

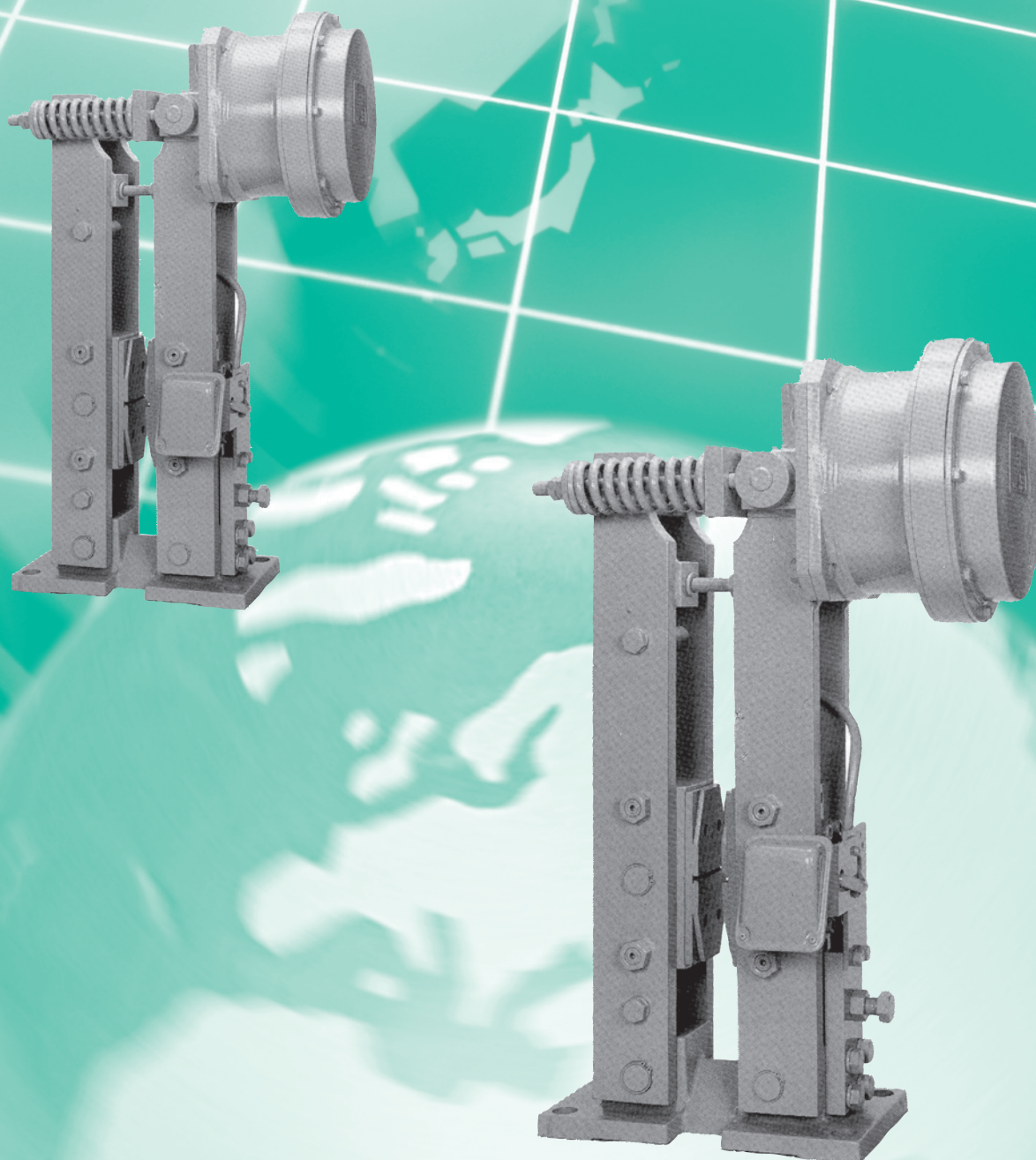


No.SC-192

Disk-type brakes

BRP2 type AC-operated DC electromagnetic brakes

For cranes, general industrial machinery,
and auxiliary steel-rolling machines



Satuma Electric Mfg. Co., Ltd.

The BRP2 type AC-operated DC electromagnetic brakes is a compact disk-type electromagnetic brake used to stop motors equipped with a regenerative braking control system such as inverters.

