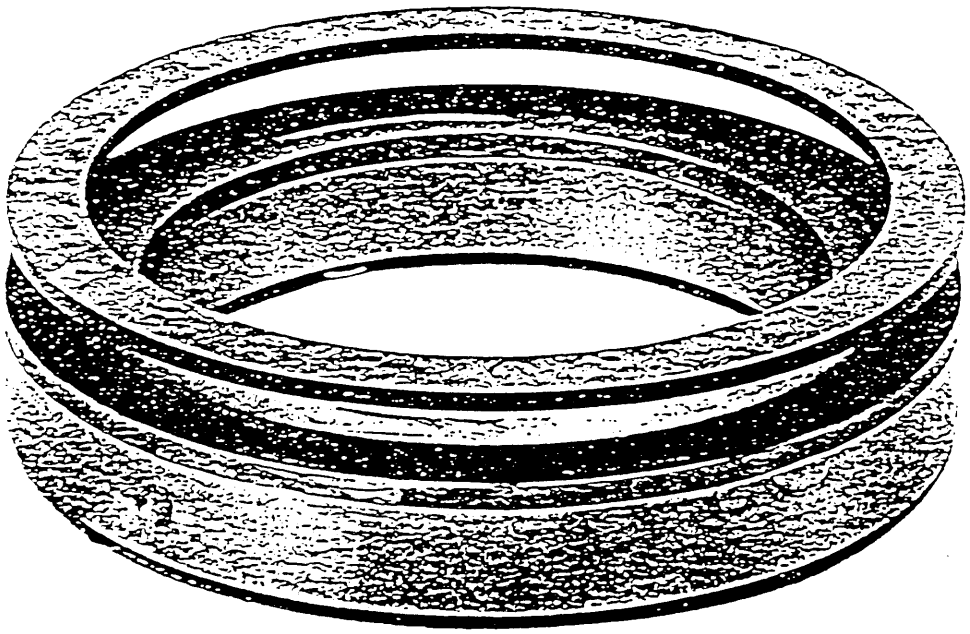
Instruction Manual

Dry Type Negative Actuation Magnetic Brake for DYNASERV

Model / BXM

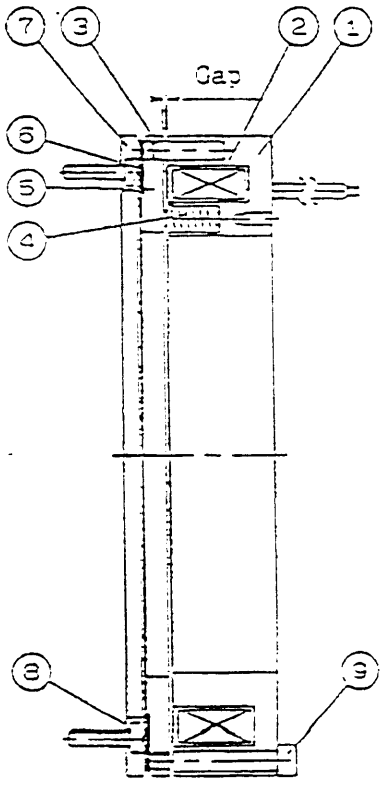


1. GENERAL SPECIFICATION

Model		□BXM2.5-000B	□BXM10-000B
Applicable DYNASERV type		DM Series Type B	DM Series Type A
Rated voltage (DC/V)		24	24
Input (W/20℃)		28	45
Positive friction torque (N.m)		20	110
Spring pressure (N)		650	2100
Gap (mm)		0.2	0.2
Accessories	Hexagon socket head cap screw	M4 × 16 - 6 pcs.	M4 × 20 - 12 pcs.
	Hexagon socket head bolt	M5 × 33 - 4 pcs.	M5 × 40 - 4 pcs.

2. CONSTRUCTION

No.	Name
1	Yoke
2	Coil
3	Pin
4	Spring
5	Armature
6	Facing
7	Friction disc
8	Hexagon socket head cap screw
9	Hexagon socket head bolt



3. OPERATION

In this brake, the brakes are applied by spring pressure and released by electric magnets.
Friction disc (7) is secured to the motor by hexagon socket head setscrew (8). Armature (5) and facing (6) are mated with pin (3) in Yoke (1) and are pushed against friction disk (7) by spring (4).
When current flows through coil (2) molded into yoke (1), yoke (1) acts as magnet to attract armature (5) against the force of spring (4). Thus, the brake is released.
When the current flowing through coil (2) is cut off, armature (5) moves apart from yoke (1) under the force of spring (4) to push facing (6) against friction disc (7) while sliding along pin (3), causing braking.

<Note>

The gap between the pole surfaces of yoke (1) and armature (5), when current flowing through coil (2) is cut off, directly influences brake torque and action. If it exceeds a maximum value, armature (5) is not attracted thus failing to release the brake. Therefore, always maintain its constant value.

