Instruction Manual

BE-A/B Type Dynamic Brake (DYNASERV dedicated board type)

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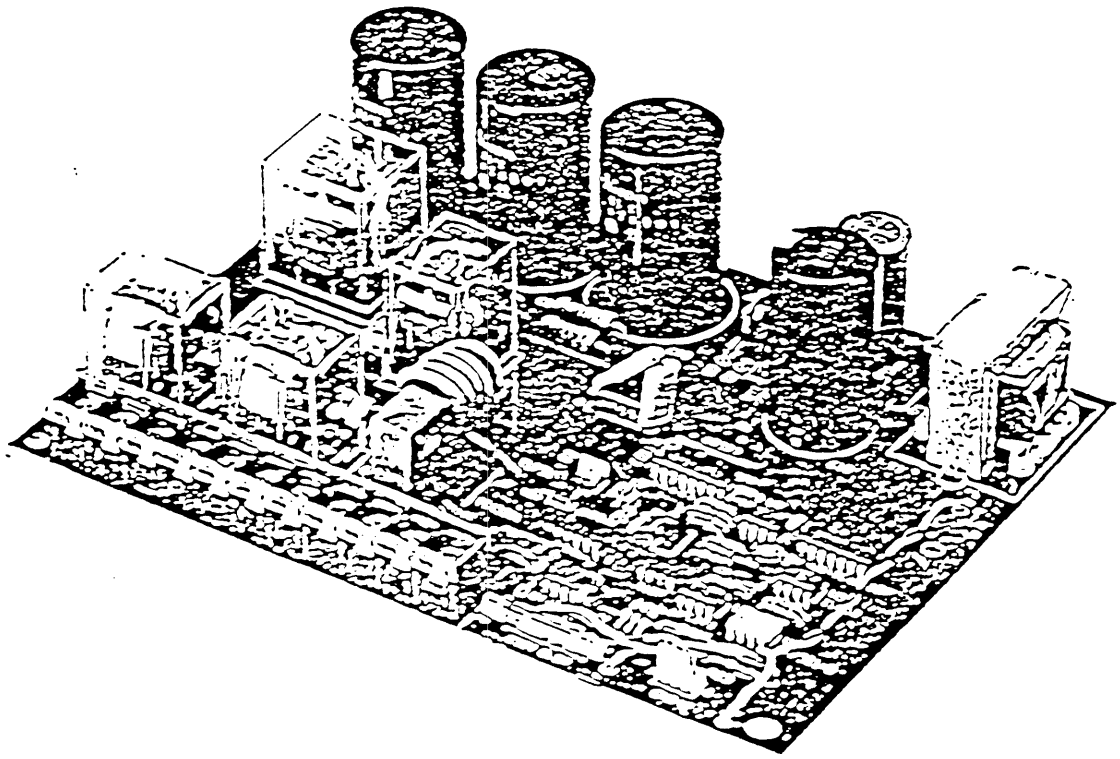


Introduction

Thank you for purchasing our DYNASERV-dedicated dynamic brake. This generation type brake was developed for DYNASERV DD motors and is of simple construction, making it easy to assemble into industrial machinery such as robots with built-in DYNASERV and hence, suitable for a wide range of applications.

This instruction manual describes those items that are considered to be necessary when using this brake so that its functions and usage cautions are fully understood prior to commencing operation.

Cautions

- Copying of part or all of the contents of this manual is strictly prohibited.
- The contents of this manual may be subject to change without notice.
- This manual is prepared carefully, but if any mistakes and/or omissions are found, please contact our sales or service representative immediately.
- Any damage or indirect damage due to our unintentional mistakes as a result of operation in accordance with this instruction manual may not our responsibility.

Contents

1. Outline

This negative action type electric power generation brake was developed especially for DYNASERV and has the following features.

- ◆ Simple construction ... No mechanical devices are required in the motor section, and efficient torque control is achieved simply by connecting this brake between the motor and driver sections.
- ◆ Power failure compensation ... Even during power failure, the same control torque as that at power-ON is available, through the use of a built-in power failure compensator.
- ◆ Both velocity change and capacitor types are available. ... Both velocity change and capacitor versions of this brake are available. The former is suitable for either high or low velocity applications while the latter is for use in the high-velocity area, making the model range suitable for a wide range of applications.
- ◆ Maintenance free

2. Operational Cautions

(1) Because the brake was designed especially for use with DYNASERV, it may not display its specified performance when used with other motors.

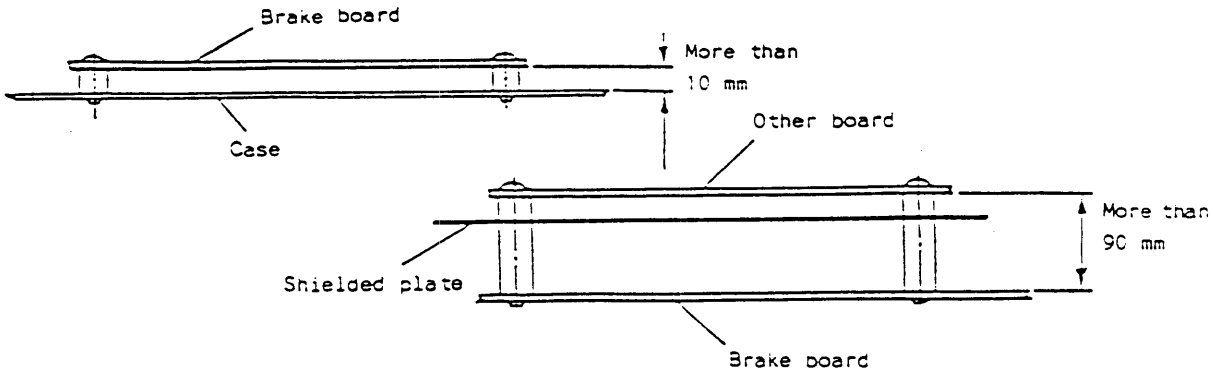
(2) When the brake has been activated, do not attempt to rotate the stopped motor by force, as doing so may overheat the internal resistor.

(3) When coupling this brake to a DYNASERV, do not mistake the connection of the A, B and C phases and GND, especially in the motor and driver sections, as doing so may stop DYNASERV from operating normally.

(4) When this brake is operated repeatedly, operate it at minimum intervals of 1 minute, otherwise the internal resistor may overheat.

(5) Both 100 V AC and 200 V AC power supply voltages are available. Always check to make sure that the correct one is being used.

(6) When installing the brake board, separate it from the case by more than 10 mm or keep it away from other boards more than 90 mm when the other board is laid on top of the parts installation side of the brake board. (See the figure below.) Also, if necessary, install a shielded plate as shown in the following figure.



