YASKAWA

FOR VARISPEED-600 SERIES INVERTER

BRAKING UNIT
BRAKING RESISTOR UNIT
INSTRUCTIONS

MODEL: BRAKING UNIT CDBR-□□□
BRAKING RESISTOR UNIT LKEB-□□□

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.



YASKAWA

MANUAL NO. TOE-C726-2F

PREFACE

Braking resistor unit and braking unit are used to consume regenerative energy from motor in the braking resistor unit at deceleration and to improve the transistor inverter braking ability.

Before using the braking resistor unit and braking unit, a thorough understanding of this manual is recommended. This instruction manual will be of great help for daily maintenance, inspection and troubleshooting.

Inverters to which the braking resistor unit and braking unit can be connected are of the following series:

- VS–616 Series
- VS–676 Series
- VS–866 Series

General Precautions

- Some drawings in this manual are shown with the protective cover or shields removed, in order to describe with more clarity. Make sure all covers and shields are replaced before operating this product.
- Since the drawings in this manual are represented examples, some are subject to differ from delivered products.
- This manual may be modified when necessary because of improvement of the product, modification or changes in specifications. Such modifications are denoted by a revised manual No.
- To order a copy of this manual, if your copy has been damaged or lost, contact your YASKAWA representative.
- YASKAWA is not responsible for any modification of the product made by the user since that will void your guarantee.

NOTES FOR SAFE OPERATION

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the braking unit and the braking resistor unit. In this manual, NOTES FOR SAFE OPERATION are classified as “WARNING” or “CAUTION.”



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment.
It may also be used to alert against unsafe practices.

Even items described in 

may result in a vital accident in some situations. In either case, follow these important notes.



: These are steps to be taken to insure proper operation.

RECEIVING

⚠ CAUTION

(Ref. page)

- Do not install or operate any braking unit or braking resistor unit which is damaged or has missing parts. 15
  Failure to observe this caution may result in personal injury or equipment damage.

INSTALLATION

⚠ CAUTION

(Ref. page)

- Lift the cabinet by the base. When moving the unit, never lift by the front cover. 16
  Otherwise, the main unit may be dropped causing damage to the unit.

- Mount the braking unit and braking resistor unit on nonflammable material (i.e. metal). 16
  Failure to observe this caution can result in a fire.

- When mounting multiple units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 40°C. 16
  Overheating may cause a fire or damage to the unit.

WIRING

⚠ WARNING

(Ref. page)

- Only commence wiring after verifying that the power supply is turned OFF. 27
  Failure to observe this warning can result in an electrical shock or a fire.
- High voltage exists at all terminals of braking unit and braking resistor unit. 27
  Failure to observe this warning can result in an electrical shock.
- Wiring should be performed only by qualified personnel. 27
  Failure to observe this warning can result in an electrical shock or a fire.
- When wiring the emergency stop circuit, check the wiring thoroughly before operation. 27
  Failure to observe this warning can result in personal injury.
- Make sure to ground the ground terminal ⏚. 27
  (Ground resistance
  200V class: 100W or less, 400V class: 10W or less)
  Failure to observe this warning can result in an electrical shock.

⚠ CAUTION

(Ref. page)

- Verify that the rated voltage of the braking unit and the braking resistor unit coincides with the AC power supply voltage. 27
  Failure to observe this caution can result in personal injury or a fire.

- Do not perform a withstand voltage test of the braking unit and braking resistor unit. 27
  It may cause semi−conductor elements to be damaged.

- Connect braking resistors, braking resistor units, and braking units as shown in the I/O wiring examples. Use properly rated wire in accordance with table 2 on page 31. 27
  Otherwise, a fire can occur.

- Tighten terminal screws to the specified tightening torque. 27
  Failure to observe this caution can result in a fire.

OPERATION

⚠ WARNING

(Ref. page)

- Only turn ON the input power supply after replacing the front cover. Do not remove the cover while current is flowing. 41
  Failure to observe this warning can result in an electrical shock.

⚠ CAUTION

(Ref. page)

- Never touch the heatsink or discharging resistor since the temperature is very high. 41
  Failure to observe this caution can result in harmful burns to the body.
- Do not check signals during operation. 41
  The machine or the inverter may be damaged.
- All the constants of the the braking unit and the braking resistor unit have been preset at the factory. Do not change the settings unnecessarily. 41

MAINTENANCE AND INSPECTION

⚠ WARNING

(Ref. page)

- Never touch high−voltage terminals in the the braking unit and braking resistor unit. 46
  Failure to observe this warning can result in an electrical shock.

- Replace all protective covers before powering up the braking unit and the braking resistor unit. To remove the cover, make sure to shut OFF the molded−case circuit breaker. 46
  Failure to observe this warning can result in an electrical shock.

- Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turned OFF. 46
  The capacitors are still charged and can be dangerous.

- Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement. 46
  [Remove all metal objects (watches, bracelets, etc.) before operation.]
  (Use tools which are insulated against electrical shock.)
  Failure to observe this warning can result in an electrical shock.

⚠ CAUTION

(Ref. page)

- The control PC board employs CMOS ICs. Do not touch the CMOS elements. 46
  They are easily damaged by static electricity.
- Do not connect or disconnect wires or connectors while power is applied to the circuit. 46
  Failure to observe this caution can result in personal injury.

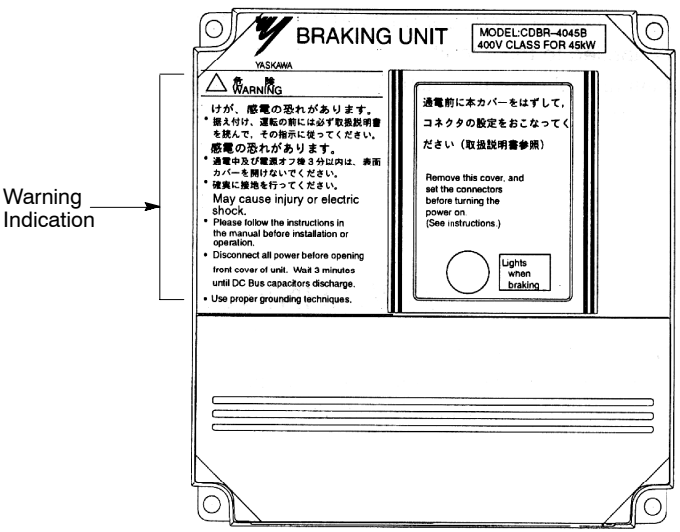
OTHERS

⚠ WARNING

- Never modify the product.
  Failure to observe this warning can result in an electrical shock or personal injury and will invalidate the guarantee.

WARNING INDICATION

A warning label is displayed on the front cover of the braking unit, as shown below. Follow these instructions when handling the braking unit and the braking resistor unit .



Example of Braking Unit Model CDBR−4045B

Warning Indication



危　険
WARNING

けが、感電の恐れがあります。

・据え付け、運転の前には必ず取扱説明書を読んで、その指示に従ってください。

感電の恐れがあります。

・通電中及び電源遮断後3分以内は、表面カバーを開けないでください。

・確実に接地を行ってください。

May cause injury or electric shock.

・Please follow the instructions in the manual before installation or operation.
・Disconnect all power before opening front cover of unit. Wait 3 minutes until DC Bus capacitors discharge.
・Use proper grounding techniques.

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1. RECEIVING

The braking resistor unit and braking unit have been put through severe tests at the factory before shipment. After unpacking, however, check and see the following. If any malfunctions are found, contact your YASKAWA representative.

- Their nameplate data meet your requirements.
- They have sustained no damage while in transit.
- Fastening bolts and screws are not loose.

2. INSTALLATION

2.1 LOCATION

If the units are temporarily stored or machine stops for an extended length of time, the following precautions should be taken. Store the units under the following conditions.

- Free from rainfall and drops of water.
- Clean and dry.
- Free from corrosive gases and liquids.
- Free from dirt and dust.
- Ambient temperature: 14 to 104°F, –10 to 40°C.
- Humidity: 90% RH or less (no condensation)
- Free from vibration.

2.2 INSTALLATION

For full use of the braking resistor unit or braking unit functions, install the units in a location to satisfy the following conditions:

Figs. 1 to 8 show the external dimensions and the spaces from the periphery.

- Provide the spaces shown in Figs. 1 to 8 between the units and the periphery.
- Since the braking resistor unit generates heat, provide sufficient spaces from devices which are weak against heat.
- Install the units at such locations that all requirements described in Par. 2.1 “LOCATION” are satisfied.
- Install the units in the directions shown in Figs. 1 to 8. There will be no problem if they are installed vertically.