Features

1. The air damper equipped as standard equipment minimizes shock and noise.
2. An automatic adjustment system is adopted to adjust the vertical gap of the brake lining.
3. Since an unlubricated type bush is adopted for the major pin unit, unlubricated operation is permissible in a general indoor environment.
4. Since the brake lining is made of a sintered alloy, no fade phenomenon occurs, allowing the brake to deliver stable performance, even in a high-temperature environment.
5. Since the brake (lining) is bilaterally symmetrical, it can be mounted on either side of the disk rotor. (Note that the terminal box must be mounted on the reverse side.)

1. Rating

Table 1

B r a k e t y p e	BRP2 type AC-operated DC electromagnetic brakes
A c t u a t i o n	Off brake (Instantaneous strong-excitation type)
A p p l i c a t i o n	For crane hoisting and industrial machinery, For traversing and traveling of cranes (used for motors with regenerative braking control such as inverters)
A m b i e n t t e m p e r a t u r e	-10°C ~ +40°C
Protective structure of operation unit	Dustproof type (Main unit: Unprotected type)
Insulation class of operation unit	Class B insulation
Rated voltage and frequency	200V-50Hz、220V-60Hz、400V-50Hz、440V-60Hz
Usage rate of operation unit	60%
A c t u a t i n g c y c l e	400 cycle/hour
C o a t i n g c o l o r	Munsell 5B5/0.5

2. Specifications

Table 2

Brake type	Electromagnet type	Control box type	Braking torque (N · m)	Disk rotor diameter (mm)	Maximum emergency braking workload (kJ)		Maximum emergency braking rotational speed (min ⁻¹) Note 1
					30 m/s or less	80m/s	
BRP2-180-1	MD15D	BRD-SC	150 ~ 240	Φ 350	568	343	4300
			175 ~ 280	Φ 400	764	461	3800
BRP2-180			270 ~ 395	Φ 350	568	343	4300
			310 ~ 460	Φ 400	764	461	3800
BRP2-225-1	MD17D	BRD-SC	410 ~ 610	Φ 400	764	461	3800
			475 ~ 700	Φ 450	941	568	3300
			540 ~ 790	Φ 500	1130	676	3000
BRP2-225			625 ~ 885	Φ 400	764	461	3800
			720 ~ 1020	Φ 450	941	568	3300
			810 ~ 1150	Φ 500	1130	676	3000
BRP2-280-1	MD24D	BRD-SC	920 ~ 1380	Φ 450	941	568	3300
			1050 ~ 1580	Φ 500	1130	676	3000
			1310 ~ 1970	Φ 600	1680	1010	2500
			1580 ~ 2370	Φ 700	2190	1310	2150
BRP2-280			1410 ~ 1930	Φ 450	941	568	3300
			1610 ~ 2200	Φ 500	1130	676	3000
			2010 ~ 2750	Φ 600	1680	1010	2500
			2410 ~ 3300	Φ 700	2190	1310	2150
BRP2-355-1	MD29D	BRD-SC	2230 ~ 3240	Φ 600	1680	1010	2500
			2700 ~ 3920	Φ 700	2190	1310	2150
			3170 ~ 4590	Φ 800	2960	1770	1900
BRP2-355	MD31D	BRD-LC	3610 ~ 5700	Φ 600	1680	1010	2500
			4360 ~ 6890	Φ 700	2190	1310	2150
			5120 ~ 8080	Φ 800	2960	1770	1900

Note 1: Keep the normal braking rotational speed at approximately 1/10 of the maximum emergency braking rotational speed.

