Instruction Manual

DB Unit

Braking unit

200V class 11-22kW / BU22-2C

400V class 11-22kW / BU22-4C

⚠ CAUTION

- Deliver this instruction manual without fail to those who actually operate the equipment.
- Read this operation manual and understand the description before installing, connecting (wiring), operating or performing maintenance and inspection of the braking unit.
- Keep this instruction manual in a safe place until the braking unit is discarded.
- The product is subject to change without prior notice.

Fuji Electric FA Components & Systems Co., Ltd. **INR-SI47-0845b-E**

Introduction

Thank you for purchasing our braking unit. This equipment discharges the braking force in braking operation of Fuji's general purpose inverter to a resistor. For applicable inverter models, refer to Table A.

Before starting operation, read through this operation manual to understand the handling method and operate correctly. An incorrect handling will obstruct correct operation or cause a reduced life or failure. Keep the instruction manual in a safe place even after operation is started.

This operation manual does not cover the inverter handling. For the handling of the inverter, refer to the applicable inverter instruction manual.

Table A. Applicable Inverter Models

Class	Model	
200V	General-purpose inverter	FRENIC5000 G11S/P11S Series FRENIC5000 G11UD Series
400V	General-purpose inverter	FRENIC5000 G11S/P11S Series FRENIC5000 G11UD Series

Safety Precautions

Read through this operation manual carefully before installing, connecting, (wiring), operating or performing maintenance and inspection for correct usage.

Be familiar with all the devices, safety information, and cautionary items.

In this operation manual, safety precautions are described under the following titles.

⚠ WARNING	Wrong handling may cause danger possibly accompanying deaths or serious injuries.
⚠ CAUTION	Wrong handling may cause danger possibly accompanying minor or moderate injuries or material losses.

Precautions described in the caution category may cause serious results in some circumstances.

Both precautions are important; observe the description without fail.

Application

⚠ WARNING

- This unit discharges the braking force in braking operation of Fuji's general purpose inverter to a resistor. It cannot be used for other applications.
  Risk of fire
- This unit cannot be used for applications directly related to personal danger such as a life support system.
- This product is manufactured under strict quality control. However, if it is used for equipment where serious accidents or losses may occur in case of failure of this product, install a safety device.
  Risk of accident

Installation

⚠ WARNING

- Install to nonflammable matter such as metals.
  Risk of fire
- Do not place flammable matter nearby.
  Risk of fire
- Contain the unit inside a distribution panel or the like so that it cannot be touched easily.
  Risk of electric shock or accident
- Use bolts of the specified sizes for installation without fail.
  Risk of accident or injuries

⚠ CAUTION

- Do not hold the front cover when carrying.
  Risk of drop and injuries
- Do not allow lint, paper, wood dust, other dust, metallic dust or other types of foreign matter to intrude in the braking unit or do not allow them to be stuck on the heat sink.
  Risk of fire or accident
- Do not install and operate the braking unit if it is damaged or some parts are missing.
  Risk of injuries

Wiring

⚠ WARNING

- Use the designated size for wiring cables.
  Risk of fire
- Do not make a mistake in the polarity (+, -) of the DC terminals (P(+), N(-)) and inverter connection terminals.
  Risk of fire
- Be sure to connect the grounding cable.
  Risk of electric shock or fire
- Have the wiring work conducted by a qualified electrician.
  Risk of electric shock
- Check that the power is turned off (opened).
  Risk of electric shock
- Be sure to install the main body first before starting wiring.
  Risk of electric shock or injuries

⚠ CAUTION

- Check that the rated voltage of the product conforms to the rated voltage of the inverter.
  Risk of injuries
- Do not connect the braking resistor directly to the DC terminals (P(+), N(-)).
  Risk of fire
- Noise is generated from the unit and wiring. Be careful of malfunction of nearby sensors or devices.
  Risk of accident

Operation

⚠ WARNING

- Be sure to install the surface cover before turning the power on (closing). Do not remove the cover while the power is turned on.
  Risk of electric shock
- Do not touch the terminals of the braking unit while the power is supplied to the inverter or even if the unit is stopped.
  Risk of electric shock

⚠ CAUTION

- Do not use the main circuit ON/OFF switch to start or stop the inverter.
  Risk of failure
- Do not touch the heat sink and braking resistor because they become hot.
  Risk of burns
- The braking function of this unit does not guarantee mechanical suspension.
  Risk of injuries

Maintenance, inspection and parts replacement

⚠ WARNING

- Turn the power off (open) and wait for at least 10 minutes before starting inspection.
  Check that the charge lamp is unlit and check that the DC voltage across the P(+) and N(-) terminals is 25V or lower.
  Risk of electric shock
- Do not perform maintenance, inspection or parts replacement if you are not the appointed person.
  Take off metallic objects such as watches and rings before starting work.
  Use insulated tools.
  Risk of electric shock or injuries

Disposal

⚠ CAUTION

- When discarding the product, handle it as an industrial waste.
  Risk of injuries

Others

⚠ WARNING

- Never remodel.
  Risk of electric shock or injuries

General Precautions

Schematic drawings found in this operation manual may indicate a view without covers or safety shields for explanation of details.
When operating the product, restore the covers and shields and observe the operation manual.

Conformity to UL standards and Canadian standards (cUL certification)

⚠ CAUTION

1. Use 60 / 75 ℃ Cu wire only

2. Use Class 1 wire only.

3. Field wiring connection must be made by a UL Listed closed-loop terminal connector sized for the wire gauge involved Connector must be fixed using the crimp tool specified by the connector manufacturer.

4. An optional cooling fan with minimum air flow rate of 0.5 m^3/minute must be provided when the dynamic braking unit is used at 30%ED rating.

⚠ CAUTION

Required torque and wire size.

Unit type	Required torque [lb-inch](N·m)		Wire range [AWG]	
	Main terminal	Control	Main terminal	Control
BU22-2C	15.9 (1.8)	0.7	10	16-24
BU22-4C			14	

The inverter connected to the inverter is listed below.

Unit type	Applied Inverter
BU22-2C	3Ph 200-240V 50Hz/60Hz
BU22-4C	3Ph 380-480V 50Hz/60Hz

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1 Before Starting Operation

1-1 Shipment Inspection

Unpack and check the following items.
If you have any question or trouble, contact the store of purchase or nearest Fuji's sales office.

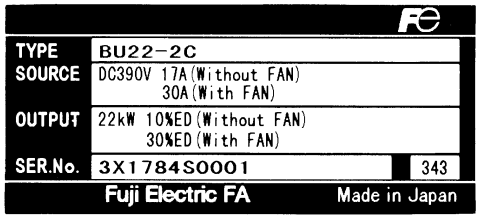


Fig. 1-1-1. Rating Nameplate

(1) Refer to the rating nameplate to check if the delivered product is the ordered one.

