900 7595 FAX:972-3-900 7599

25 NETHERLANDS
AMMERTECH B. V.
Achterhoek 15 3705 CB HELMOND,
THE NETHERLANDS
TEL:31-492 594 300 FAX:31-492 594 349

29 PORTUGAL
RF PORTUGAL - ROLAMENTOS E COMPONENTES, LDA,
RUA DO CASTANHEIRO, 682 Z.I. DA MAIA
SECTOR II 4475-122 MAIA, PORTUGAL
TEL:351 22 947 8950 FAX:351 22 947 8960

33 SINGAPORE
SING HUAT HARDWARE & MACHINERY PTE., LTD.
327-329, JALAN BESAR 208891 SINGAPORE
TEL:65-6293-6861 FAX:65-6293-8516

37 TAIWAN
ACE PILLAR CO., LTD.
2F NO.7, LANE 83 SEC. 1, KUANG-FU RD., SAN-CHUNG CITY,
TAIPEI HSIEH 241, TAIWAN
TEL:886-2-2995-8400 FAX:886-2-2995-3466

41 U.K.
HMK TECHNICAL SERVICES LTD.
KAPPA HOUSE HATTER STREET CONGLETON CHESHIRE
CW12 1QU UNITED KINGDOM
TEL:44 1260 279411 FAX:44 1260 281022

46 GERMANY
INTORQ GmbH & Co.KG
WULMSER WEG 5, D-31855 AERZEN GERMANY
TEL:49-5154-9539-41 FAX:49-5154-9539-10

50 GERMANY
SCHMIDT-KUPPLUNG GmbH
WILHELM-MAST-STRASSE 15 D-38304
WOLFENBUETTEL, GERMANY
TEL:49-5331-9552-500 FAX:49-5331-9552-552

54 SWITZERLAND
ROSTA AG
HAUPTSTRASSE 58 SH-5502, HUNZENSWIL,
SWITZERLAND
TEL:41-62-897-2421 FAX:41-62-897-1510

14 BRAZIL
KAISHIN INDUSTRIA E COMERCIO LTDA.
RUA ANTONIO FIDELIS, 398 LAPA DE
BAIXO CEP-05068-001 SAO PAULO-SP-BRAZIL
TEL:55-11-3617-3141 FAX:55-11-3617-3142

18 HONG KONG
ON GEAR E & M PRODUCTS LTD.
RM 506-509 5/F., CCT TELECOM BUILDING, 11 WO
SHING STREET, FO TAN, HONG KONG
TEL:852-2690-3320 FAX:852-2690-2326

22 ITALY
BIANCHI CUSCINETTI S. p. A.
VIA G. ZURETTI, 100 - 20125 MILANO, ITALY
TEL:39-02678861 FAX:39-026701062

26 NEW ZEALAND
R. R. FISHER & CO., LTD.
13 SPRING STREET, PAPATOETOE, AUCKLAND,
NEW ZEALAND
TEL:64-9278-4059 FAX:64-9279-8286

30 SINGAPORE
ACE PILLAR(S) PTE LTD.
NO.1, KAKI SIKIT AVE 3, KB-1, #06-02,
SINGAPORE 416 087
TEL:65-6748-6586 FAX:65-6748-5613

34 SOUTH KOREA
K-MECHATECH CO., LTD.
BL.436-5, JEUNGGEON-RI, HYANGNAM-EUP,
HWASEONG-SI, GYEONGG-DO, 445-921, KOREA
TEL:82-31-366-3671 FAX:82-31-366-3673

38 THAILAND
ID MART CO., LTD.
168/57 NAKHAIWAS ROAD, KHAENG LADPRAO,
KHET LADPRAO, BANGKOK 10230, THAILAND
TEL:66-2530-3777 FAX:66-2530-6777

42 U.S.A.
BRAKELOUTCH, LLC
49 VISTA Dr. FLANDERS, NEW JERSEY 07936, U.S.A.
TEL:1-973-584-4539 FAX:1-973-584-2371

47 GERMANY
KENDRION MAGNETA GmbH
DIBBETWEG 31, D-31855 AERZEN OT
GROSS BERKEL, GERMANY
TEL:49-5154-953132 FAX:49-5154-953141

51 ITALY
MOTOVARIO S. p. A.
VIA QUATTROPASSI, 1/3-41043 FORMIGINE (MO),
ITALY
TEL:39-059579711 FAX:39-059579710

55 U.S.A.
CENTA CORPORATION
2570 CLEVELAND DRIVE #128 AURORA, ILLINOIS
60502-8588 U.S.A.
TEL:1-630-236-3500 FAX:1-630-236-3565

15 CHINA
NANJING ANSEN M & E EQUIPMENT CO., LTD.
WEST BLOCK 2/F., NO.1 BUILDING, SCIENCE & TECHNOLOGY
GARDEN, NO.12 DINGHUAMEN, NANJING,
TEL:86-25-8375-2618 FAX:86-25-8375-2698

19 INDONESIA
PD. CENTRAL TECHNIK
JL. GUNUNG SAHARI, KOMP. MARINA MANGGA DUA
BLOCK F NO.1 JAKARTA 14420 - INDONESIA
TEL:62-21-645-5152 FAX:62-21-640-3975

23 MALAYSIA
HIMALAYA POWER TRANSMISSION SDN. BHD.
GROUND & 1ST FLOOR, BINTULU-MINI ROAD, SUBLOT 4,
LOT 1175, BLOCK 32, KEMENA LAND DISTRICT, 97000
BINTULU, SARAWAK, P.O.BOX 3052, 97014, MALAYSIA,
TEL:60-86-311930 FAX:60-86-311039

27 PHILIPPINES
LEELONG COMMERCIAL, INC.
367-393 DASMARINAS STREET P.O. BOX 480, MANILA,
PHILIPPINES
TEL:63-2-241 8901 FAX:63-2-241 4060

31 SINGAPORE
CENTA TRANSMISSIONS FAR EAST PTE. LTD.
NO.76 TUAS SOUTH AVENUE 2 SINGAPORE 637519
TEL:65-6316-2508 FAX:65-6316-2509

35 SOUTH KOREA
WON TECH
BL.758-8, YEHYEON-RI, GUJU-MYEON, DALSEONG-GUN,
TAEGU CITY, KOREA 703-830
TEL:82-53-657-9111 FAX:82-53-657-9115

39 THAILAND
NAM SAE INTERNATIONAL TRADING CO., LTD.
32-34, SOI SRITHAMMATIRAD, CHARDENKRUNG ROAD,
POIMPRAB, BANGKOK 10100, THAILAND
TEL:66-2-222-0072 FAX:66-2-224-8071

43 VIETNAM
ANH NGHI SON SERVICE TRADING CO., LTD.
D3 MIEU NOI RESIDENT AREA, DINH TIEN HOANG STREET,
W/3, BINH THANH DIST., HCMC, VIETNAM
TEL:84 8 3517 0401 FAX:84 8 3517 0403

MIKI PULLEY CO., LTD.

http://www.mikipulley.co.jp/

461 Imaininami-cho, Nakahara-ku, Kawasaki-shi, Kanagawa-ken, JAPAN