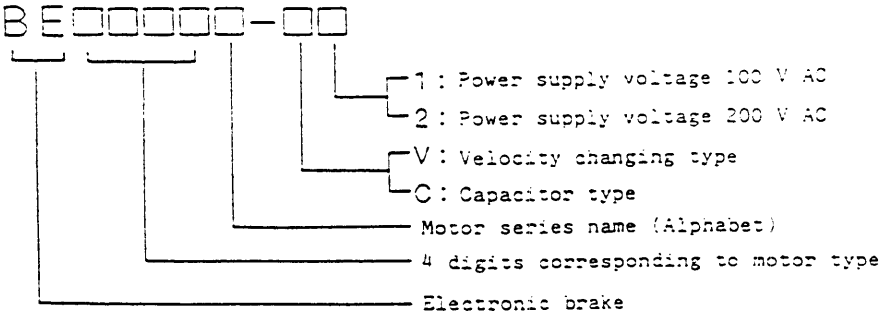
3. Specifications

Product Model No.	BE1200A	BE1150A	BE1100A	BE1050A	BE1045B	BE1030B	BE1015B
Applicable motor	DM1200A	DM1150A	DM1100A	DM1050A	DM1045B	DM1030B	DM1015B
Braking angle (Max.)	110°	110°	120°	160°	200°	230°	270°
Measured condition: No. of revolutions (rps)	1				2		
Measured condition: Load inertia ($kg \cdot m^2$)	5.0	4.3	3.6	2.9	0.6	0.5	0.4
Construction	Printed board type						
Dimensions (L x W x H mm)	210 × 170 × 55 (Max.)						
Weight (g)	1000 (Max.)						
During operation: Ambient temperature (℃)	0~50						
During operation: Ambient humidity (%)	20~90RH (No dew condensation allowed)						
During storage: Ambient temperature (℃)	-20~85						
During storage: Ambient humidity (%)	20~90RH (No dew condensation allowed)						
Atmosphere	Corrosive gases and/or dust should not exist.						
Power supply	AC100V/200V $^{+10\%}_{-15\%}$, 50/60Hz (100 V or 200 V AC: Determined by Model No.)						
Power consumption (W)	10						

Note: Braking rotation angle ... The values shown in the above table are those measured in accordance with the above measured conditions, and are for the velocity changing type. For braking revolution angles when load conditions are changed, see page 17.

4. Model No.

Product Model No. has the following meaning.



Example: BE1200A-V2
Electronic brake
Corresponding to the 1200 motor type
A Series
Velocity changing type
Power supply voltage: 200 V AC

5. Product Configuration

This brake consists of the following device and accessories when it is purchased.

Name		Q'ty	Remarks
Mainframe		1	
Standard accessories	Connector	1	Type No. 5051-04 (Made by MOLEX)
	Terminals	4	Type No. 5159TL (Made by MOLEX)