	BXM2.5-000B	BXM10-000B
St'd value (mm)	0.2	0.2
Maximum value (mm)	0.4	0.6

4. STOP ANGLE CALCULATION EQUATION

Stop angle of this brake is calculated from the following equation.

θ : Stop angle $= (t + t_1 + t_2) \cdot 360 \cdot n$

t : Braking time $= \dfrac{GD^2 \times 60 \times n}{2 \times 37.5 \times Td}$ [sec]

t_1 : Brake open time [sec]

t_2 : Relay delay time [sec]

GD^2 : 4J (J: Moment of inertia [kg·m²])

n : No. of revolutions [rps]

Td : Dynamic friction torque (Static friction torque Ts × 0.7) [N·m]

<Calculation example>

- Motor used: DM1060B
- Load conditions: Load inertia <J> = 10× J_M (J_M = 0.023 kg·m² Rotor inertia of motor used) <J> = 0.23 kg·m²
- No. of revolutions: n = 1 rps
- Dynamic friction torque: T_d = 14N·m
- Brake open time : t_1 = 0.06 sec (Reference value: For BXM10 — 0.1 sec)
- Relay delay time: t_2 = 0.082 sec (To vary with operation condition)

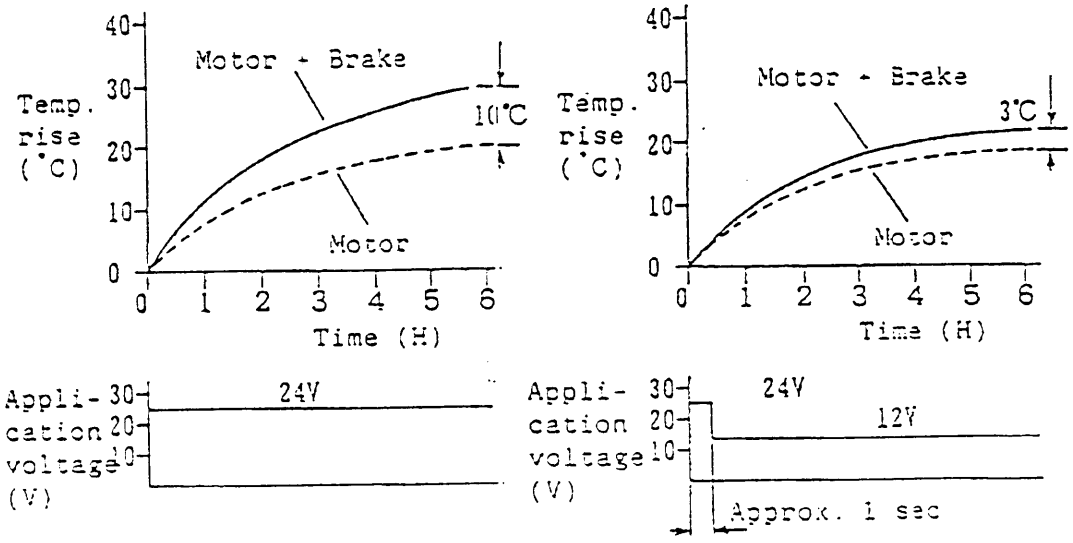
$$t = \frac{4 \times 0.23 \times 60 \times 1}{2 \times 37.5 \times 14} = 0.053 \text{ sec}$$

$$\theta = (0.053 + 0.06 + 0.082) \times 360 \times 1$$

$$= 71^\circ$$

5. APPLICATION VOLTAGE AND TEMPERATURE RISE

Motor temperature rise at 24 V DC brake application voltage is approximately 10°C as shown in the following graph. Therefore, when the brake is left in the "OFF" state for a prolonged period (solenoid energized state), a voltage of 24 V is applied during the first 1 sec time period and then it is lowered to 12 V. Thus, temperature rise can be restricted to approximately 3°C under the same conditions. Therefore it is recommended that this method be employed when an influence by motor temperature is taken into account.

