INOVANCE

MDBUN Series
Braking Unit User Guide

User Guide

A01
Data Code 19011140

Preface

Thank you for purchasing the MDBUN series braking unit developed by Inovance.

The MDBUN series braking units mainly apply to situations where AC drives or servo drives (hereinafter referred to as drives) require rapid speed reduction, positioning, and braking. When the drive brakes, the kinetic energy is converted to the electric energy which is fed back to the drive due to the mechanical inertia of the load. This will cause rising of the DC bus voltage of the drive. To ensure normal running of the drive, a braking unit is required. Therefore, the regenerative energy can be consumed by the braking resistor, preventing the drive from stopping due to overvoltage protection or even being damaged.

The MDBUN series braking unit provides comprehensive protection functions, such as protection against overcurrent, overvoltage, overheat, and braking unit open circuit and short circuit. It allows you to set parameters including braking start/stop voltage and braking rate. Multiple braking units can be deployed in master/slave mode to meet the braking requirements of high power drive.

The MDBUN braking unit also applies to large-inertia applications that require sudden stop, such as elevators, textile machines, paper making machines, centrifuges, wire drawing machines, wire winding machines, proportional linkage systems, and overhead cranes.

§ First use

Before using the product for the first time, read this guide carefully. If you have any questions concerning the functions or performance, contact technical support engineers.

§ Standard compliance

The following table lists the directives and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE certification	EMC Directive	2014/30/EU	EN 61800-3
	Low Voltage Directive (LVD)	2014/35/EU	EN 61800-5-1
	RoHS Directive	2011/65/EU	EN 50581
UL certification	-		UL61800-5-1 C22.2 No.14-13

Revision History

Date	Version	Description
May 2019	A00	First release
January 2022	A01	Added the weight information in "1.2 Product Model and Technical Specifications". Updated the description of TA/TB/TC in "2.2.1 Terminal Descriptions". Added "2.2.2 Main Circuit Cable Selection". Updated "2.2.3 Wiring of the Braking Unit". Updated "Table 5-1 Recommended values of braking units and braking resistors (Td = 100%)" Deleted the customer phone. Added the external operating panel model in "3.2 Introduction to Parameter Settings and Operating Panel". Added parameters in "3.6 Parameter List". Added fault codes in "Chapter 4 Troubleshooting and Solution".

§ How to Obtain

This user guide is delivered with the product. Contact your sales representative for any additional order.

To obtain the electronic user guide, log in to Inovance's website (http://www.inovance.com), choose Support > Download, search by keyword, and then download the PDF file.

Contents

Fundamental Safety Instructions

Safety Precautions

1) Read and comply with the safety instructions during installation, operation, and maintenance of the equipment.
2) To ensure personal and equipment safety, follow the marks on the equipment and all the safety instructions in this document.
3) "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
4) Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
5) Inovance shall take no responsibility of any personal injuries or property damage caused by improper use.

Safety Levels and Definitions

Indicates that failure to comply with the notice will result in death or severe personal injuries.

Indicates that failure to comply with the notice may result in death or severe personal injuries.

Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

General Safety Instructions

Unpacking
 ◆ Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking. ◆ Unpack the package by following the unpacking sequence. Do not strike the package violently. ◆ Check whether there is damage or rust on the surface of the equipment and equipment accessories before unpacking. ◆ Check whether the package contents are consistent with the packing list before unpacking.
 ◆ Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories unpacking. ◆ Do not install the equipment if you find water seepage or missing or damaged components upon unpacking. ◆ Do not install the equipment if you find the packing list does not conform to the equipment you received.
Storage and Transportation

CAUTION

- Store and transport the equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

WARNING

- Use professional loading and unloading equipment to move large-scale or heavy equipment.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.

Installation

WARNING

- Read through the guide and safety instructions before installation.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- Do not install this equipment in places with strong electric or magnetic fields.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
-
- The installation personnel must be familiar with all the installation requirements and related technical documents.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.

Wiring

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Never perform wiring with power ON. Failure to comply will result in an electric shock.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least 10 minutes before further operations because residual voltage exists after power-off.
- Check that the equipment is grounded properly. Failure to comply will result in an electric shock.
- During wiring, follow the proper electrostatic discharge (ESD) procedure, and wear an antistatic wrist strap. Failure to comply will damage the equipment or the internal circuits of the equipment.