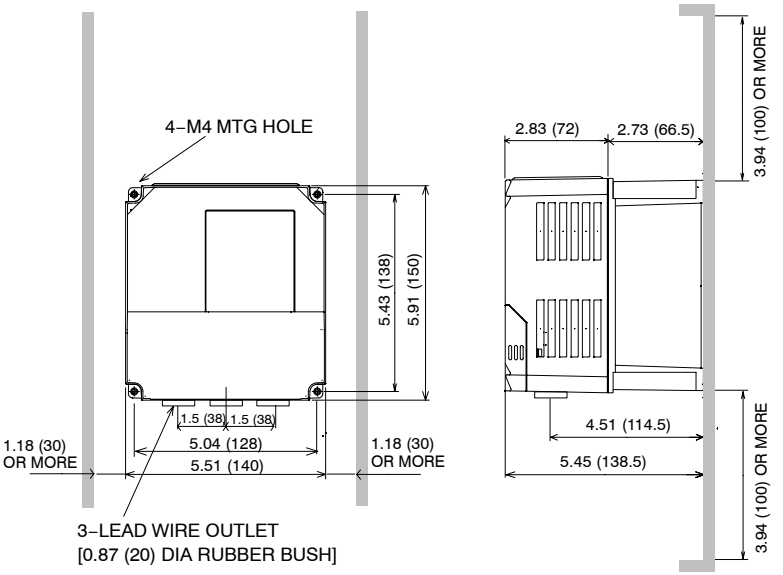


Fig. 1 Braking Unit Dimensions in inches (mm) CDBR−2015B, −2022B, −4030B, −4045B

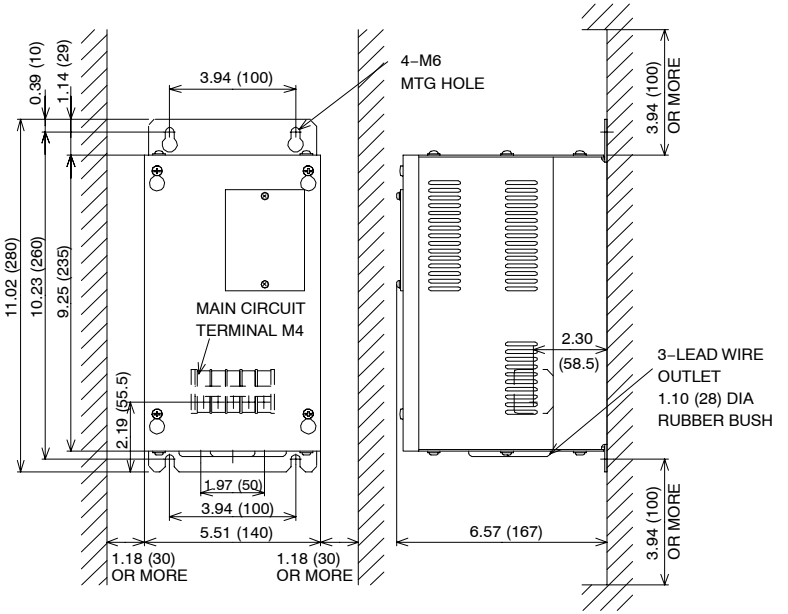


Fig. 2 Braking Unit Dimensions in inches (mm) CDBR–5037B

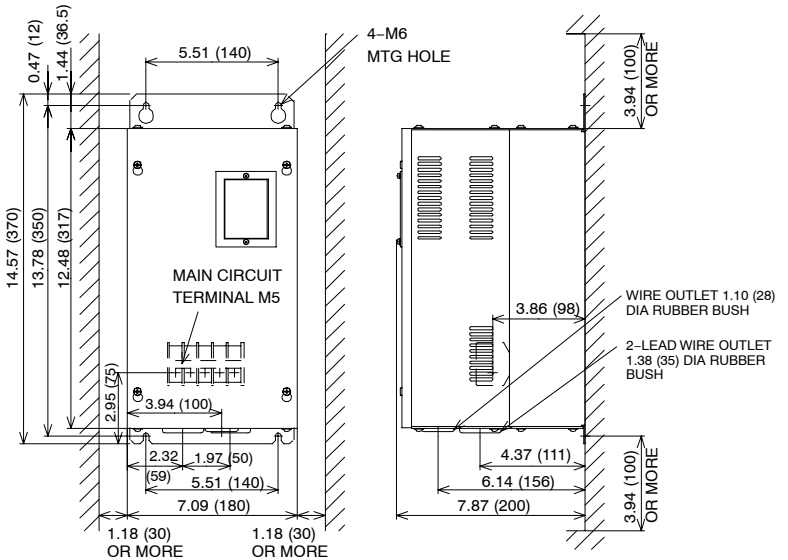


Fig. 3 Braking Unit Dimensions in inches (mm) CDBR–2045B

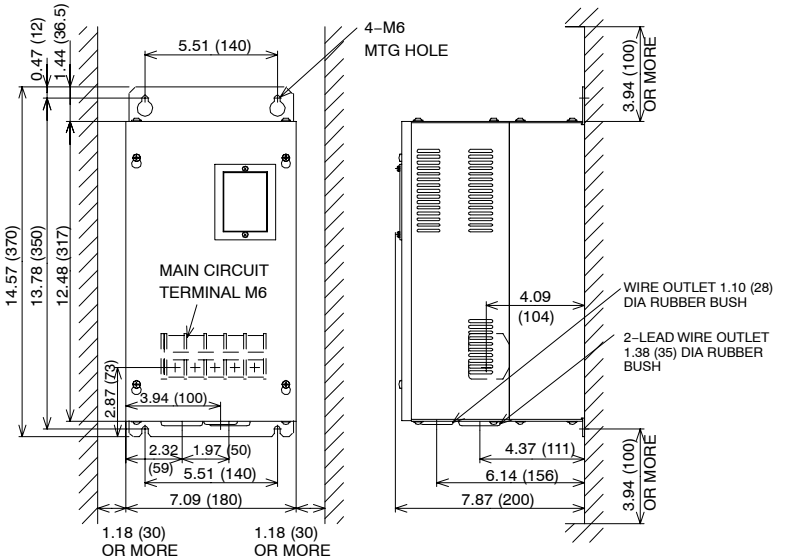


Fig. 4 Braking Unit Dimensions in inches (mm) CDBR−2110B

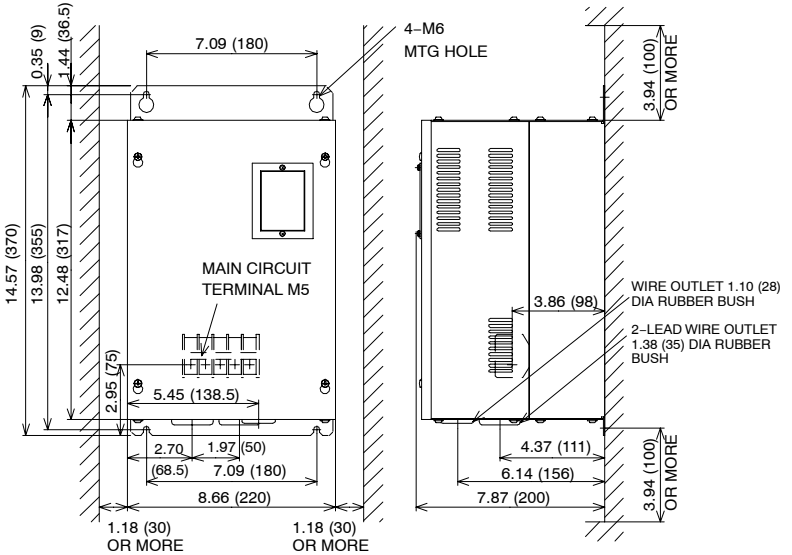


Fig. 5 Braking Unit Dimensions in inches (mm) CDBR–4090B, –5110B

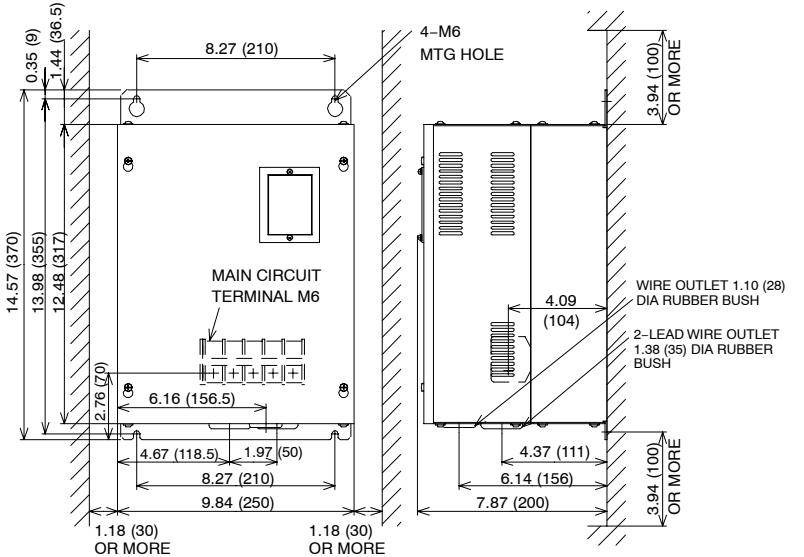
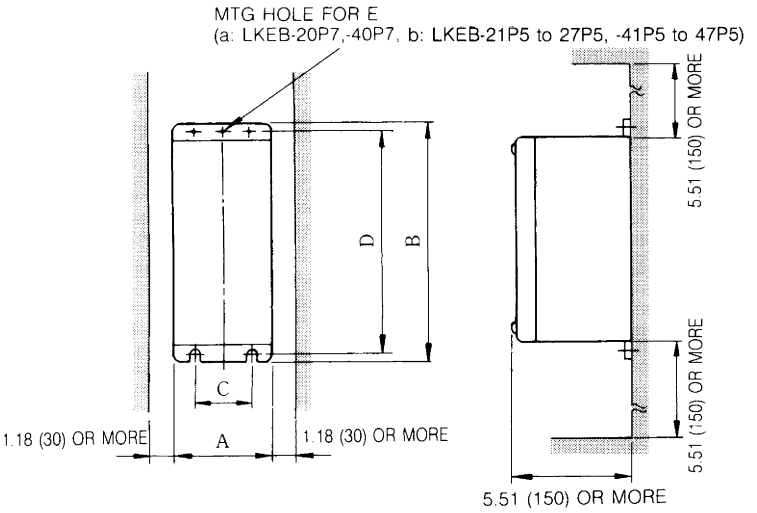
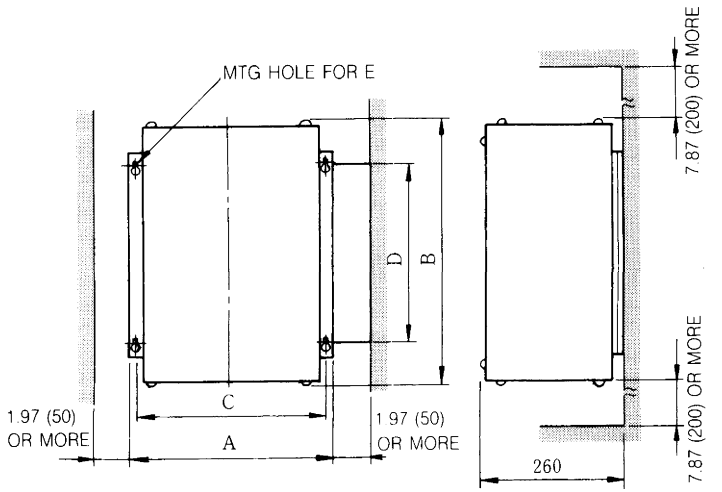