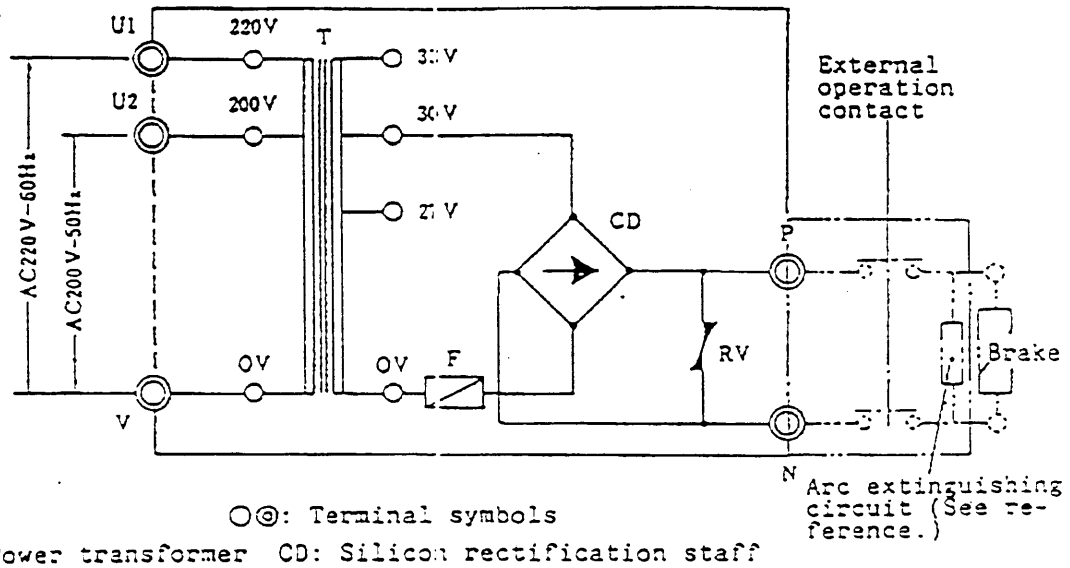


6. POWER SUPPLY UNIT

(1) Standard Power Supply

The standard power supply specifications for this brake are 24 V DC output voltage and 3 A (max.) output current. Recommended power supply circuit and external connection diagrams are shown in the following.

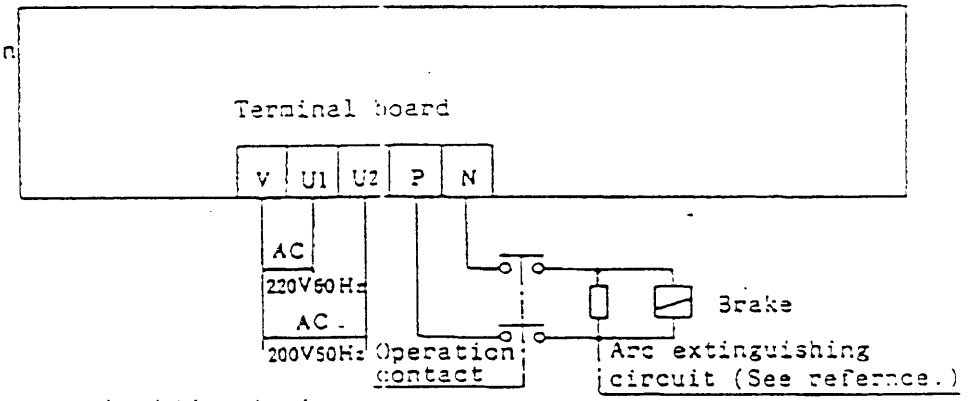
Circuit diagram



○◎: Terminal symbols

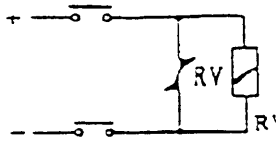
T: Power transformer CD: Silicon rectification staff
RV: Varistor F: Fuse

External connection diagram



Note: Arc extinguishing circuit

Since the brake may generate very large counter-voltage to damage the contacts when operation contacts are opened owing to induction load, it is recommended that an appropriate arc extinguishing circuit be connected.



RV: Varistor
(Recommended varistor: Made by Ishizuka Electronics/ Type A32505.., Operation voltage: Less than 24V)

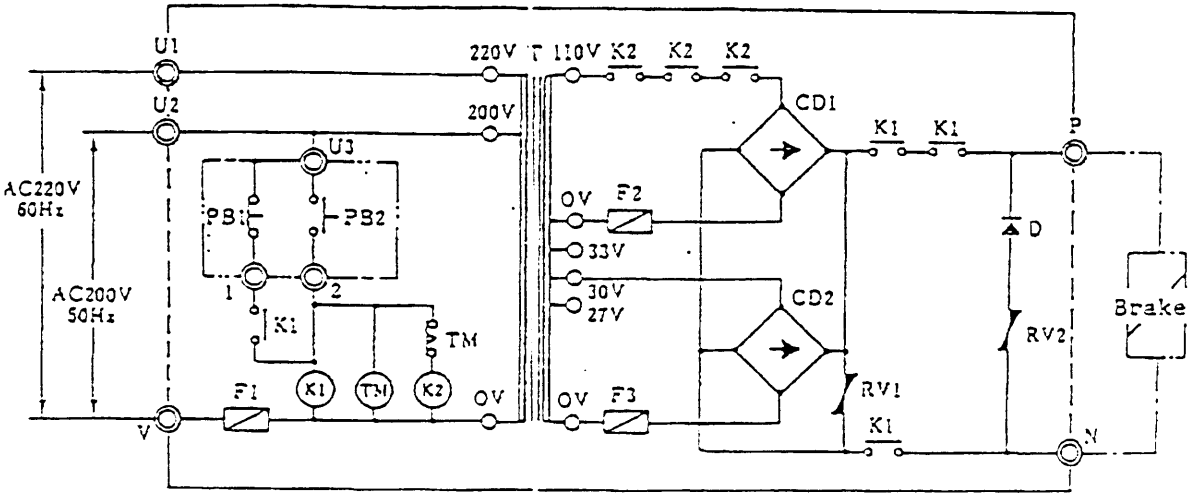
Specification

Input voltage (V)	Output voltage (V)	Output current (A)
AC 200/220 50/60 Hz	DC 24	max. 3.0