TYPE : Type of braking unit

BU 22 − 2 C
- C → Standard series : C
- 2 → Power source voltage class of the inverter: 2→ 200V class. 4 → 400V class
- 22 → Standard applied motor capacity of inverter : 22→22kW
- BU → Product type

SOURCE : Power source rating
OUTPUT : Output rating
SER.No.: Serial number

3 1 1234R0001
- 1234R0001 → Serial manufacturing lot number
- 1 → Manufacturing month: 1 to 9 → January to September X → October. Y → November. Z → December
- 3 → Manufacturing year: The last one digit of year. 3 → Year 2003

(2) Check if there are any missing or broken parts or dents or other transportation damage in the cover and main body.
(3) The braking resistor is not attached. Prepare a suitable resistor matching the specifications separately.

1-2 Appearance of Product

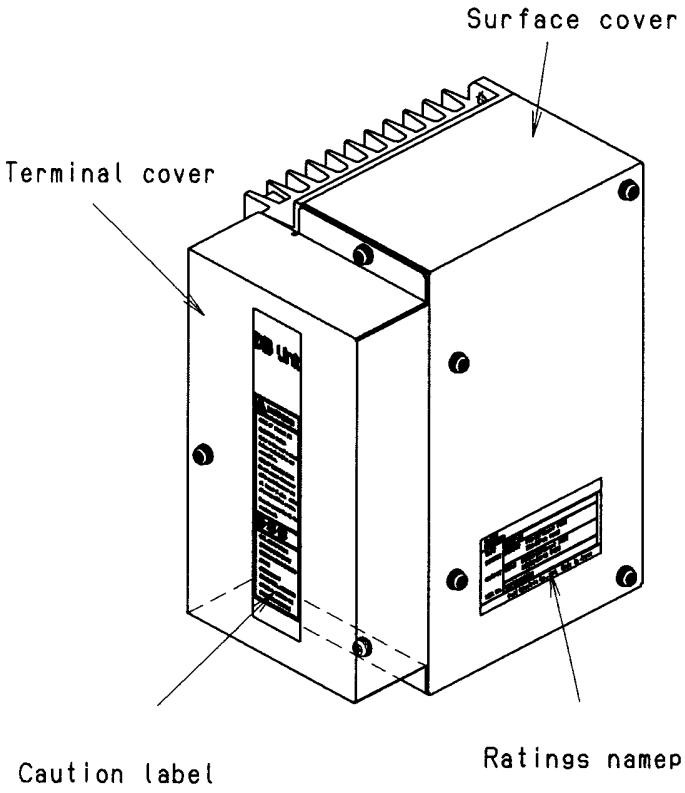


Fig. 1-2-1. Appearance of Product

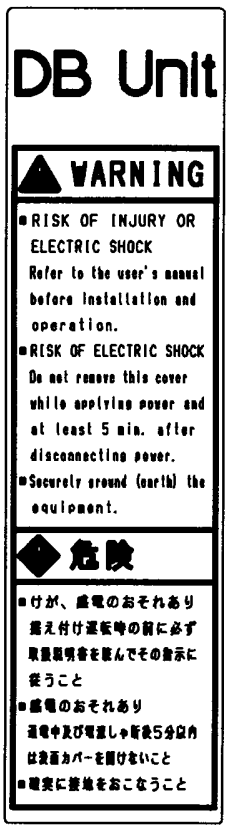


Fig. 1-2-2

1-3 Handling the Product

(1) Removal of terminal cover
Loosen the mounting screws of the terminal cover and, while holding the terminal cover, remove it as shown in Fig. 1-3-1

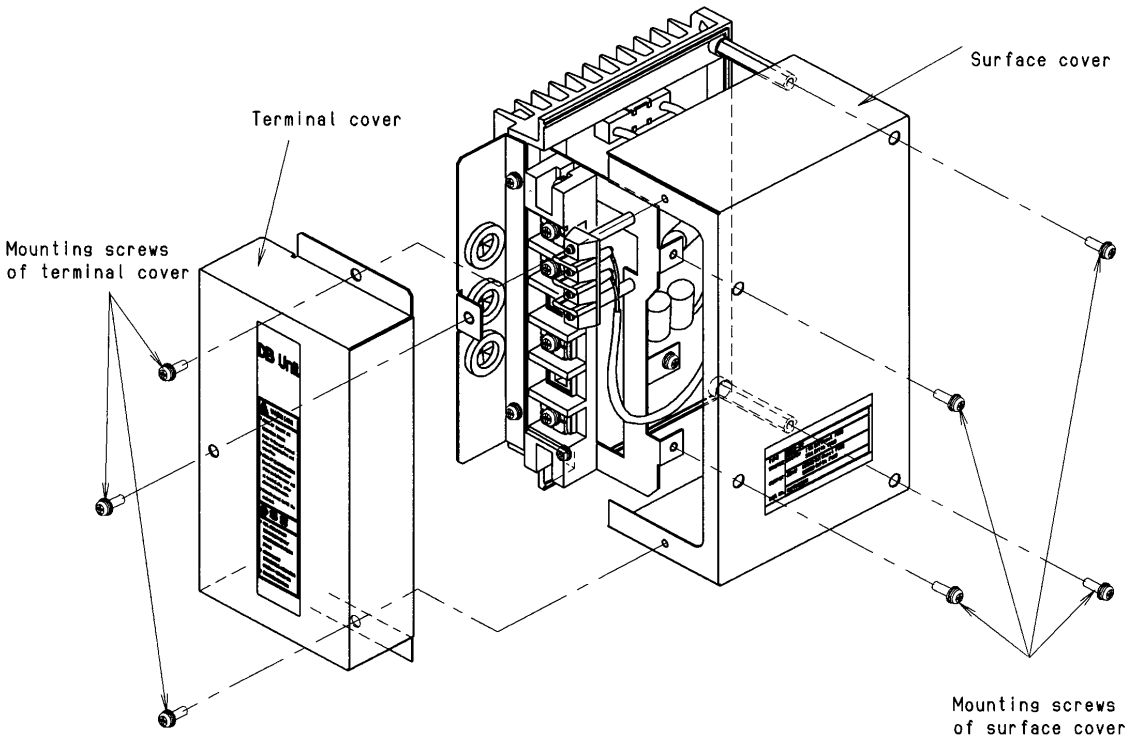


Fig. 1-3-1. Removal of Terminal Cover and Surface Cover

1-4 Transportation

Be sure to hold the main body when transporting.
If the cover or parts are held, there is danger of braking or dropping.

1-5 Storage

Store the product in an environment specified in Table 1-5-1.
Table 1-5-1 Storage Environment

Item	Specification	
Ambient temperature	–10 ~ +50°C	Place free from condensation or icing caused by abrupt temperature changes
Storage temperature NOTE1	–25 ~ +65°C	
Relative humidity	5 ~ 95% Note 2	
Atmosphere	Free from dust, direct sunshine, corrosive or flammable gases, oil mist, vapor, water drops or vibration. Free from much salt	

Note 1: The storage temperature indicates the temperature in short period such as during transportation.
Note 2: Even if the temperature satisfies the specification values, condensation or icing occurs at places with steep temperature changes. Avoid such places.
(1) Do not place directly on the floor.
(2) If the ambient atmosphere is adverse, pack the unit with a vinyl sheet or the like to store.
(3) If moisture may cause ill effects, place a drying agent such as silica gel inside the package before packing as described at (2).