Fig. 6 Braking Unit Dimensions in inches (mm) CDBR–4220B, –5300B



Braking Resistor Unit Model (LKEB-□)	Dimensions in inches (mm)				
	A	B	C	D	E
20P7	4.13 (105)	10.83 (275)	1.97 (50)	10.24 (260)	M5
21P5	5.12 (130)	13.78 (350)	2.95 (75)	13.19 (335)	M5
22P2	5.12 (130)	13.78 (350)	2.95 (75)	13.19 (335)	M5
23P7	5.12 (130)	13.78 (350)	2.95 (75)	13.19 (335)	M5
25P5	9.84 (250)	13.78 (350)	7.87 (200)	13.19 (335)	M6
27P5	9.84 (250)	13.78 (350)	7.87 (200)	13.19 (335)	M6
40P7	4.13 (105)	10.83 (275)	1.97 (50)	10.24 (260)	M5
41P5	5.12 (130)	13.78 (350)	2.95 (75)	13.19 (335)	M5
42P2	5.12 (130)	13.78 (350)	2.95 (75)	13.19 (335)	M5
43P7	5.12 (130)	13.78 (350)	2.95 (75)	13.19 (335)	M5
45P5	9.84 (250)	13.78 (350)	7.87 (200)	13.19 (335)	M6
47P5	9.84 (250)	13.78 (350)	7.87 (200)	13.19 (335)	M6

Fig. 7 Braking Resistor Unit Dimensions in inches (mm) [for 0.5 to 10HP (0.4 to 7.5kW)]

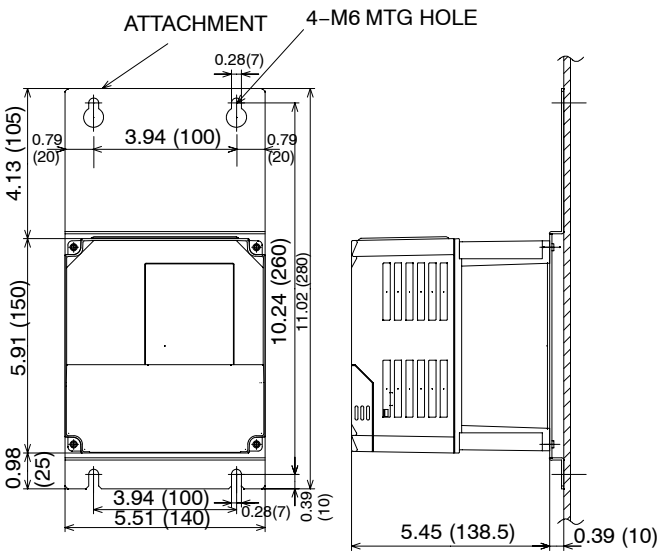


Braking Resistor Unit Model (LKEB-□)	Dimensions in inches (mm)				
	A	B	C	D	E
2011	10.48 (266)	21.38 (543)	9.69 (246)	13.39 (340)	M8
2015	14.02 (356)	21.38 (543)	13.23 (336)	13.39 (340)	M8
2018	17.56 (446)	21.38 (543)	16.77 (426)	13.39 (340)	M8
2022	17.56 (446)	21.38 (543)	16.77 (426)	13.39 (340)	M8
4011	13.78 (350)	16.22 (412)	12.99 (330)	12.80 (325)	M6
4015	13.78 (350)	16.22 (412)	12.99 (330)	12.80 (325)	M6
4018	17.56 (446)	21.38 (543)	16.77 (426)	13.39 (340)	M8
4022	17.56 (446)	21.38 (543)	16.77 (426)	13.39 (340)	M8
4030	14.02 (356)	37.64 (956)	13.23 (336)	29.13 (740)	M8
4037	17.56 (446)	37.64 (956)	16.77 (426)	29.13 (740)	M8
4045	17.56 (446)	37.64 (956)	16.77 (426)	29.13 (740)	M8

Fig. 8 Braking Resistor Unit Dimensions in inches (mm) [for 15 to 60HP (11 to 45kW)]

2.3 REPLACEMENT OF CONVENTIONAL BRAKING UNITS WITH NEW UNITS

To replace conventional braking units (models CDBR−2015, −2022, −4030, −4045) with new units (CDBR−2015B, −2022B, −4030B, −4045B), an exclusive−use attachment is required. Contact your YASKAWA representative.



Code No.: DACT32732−AD

Fig. 9 Mounting Dimensions of Attachment in inches (mm)

The main circuit terminal symbols are different between conventional models and new models. Refer to the following table.

Table 1 Main Circuit Terminal Symbols

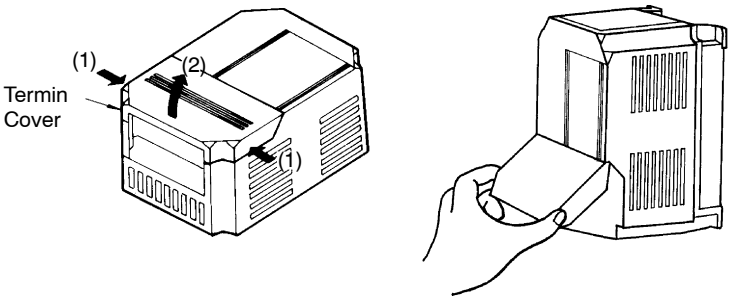
Conventional Models	New Models
N	$\ominus$
P	$\oplus$
P_0	$\oplus_0$
B	$\ominus_0$

3. WIRING

3.1 REMOVING AND REPLACING THE COVERS OF THE BRAKING UNIT (MODELS CDBR–2015B, –2022B, –4030B, –4045B)

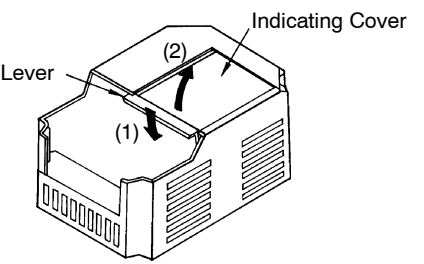
(1) Removing and Replacing the Terminal Cover

For removing, grasp the terminal cover at (1) on both sides and then lift in the direction of (2). For replacing, reverse the method.



(2) Removing and Replacing the Indicating Cover

Remove the terminal cover first. Push down on the lever in the direction of (1) and lift the cover in the direction of (2). For replacing, reverse the method.



3.2 SECTION NAMES

Figs. 10, 11 and 12 show appearance and each section name of braking unit and braking resistor unit respectively.

Thermal overload relay protects the braking resistor unit for models LKEB−20P7 to −27P5, and thermal protector protects the braking resistor unit for models LKEB−2011 to −2022 and −4018 to −4045.