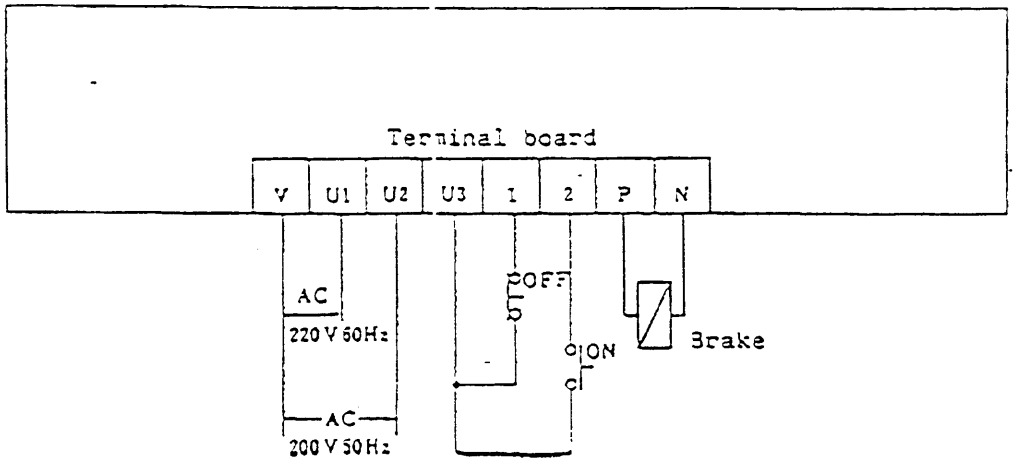
(2) High-Speed Control Power Supply

When it is necessary to hasten equipment start and stop by hastening brake attraction and torque rise and also to perform slip prevention and fixed-position stop, it is possible to activate the brake function more effectively by the application of high voltage two to three times the rated voltage within a short time period. Recommended power supply and external connection diagrams are shown in the following. However, in this case since application voltage exceeds arc extinguishing circuit varistor operation voltage, connect a diode in series with the varistor.

Circuit diagram



External connection diagram



Specification

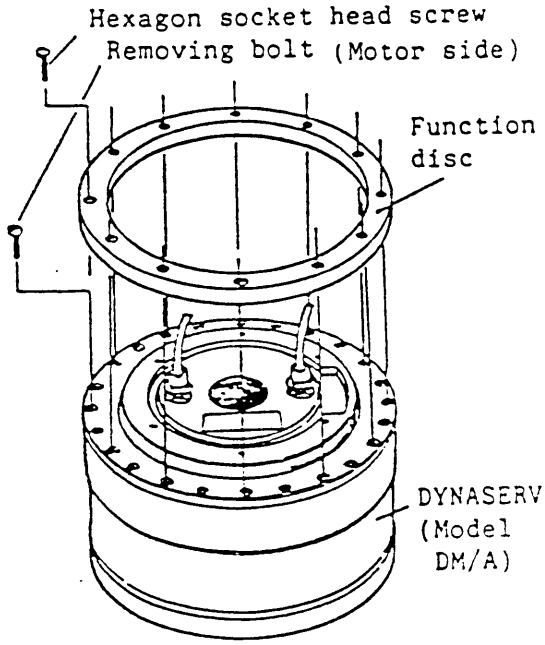
Input voltage (V)	Output voltage (V)	Output current (A)	High-voltage application time
AC200/220 50/60 Hz	DC24	max 3.0	Std current 0.5 (min. 0.1 to max. 1.0)

7. ASSEMBLY PROCEDURE

Remove every other bolt but finally all the bolts screwed along the outer circumference at the bottom of the motor rotating section (side with cables extended). (For Model DM/A: 12 bolts and for Model DM/B: 6 bolts) Mount friction disc (7) with hexagon socket head cap screws attached utilizing these threads. Evenly tighten each screw.