2 Installation and Connection

2-1 Operating Environment

Install the unit in the environment shown in Table 2-1-1.

Table 2-1-1. Operating Environment

Item	Specification
Site	Indoors
Ambient temperature	–10 ~ +50℃
Relative humidity	5 ~ 95% (Without condensation)
Atmosphere	Free from dust, direct sunshine, corrosive gases, oil mist, vapor or water drops. Free from much salt. Free from condensation caused by abrupt temperature changes
Altitude	1,000m maximum (If 1,000m is exceeded, reduce the inverter output according to the inverter operation manual.)
Vibration	3.0mm at 2～9Hz, 9.8m/s^2 at 10～20Hz, 4.9m/s^2 at 20～55Hz, 1.0m/s^2 at 55～200Hz

2-2 Installation Method

(1) Install the braking unit on a solid structure securely with bolts and vertically so that the label characters are seen in front.

(2) The braking unit generates heat during operation. Reserve space shown in Fig. 2-2-1 to assure passage of cooling air. Because the generating heat is radiated above, do not install below a device susceptible to heat.

(3) The temperature of the heat sink rises up to about 90°C during operation of the braking unit. The material of the mounting face at the back of the braking unit must bear the temperature rise with a sufficient margin.

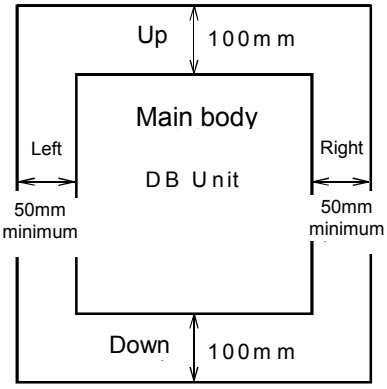


Fig. 2-2-1

⚠ WARNING	Install on nonflammable matter such as metals. **Risk of fire**

(4) When the unit is installed inside the control panel or the like, take sufficient care of ventilation so that the ambient temperature of the braking unit does not exceed the specification value. Do not house in an ill-ventilated small airtight container.

(5) When two or more inverters and the braking unit are housed in the same equipment or inside the control panel, side-to-side installation is recommended to reduce the mutual effects of heat. If the units must be installed vertically for unavoidable reason, install a partition plate or the like so that the heat generating at the lower unit does not give ill effects on the upper unit.

⚠ CAUTION	Do not allow lint, paper, wood dust, other dust, metallic dust or other foreign matter to intrude inside the unit or do not allow them to be stuck on the heat sink. **Risk of fire or accident**

2-3 Connection

After the terminal cover is removed, each terminal block becomes visible (see Fig. 2-3-1). Take care of the following items and connect without mistakes.

2-3-1 Basic Connection

(1) Connect the DC link connection terminals (P(+), N(-)) with the DC link circuit terminals (P(+), N(-)) of the inverter. The unit and the inverter will be damaged if the polarity is incorrect or other terminals are connected. As well, check that the source voltage conforms to the specification of the connected inverter.

(2) Be sure to ground the grounding terminal to avoid disasters such as electric shock and fire and to reduce noise.

(3) Use crimp terminals with high connection reliability for the connection between the terminal and cable.

(4) After finishing connection (wiring) work, check the following.
   a. Correct connection
   b. Failure to connect
   c. Short circuit or ground fault of terminals and cables

(5) To change connection after power application
   After the power is turned off, it takes time until the smoothing capacitor in the DC circuit of the main circuit is discharged. Before starting work, wait until the charge lamp is unlit and check that the DC voltage has dropped to a safe voltage (25Vdc or lower) with a multimeter or the like to avoid danger. In addition, short circuiting may cause sparks if there is a remaining voltage (charge). Wait until the voltage becomes low.

⚠ WARNING	・Be sure to connect the grounding cable. **Risk of electric shock or fire** ・Have wiring work done by a qualified electrician. ・Check that the power is turned off (opened) before starting work. **Risk of electric shock**