6. Dimensional Outline Drawing and Mounting Diagram (Unit: mm)

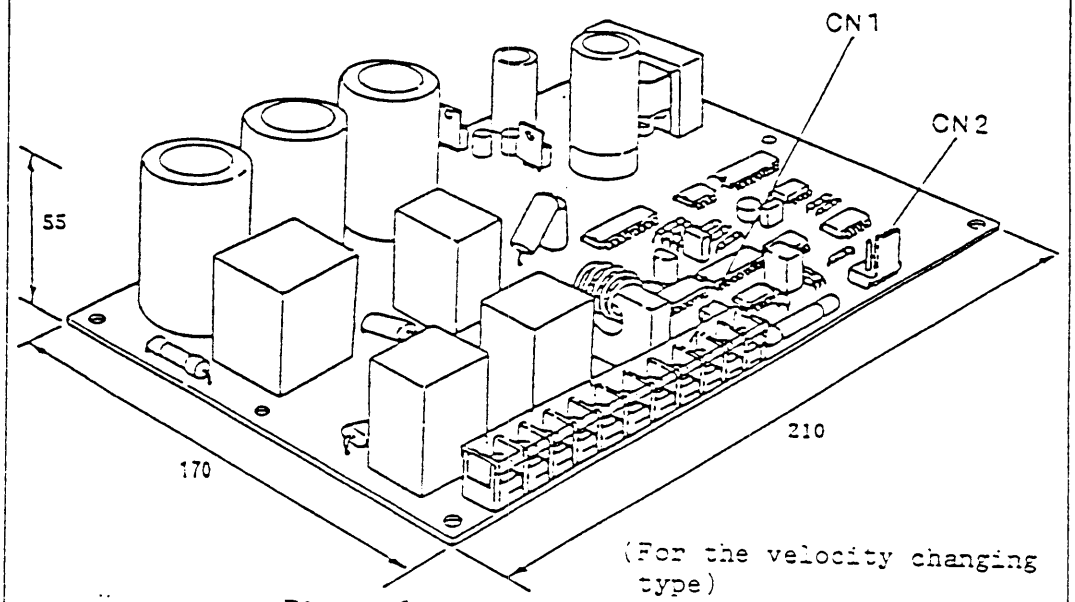


Figure 6-1 Dimensional Outline Drawing of Dynamic Brake

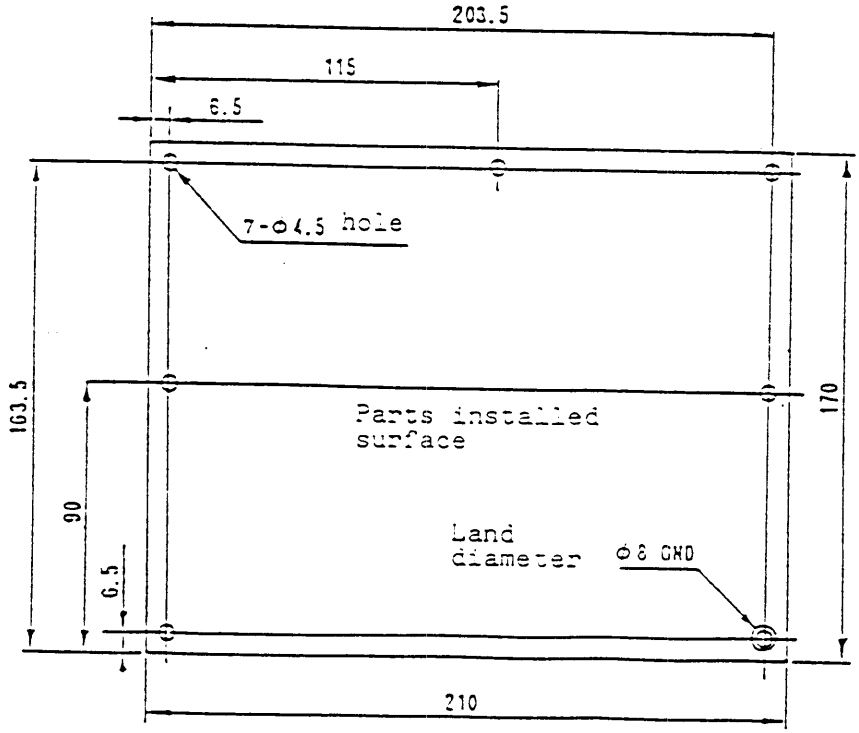


Figure 6-2 Mounting Diagram

7. Interface

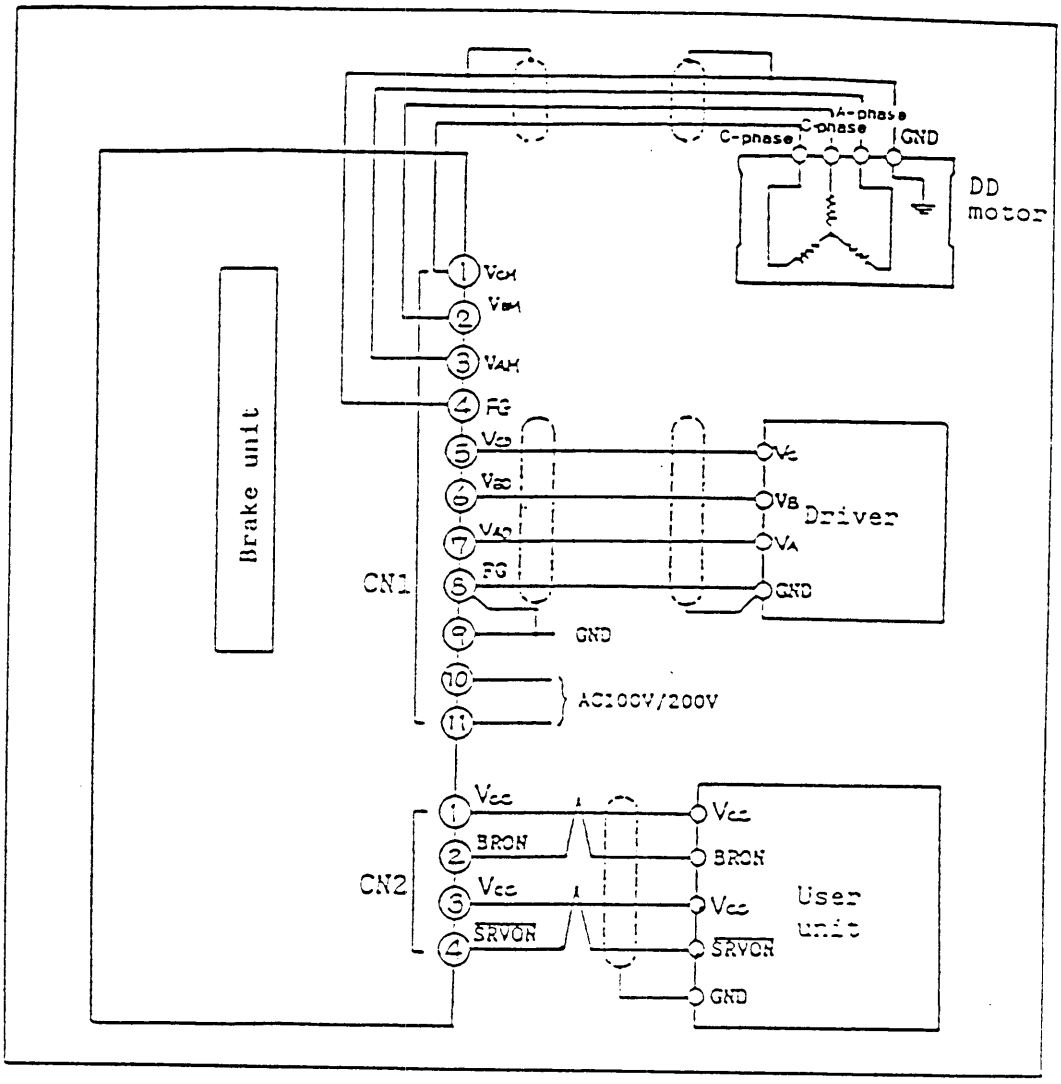


Figure 7-1 Interface Connection Diagram

Connector No.	Signal name	Meaning
CN1-1	V_{CM}	Motor C-phase
2	V_{BM}	Motor B-phase
3	V_{AM}	Motor A-phase
4	FG	Frame grounding
5	V_{CD}	Driver C-phase
6	V_{BD}	Driver B-phase
7	V_{AD}	Driver A-phase
8	FG	Frame grounding
9	GND	Grounding
10	AC	AC input
11	AC	AC input

Connector No.	Signal name	Meaning
CN2-1	Vcc	Power supply voltage
2	BRON	Brake ON
3	Vcc	Power supply voltage
4	$\overline{\text{SRVON}}$	Servo ON