<Note>

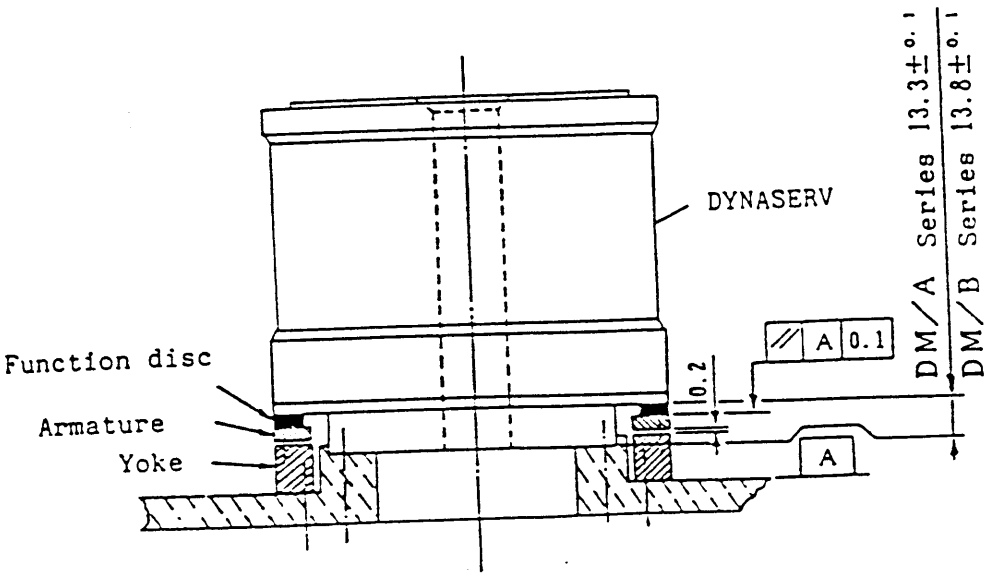
1. At this time, never loosen the remaining bolts which fasten the motor clamp.
2. During assembly work, avoid entry of dust inside the motor.
3. Do not scratch nor attach dust, iron powder, oil and/or water to the surface of the friction disc (7). When the surface becomes stained, wipe it dry with a cloth dampened with ligroin.
   Also, when the surface is scratched polish it with sand paper.



Armature (5) and yoke (1) are integrated with assembly bolt (9), but before the brake is actually installed on the seat, adjust the gap to 0.2 mm using assembly bolt (9). For this purpose, drill a hole in the seat so that the bolt can be removed afterward.

Keep the position between the motor and brake after installation so that the gap between the armature and yoke remains 0.2 mm (Standard and maximum values: BXM10-000B; 0.6 mm/BXM2.5-000B; 0.4 mm) and the parallelism between the yoke mounting surface and the friction disc surface on the motor

side becomes less than 0.1. After assembly is completed, always remove assembly bolt (9).