WARNING

- Do not connect the input power supply to the output end of the equipment. Failure to comply will result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment.

Power-on

DANGER

- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- During power-on, unexpected operations may be triggered on the equipment or mechanical devices connected to the equipment. Therefore, stay away from all the mechanical devices.
- After power-on, do not open the cabinet door or the protective cover of the equipment. Failure to comply will result in an electric shock.
- Do not touch any wiring terminals after power-on. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment after power-on. Failure to comply will result in an electric shock.

Operation

DANGER

- Do not touch any wiring terminals during operation. Failure to comply can result in an electric shock.
- Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Signal detection must be performed by only professionals during operation. Failure to comply will result in personal injuries or equipment damage.

WARNING

- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.
- Do not start or stop the equipment by turning on or off the contactor. Failure to comply will result in equipment damage.

Maintenance

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply will result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least 10 minutes.

WARNING

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment after power-on. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least 10 minutes.

WARNING

- Submit the repair request according to the warranty agreement.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in more damages.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal

WARNING

- Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety Labels

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Label	Description
	◆ Read through the safety instructions before operating the equipment. Failure to comply may result in death, personal injuries, or equipment damage. ◆ Do not touch the terminals or remove the cover with power ON or within 10 min after power-off. ◆ Before maintenance, inspection, and wiring, cut off the input power, and wait for at least 10 minutes until the power indicator is off.

Chapter 1 Product Information

1.1 Product Appearance and Nameplate

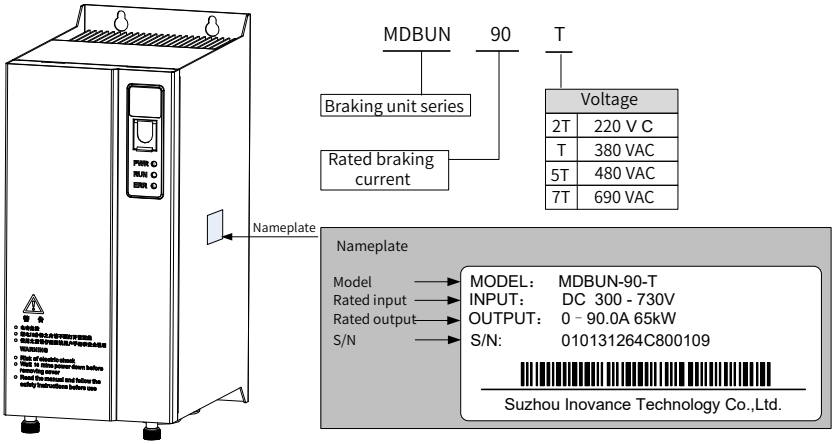


Figure 1-1 Product appearance and nameplate

1.2 Product Model and Technical Specifications

Table 1-1 Models and technical specifications of the MDBUN series braking unit

Braking Unit Model	Applicable Drive Input Voltage	Rated Continuous Braking Current (A)	Max. Peak Braking Current (A)	Rated Continuous Braking Power (KW)	Recommended Rated Braking Resistance (Ω)	Min. Braking Resistance (Ω)	Weight (kg)
MDBUN-45-2T	220 VAC	45	54	16	8	7.5	3.6
MDBUN-60-2T		60	72	21	6	5.5	3.6
MDBUN-90-2T		90	108	32	4	3.7	3.6
MDBUN-45-T	380 VAC	45	54	33	15	13.6	3.6
MDBUN-60-T		60	72	45	11	10.2	3.6
MDBUN-90-T		90	108	65	8	6.8	3.6
MDBUN-200-T		200	300	134	3.5	2.5	7.12

MDBUN-45-5T	480 VAC	45	54	34	17	15.2	3.6
MDBUN-60-5T		60	72	46	13	11.4	3.6
MDBUN-90-5T		90	108	68	9	7.7	3.6
MDBUN-200-5T		200	300	152	4	2.8	7.12
MDBUN-200-7T	690 VAC	200	300	234	6	4.2	7.32