Inside unit

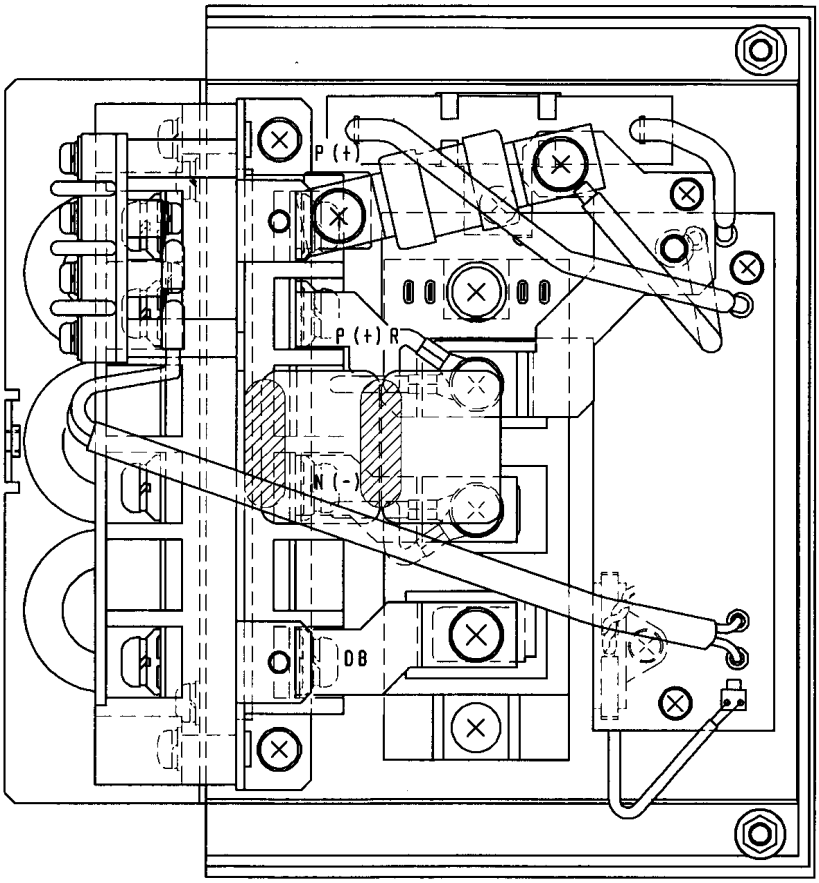


Fig. 2-3-1 Inside unit

■Basic Connection Diagram

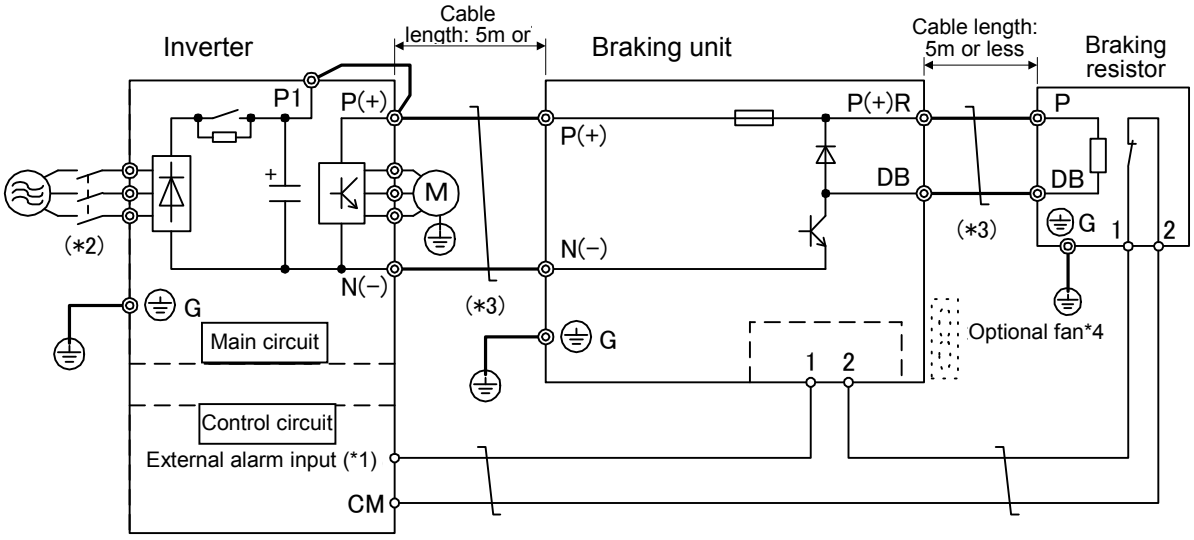


Fig. 2-3-2

(*1) The inverter may allow arbitrary assignment of digital input terminals. Use the function setting of the inverter to select external alarm input.

(*2) Connect the batch alarm output of the braking unit and braking resistor to the external alarm input of the inverter and build a sequence that opens the electromagnetic contactor with the batch alarm output of the inverter.

(*3) Be sure to twist or route in close contact (in parallel) the two cables connecting the inverter with the braking unit and that connecting the braking unit with the braking resistor.

(*4) The optional fan needs separate power supply. The source voltage varies according to the optional fan to be used. BU-F1S (single-phase 100Vac), BU-F2S (single-phase 200Vac)

2-3-2 Connection of Main Circuit and Grounding Terminal

Table 2-3-1. Function of Main Circuit Terminals and Grounding Terminal

Terminal symbol	Terminal name	Description
P(+), N(-)	DC link connection terminal	The DC link circuit voltage of the inverter is connected.
P(+)R, DB	Terminals for connecting braking resistor	The braking resistor is connected.
⏚ G	For grounding the braking unit	Connection terminal for chassis (case) of the braking unit

(1) DC link connection terminal (P(+), N(-))

1) Connect the DC link circuit terminals P(+) and N(-) of the inverter with the terminals P(+) and N(-) of the braking unit.
2) Arrange units so that the wiring length is within 5m. Twist or route in close contact (in parallel) the two cables.
3) Do not connect to the AC power supply.

(2) Terminal for connection of braking resistor (P(+)R, DB)

1) Connect terminal P and DB of the braking resistor to terminal P(+)R and DB of the braking unit.
2) Arrange units so that the wiring length is within 5m. Twist or route in close contact (in parallel) the two cables.
3) Do not connect to the AC power supply.

(3) Unit grounding terminal (⏚ G)

Be sure to ground unit grounding terminal (G⏚) for safety and noise reduction. The Electric Equipment Engineering Standard requires grounding work of the metallic frame of electric devices for the prevention of electric shock, fire and other disasters.
Follow the procedure below to connect.

1) Connect to class D grounding electrode (200V class) or class C grounding electrode (400V class) according to Electric Equipment Engineering Standard.
2) Connect a thick and short cable between the grounding terminal and the grounding electrode exclusively provided for the inverter system.

Table 2-3-2

Voltage class	Type of grounding work	Grounding resistance
200V	Class D grounding work	100Ω maximum
400V	Class C grounding work	10Ω maximum

⚠CAUTION	・ Do not connect the AC power supply to DC link terminals (P(+), N(-)). **Risk of accident** ・ Do not connect the braking resistor directly to the DC link terminals (P(+), N(-)). ・ Check if the specifications of the product match the connected inverter. ・ The braking resistor may generate excessive heat if the braking unit is broken. Build a sequence for shutting off the power supply of the inverter input upon an alarm signal. **Risk of fire**

2-3-3 Connection of Control Terminal

The function of the control circuit terminal is described in Table 2-3-3.

Table 2-3-3

Terminal symbol	Terminal name	Description
1, 2	Braking unit batch alarm output	IGBT for driving the DB and overheat generation of the braking resistor are output.

(1) Braking unit batch alarm output (1, 2)

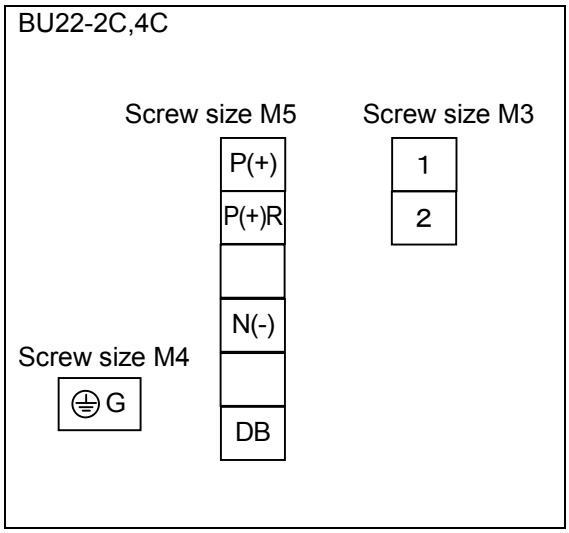
1) Connect the inverter's contact input terminals assigned to external alarm input, to the braking unit and braking resistor terminals in series in order of: 1 ⇨ 2 ⇨ 1 ⇨ 2. If there is a short bar at the inverter's target contact input terminal, remove it.

(2) Others

1) Route the control terminal cables as far away as possible from the main circuit cables. Otherwise malfunction caused by noise may result.
2) Tie the control cables inside units so that they do not make contact with live parts of the main circuit (such as the terminal block of the main circuit).

⚠ WARNING	• Because the sheath of the general control cable is not reinforced insulation, a high voltage of the main circuit may intrude the control signal when the insulating sheath is broken due to some reason. **Risk of electric shock**
⚠ CAUTION	• Noise is generated from the inverter, motor, cable and so on. Take care of malfunction of surrounding sensors and devices. **Risk of accident**

2-3-4 Terminal Layout



2-3-5 Standard applied device and cable size

Voltage	Applied motor (kW)	Braking unit		Braking resistor			Tightening torque (N·m)			Recommended cable size (mm^2) (Note 1)		
		Model	Qty	Model	Resistance (Ω)	Qty	Main circuit	Grounding	Control	DB circuit (P(+), N(-), P(+)R, DB)	Ground (⏚ G)	Control
200V	11	BU22-2C	1	DB11-2C DB11-2	10	1	2	1.8	0.5	2 Note 2 3.5 Note 3		1.25
	15		1	DB15-2C DB15-2	8.6	1						
	18.5		1	DB22-2C	5.8	1						
				DB18.5-2	6.8							
	22		1	DB22-2C DB22-2	5.8	1						
400V	11	BU22-4C	1	DB11-4C DB11-4	40	1	2	1.8	0.5	2		1.25
	15		1	DB15-4C DB15-4	34.4	1						
	18.5		1	DB22-4C	22	1						
				DB18.5-4	27							
	22		1	DB22-4C DB22-4	22	1						

Note 1: The cable to be used is 600V HIV insulated cable with allowable temperature 75°C. Selection is made on assumption that the ambient temperature is 50°C.
Note 2: The operation ratio is considered in 10%ED.
Note 3: The operation ratio is considered in 30%ED.