V_{CC} = + 5V to + 12 V

8. Wiring

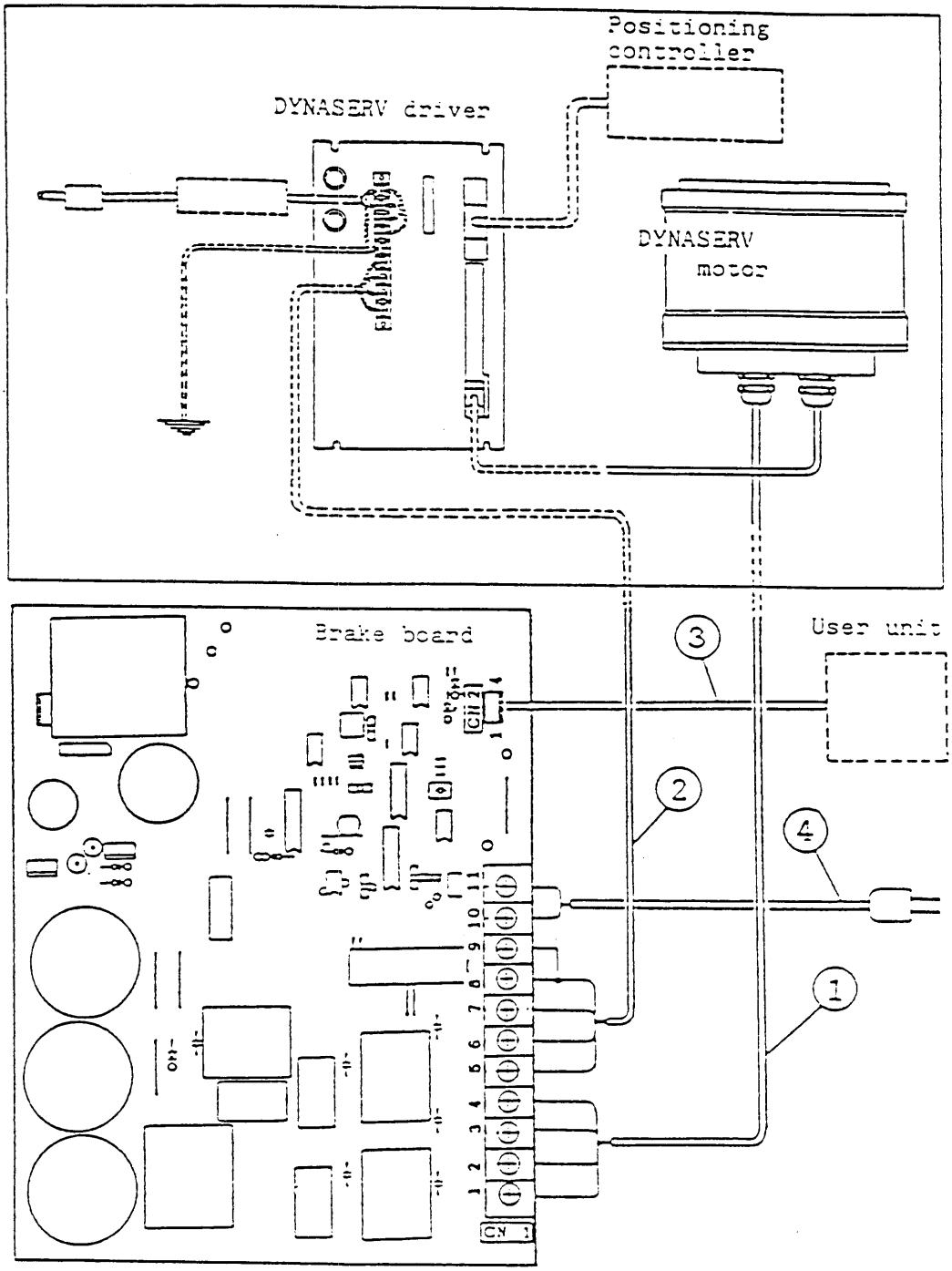


Figure 8-1 Wiring Diagram

Notes: Cables used for wiring related to the brake in the above wiring diagram should be as follows.

① Same specifications as those of the power cable from the motor: Current capacity 20 A (A Series), or 15 A (B series)
Cable size: HIV 2.0 mm² or more,
Length : less than 30 m (① + ②)

② Same as in ①

③ Current capacity: More than 100 mA DC
Twisted pair collectively shielded wire (core cross section: More than 0.2 mm², zinc plated, twisted soft copper wire) Length: Less than 30 m

④ Current capacity: More than 1A AC

To avoid miss operation by electrical noise, wiring should take care of as follows

(1) To insert serge current absorb circuit, when used solenoid, relay, and other magnetic switch on line or closed.

(2) To insert noise filter on power souce line and input signal line, when existing high frequency noise generated souce on line or closed.

9. Circuit Configuration and Operation

(1) Circuit configuration

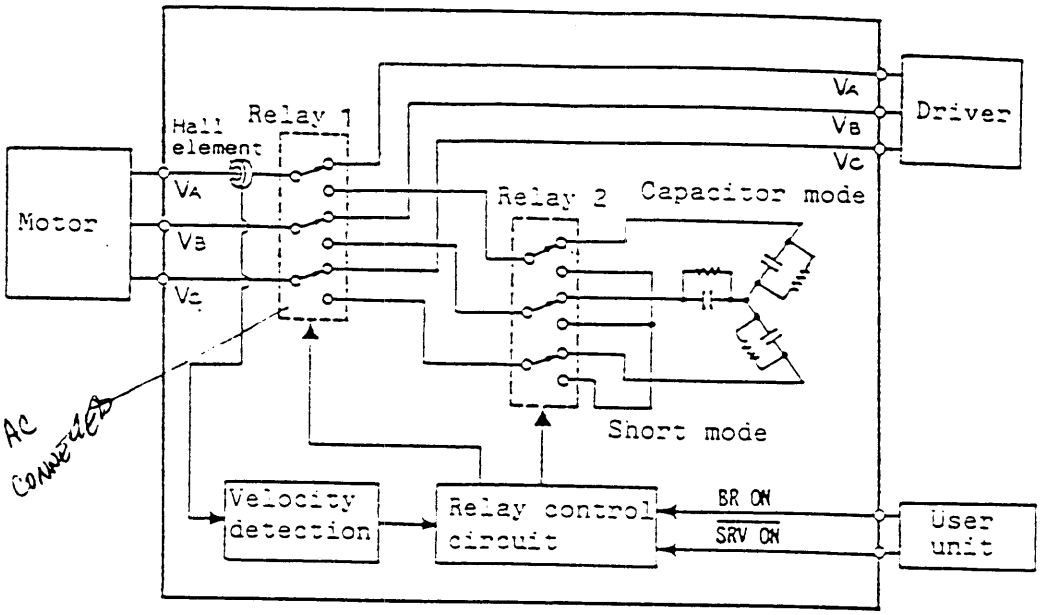


Figure 9-1 Circuit Configuration Block Diagram

Note: In the capacitor type circuit configuration
There is no "Relay-2", but the motor output is directly connected to the capacitor circuit from "Relay-1".

(2) Operation

· Velocity changing type

Both high and low-velocity types are effective. Greater braking torque is obtained with the coil shorted than that of the capacitor type at low velocity. It is possible automatically to select the capacitor mode and the short mode by detecting the velocity.

If the <BRON> and <$\overline{\text{SRVON}}$> signal from the user unit is set to "H" or the power supply is suspended, "Relay-1" is turned OFF and the motor is connected to the capacitor mode of "Relay-2".

Next, as shown in Figure 9-2, braking torque in the capacitor mode becomes smaller than in the short mode, so "Relay-2" is turned OFF to short the motor.

· Capacitor type

This is effective in the high-velocity region. The effect of motor coil inductance becomes large at high velocity, and therefore it is restricted by a capacitor which converts rotating energy to thermal energy.

Operation is the same as that of the velocity changing type, but no short mode is available.

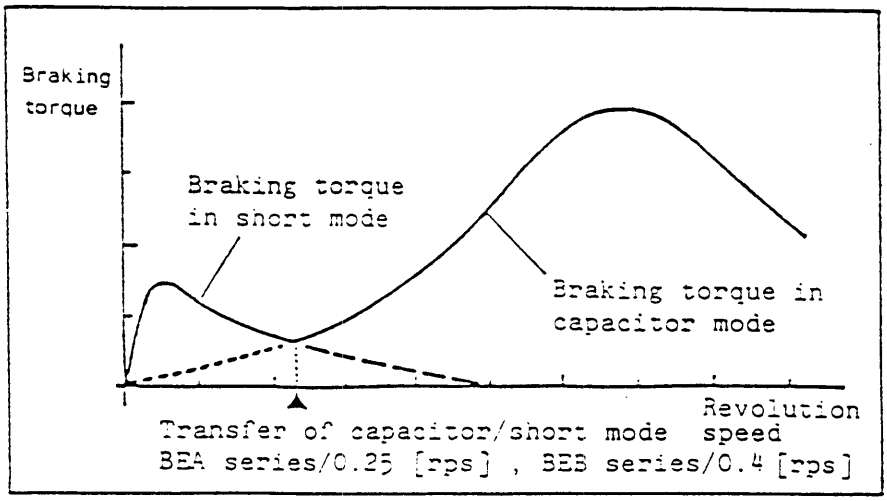


Figure 9-2 Generated Torque Diagram

From the above, when selecting the brake, refer to the following table.