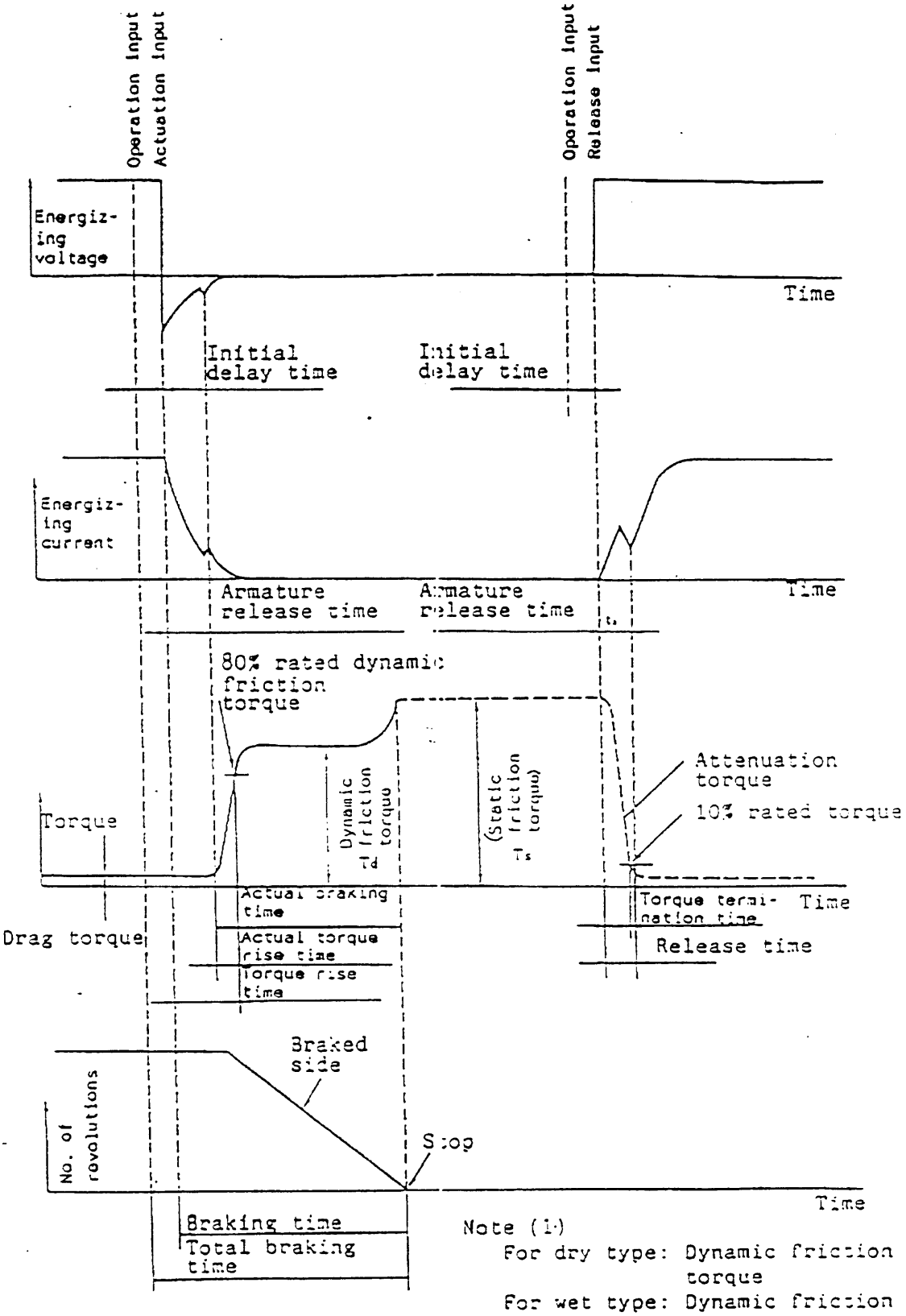


8. TROUBLESHOOTING

Problem	Cause	Measures
No attraction of armature (or attraction is weak)	· No voltage is applied. · Voltage is low.	· Electric circuit check and repair
	· Coil is disconnected.	· Replacement after cause of coil disconnection is remedied.
	· Foreign matter exists in between pole surfaces.	· Removal (Cleaning after disassembly if necessary)
	· Gap is wide.	· Adjustment after measurement
Armature is not apart.	· Power is not turned OFF.	· Electric circuit check and repair
	· Foreign matter presents.	· Remove foreign matter after disassembly.
	· Armature is burnt internally.	· Disassemble the armature and replace it if it cannot be repaired.
Coil is burnt.	· Voltage is high.	· Check electrical circuit and replace the brake after this voltage is returned to standard voltage.
	· Coil shorting internally.	· Replacement of brake itself
	· Heat gererated by slippage	· Armature is not attracted. · Brake torque is small. · Load condition is changed. · Usage is frequent · Improper timing with motor. · Facing is burnt. Check which is the cause of trouble. Replace the coil if necessary.

Problem	Cause	Measures
Large slippage and improper brake application	· Small brake torque	· Gap is small.
		· Oil is attached to the facing. Confirm if the trouble is for the above reason and repair the brake if necessary.
	· Load condition is changed.	· Load GD^2 becomes large. · No. of revolutions becomes large. · Load torque changes. Check the cause of the trouble and take necessary measures.
	· Facing is burnt.	· Check the cause of burning and take necessary measures. Replace the brake if necessary.
	· Improper timing with motor	· Check electrical circuit, and take a time from motor OFF to brake ON, if necessary.
Brake box becomes extremely hot. (burnt)	· High heat generated by slippage.	· Check the cause of the trouble, and replace the brake, if necessary.
	· Shorting within coil	· Replacement of brake itself.
	· High voltage	· Electrical circuit check and repair.
Facing is burnt.	· Heat generated by slippage.	· Replacement (after the cause of the trouble is remedied.)