3 Operation

3-1 Inspection and Preparation Before Operation

Inspect the following items before starting operation.

(1) Check for correct connection.
Take care of the following points among all.

a. Check if the DC link connection terminals P(+) and N(-) and braking resistor connection terminals P(+)R and DB are not connected to the AC power supply.

b. Check if the braking resistor connection terminals P(+)R and DB are not connected with the DC link voltage.

c. Check if the grounding terminal is securely grounded.

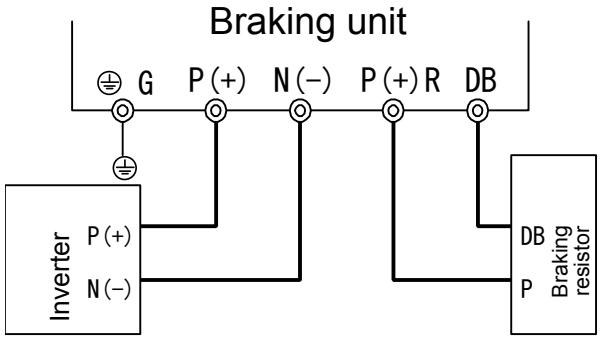


Fig. 3-1-1. Braking Unit Connection Diagram

(2) Check if there is not a short circuit or ground fault across terminals or bare live parts.

(3) Check if terminals, connectors and screws are not loose.

After turning the power on, check the following.

(1) Check if the inverter doesn't show an external failure alarm.

(2) Check if the fan rotates (for models with optional fan).

⚠ WARNING	• Be sure to install the surface cover before turning the power on (closing). Do not remove the cover while the power is ON. **Risk of electric shock**

4 Protective Action

4-1 Protective Action

If a fault shown in Table 4-1 occurs, the braking unit stops the DB drive signal and issues a batch alarm signal at terminals 1 and 2 (the batch alarm signal does not have a means to discriminate the description of the alarm).
This alarm signal causes to actuate the protective function of the inverter to trip, and an external alarm is displayed on the keypad panel of the inverter while the motor coasts to stop.
Because the braking resistor may be excessively overheated upon failure of the braking unit, build a sequence to shut off the power upon activation of a protective function of the inverter.

Table 4-1

Alarm	Description
Overheated heat sink	The temperature of the heat sink is high because operation is at a braking frequency exceeding the specification limit, the ambient temperature is too high, or the heat sink is clogged.
Overheated braking resistor	The temperature of the braking resistor is high because the operation frequency of the braking resistor is too high.

In addition, the fuse in the braking unit prevents secondary breakage by blown out when the internal circuit is short or damaged. Regenerated inverter may have OU trip with it blown out.

4-2 Alarm Reset

If the inverter has tripped, remove the cause and reset the inverter according to the instruction described in the inverter operation manual. When resetting, turn the inverter operation command off. If the operation command is on, operation will be started after the inverter is reset.

⚠ WARNING	If the inverter is reset from an alarm with the operation signal turned on, operation will start suddenly. Check that the operation signal is turned off before resetting. **Risk of accident**

5 Maintenance and Inspection

Perform daily inspection and periodic inspection to avoid failure and maintain reliable operation over a long period. Take care of the following items when working.

5-1 Daily inspection

Visually check for faults in operation state without removing cover or the like, while the power is turned on. Regular inspection includes the following criteria.

(1) Check if the expected performance (satisfying the standard specifications) is obtained.
(2) Check if the surrounding environment satisfies the standard specifications.
(3) Check if there is any abnormal noise, excessive vibration or malodor.
(4) Check if there are traces of overheat or discoloration.

5-2 Periodic Inspection

Stop the operation and turn the power off and remove the surface cover to perform periodic inspection. It takes time after the power is turned off until the smoothing capacitor at the DC part of the main circuit is discharged. To avoid danger, wait until the CHARGE lamp is unlit and check that the DC voltage has dropped to a safe value (25VDC or lower), using a multimeter or the like.

⚠ WARNING	• Turn the power off (open) and wait for at least five minutes. Further, check that the CHARGE lamp is unlit and measure the DC voltage across terminals P(+) and N(-) to check if the measurement is 25VDC or lower. **Risk of electric shock** • Do not perform maintenance and inspection or parts replacement unless you are the appointed person. Take off metallic objects (such as watches and rings) before starting work. Use insulated tools. Never remodel. **Risk of electric shock or injuries**

Table 5-2-1. Periodic Inspection List

Inspection point		Inspection item	Inspection method	Judgment criteria
Surrounding environment		Check the ambient temperature, humidity, vibration, and atmosphere (presence / absence of dust, gas, oil mist, water drops).	Visually check and measure with measuring instruments.	The standard specification must be satisfied.
		Check if foreign matter such as a tool or dangerous matter is left nearby.	Visual inspection	Not left.
Voltage		Check if the voltage of the main circuit and control circuit is correct.	Measure using a multimeter or the like.	The standard specification value must be satisfied.
Structural parts such as frame and cover		Check if there is abnormal noise or excessive vibration.	Visual or auditory inspection	No fault
		Check if bolts (tightened parts) are not loose.	Retighten.	No fault
		Check for deformation and breakage. Check for discoloration caused by overheat. Check for stuck dirt or dust.	Visual inspection	No fault
Main circuit	Common	Check if bolts are not loose or missing.	Retighten.	No fault
		Check if devices and insulating matter are deformed, cracked, broken, or discolored due to overheat or deterioration. Check for stuck dirt or dust.	Visual inspection	No fault Note: A discolored bus bar does not indicate a problem in its characteristics.
	Conductors and cables	Check if the conductor is discolored or deformed due to overheat. Check if the sheath of the cable is broken, cracked or discolored.	Visual inspection	No fault
	Terminal block	Check for breakage.	Visual inspection	No fault
	Smoothing capacitor	Check for liquid leakage, discoloration, cracks and swollen case. Check if the safety valve protrudes or the valve is swollen excessively.	Visual inspection	No fault
	Resistor	Check for malodor caused by overheat and cracked insulators.	Smelling or visual inspection	No fault
		Check for a broken wire.	Visually check or disconnect either terminal and measure with a multimeter.	Within +/-10% of displayed resistance

(Cont'd)

Control circuit	Control printed board and connectors	Check if screws and connectors are not loose. Check for malodor and discoloration. Check for cracks, breakage, deformation and excessive rust. Check the capacitors for liquid leakage and traces of deformation.	Retighten. Smelling or visual inspection Visual inspection	No fault
Cooling system	Cooling fan	Check for abnormal noise and excessive vibration.	Auditory or visual inspection. Turn by hand. Turn the power off without fail.	Smooth rotation
		Check for loose bolts.	Retighten.	No fault
		Check for discoloration caused by overheat.	Visual inspection	No fault
	Ventilation path	Check if the heat sink or suction or exhaust ports are clogged or if foreign matter is stuck.	Visual inspection	No fault

Note: Wipe off dirt using chemically neutral cleaning cloth. Suck duct with a vacuum cleaner.