Motor rotation speed [rps]		Braking
A Series	B Series	
0 to 1.2	0 to 2.4	Velocity changing type
0.25 to 1.2	0.4 to 2.4	Capacitor type
0 to 0.25	0 to 0.4	Short mode

(3) Interface circuit configuration

The CN2 terminal on this brake consists of a photocoupler as shown in the following diagram.

Inputting <VCC> activates the circuit, but the "H" or "L" input signal in this case has the following meaning.

"H": <VCC> level voltage (VCC = +5 V to +12 V)

"L": <GND> level voltage

Note: Other pins ③ and ④ on the CN2 terminal have the same circuit configuration.

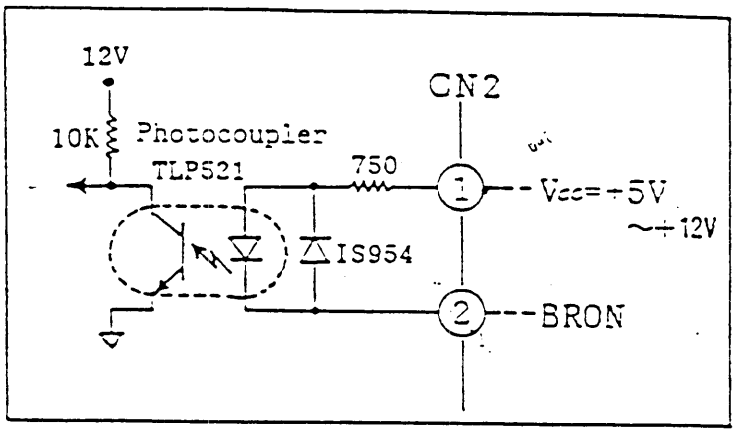


Figure 9-3 Interface Circuit Configuration

(4) Signal and operation status

<BRON>	<$\overline{\text{SRVON}}$>	<Relay 1>	Connection with motor	Brake power
-	-	OFF	Short	OFF
L	L	ON	Driver	ON
L	H	ON	Driver	ON*
H	H	OFF	Capacitor, short	ON**

Note: *: In this status, a robot can be programmed directly.

**: When the power is turned from ON to OFF, this means a power failure has occurred, but operation is the same as in the power-ON status due to power failure compensation.

10. Operation Procedure

(1) Preparation

Turn OFF the driver power of DYNASERV in use.

Remove the power cable from the motor.

(2) Connection

Connect and wire the brake between the motor and the DYNASERV driver in accordance with the connection diagram.

(3) Operation procedure

① Prior to turning ON the DYNASERV power, turn ON the brake power. AC for Brake

② Disconnect the connection of the brake CN2 terminal, or set the <BRON> and <$\overline{\text{SRVON}}$> signal to "H".

③ Check to see if the brake is activated in this status.

④ Next, connect the brake's CN2 terminal, then set the <BRON> and <$\overline{\text{SRVON}}$> signals to "L".

⑤ Check to see if the brake is released in this status.

⑥ Turn ON the DYNASERV's driver power.

Set the <$\overline{\text{SRVON}}$> signal to "L" and the mode to the test mode, then check to see if the brake is activated normally. MOTOR NORMAL OPERATION

If the above operation causes no abnormality, the brake is operating normally.

11. Trouble and Measures

Trouble	Probable cause	Inspecting items	Measures
The motor does not start	Incorrect connection	Check the connection of the motor's A, B and C phases and GND.	Make sure that the wiring is correct by referring to the wiring diagram.
	Incorrect power supply wiring	Check the wiring.	Make sure that the wiring is correct by referring to the wiring diagram.
	Fuse burnt out in the brake circuit	Check the fuse.	Replace the board if the fuse is burnt out.
Motor rotation is instable.	Incorrect connection	Check the connection of the motor's A, B and C phases and GND.	Repair the faulty section.
The brake is not activated.	Incorrect signal wiring	Check the wiring.	Make sure that the wiring is correct by referring to the wiring diagram.

Note: If it is assumed that the brake is faulty, the board itself should be replaced. Therefore, do not replace or repair any parts on the board.

If the brake fails or is damaged in the normal operating status due to defect attributed to faulty manufacture, within one year of the date of purchase, it will be repaired free of charge.

12. <Reference Data> Quick Reference Braking Revolution Angle Graphs

The following graphs show the relationship between load inertia (load inertia moment) and braking revolution angle with respect to revolution speed.
All the braking revolution angles are maximum values. Each graph is a plot of braking revolution angle with respect to each revolution speed when load inertia is changed at up to 30 times rotor inertia (JM). This is shown for both the speed changing and capacitor types.
Braking angle can be read from each graph when load inertia and revolution speed are known, but when an intersecting point does not fall on the curve, the angle can be read as an approximate value. Each graph is only for your reference.