1.3 Product Working Principle

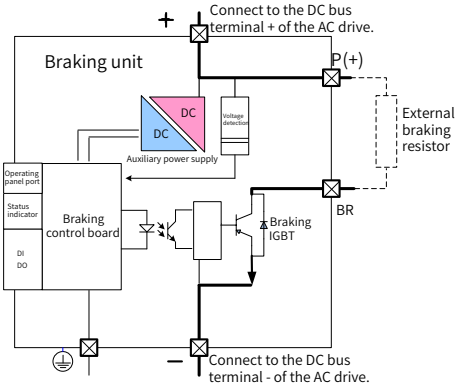


Figure 1-2 Braking unit application principle

The braking unit consumes the electric energy fed back from the external load to the drive to limit the voltage of the drive within a secure range. This ensures the normal running of the drive and meets process requirements.

Before normal running of the braking unit, you must set the braking start and stop voltage based on the AC power voltage class of the drive. The following figure shows the relationship among the braking start voltage, braking stop voltage, and bus voltage during normal running of the bus capacitor.

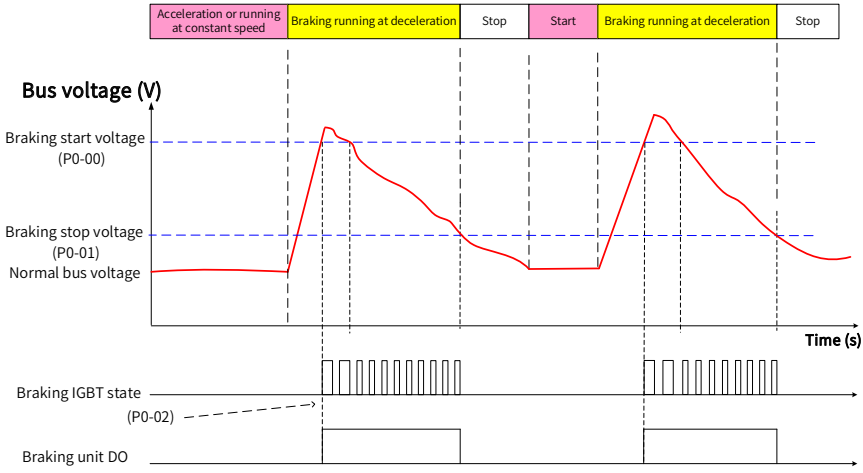


Figure 2-1 Working principle of the MDBUN braking unit

As shown in the preceding figure, the relationship among the three voltages is as follows: braking start voltage > braking stop voltage> normal bus voltage. When

the braking unit is in the master mode, the control circuit detects the bus voltage in real time. If the bus voltage reaches the set braking start voltage (set in P0-00), the braking IGBT starts to work and discharges the electricity in the main capacitor of the drive through the external braking resistor until the bus voltage drops below the braking stop voltage (set in P0-01). The start braking rate (set in P0-02) of the braking unit can also be set to adjust the discharge power during braking so as to change the braking time.

1.4 Load Curve of the Braking unit

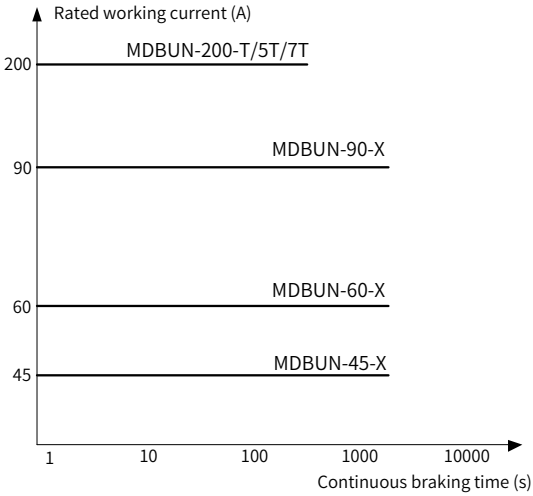


Figure 1-3 Load curve of the MDBUN series braking unit

Notes

(1) In figure 1-4, X represents the braking unit with different voltage classes, namely 2T, T and 5T.

