Ultraslim design spring-actuated brakes

MODEL BXR
SPRING-ACTUATED BRAKES

Ultraslim design spring-actuated brakes

The spring actuated type brake BXR model is an electromagnetic brake actuated by spring force in the non-energized state that is used for retention and panic braking. It plays the role of retaining the halting state of a rotating body or moving body by braking operation. The shape is an ultra-slim design that is 2/3 that of our conventional models. It is best suited to embedding into a servo motor or robot due to low idle abrasion and low inertia achieved by utilizing the light-weight rotor.

Adapted to the RoHS

Spline hub models added to the lineup

Spline hub models with low backlash have been added to the lineup, joining the original models that use square hubs for the rotor hub used to connect the rotating body and rotor together. These spline hub models provide even higher precision part retaining power.

Optimum design by 3D-CAD and FEM

The up-to-date CAE system was adopted in the starting stage of design. Additionally, the low-capacity design saves energy. Heat generation of coil caused by temperature rise is also reduced.
Ultraslim design with 2/3 of thickness compared with the conventional company product

Compared with BX series, which is the conventional company product, the thickness has been reduced to 2/3.

The lead wire that was taken from the outside diameter can be taken in the direction of the shaft of the reverse mounting surface. The limited space can be utilized as efficiently as possible.

Thorough reduction of rotor weight

High-intensity glass cloth has been adopted for the core material of the rotor to secure sufficient strength and to actualize overwhelming lighter weight.
**SPRING-ACTUATED BRAKES**

**BXR (-10) Model  Square hub**

### Specifications

<table>
<thead>
<tr>
<th></th>
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* For the armature pull in time and release time in the case of alternating-current side switching. * The backlash values given are for between the rotor and rotor hub.

### Dimensions

* Lead wire pullout position for size 14 is at 60°

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>Radial dimensions [mm]</th>
<th>Axial direction dimensions [mm]</th>
<th>Bore dimensions [mm]</th>
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<td>136</td>
<td>d</td>
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**How to Place an Order**

BXR-14-10-038-24V-28DIN

- **Size**: Bore diameter (Dimensional symbol d)
- **Shape fitting**: Voltage (Refer to the specifications table)
- **10**: Static friction torque [N·m] (Refer to the specifications table. On the three-digits code)

* Lead wire length: 400mm

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**Refer to the specifications table. On the three-digits code**

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* Lead wire pullout position for size 14 is at 60°
SPRING-ACTUATED BRAKES

BXR (-20) Model Spline hub

Specifications

<table>
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<tr>
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</table>

* For the armature pull in time and release time in the case of alternating current side switching. * The backlash values given are for between the rotor and rotor hub.

Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>Radial dimensions [mm]</th>
<th>Axial direction dimensions [mm]</th>
<th>Bore dimensions [mm]</th>
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<td>C: 82</td>
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<td>B: 80</td>
<td>C: 82</td>
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How to Place an Order

BXR-14-20-038-24V-28DIN

Size

Shape fitting
20: Spline

Bore diameter (Dimensional symbol d)
Voltage (Refer to the specifications table)
Static friction torque [N・m]
(Refer to the specifications table. On the three-digits code)

To download CAD data or product catalogs
**SPRING-ACTUATED BRAKES**

# 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 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 ± 10% of the rated voltage value.
  - **Air gap adjustment**
    BXR 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 circuit protectors**

<table>
<thead>
<tr>
<th>Input voltage</th>
<th>Brake voltage</th>
<th>Recommended circuit protector (varistor)</th>
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</thead>
<tbody>
<tr>
<td>DC 24V</td>
<td>DC 24V</td>
<td>NV0075CD082 or an equivalent</td>
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</tbody>
</table>

* NVD□SCD□ parts are manufactured by KOA Corporation.*

DC24V indicates a product recommended with a stepdown transformer or the like.

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- **Precautions for mounting**
  - **Affixing the rotor hub**
    Affix the rotor hub to the shaft with bolts, snap rings, or the like such that the rotor hub does not touch the armature or stator. Leave at least dimension J or J1 on spline hub types, since the rotor hub may contact the armature.
  - **Bolts**
    Implement screw-locking measures such as use of an adhesive threadlocking compound to bolts used to install brakes.
  - **Shafts**
    The shaft tolerance should be h7 class (JIS B 0401).
  - **Accuracy of brake attachment surfaces**
    Make sure that concentricity (X) and perpendicularity (Y) do not exceed the allowable values of the table below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>Concentricity (X) T.I.R. [mm]</th>
<th>Perpendicularity (Y) T.I.R. [mm]</th>
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<td>BXR-08</td>
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<tr>
<td>BXR-10</td>
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<td>0.4</td>
<td>0.05</td>
</tr>
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<td>BXR-12</td>
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<td>0.06</td>
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<td>BXR-14</td>
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* NVD□SCD□ parts are manufactured by KOA Corporation.*

# Operating characteristics

<table>
<thead>
<tr>
<th>Control input</th>
<th>Driven side Torque build-up time (tp) [s]</th>
<th>Torque Rotation speed [rpm]</th>
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<tbody>
<tr>
<td>DC side</td>
<td>0.220</td>
<td>0.120</td>
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<tr>
<td>DC side</td>
<td>0.100</td>
<td>0.030</td>
</tr>
<tr>
<td>DC side</td>
<td>0.050</td>
<td>0.020</td>
</tr>
</tbody>
</table>