5-3 Insulation Test

The insulation test is conducted before shipment from the factory. Avoid Megger test whenever possible. When performing a Megger test for unavoidable reason, follow the description below. A wrong test procedure may cause breakage of the product. Take sufficient care.

The dielectric strength test, too, may cause breakage of the product if the test procedure is wrong. Contact the store of purchase or our nearest sales office if a pressure resistance test is necessary.

(1) Megger test of main circuit

1) Use a 500Vdc Megger and make sure to conduct with a discrete breaking unit. (Disconnect both the main circuit cable and control cable)
2) Connect the main circuit terminals, using a common cable, as shown in Fig. 5-3-1.
3) The Megger test must be only across the common cable of the main circuit and ground (terminal ⏚ G).
4) 5MΩ or larger measurement displayed at Megger indicates a correct state. (Measurement with a discrete unit)

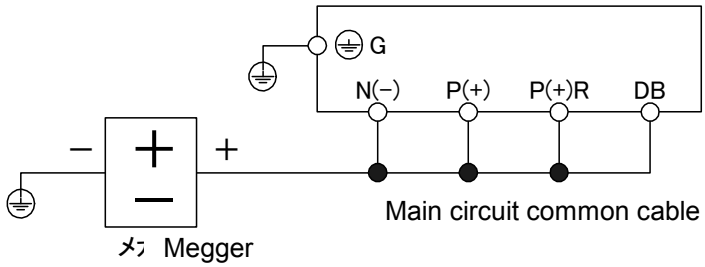


Fig. 5-3-1. Megger Test

(2) Insulation test of control circuit

Do not perform a Megger test or dielectric strength test of the control circuit. For the control circuit, prepare a high resistance range tester.

1) Disconnect all external cables from the control circuit terminals.
2) Perform continuity test in respect to the ground. 1MΩ or larger measurement indicates the correct state.

(3) External main circuit and sequence control circuit

Disconnect all terminals from the unit so that the test voltage will not be applied to the unit.

5-4 Replacement Parts

The life of the part depends of the type of the part.
The life of the part varies according to the surrounding environment and operating conditions.
It is recommended to replace parts while referring to Table 5-4-1 as a measure.
For the replacement method, contact the store of purchase or our nearest sales office.

Table 5-4-1. Replacement Parts

Part name	Standard replacement years	Replacement method and others
Cooling fan	3 years	Replace with a new part.
Fuse	10 years	Replace with a new part.
Other parts	—	Determine after investigation.

5-5 Inquiry About Product and Guarantee

(1) Notice for inquiry
For breakage of the product, uncertainties, failure or inquiries, contact the store of purchase or our nearest sales office and let us know the following items.
a. Model of braking unit
b. SER NO. (production number)
c. Purchase timing
d. Description of inquiry (For example, point of breakage and scale of breakage, uncertainties, failure symptom and circumstances, etc.)

(2) Guarantee of product
The guarantee period of the product is one year after purchase or 18 months since the month and year of production specified on the nameplate, whichever comes earlier. However, repairs will be charged in the following cases even if they are handled in the guarantee period.
1) Failure caused by handling errors or inadequate repair or remodeling
2) Operation in the range exceeding the standard specification value
3) Failure caused by dropping after delivery or damage caused by transportation
4) Failure caused by earthquake, fire, flood or wild wind, lightning, irregular voltage, or other acts of God or secondary disaster

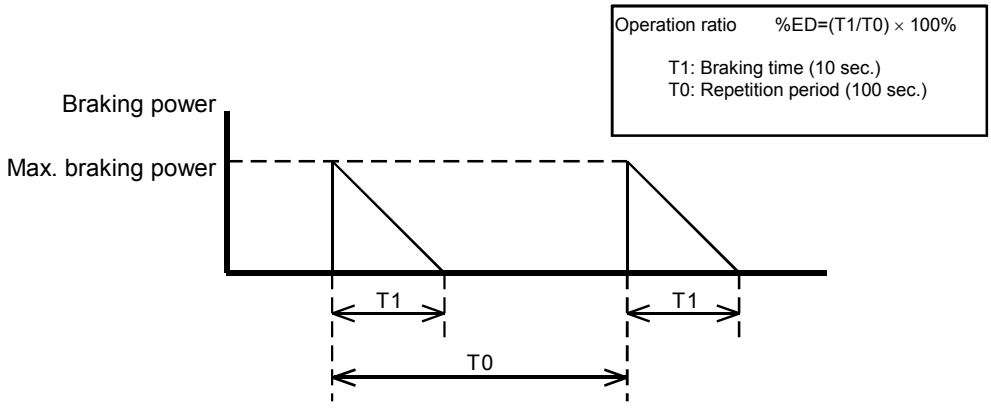
6 Specifications

6-1 Standard Specifications

6-1-1 Braking Unit

Class	200V	400V
Type	BU22-2C	BU22-4C
Minimum connecting resistance (Ω)	5.8	22
Maximum braking power (kW)	22	22
Generating loss (10%ED)(W)	20	15
Rated input current (Arms)	17	9
Mass (kg)	2	2
Braking torque	150% (Instantaneous maximum torque)	
Operation ratio	10%ED (30%ED with optional fan) *1,*2	
Braking time	10 sec.: period 100 sec. (30 sec. with optional fan) *1,*2	
Action voltage (V)	390	780
Protective functions	• Blown fuse • Overheated heat sink • Overheated braking resistor If one of faults listed on the left is sensed, IGBT inside the braking unit is stopped.	
Cooling method	Self-cooling (forced air cooling with optional fan)	
Operation site	Indoors Altitude within 1000m Without corrosive gas, dust or direct sunshine	
Operating ambient temperature	−10℃ ~ +50℃	

*1) The operation ratio (%ED) and braking time are converted under the deceleration braking conditions as shown in the figure below.



The rated current is the effective current in interval T0. T0 should be less than 100s.

*2) For models with an optional fan, the operation ratio (%ED) is calculated on assumption that the braking time (T1) is 30 seconds.