(1) Speed changing type

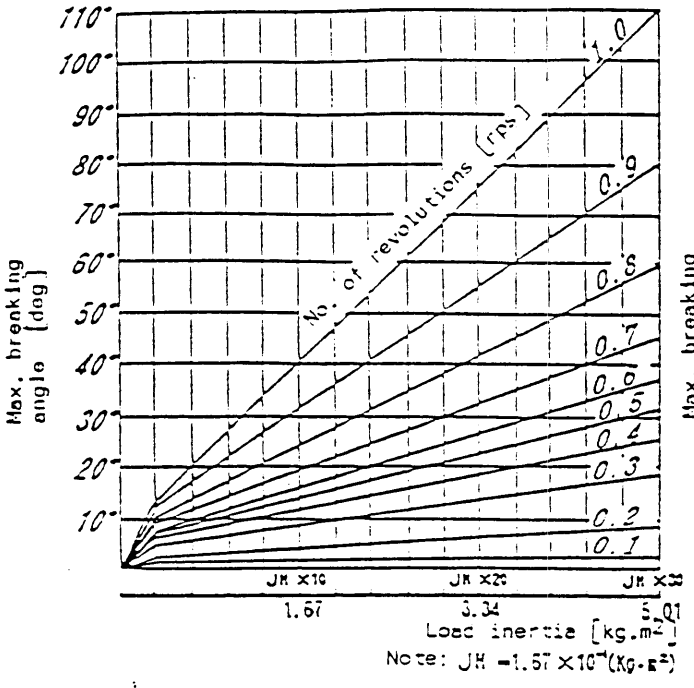


Figure 12-1 DM1200A+BE1200A-V

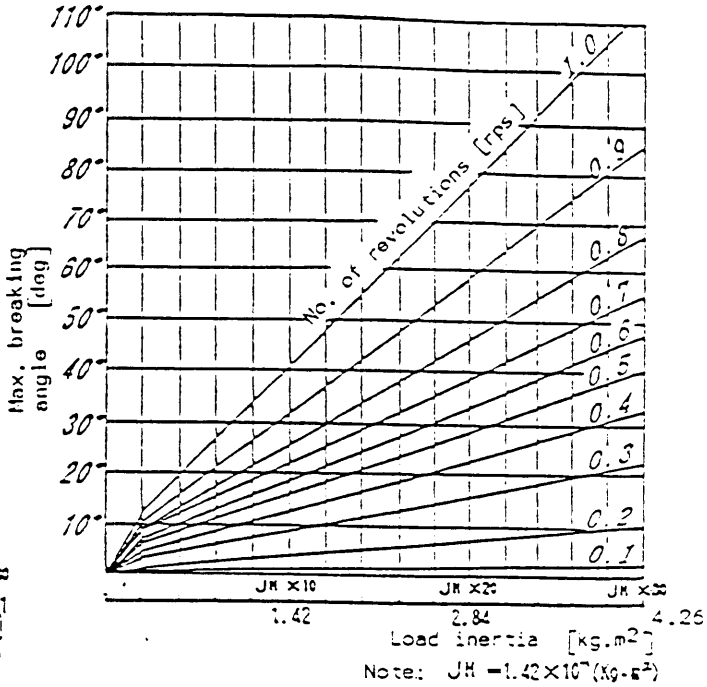


Figure 12-2 DM1150A+BE1150A-V

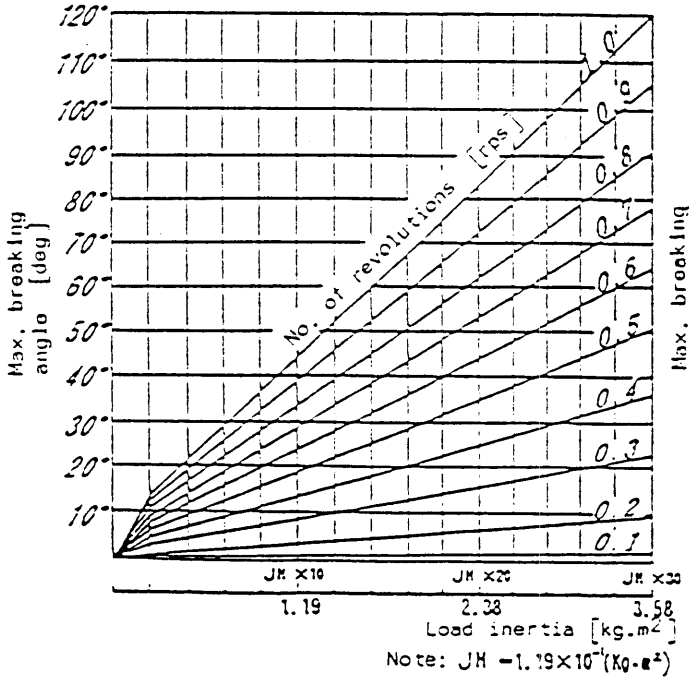


Figure 12-3 DM1100A+BE1100A-V

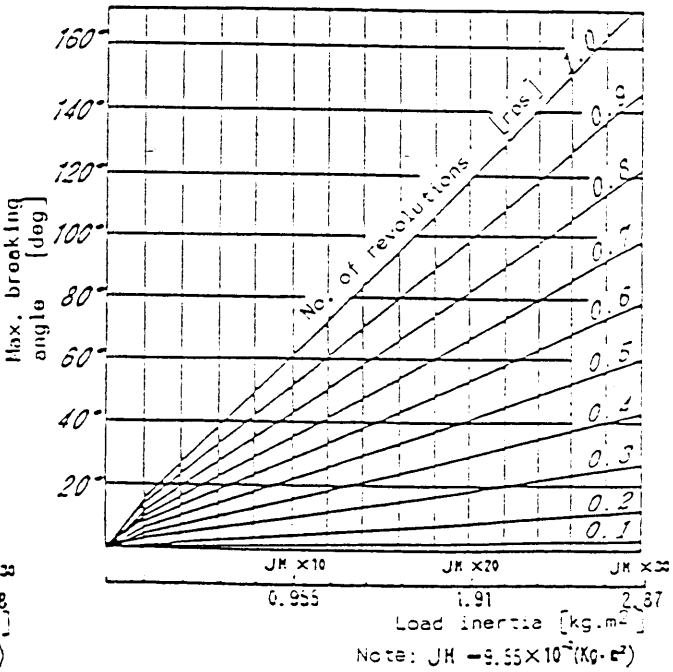


Figure 12-4 DM1050A+BE1050A-V

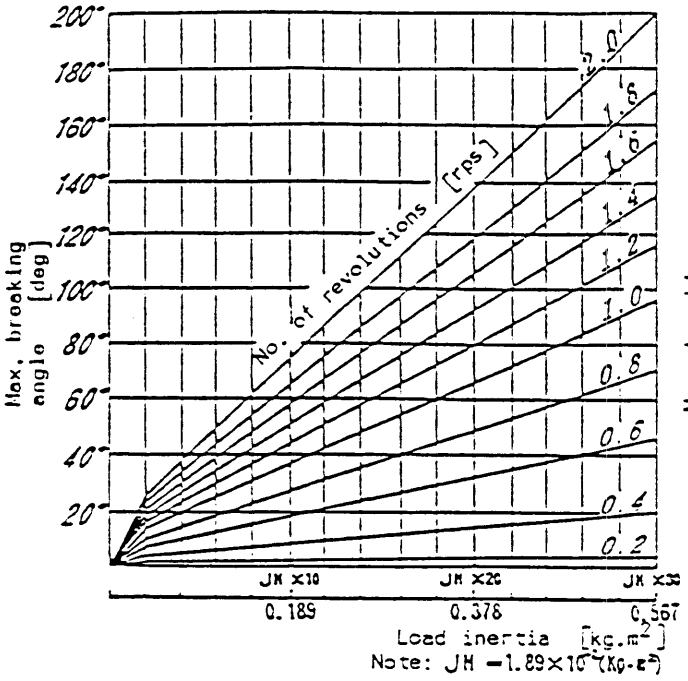