(2) In figure 1-4, the curve represents the maximum continuous braking time of the braking unit at the rated current. The maximum continuous braking time of the MDBUN-200-T/5T/7T is four minutes, and the braking frequency is no more than 50% or the interval is no less than four minutes. The maximum continuous braking time of the MDBUN-45-X, MDBUN-60-X, and MDBUN-90-X is 30 minutes, and the braking frequency is no more than 50% or the interval is no less than 30 minutes.

Chapter 2 Mechanical and Electrical Installation

2.1 Mechanical Installation

2.1.1 Installation Environment

1) The environmental requirements for the braking unit and the drive are the same. The ambient temperature, humidity, etc. of the braking unit shall not exceed the permitted range of the design, as shown in table 2-1.

2) Install the braking unit and external braking resistor on the surface of incombustible objects with sufficient room for heat dissipation.

3) Ensure that the installation environment is free of corrosive, combustible, and explosive gas.

4) Ensure that the installation environment is free from dust and metal powder.

Table 2-1 Environment requirements for the MDBUN series braking unit

Item	
Altitude	Lower than 1000 m (> 1000 m: derated by 1% for every additional 100 m; max. altitude: 3000 m)
Ambient temperature	-10° C to +40° C
Relative humidity	Lower than 95% RH, non-condensing
Vibration	Lower than 5.9 m/s^2 (0.6g)
Storage temperature	-20° C to +60° C
Pollution degree	PD2
Cooling method	Air cooling
IP rating	IP20

2.1.2 Outline Dimensions and Installation Clearance

Figures 2-1 and 2-2 describe the outline dimensions of the MDBUN series braking units.

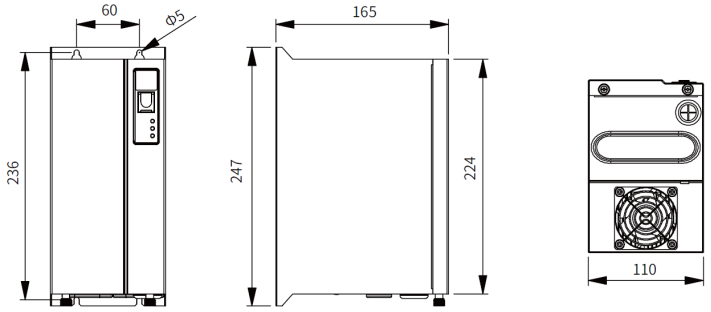


Figure 2-1 Outline dimensions (unit: mm) of the MDBUN series braking units (MDBUN-45-2T to MDBUN-90-2T, MDBUN-45-T to MDBUN-90-T, MDBUN-45-5T to MDBUN-90-5T)

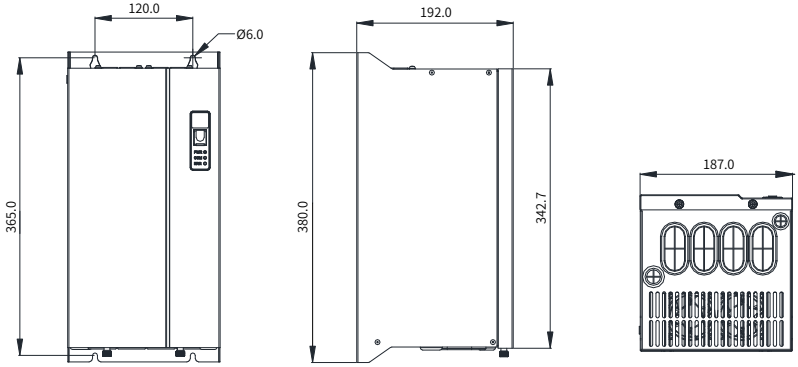


Figure 2-2 Outline dimensions (unit: mm) of the MDBUN series braking units (MDBUN-200-T, MDBUN-200-5T, MDBUN-200-7T)