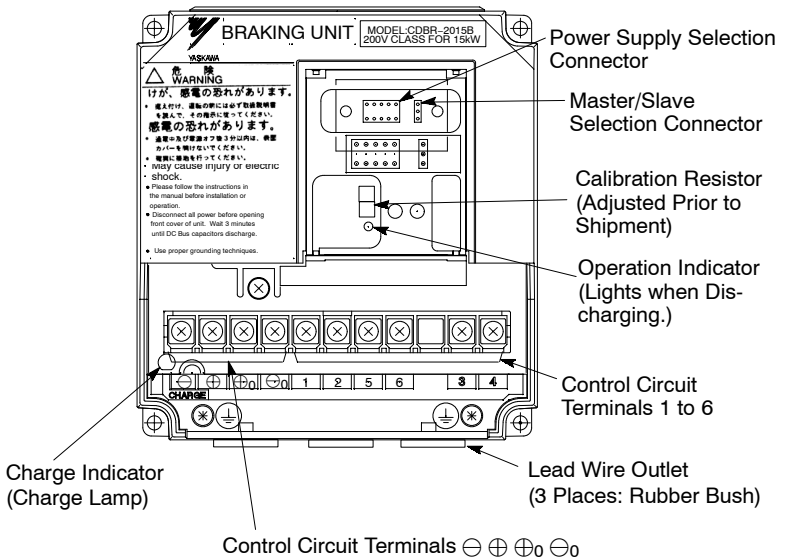


Fig. 10 Braking Resistor Unit Model CDBR−2015B (Terminal Cover and Indicationg Cover Removed)

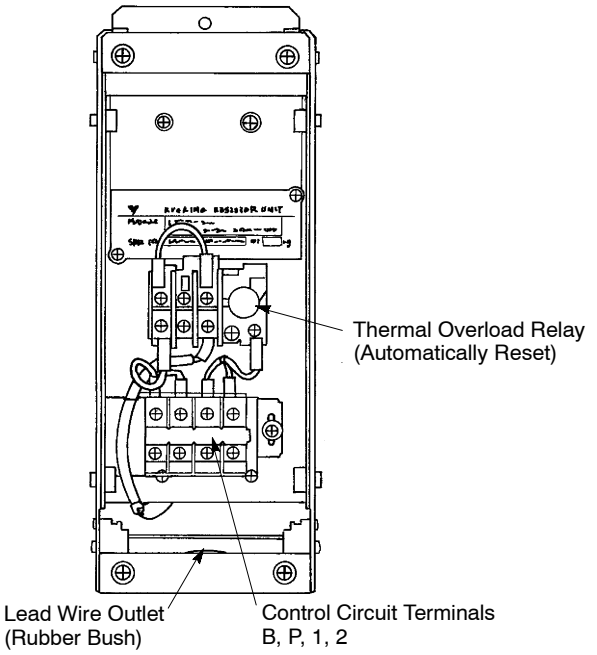


Fig. 11 Braking Resistor Unit Model LKEB−20P7 (Front Cover Removed)

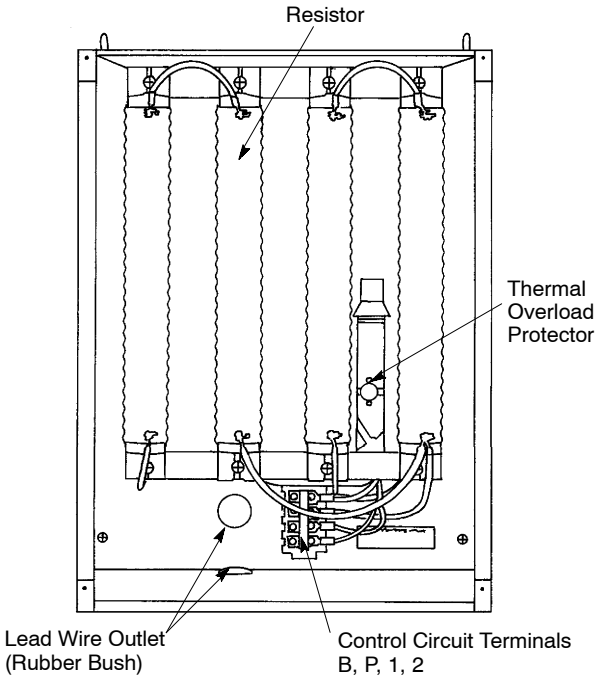


Fig. 12 Braking Resistor Unit Model LKEB−2022 (Front Cover Removed)

3.3 CIRCUITS AND WIRING SPECIFICATIONS

Table 2 Circuits and Wiring Specifications

Name	Circuit	Terminals	Wire Size AWG (mm²)	Wire Type	Terminal Screw	Max. Torque lb·in (N·m)
Braking Unit (Models CDBR −2015B, −2022B, −4030B, −4045B, −5037B)	Main	⊕ ⊕0 ⊖ ⊖0	12−10 (3.5−5.5)	600V (High Voltage)*3 vinyl sheathed wire or equivalent	M4	13.3 (1.50)
	Control	1 2 3 4 5 6	18−14 (0.75−2)			
Braking Unit (Model CDBR −2045B, −4090B, −5110B)	Main	⊕ ⊕0 ⊖ ⊖0	10−8 (5.5−8)		M5	21.7 (2.45)
	Control	1 2 3 4 5 6	18−14 (0.75−2)		M4	15.6 (1.76)
Braking Unit (Model CDBR−2110B, −4220B, −5300B)	Main	⊕ ⊕0 ⊖ ⊖0	4 (22) 8−6 (8−14)*1		M6	43.4 (4.90)
	Control	1 2 3 4 5 6	18−14 (0.75−2)		M4	15.6 (1.76)
Braking Resistor Unit (Model LKEB−☐)	Main	B P	12−10 (3.5−5.5)		M4 (M5) *2	15.6 (1.76) (21.7(2.45))
	Control	1 2	18−14 (0.75−2)		M4	15.6 (1.76)

*1 For wire size of 8−6 (8−14), use UL1283 heat−resistant vinyl−insulated wire or equivalent.

*2 M4 for Models LKEB−20P7 to −27P5 or −40P7 to −4015.
M5 for Models LKEB−2011 to −2022 or −4018 to −4045.

*3 Models−5037B, −5100B, and −5300B can reach an operating voltage of 1040 VDC. Please select wire which is suitable for the operating voltage.

3.4 WIRING PRECAUTIONS

(1) Wiring Leading–in Method

Lead in the wire through the knockout hole on the unit bottom. Since the knockout hole is provided with a rubber bush, cut the rubber bush central crosswise with a blade and lead the wire through.

(2) Separation from Signal Lines

Since strong noise component is superimposed on the braking resistor unit and braking unit wiring, separate the units from signal lines which are weak against noise.

(3) Wiring Distance

Wiring distance between the braking resistor unit and braking unit or braking unit and inverter must be provided as shown in Fig. 13. Make sure to bundle the wires between the units.

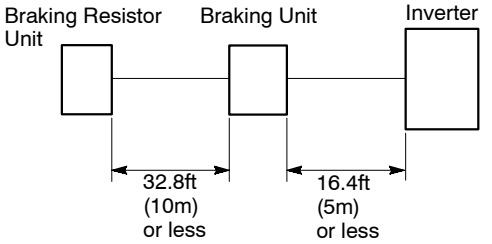


Fig. 13 Wiring Distance

(4) Grounding Method

- Mount the braking resistor unit on a grounded metallic plate. When it cannot be mounted on a grounded metallic plate, pull out the lead wire from the mounting screw section to ground.
- Braking unit grounding terminal must be provided with class 3 ground (ground resistance: 100Ω or less.)
- Use the sizes specified in “INTERNAL CONNECTION SPECIFICATIONS” for grounding cables.

3.5 INTERCONNECTION

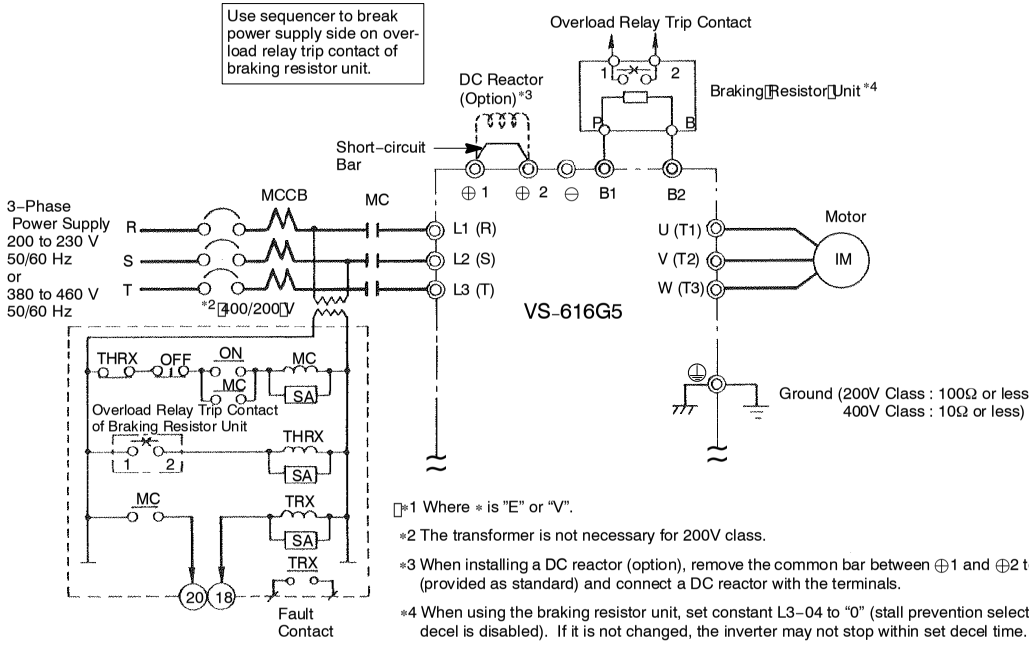
Figs. 14 to 20 show the interconnecting diagrams of the braking unit or braking resistor unit and VS−616G5.

Refer to Par. 3.3, “Wiring Precautions” for proper wiring in actual wiring design and work.

Be sure to connect braking resistors or braking resistor units to the braking units.

Connect only braking resistors or Braking Resistor Units (LKEB−XXXX) to Braking Units.

NOTE If using another braking resistor instead of YASKAWA braking resistor unit, be sure to protect by thermal overload relay.