3. External dimensions

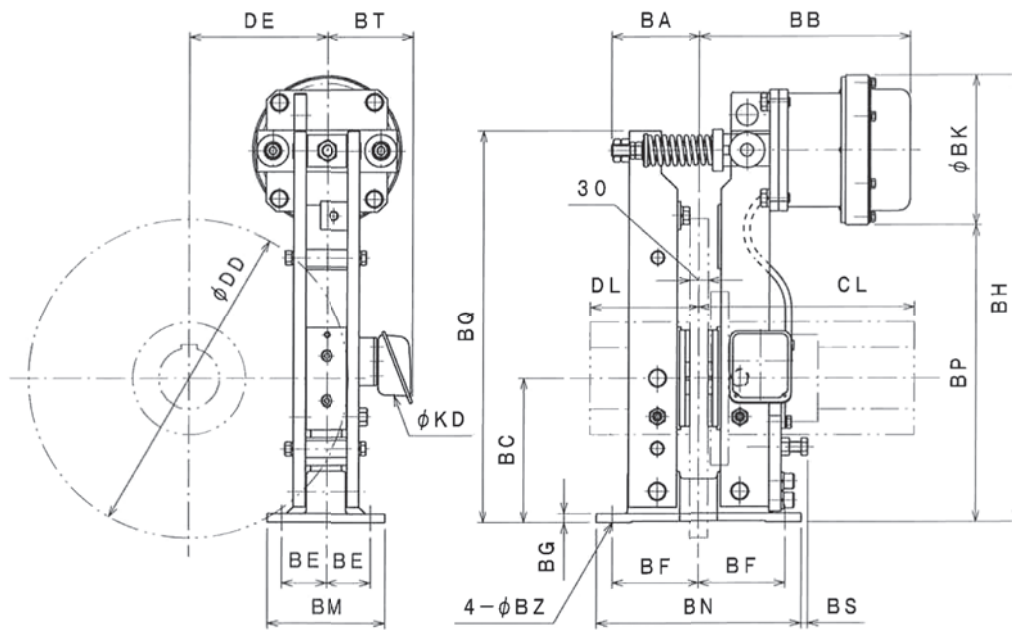
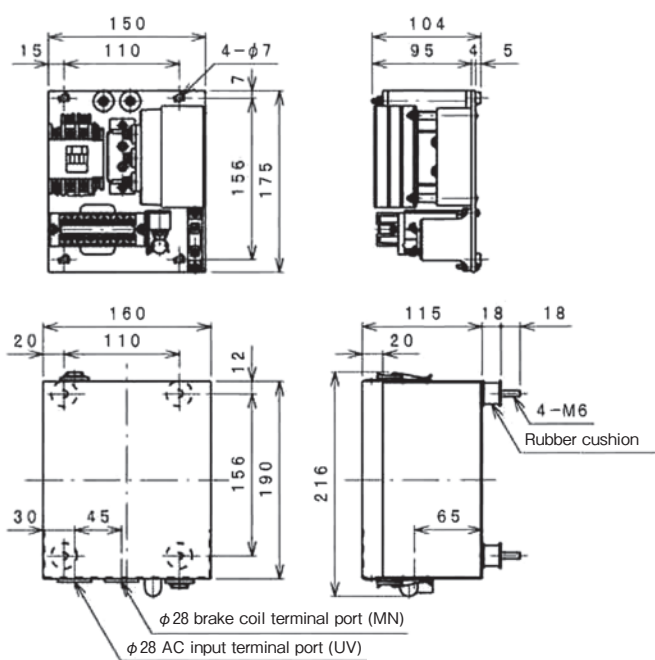


Fig. 1 External brake dimensions (mm)

Table 3 External brake dimensions (mm)

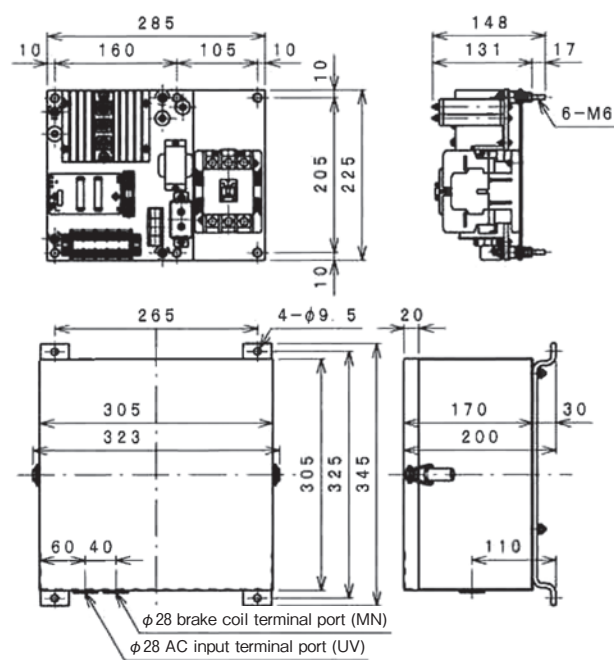
Brake type	Brake main body (mm)																Mass (kg)
	BA	BB	BC	BG	BH	BP	BK	BQ	BE	BF	BM	BN	BS	BZ	BT	KD	
BRP2-180-1 BRP2-180	122 *145	292	180	13	563	350	213	481	60	115	150	260	11	15	125	28	55
BRP2-225-1 BRP2-225	138 *160	328	225	14	699	465	234	612	70	135	185	320	0	24	135	28	85
BRP2-280-1 BRP2-280	170 *185	341	280	22	863	557	306	745	75	160	200	370	8	28	150	28	175
BRP2-355-1	213 *234	394	355	22	1076	714	362	935	100	210	270	490	0	35	194	34	330
BRP2-355	213 *234	454	355	22	1086	704	382	935	100	210	270	490	0	35	194	34	375