9. BRAKE ACTUATION CHARACTERISTICS

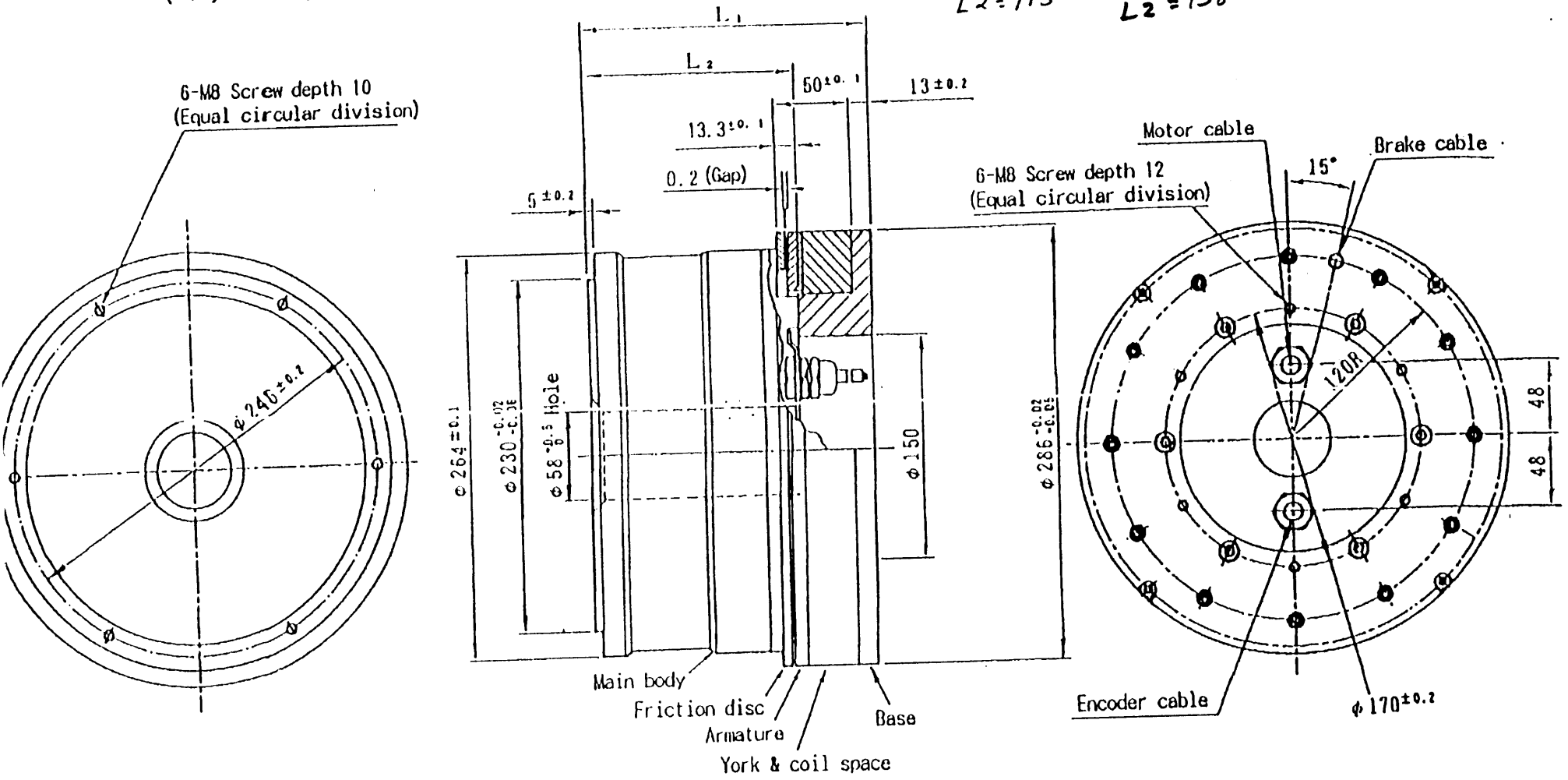


DYNASERV with magnetic brake model/ Outline drawing (unit:mm)