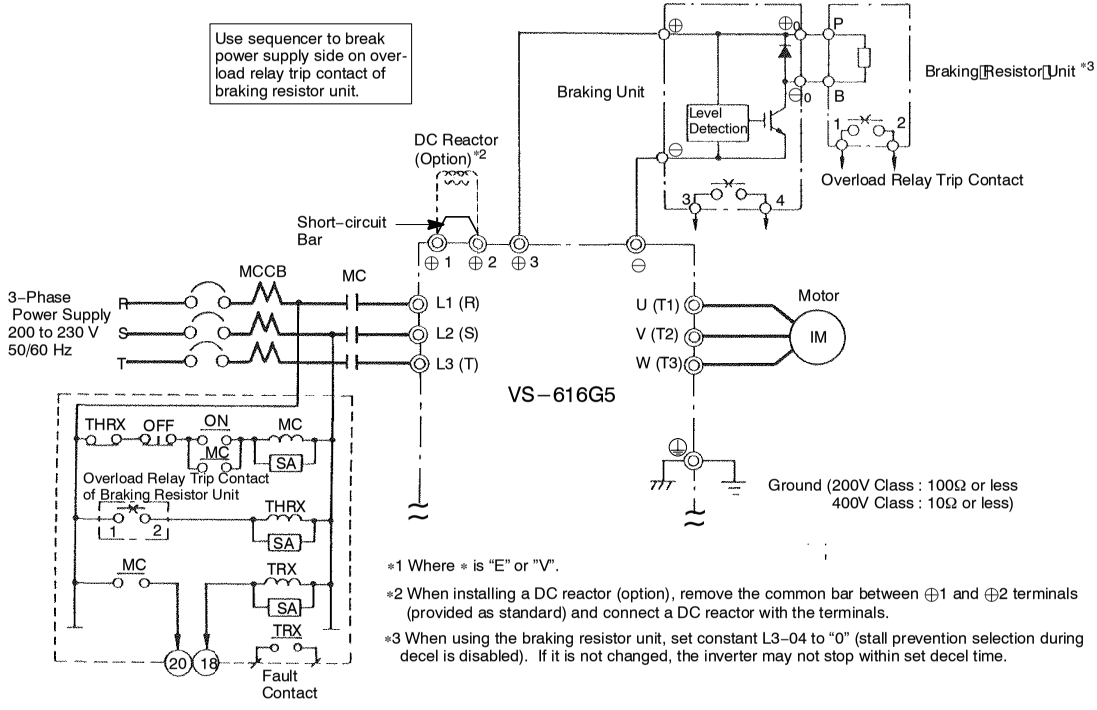
*1 Where * is "E" or "V".

*2 The transformer is not necessary for 200V class.

*3 When installing a DC reactor (option), remove the common bar between ⊕1 and ⊕2 terminals (provided as standard) and connect a DC reactor with the terminals.

*4 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

Fig. 14 For Models CIMR-G5*20P4 to -G5*27P5 (200 V Class 0.55 to 7.5 kW), Models CIMR-G5*40P4 to -G5*4015 (400 V Class 0.4 to 15 kW)

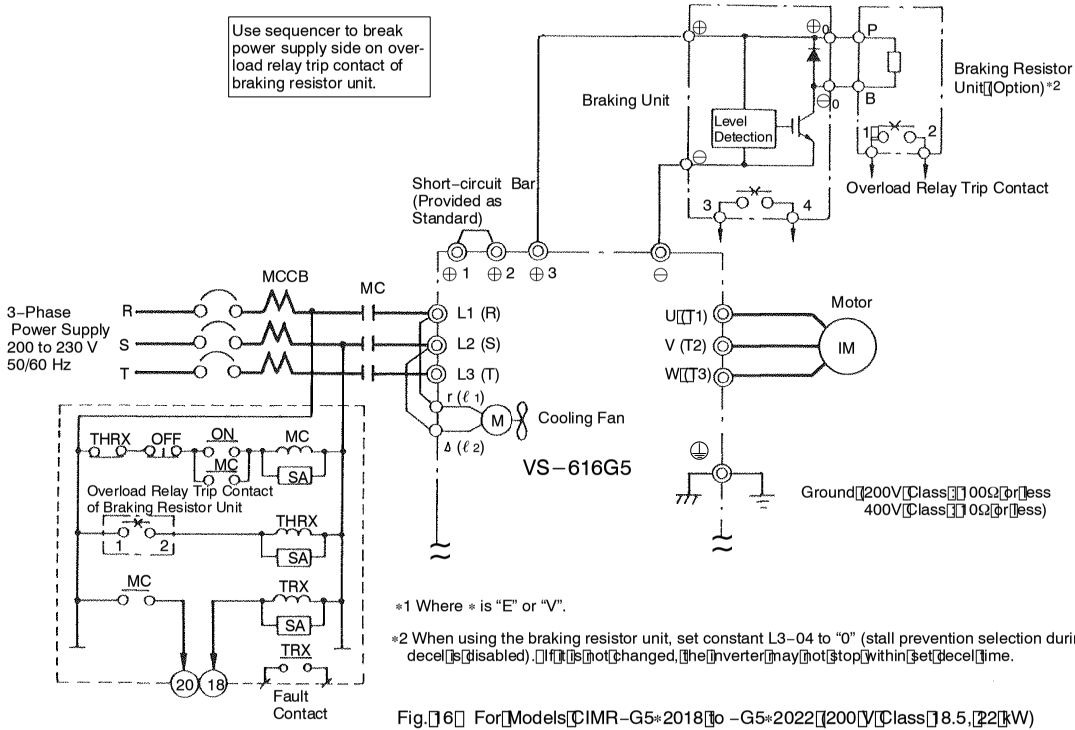


*1 Where * is "E" or "V".

*2 When installing a DC reactor (option), remove the common bar between ⊕1 and ⊕2 terminals (provided as standard) and connect a DC reactor with the terminals.

*3 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

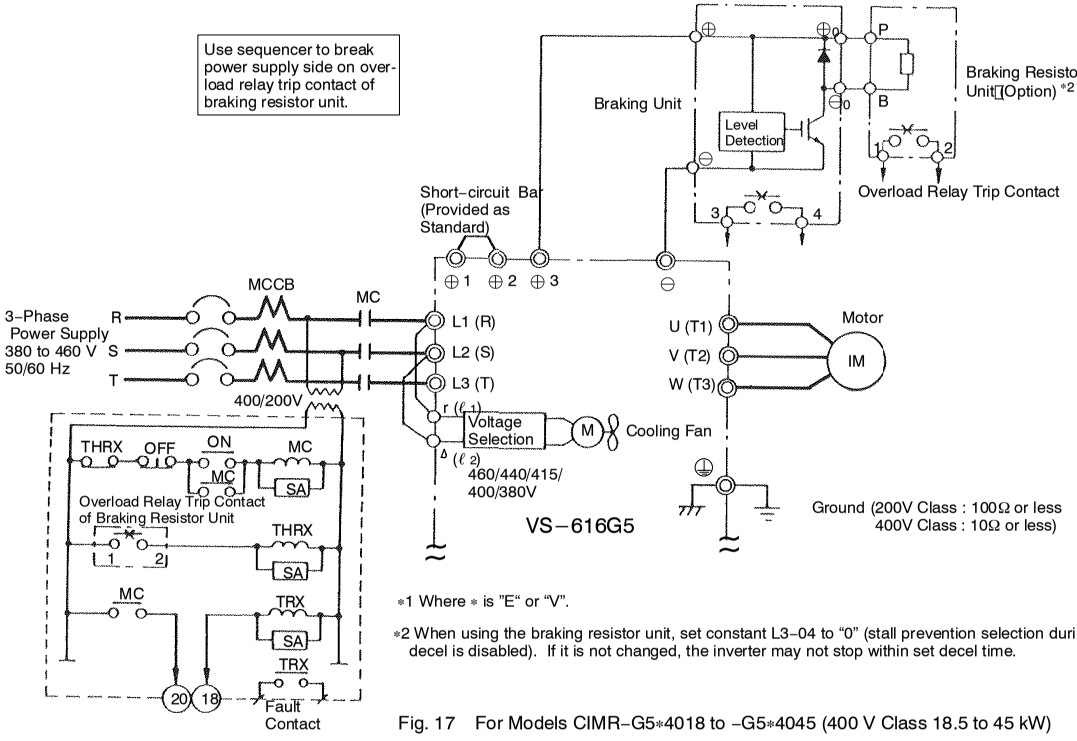
Fig. 15 For Models CIMR-G5*2011 to -G5*2015 (200 V Class 11, 15 kW)



*1 Where * is "E" or "V".