6-1-2 Braking Resistor

1) Item supporting 10%ED

200V class

Type	DB11-2C	DB15-2C	DB22-2C
Standard applied motor (kW)	11	15	22
Resistance (Ω)	10	8.6	5.8
Max. capacity (kW)	11	15	22
Power-on current (A)	9	11	17
Mass (kg)	10	13	22

400V class

Type	DB11-4C	DB15-4C	DB22-4C
Standard applied motor (kW)	11	15	22
Resistance (Ω)	40	34.4	22
Max. capacity (kW)	11	15	22
Power-on current (A)	5	6	9
Mass (kg)	11	14	21

Operation ratio	10%ED (Standard braking unit specifications; refer to *1)
Braking time	10 sec.: period 100 sec. (standard braking unit specifications; refer to *1)
Operating ambient temperature	−10℃ ~ +50℃

2) Item supporting 5%ED

200V class

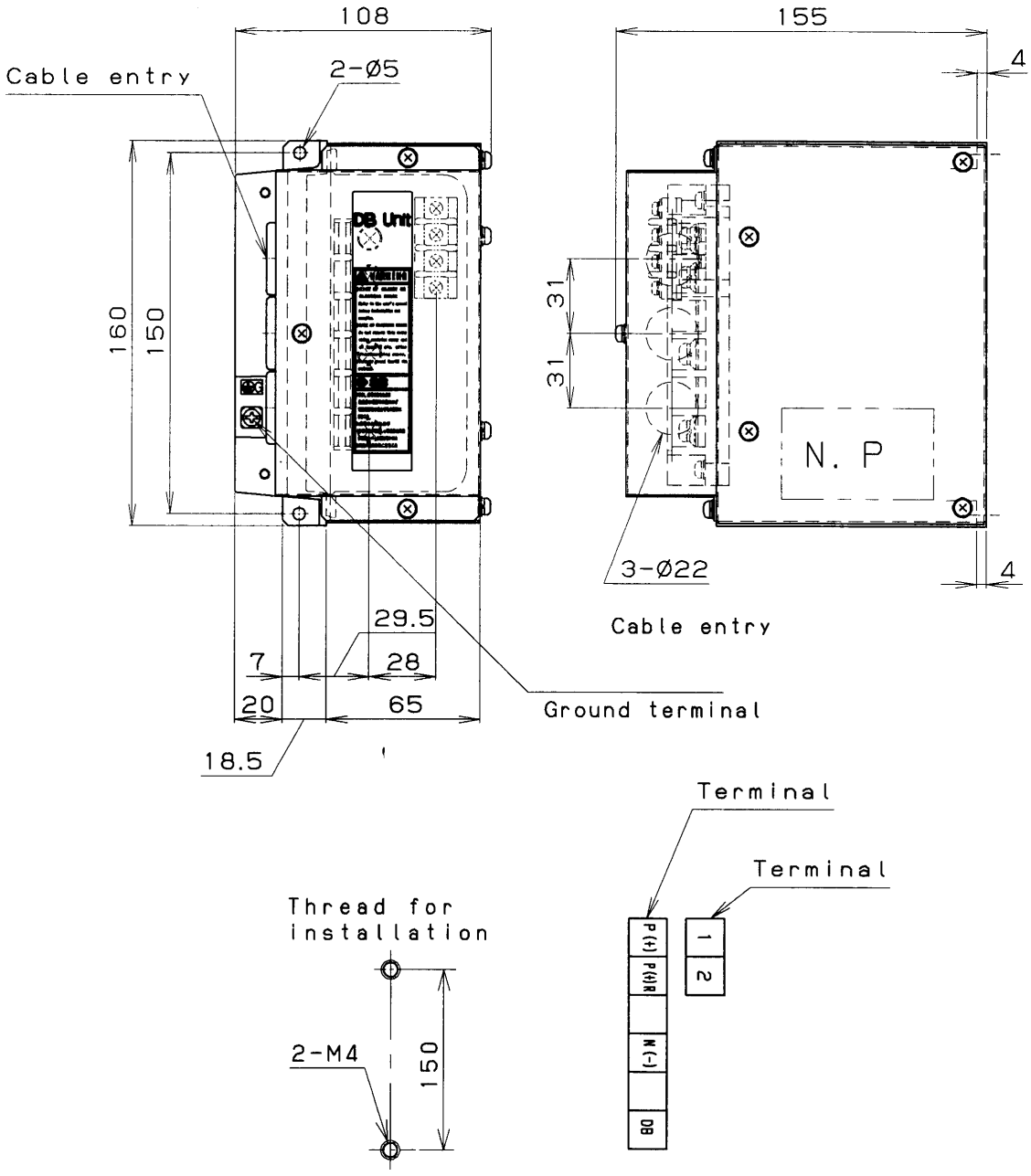
Type	DB11-2	DB15-2	DB18.5-2	DB22-2
Standard applied motor (kW)	11	15	18.5	22
Resistance (Ω)	10	8.6	6.8	5.8
Max. capacity (kW)	11	15	18.5	22
Power-on current (A)	9	11	14	17
Mass (kg)	10	13	18	22

400V class

Type	DB11-4	DB15-4	DB18.5-4	DB22-4
Standard applied motor (kW)	11	15	18.5	22
Resistance (Ω)	40	34.4	27	22
Max. capacity (kW)	11	15	18.5	22
Power-on current (A)	5	6	7	9
Mass (kg)	11	14	19	21

Operation ratio	10%ED(Standard braking unit specifications; refer to *1)
Braking time	10 sec.: period 100 sec. (standard braking unit specifications; refer to *1)
Operating ambient temperature	−10℃ ~ +50℃

6-2 External Dimensions



7 Optional Fan

This braking unit can increase the braking time and operation ratio by using the optional fan.

	Standard specification	With optional fan
Braking time	10 sec.	30 sec.
Operation ratio	10%ED	30%ED

(Refer to *1 and *2 in Chapter 6 “Standard Braking Unit Specifications.”)

7-1 Specifications of Optional Fan

Type	BU-F1S	BU-F2S
Input source voltage specification	Single-phase 90-110Vac 50/60Hz	Single-phase 180-220Vac 50/60Hz
Mass	0.5kg	
Operating ambient temperature	−10℃ ~ +50℃	

7-2 Installation of Optional Fan Unit

7-2-1 Installation (Fig. 7-2-1)

(1) Use the fan unit fixing screw at four places on the side of the unit to fix the fan unit. (The fan unit fixing screws come with the fan unit.)

(2) In order to secure the air passage of the fan unit, provide the space shown in the Installation Method (Fig. 2-2-1) with the Fan Unit is installed.

(3) The wiring port is plugged. Open a hole to pass fan power cables.