Figure 12-5 DM1045B+BE1045B-V

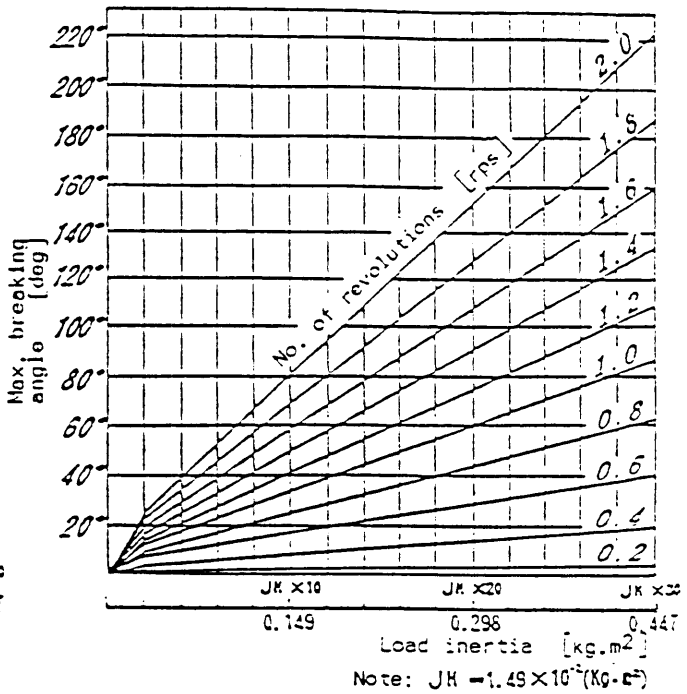


Figure 12-6 DM1030B+BE1030B-V

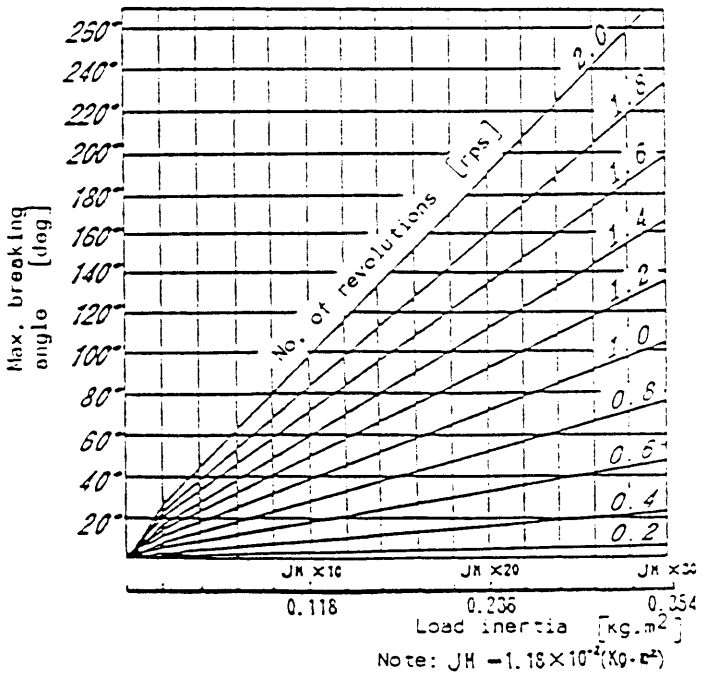


Figure 12-7 DM1015B+BE1015B-V

(2) Capacitor type

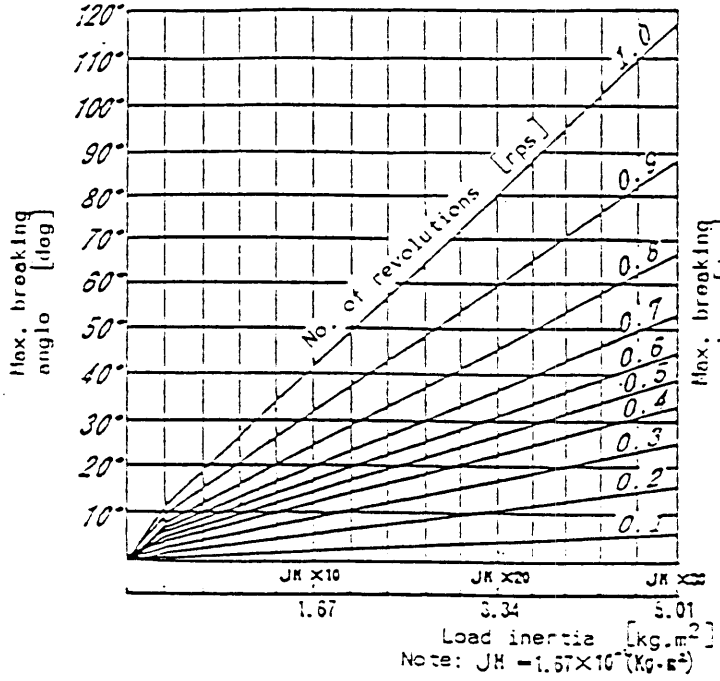


Figure 12-8 DM1200A+BE1200A-C

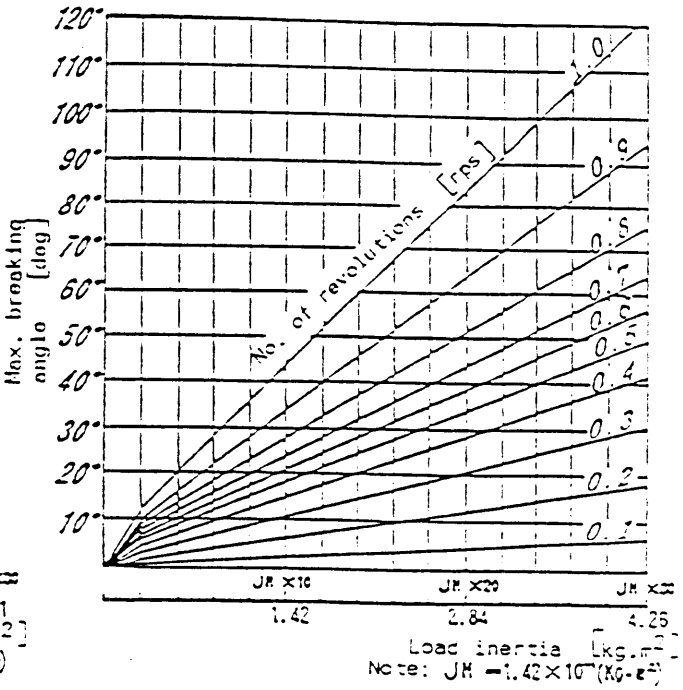


Figure 12-9 DM1150A-BE1150A-C