*2 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

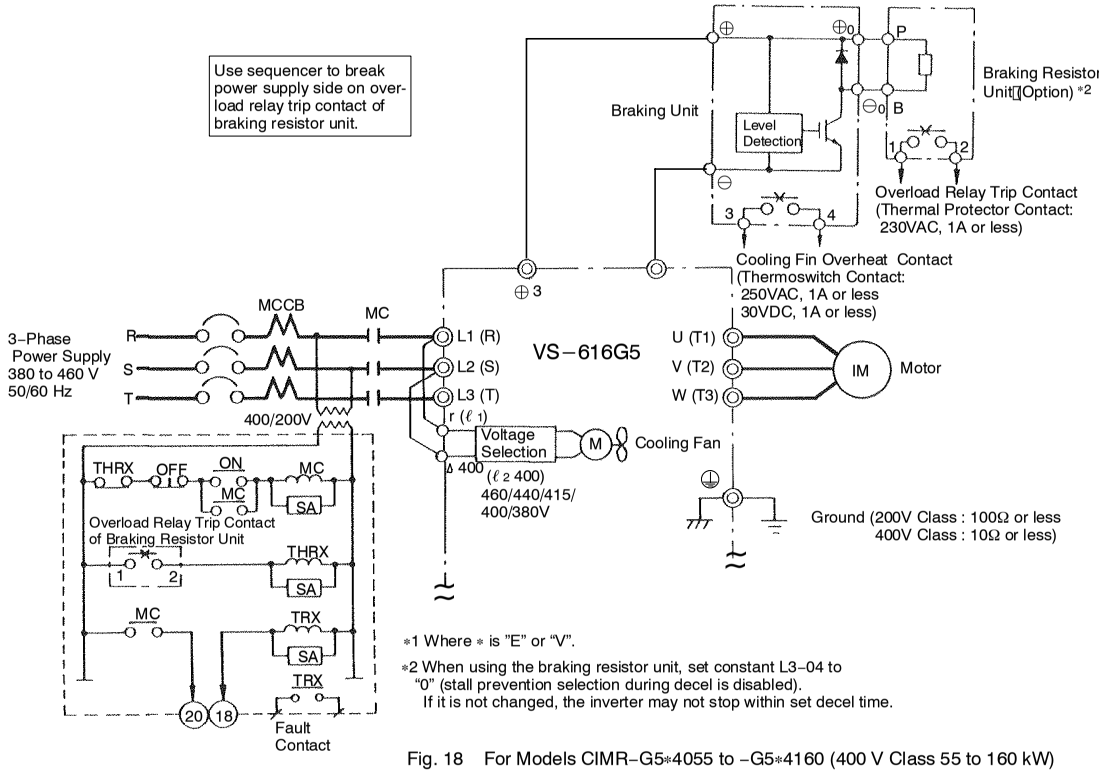
Fig. 16 For Models CIMR-G5*2018 to -G5*2022 (200 V Class 18.5, 22 kW)



*1 Where * is "E" or "V".

*2 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

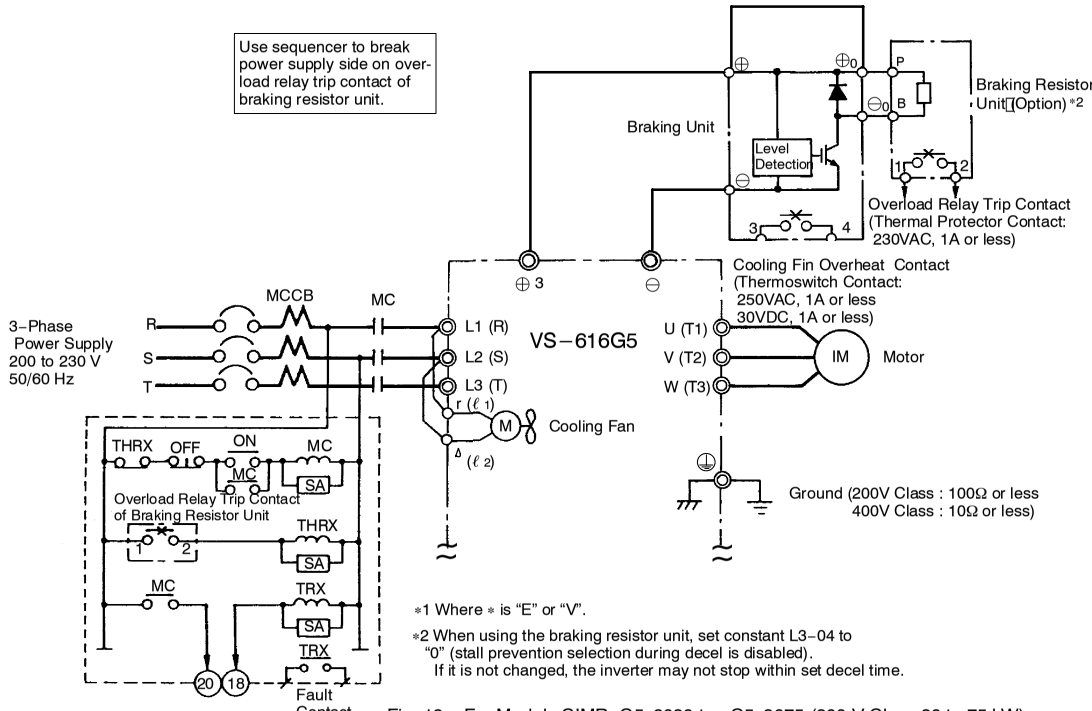
Fig. 17 For Models CIMR-G5*4018 to -G5*4045 (400 V Class 18.5 to 45 kW)



*1 Where * is "E" or "V".

*2 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

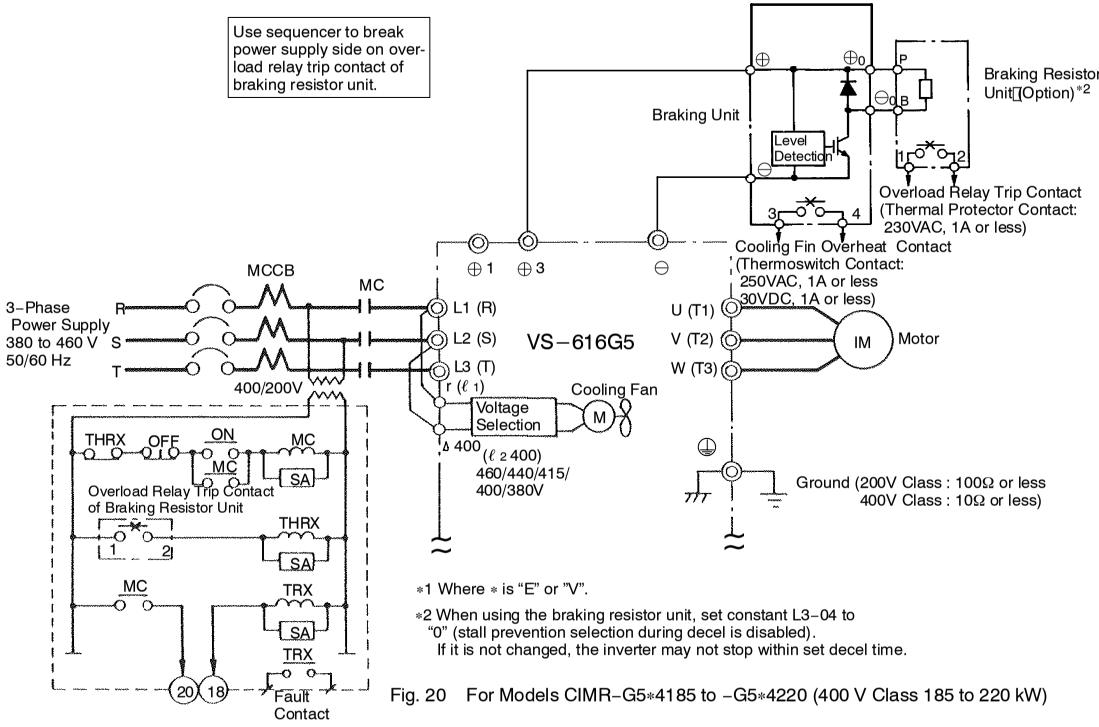
Fig. 18 For Models CIMR-G5*4055 to -G5*4160 (400 V Class 55 to 160 kW)



*1 Where * is "E" or "V".

*2 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

Fig. 19 For Models CIMR-G5*2030 to -G5*2075 (200 V Class 30 to 75 kW)



∗1 Where ∗ is "E" or "V".

∗2 When using the braking resistor unit, set constant L3-04 to "0" (stall prevention selection during decel is disabled). If it is not changed, the inverter may not stop within set decel time.

Fig. 20 For Models CIMR-G5∗4185 to -G5∗4220 (400 V Class 185 to 220 kW)

4. OPERATION

4.1 ADJUSTMENT

The braking resistor unit and braking unit do not have to be adjusted.

Especially, do not readjust the braking unit except in the case described in Par. 4.2, “Power Supply Voltage Selection Connector Setting.”

4.2 POWER SUPPLY VOLTAGE SELECTION CONNECTOR SETTING

It may be necessary to select power supply voltage selection connector for braking unit according to main circuit power supply type. Table 3 shows the relationship between the power supply voltage selection connector and braking start voltage.

The following is the setting prior to shipment:

- 200V class: 220V
- 400V class: 440V
- 575V class: 575V

For removing the terminal cover and the indicating cover, refer to Par. 3.1.