Dimensions marked with an asterisk (*) are those obtained when the brake lining has been worn, decreasing to the thickness limit.



Top: Main body (Mass: 2.4 kg) Bottom: With case (Mass: 3.9 kg)

Fig. 2 External dimensions of control box (BRD-SC) (mm)



Top: Main body (Mass: 5.2 kg) Bottom: With case (Mass: 10.5 kg)

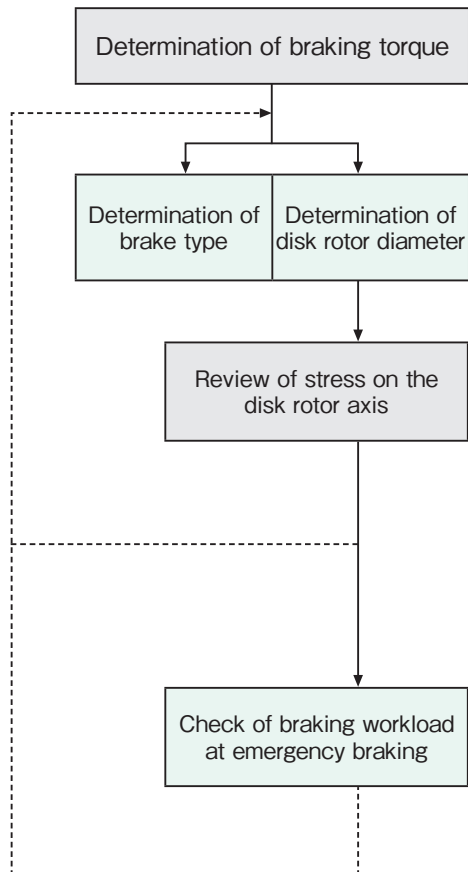
Fig. 3 External dimensions of control box (BRD-LC) (mm)

Table 4 External disk rotor dimensions (mm)

Brake type	Disk rotor diameter	Effective radius	Disk rotor (standard)			Coupling-type disk rotor				
	Φ DD	DE	DL	J (kg · m ²)	Mass (kg)	DL	CL	J (kg · m ²)	Transmitted torque (N · m)	Mass (kg)
BRP2-180-1 BRP2-180	350	145	150	0.34	33	150	300	0.41	380	26/15
	400	170		0.58	40			0.65	430	34/20
BRP2-225-1 BRP2-225	400	165	170	0.58	42	170	335	—	—	—
	450	190		0.95	53			1.17	1100	49/41
	500	215		1.43	67			1.60	1450/1940	58/45
BRP2-280-1 BRP2-280	450	175	200	0.95	57	200	350	—	—	—
	500	200		1.43	72			—	—	—
	600	250		3.00	103			3.25	2800	89/76
	700	300		5.50	141			5.85	3400	115/85
BRP2-355-1	600	240	240	3.00	104	240	400	—	—	—
	700	290		5.50	163			5.93	4500	123/108
	800	340		9.00	189			9.75	6800	171/165
BRP2-355	600	240	240	3.00	104	240	465	—	—	—
	700	290		5.50	163			5.93	4500	123/108
	800	340		9.00	189			9.75	6800	171/165

4. Selection

Select an appropriate brake by following the procedure shown below.



(Hoisting): 185 to 200% of motor torque

(Traversing and traveling): 70 to 100% of motor torque

The maximum rotation speed shall not exceed the maximum emergency braking rotational speed.

(Keep the normal braking rotational speed at approximately 1/10 of the maximum emergency braking rotational speed.)

When braking is to be performed using only one brake, bending moment is applied to the disk rotor shaft. Check the stress in this case.