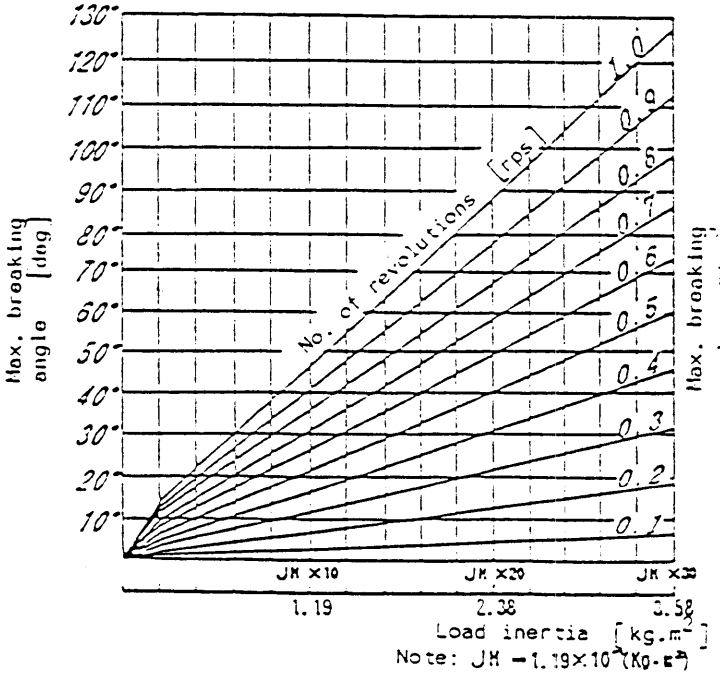


Figure 12-10 DM1100A-BE1100A-C

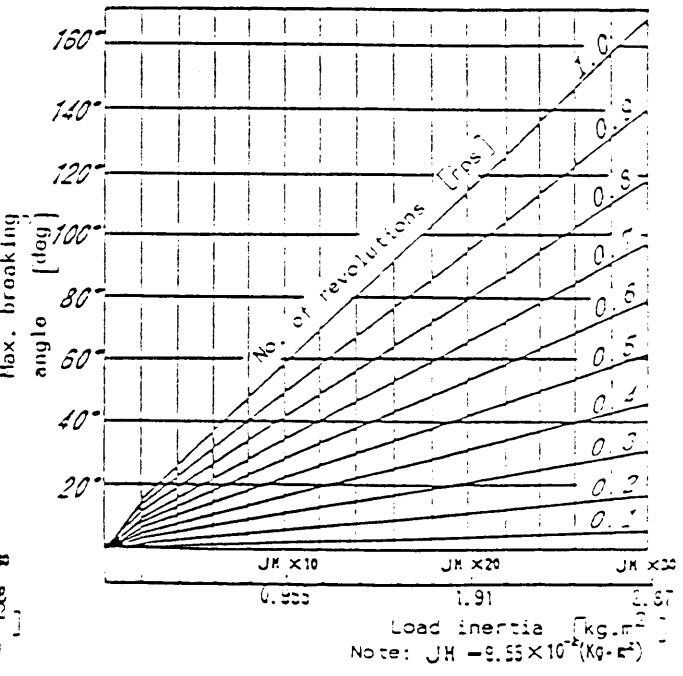


Figure 12-11 DM1050A-BE1050A-C

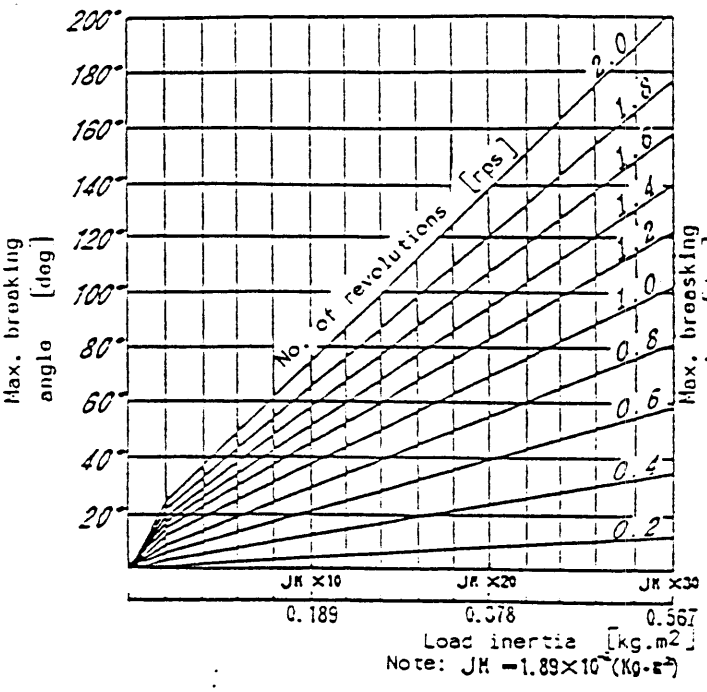


Figure 12-12 DM1045B+BE1045B-C

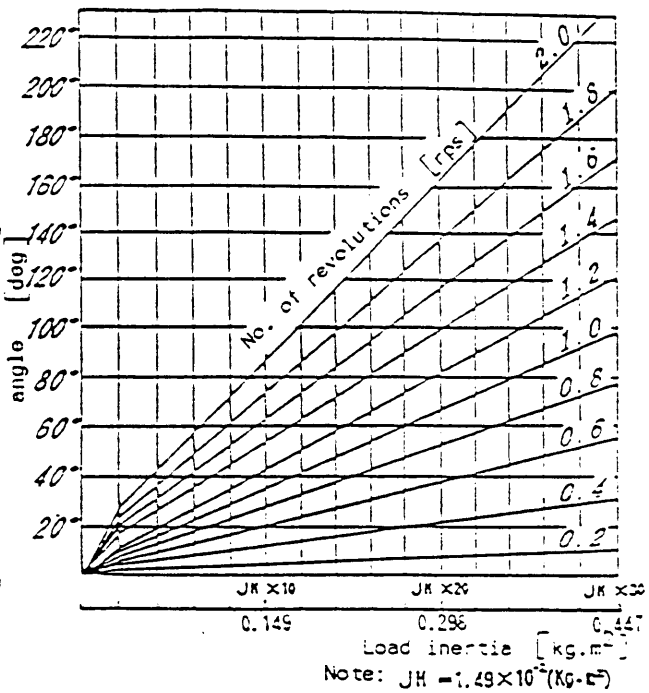


Figure 12-13 DM1030B+BE1030B-C

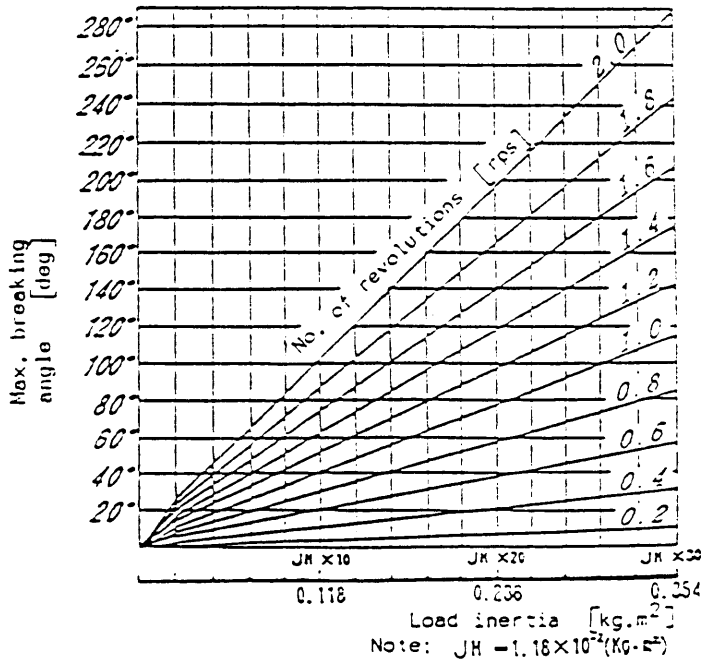


Figure 12-14 DM1015B+BE1015B-C