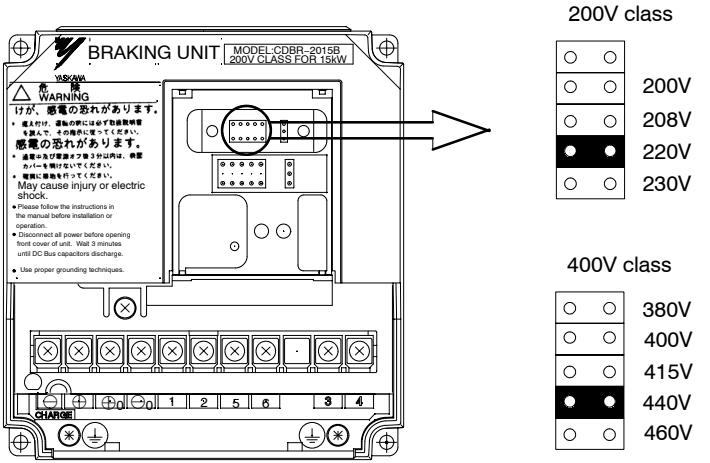


Fig. 21 Braking Unit Power Supply Voltage Selection
(Models CDBR−2015B, −2022B, −4030B, −4045B, Terminal Cover and Indicating Cover Removed)

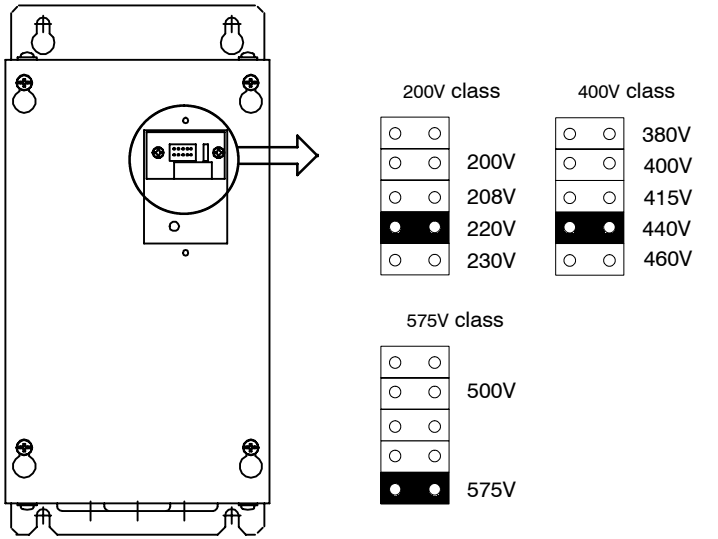


Fig. 22 Braking Unit Power Supply Voltage Selection
(Models CDBR−2045B, −2110B, −4090B, −5037B, −5110B, −5300B,
Indicating Cover Removed)

Table 3 Power Supply Voltage Selection Connector and Braking Start Voltage

200V Class* Power Supply Voltage	Braking Start Voltage (PN Bus−bar Voltage)	400V Class* Power Supply Voltage	Braking Start Voltage (PN Bus−bar Voltage)	575V Class* Power Supply Voltage	Braking Start Voltage (PN Bus−bar Voltage)
230V	380V (TYP)	460V	760V (TYP)	575V	950V (TYP)
220V	365V (TYP)	440V	730V (TYP)	–	–
208V	345V (TYP)	415V	690V (TYP)	–	–
200V	330V (TYP)	400V	660V (TYP)	500V	825V (TYP)
–	–	380V	630V (TYP)	–	–

*Allowable voltage fluctuation is ±10%

4.3 MASTER/SLAVE SELECTION CONNECTOR SETTING

Selection Connector Setting MASTER side is selected prior to shipment. Use the units without changing the setting.

SLAVE side is selected when more than one braking unit is combined to use and braking start levels must coincide. Refer to Par. 4.4, “Parallel Connection of Braking Unit” for details.

4.4 PARALLEL CONNECTION OF BRAKING UNIT

For using more than one parallel−connected braking unit, connect and select the connectors as follows. (See Fig. 23.)

- Braking units have a MASTER/SLAVE selection connector. (See Fig. 10.) Select MASTER side only for braking unit 1 and select SLAVE side for braking units 2 and 3.
- Connect thermal protector on the braking resistor unit and thermoswitch on the braking unit in parallel. Refer to Figs. 15 and 18 for proper wiring.
- Use properly rated wire in accordance with table 2 on page 31.
- Use twisted−pair wires of 1mm or less for connection between 5, 6 and 1, 2 of the braking units.
- Parallel connection of braking unit is possible up to a maximum of 10 units.

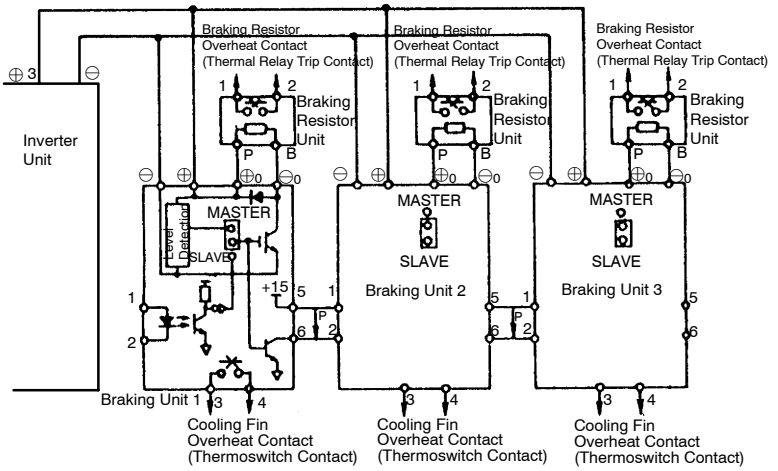


Fig. 23 Example of Parallel Connection of Three Braking Units

4.5 OPERATION

Check that required deceleration characteristics can be obtained. While the braking unit is operating, BRAKE lamp lights for easy check of operation.

NOTE High voltage is applied to the braking unit. At normal operation, do not operate the unit without cover.

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5. TROUBLESHOOTING

Only authorized personnel should be permitted to perform maintenance and inspections or replace parts.

No.	Fault Status	Cause	Corrective Action
1	Braking resistor unit overload relay (or thermal overload protector) trips when not decelerating.	• Without braking unit Inverter built−in main circuit discharging transistor short circuited	Replace the inverter.
		• With braking unit Braking unit main circuit discharging transistor short circuited	Replace the unit.
		Improper braking unit power supply voltage selection connector setting (Power supply voltage > power supply voltage selection position)	Set it again.
2	Inverter trips at overvoltage (OV).	Insufficient braking resistor unit capacity	Examine the braking conditions again.
		Improper wiring	Check and repair.
		Braking unit fault	Replace the unit.
3	Braking resistor unit overload relay (or thermal protector) sometimes trips.	Insufficient braking resistor unit capacity	Examine the braking conditions again.
4	Braking unit trips by heat sink overheat.	Excessive start/stop switching frequency	Examine the operating conditions again.
		Excessive load inertia	
		Improper combination of braking unit and braking resistor unit	Reset.
		Ambient temperature 104°F (40°C)	Reduce it.

6. SPECIFICATIONS

6.1 BRAKING UNIT AND BRAKING RESISTOR UNIT APPLICATION LIST

200 to 230V

Inverter	Braking Unit		Braking Resistor Unit			Approx. Braking Torque (10%ED) %
Max Applicable Motor Capacity HP(kW)	Model (CDBR – □)	Unit Q'ty	Model (LKEB – □)	Resistor Spec. (per unit)	Unit Q'ty	
0.5 (0.4)	—	—	20P7	70W 200Ω	1	220
1 (0.75)	—	—	20P7	70W 200Ω	1	125
2 (1.5)	—	—	21P5	260W 100Ω	1	125
3 (2.2)	—	—	22P2	260W 70Ω	1	120
5 (3.7)	—	—	23P7	390W 40Ω	1	125
7.5 (5.5)	—	—	25P5	520W 30Ω	1	115
10 (7.5)	—	—	27P5	780W 20Ω	1	125
15 (11)	2015B	1	2011	2400W 13.6Ω	1	125
20 (15)	2015B	1	2015	3000W 10Ω	1	125
25 (18.5)	2022B	1	2018	4800W 8Ω	1	125
30 (22)	2022B	1	2022	4800W 6.8Ω	1	125
40 (30)	2015B	2	2015	3000W 10Ω	2	125
50 (37)	2015B	2	2015	3000W 10Ω	2	100
60 (45)	2022B	2	2022	4800W 6.8Ω	2	120
75 (55)	2022B	2	2022	4800W 6.8Ω	2	100
100 (75)	2110B	1	2022	4800W 6.8Ω	3	110
120 (90)	2110B	1	2022	4800W 6.8Ω	4	120
150 (110)	2110B	1	2022	4800W 6.8Ω	5	100

380 to 460V

Inverter	Braking Unit		Braking Resistor Unit			Approx. Braking Torque (10%ED) %
Max Applicable Motor Capacity HP(kW)	Model (CDBR – □)	Unit Q'ty	Model (LKEB – □)	Resistor Spec. (per unit)	Unit Q'ty	
0.5 (0.4)	—	—	40P7	70W 750Ω	1	230
1 (0.75)	—	—	40P7	70W 750Ω	1	130
2 (1.5)	—	—	41P5	260W 400Ω	1	125
3 (2.2)	—	—	42P2	260W 250Ω	1	135
5 (3.7)	—	—	43P7	390W 150Ω	1	135
7.5 (5.5)	—	—	45P5	520W 100Ω	1	135
10 (7.5)	—	—	47P5	780W 75Ω	1	130
15 (11)	—	—	4011	1040W 50Ω	1	135
20 (15)	—	—	4015	1560W 40Ω	1	125
25 (18.5)	4030B	1	4018	4800W 32Ω	1	125
30 (22)	4030B	1	4022	4800W 27.2Ω	1	125
40 (30)	4030B	1	4030	6000W 20Ω	1	125
50 (37)	4045B	1	4037	9600W 16Ω	1	125
60 (45)	4045B	1	4045	9600W 13.6Ω	1	125
75 (55)	4030B	2	4030	6000W 20Ω	2	135
100 (75)	4045B	2	4045	9600W 13.6Ω	2	145
150 (110)	4030B	3	4030	6000W 20Ω	3	100
200 (160)	4220B	1	4045	9600W 13.6Ω	4	140
300 (220)	4220B	1	4037	9600W 16Ω	5	110
400 (300)	4220B	2	4045	9600W 13.6Ω	6	110
800 (600)	4220B	4	4045	9600W 13.6Ω	12	110