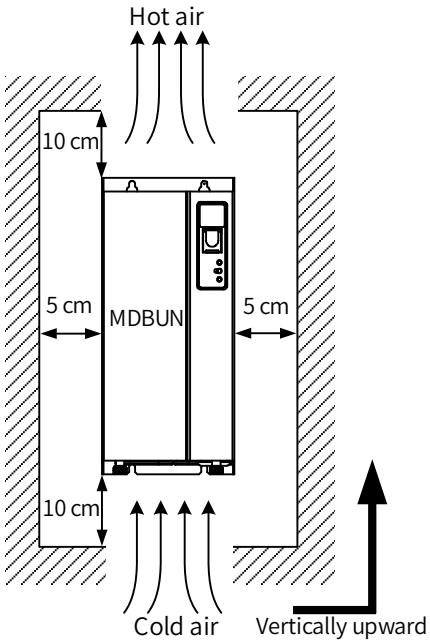


Figure 2-3 Installation clearance for the MDBUN series braking units

2.1.3 Mechanical Installation Suggestions

1) Install the braking resistor in the space with good ventilation, because the braking resistor gets heated when consuming the feedback energy generated during braking.
2) Install the braking unit upright to facilitate heat dissipation. Do not lay it upside-down or horizontally.
3) If multiple braking units are connected to the drive, install them side by side. If one row of the braking unit needs to be installed above another row, install an air guide plate to prevent braking units in the lower row from heating those in the upper row.
4) Ensure that the clearance among the braking unit, drive, and other electrical device meets the requirements shown in Figure 2-3.

2.2 Electrical Installation

Remove the braking unit cover and then wire the main circuit and control circuit of the braking unit. The terminal is shown in figure 2-4 and figure 2-5.

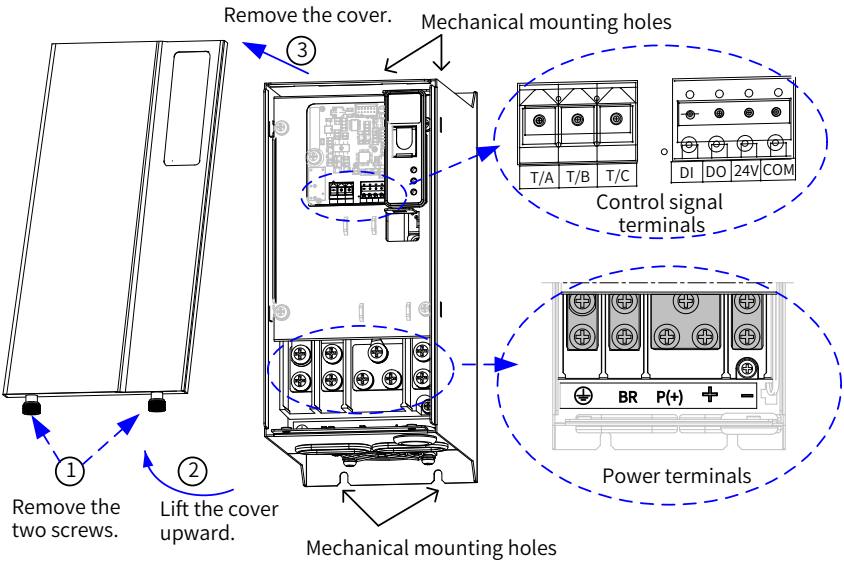


Figure 2-4 Terminals of the MDBUN series braking units (MDBUN-45-2T to MDBUN-90-2T, MDBUN-45-T to MDBUN-90-T, MDBUN-45-5T to MDBUN-90-5T)