* NVD□SCD□ parts are manufactured by KOA Corporation.*

- **Operating time**
  - **Armature pull in time**
    The time from when current flow first starts until the armature is pulled in and torque disappears.
  - **Armature release time**
    The time from when current shuts off until the armature returns to the braking system.
  - **Braking time**
    Use the following equation to find the brake time required for a single operation.

\[
T_b = \frac{1}{J} \times \left( T_s + \frac{4J\omega_n^2}{n^2} \right) \times \left( \frac{1}{n^2} \right)
\]

Where:
- \(T_b\) is the braking time [s]
- \(T_s\) is the static friction torque of the brake [N・m]
- \(J\) is the total moment of inertia on load side [kg・m^2]
- \(\omega_n\) is the rotation speed [rad/s]
- \(n\) is the number of times the brake is used

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- **Consideration of required torque to hold loads**
  - **Holding torque**
    The required holding torque should be determined before selecting a brake size. The required holding torque is the maximum load torque that the brake needs to hold in the operating environment; however, it should be about once per minute or better. When the braking energy of a single operation \(E_b\) is limited to emergency braking. You must confirm that required specifications are satisfied.

\[
E_b = \frac{1}{2} \times J \times n^2 \times \left( T_s + \frac{4J\omega_n^2}{n^2} \right) \times \left( \frac{1}{n^2} \right)
\]

Where:
- \(E_b\) is the total braking energy [J]
- \(J\) is the total moment of inertia on load side [kg・m^2]
- \(n\) is the number of times the brake is used

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- **Consideration of energy**
  - **Emergency braking energy**
    Use the following equation to find the braking energy \(E_b\) for a single operation.

\[
E_b = \frac{1}{2} \times J \times n^2 \times \left( T_s + \frac{4J\omega_n^2}{n^2} \right) \times \left( \frac{1}{n^2} \right)
\]

Where:
- \(E_b\) is the total braking energy [J]
- \(J\) is the total moment of inertia on load side [kg・m^2]
- \(n\) is the number of times the brake is used

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- **Provisional selection of size**
  - **Emergency braking energy**
    Use the following equation to confirm that required specifications are satisfied.

\[
E_b = \frac{1}{2} \times J \times n^2 \times \left( T_s + \frac{4J\omega_n^2}{n^2} \right) \times \left( \frac{1}{n^2} \right)
\]

Where:
- \(E_b\) is the total braking energy [J]
- \(J\) is the total moment of inertia on load side [kg・m^2]
- \(n\) is the number of times the brake is used

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- **Consideration of number of operations**
  - **Emergency braking energy**
    Use the following equation to confirm that required specifications are satisfied.

\[
E_b = \frac{1}{2} \times J \times n^2 \times \left( T_s + \frac{4J\omega_n^2}{n^2} \right) \times \left( \frac{1}{n^2} \right)
\]

Where:
- \(E_b\) is the total braking energy [J]
- \(J\) is the total moment of inertia on load side [kg・m^2]
- \(n\) is the number of times the brake is used

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- **Consideration of required torque to hold loads**
  - **Emergency braking energy**
    Use the following equation to find the required emergency braking energy.

\[
E_b = \frac{1}{2} \times J \times n^2 \times \left( T_s + \frac{4J\omega_n^2}{n^2} \right) \times \left( \frac{1}{n^2} \right)
\]

Where:
- \(E_b\) is the total braking energy [J]
- \(J\) is the total moment of inertia on load side [kg・m^2]
- \(n\) is the number of times the brake is used

* NVD□SCD□ parts are manufactured by KOA Corporation.*
### Precautions for handling
- Shafts
- Frictional surface
- Lead wires

#### Items Checked for Design Purposes

- **SPRING-ACTUATED BRAKES**
  - Make sure that concentricity (X) and perpendicularity (Y) do not exceed the allowable values of the table below.
  - Leave at least dimension J or J1 on spline hub types, since the threadlocking compound to bolts used to install brakes.
  - Be careful not to pull excessively on the brake lead wires, bend them at sharp angles, or allow them to hang too low.
  - Be careful when handling such parts and materials as most electromagnetic braking systems are made using flexible materials.
  - Recommended circuit protectors
  - Included varistor
  - Recommended circuit protector device in parallel with the brake.
  - If using a power supply that is not equipped with a circuit protector device, you must confirm that this result is sufficiently smaller than the allowable braking energy $E_{b\text{at}}$ of the selected brake.

#### Environment
- Areas with oil, moisture, dust, and other particles that could affect friction surfaces. Attach the protective cover when working in these areas.
- These brake units are dry braking systems, meaning that the friction surface changes in power supply voltage. Make sure to keep power supply voltage above satisfies the following equation must be selected.

#### 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.

$$Ts > T \text{ (N} \cdot \text{m)}$$

#### 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 the result is sufficiently smaller than the allowable braking energy $E_{b\text{at}}$ of the selected brake.

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

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

$$Eb < E_{b\text{at}} \text{ [J]}$$

#### 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.

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

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 $Eb$ is 70% or more of the allowable braking energy $E_{b\text{at}}$, however, allow the brake to cool sufficiently after emergency braking before resuming use.

#### Operating characteristics

#### Operating time

- **ta**: 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

<table>
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<tr>
<th>Model</th>
<th>Size</th>
<th>Voltage [V]</th>
<th>Switching</th>
<th>ta [s]</th>
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