6.2 BRAKING UNIT FOR 575V CLASS APPLICATION LIST

Inverter	Braking Unit		Braking Resistor Unit	Approx. Braking Torque (10%ED) %
Max Applicable Motor Capacity HP(kW)	Model (CDBR– □)	Unit Q'ty	Resistor Spec.	
5 (3.7)	—	—	560W 150Ω	180
7.5 (5.5)	—	—	560W 150Ω	125
10 (7.5)	—	—	750W 100Ω	140
15 (11)	—	—	1100W 75Ω	125
20 (15)	—	—	1500W 50Ω	140
25 (18.5)	—	—	2300W 40Ω	140
30 (22)	5037B	1	2800W 38Ω	125
40 (30)	5037B	1	3900W 33Ω	110
50 (37)	5037B	1	4900W 27Ω	110
60 (45)	5037B	2	5900W 22Ω	110
75 (55)	5037B	2	7200W 18Ω	110
100 (75)	5110B	1	9800W 13.6Ω	105
120 (90)	5110B	1	12000W 11Ω	110
150 (110)	5110B	1	15000W 9Ω	110
200 (160)	5300B	1	21000W 6.8Ω	100

6.3 LIST OF APPLICABLE/NOT APPLICABLE COMBINATIONS WITH CONVENTIONAL MODELS (VS−616HII/H3, VS−616GII/G3, VS−676)

Conventional Model	Braking Unit	Braking Resistor Unit	Applicable/ Not Applicable	Remarks
VS−616HII/H3 VS−616GII/G3 VS−676	—	Model LKEB−20P7 etc.	Applicable	See connection examples of Fig 14.
VS−616HII/H3 VS−616GII/G3 VS−676	Model CDBR−15H etc.	Model LKEB−2015 etc.	Applicable	Use sequencer to break power supply side on thermal protector of the braking resistor unit side.
VS−616HII/H3 VS−616GII/G3 VS−676	Models CDBR −2015, −2015B etc.	Model LKEB−4.8K etc.	Not applicable	No thermal protective function of braking resistor unit.
VS−616HII/H3 VS−616GII/G3 VS−676	Models CDBR −2015, −2015B etc.	Model LKEB−2015 etc.	Applicable	See connection examples of Figs. 15 to 18.

6.4 BRAKING UNIT SPECIFICATIONS

Braking Unit Model CDBR–		200V to 300V				380V to 460V				500V to 575V		
		2015B	2022B	2045B	2110B	4030B	4045B	4090B	4220B	5037B	5110B	5300B
Applicable Motor Output HP (kW)		20 (15)	30 (22)	60 (45)	150 (110)	40 (30)	60 (45)	120 (90)	300 (220)	57 (37)	150 (110)	400 (300)
Output characteristics	Max. Discharge Current(A) (peak value) *	40	60	100	250	40	60	100	250	40	100	250
	Rated Discharge Current (A)	15	20	30	80	15	18	30	80	15	30	80
	Braking Start Voltage	330/345/365/380V ±3V				630/660/690/730/760V ±6V				825V/ 950V ±8V		
	Max. Hysteresis Error	Approx. 8V				Approx. 16V				Approx. 20V		
Power Supply	VDC	243 (1.35×200×0.9) to 400V peak				460 (1.35×380×0.9) to 800V peak				607 (1.35×500×0.9) to 1000V		
Protective Functions	Fin Overheat	Thermostat										
	Power Charge Indication	Charge lamp stays ON until bus voltage drops below 50V.										
Environmental Conditions	Location	Indoor (protected from corrosive gases and dust)										
	Altitude	1000m max.										
	Ambient Temperature	+14 to 104°F (−10 to +40°C) (not frozen)										
	Storage Transportation Temperature	−4 to 140°F (−20 to +60°C)										
	Humidity	90%RH (non−condensing)										
	Vibration	1G at 10 to less than 20Hz, up to 0.2G at 20 to 50 Hz										
Protective Configuration		Wall−mounted enclosed type										
Heat Loss (W)		32	38	31	64	54	59	35	71	22	53	116

* Loading time rate can be used below 10% ED (max. 10 sec.)

6.5 BRAKING RESISTOR UNIT SPECIFICATIONS

Model (LKEB – □)	Specifications		Allowable Average Dissipated Power (W)	Allowable Average Current (Effective Value) (A)	Allowable Ambient Temperature
20P7	200 to 230V	70W 200Ω	30	0.39	+14 to 122°F (−10 to +50°C)
21P5		260W 100Ω	60	0.77	
22P2		260W 70Ω	89	1.1	
23P7		390W 40Ω	150	1.9	
25P5		520W 30Ω	220	2.7	
27P5		780W 20Ω	300	3.9	
2011		2400W 13.6Ω	440	5.7	
2015		3000W 10Ω	600	7.7	
2018		4800W 8Ω	740	9.6	
2022		4800W 6.8Ω	880	11.4	
40P7	380 to 460V	70W 750Ω	30	0.20	
41P5		260W 400Ω	60	0.39	
42P2		260W 250Ω	89	0.60	
43P7		390W 150Ω	150	1.0	
45P5		520W 100Ω	220	1.5	
47P5		780W 75Ω	300	2.0	
4011		1040W 50Ω	440	3.0	
4015		1560W 40Ω	600	3.9	
4018		4800W 32Ω	740	4.8	
4022		4800W 27.2Ω	880	5.7	
4030		6000W 20Ω	1200	7.7	
4037		9600W 16Ω	1500	9.7	
4045		9600W 13.6Ω	1800	11.5	

6.6 MODELS AND CODE NOS. OF BRAKING UNIT AND BRAKING RESISTOR UNIT

(1) Braking Unit

Inverter		Model	Code No.
Voltage	HP (kW)		
200 to 230V	20 (15)	CDBR−2015B	72600−R2150B
	30 (22)	CDBR−2022B	72600−R2220B
	60 (45)	CDBR−2045B	72600−R2450B
	150 (110)	CDBR−2110B	72600−R21100B
380 to 460V	40 (30)	CDBR−4030B	72600−R4300B
	60 (45)	CDBR−4045B	72600−R4450B
	120 (90)	CDBR−4090B	72600−R4900B
	300 (220)	CDBR−4220B	72600−R42200B
500 to 575V	50 (37)	CDBR−5037B	72600−R5370B
	150 (110)	CDBR−5110B	72600−R51100B
	400 (300)	CDBR−5300B	72600−R53000B

(2) Braking Resistor Unit

Inverter		Resistor Spec. (per unit)	Model	Code No.
Voltage	HP(kW)			
200 to 230V	1 (0.75)	70W 200Ω	LKEB–20P7	72600–K2P70
	2 (1.5)	260W 100Ω	LKEB–21P5	72600–K2010
	3 (2.2)	260W 70Ω	LKEB–22P2	72600–K2020
	5 (3.7)	390W 40Ω	LKEB–23P7	72600–K2030
	7.5 (5.5)	520W 30Ω	LKEB–25P5	72600–K2050
	10 (7.5)	780W 20Ω	LKEB–27P5	72600–K2070
	15 (11)	2400W 13.6Ω	LKEB–2011	72600–K2110
	20 (15)	3000W 10Ω	LKEB–2015	72600–K2150
	25 (18.5)	4800W 8Ω	LKEB–2018	72600–K2180
	30 (22)	4800W 6.8Ω	LKEB–2022	72600–K2220
380 to 460V	1 (0.75)	70W 750Ω	LKEB–40P7	72600–K4P70
	2 (1.5)	260W 400Ω	LKEB–41P5	72600–K4010
	3 (2.2)	260W 250Ω	LKEB–42P2	72600–K4020
	5 (3.7)	390W 150Ω	LKEB–43P7	72600–K4030
	7.5 (5.5)	520W 100Ω	LKEB–45P5	72600–K4050
	10 (7.5)	780W 75Ω	LKEB–47P5	72600–K4070
	15 (11)	1040W 50Ω	LKEB–4011	72600–K4110
	20 (15)	1560W 40Ω	LKEB–4015	72600–K4150
	25 (18.5)	4800W 32Ω	LKEB–4018	72600–K4180
	30 (22)	4800W 27.2Ω	LKEB–4022	72600–K4220
	40 (30)	6000W 20Ω	LKEB–4030	72600–K4300
	50 (37)	9600W 16Ω	LKEB–4037	72600–K4370
	60 (45)	9600W 13.6Ω	LKEB–4045	72600–K4450

FOR VARISPEED-600 SERIES INVERTER

BRAKING UNIT
BRAKING RESISTOR UNIT
INSTRUCTIONS

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YASKAWA ELECTRIC CORPORATION

YASKAWA

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Specifications are subject to change without notice
for ongoing product modifications and improvements.

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