If the stress is considerable, place brakes on both sides of the disk rotor (two brakes) and halve the braking torque.
(For hoisting: 100% of motor torque × two brakes)

The braking workload shall not exceed the maximum emergency braking workload.

(Recheck if the braking workload exceeds the maximum emergency braking workload.)

5. Installation site for the brake and disk rotor

Install a disk rotor on the direct-coupling side if the motor is of the bilateral-shaft type.

(The disk rotor cannot be installed on the side of a self-cooling fan, in principle.)

6. Face deflection of the disk rotor

Limit the face deflection of the disk rotor to 0.07 mm or less.

General expressions used for brake calculations

1. Braking torque

$$T_B = \frac{9550 \times kW}{n} \times F \text{ (N} \cdot \text{m)}$$

$$T'_B = \frac{974 \times kW}{n} \times F \text{ (kgf} \cdot \text{m)}$$

2. Braking time

$$t_B = \frac{J \times n}{9.55 \times (T_B \pm T_L)} \text{ (s)}$$

$$= \frac{GD^2 \times n}{375 \times (T_B \pm T_L)} \text{ (s)}$$

3. Rotation speed at start of braking

$$n_B = n + \Delta n$$

$$= n + \frac{9.55 \times (\pm T_L) \times \Delta t}{J} \text{ (min}^{-1}\text{)}$$

$$= n + \frac{375 \times (\pm T_L) \times \Delta t}{GD^2} \text{ (min}^{-1}\text{)}$$

4. Braking distance

To determine the braking distance, calculate the rotation volume of the motor up to stop, and perform a proportional calculation based on the motor-rotation speed and the speed of the load.

- Rotation volume of the motor up to stop

$$R = \frac{n + n_B}{60} \times \frac{1}{2} \times \Delta t + \frac{n_B}{60} \times \frac{1}{2} \times t_B \text{ (Rotation)}$$

- Braking distance

$$S = V \times \frac{R}{n} \text{ (m)}$$

5. Braking workload

- Braking workload for an operation

$$A_B = \frac{J \times n^2}{183} \times \frac{T_B}{T_B \pm T_L} \text{ (J)}$$

$$A'_B = \frac{GD^2 \times n^2}{7160} \times \frac{T'_B}{T'_B \pm T'_L} \text{ (kgf} \cdot \text{m)}$$

- Braking workload per minute

$$E_B = A_B \times Z \text{ (J/min)}$$

$$E'_B = A'_B \times Z \text{ (kgf} \cdot \text{m/min)}$$

T_B : Braking torque (N·m)

T'_B : Braking torque (kgf·m)

kW : Motor output (kW)

n : Motor-rotation speed (min⁻¹)

F : Constant related to load conditions and stopping time

(Hoisting 2.0~1.85)
(Traversing, traveling 1.0~0.7)

J : Total moment of inertia converted to brake shaft (kg·m²)

$GD^2 = 4J \cdots$ Balance wheel effect (kgf·m²)

t_B : Braking time (s)

T_L : Load torque (N·m)

T'_L : Load torque (kgf·m)

Value converted into brake shaft

Code - represents the direction reverse to brake torque (lowering)

Code + represents the same direction as brake torque (hoisting)

Δn : Change in motor-rotation speed due to dead time (min⁻¹)

Δt : Dead time up to start of braking operation (s)

n_B : Rotation speed at the start of braking operation (min⁻¹)

R : Rotation volume of motor up to stop (rotation)

S : Braking distance (m)

V : Speed of load (m/min)

Z : Braking frequency (cycle/minute)

A_B : Braking workload per operation (J)

A'_B : Braking workload per operation (kgf·m)

E_B : Braking workload per minute (J/min)

E'_B : Braking workload per minute (kgf·m/min)

When ordering and making an inquiry

Please inform us of the following:

1. Application: Crane type, classification (hoisting, traversing, and traveling), usage rate, Rating of operations (cycle/hour), moment of inertia of the load
2. Operation environment: Indoor/outdoor use, ambient temperature
3. Brake type and Disk rotor diameter
4. Motor rating: Output/load hour rate, voltage, frequency (availability of inverter control regenerative braking)
5. Braking torque
6. Operation power supply: voltage, frequency
7. Spare parts



Safety precautions

Be sure to read the "Instruction Manual" or equivalent carefully before using the brake.

Contact for inquiries:

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