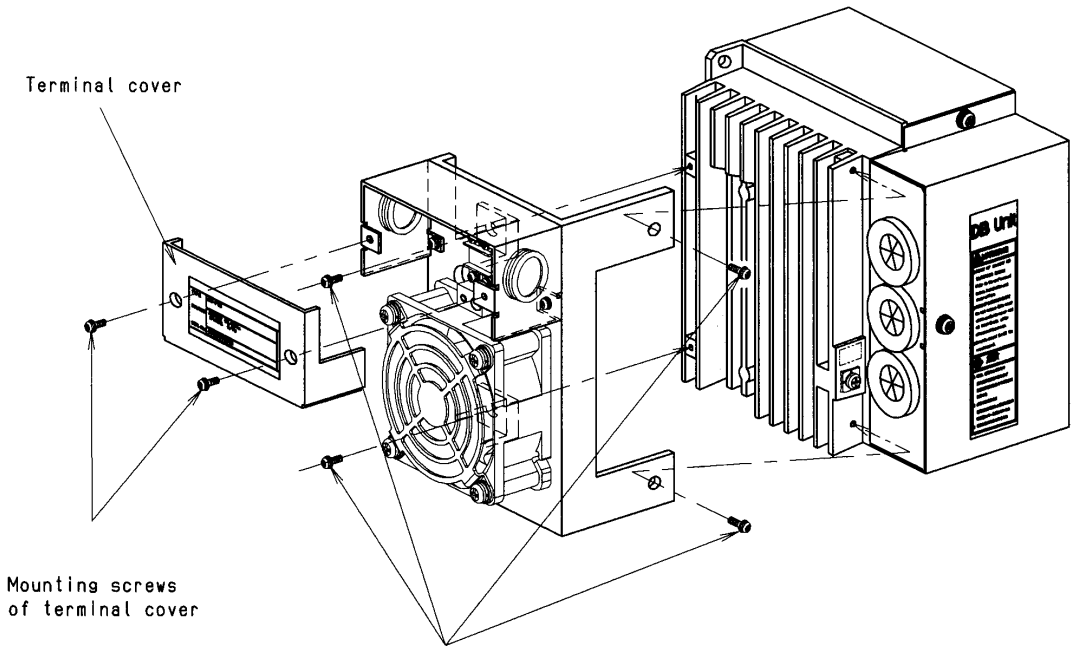


Fig. 7-2-1. Installation of Optional Fan Unit

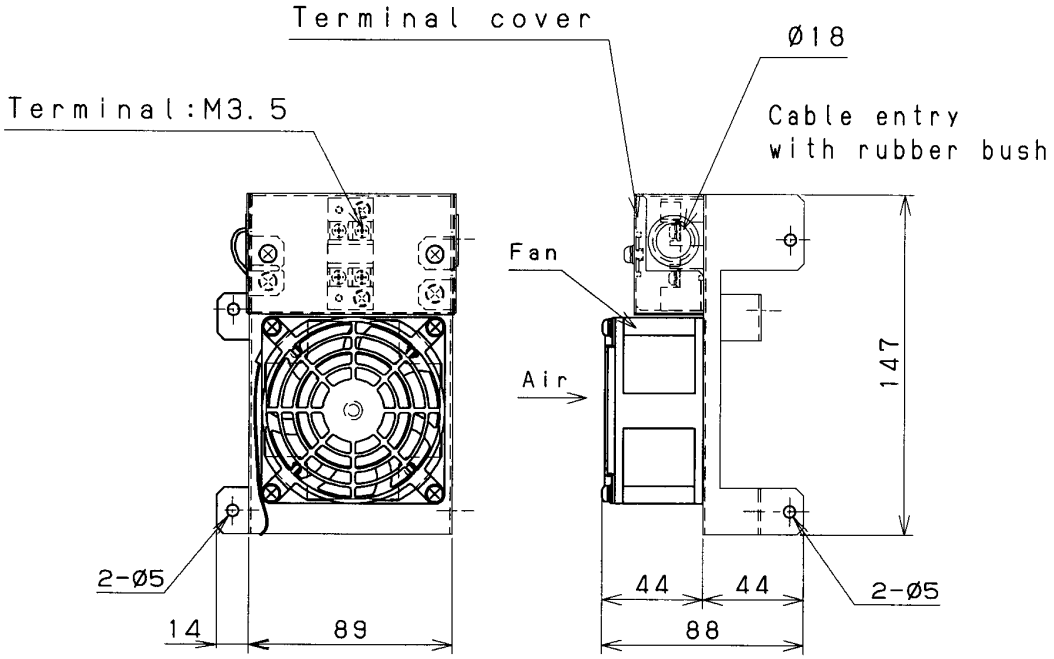
7-2-2 Optional Fan Wiring

(1) Prepare separate power supply for the fan. (The source voltage varies according to the type of the cooling fan to be used.)

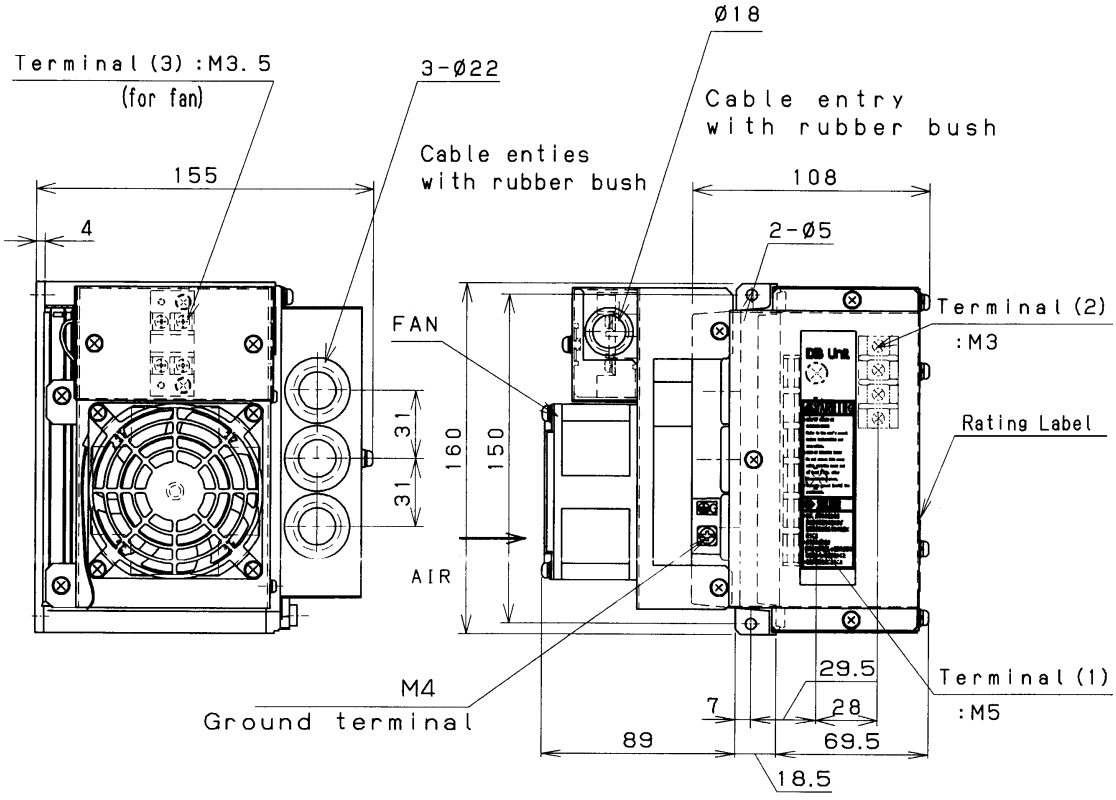
(2) Connect to the terminal block inside the fan unit.
1.25mm^2 wire size is recommended.

7-3 External Dimensions

[Fan unit] BU-F1S, BU-F2S



[DB Unit with Fan Unit] BU22-2C/4C, BU-F1S/F2S



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