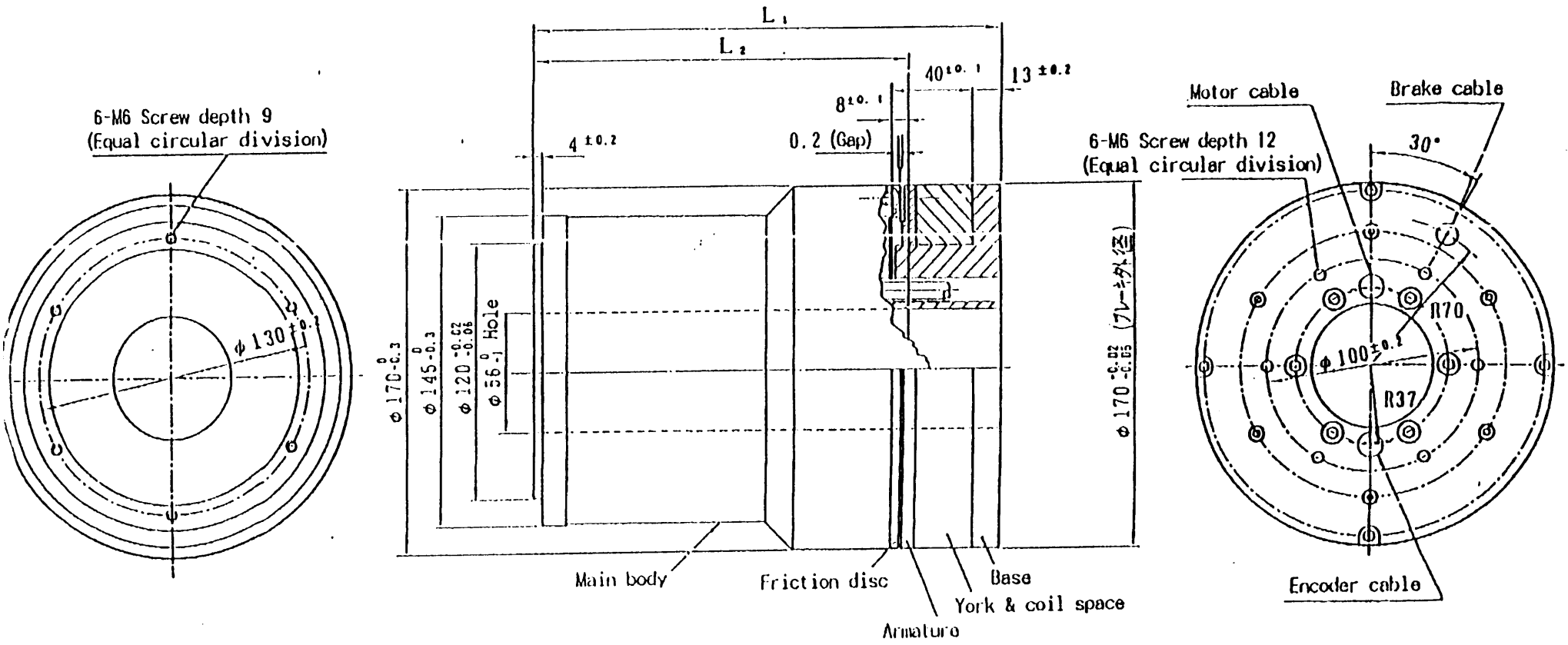
DM1050A
L1 = 163
L2 = 113

DM1100A
L1 = 188
L2 = 138

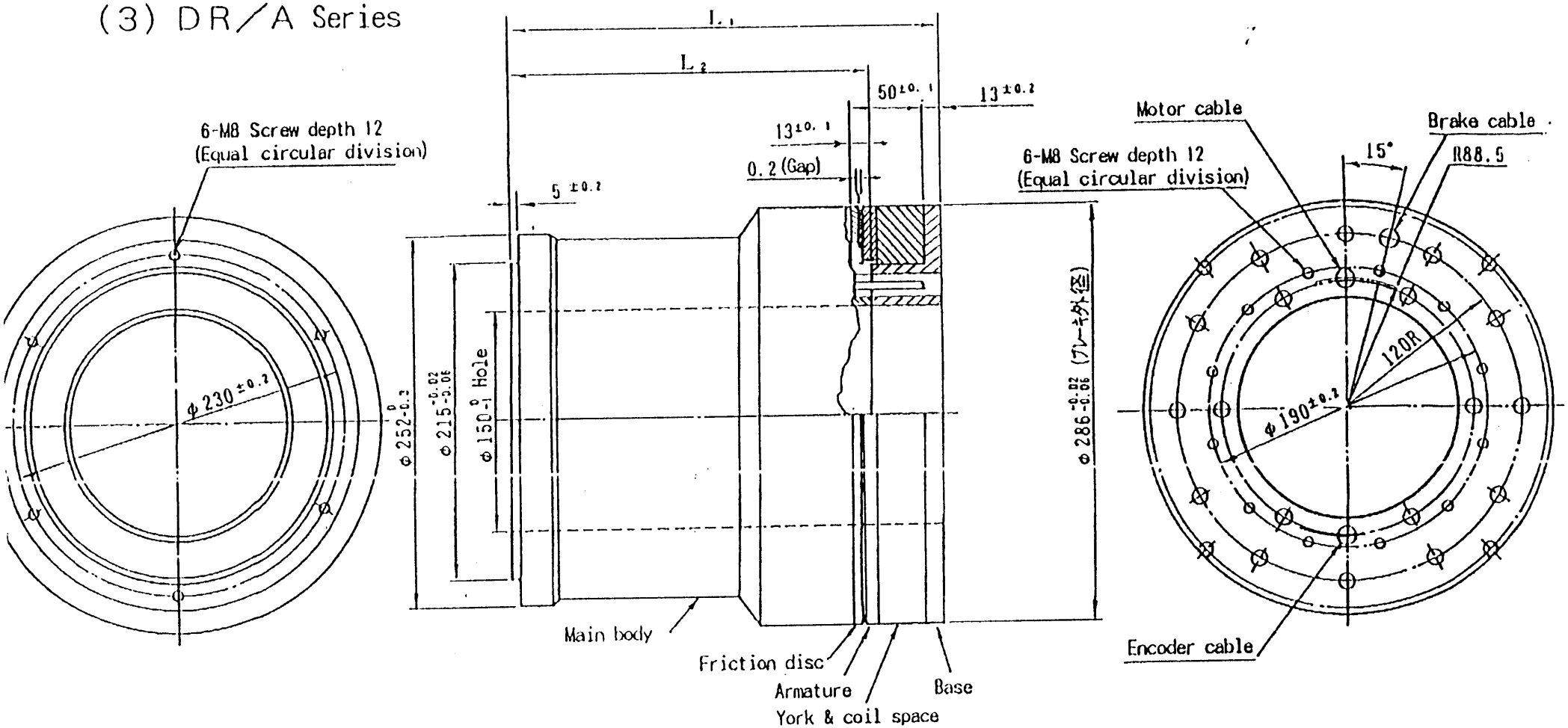
(1) DM/A Series



(4) DR/B Series


6-M6 Screw depth 9
(Equal circular division)
φ130±0.1
L1
L2
40±0.1
13±0.2
8±0.1
4±0.2
0.2 (Gap)
6-M6 Screw depth 12
(Equal circular division)
φ170 0 -0.3
φ145 0 -0.3
φ120 -0.02 -0.06
φ56 0 +1 Hole
φ170 -0.02 -0.05 (ブレーキ外径)
Main body
Friction disc
Base
York & coil space
Armature
Motor cable
Brake cable
30°
R70
φ100±0.1
R37
Encoder cable

(3) DR/A Series



for A

$L_1 = L_2 + 50\text{mm}$ (Brake) $= 467\text{mm}$

$L_2 = 417\text{mm}$