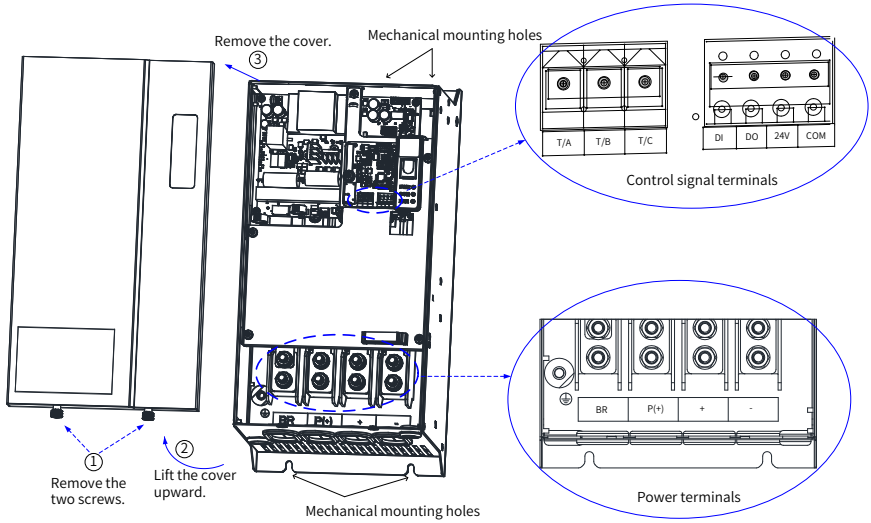


Figure 2-5 Terminals of the MDBUN series braking units (MDBUN-200-T, MDBUN-200-5T, MDBUN-200-7T)

2.2.1 Terminal Descriptions

(1) Descriptions of power terminals

Mark	Parameter Name	Description
+、-	Positive and negative terminals of the DC bus	Used as the input point of the common DC bus
P(+), BR	Braking resistor terminals	Used for connecting the braking resistor.
⏚	Used for grounding	Used for grounding

The descriptions of the preceding figure are as follows:

1) Do not reverse the polarity of the DC bus terminals (+) and (-). Otherwise, the drive and braking unit will be damaged.

2) Do not connect the grounding terminal ⏚ to the N terminal of the power supply neutral line.

3) PE terminal ⏚: The terminal must be grounded reliably, and the resistance of the grounding cable must be smaller than 4 Ω.

4) The cable between the braking unit and the drive must be a twisted-pair cable no longer than 5 meters. The length of the cable between the braking unit and the braking resistor must be no longer than 10 meters.

(2) Descriptions of control terminals

Mark	Name	Description
DI	Digital input	Master mode: input inhibition upon an external fault Slave mode: Running/stop input of the braking unit
DO	Digital output	Running/Stop signal output
TA/TB/TC	Fault relay output	TA/TB normally closed (NC) contact and TA/TC normally open (NO) contact, which act if the braking unit fails
24V, COM	Power supply/ Common terminal	Input and output auxiliary power supply and reference ground

The following figure describes the internal equivalent circuit of the control signal

terminal.

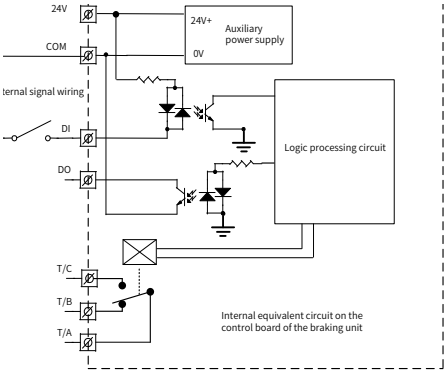


Figure 2-6 Internal equivalent circuit of the control signal terminal

The descriptions of the preceding figure are as follows:

1) Master: The DI is used as blocking input. When the input is valid, the braking unit stops working and the output is blocked. The DO is used to send the start/stop signal to the slave. When the master starts braking, the DO signal is valid; when the master stops braking, the DO signal is canceled.

2) Slave: The DI is used as start/stop signal input. The braking unit starts braking when the DI signal is valid and stops braking when the DI signal is canceled. When the master starts braking, the DO signal is valid; when the master stops braking, the DO signal is canceled.

3) TA/TB is normally closed and TA/TC is normally open. Specifications of the relay contacts used by TA/TB/TC terminals are as follows:

NC :3 A, 250 VAC/1 A, 30 VDC
NO: 3 A, 250 VAC/1 A, 30 VDC

Pay attention to the control power of the control coil of the main circuit contactor.

2.2.2 Main Circuit Cable Selection

Select IEC cables based on the following factors:

- Meeting EN 60204-1 and IEC 60364-5-52 standards
- PVC insulation
- Ambient temperature: 40° C; highest continuous operating temperature of cable insulation: 70° C
- Symmetrical cable with the copper-braided shield
- Maximum number of cables routed in parallel in the same cable tray: 9

Table 2-2 Main circuit cable selection

Braking Unit Model	Rated Continuous Braking Current (A)	Max. Peak Braking Current (A)	+/-/P(+)/BR Cable (mm2)	+/-/P(+)/BR Lug Model	Grounding Cable (mm2)	Lug Model for Grounding Cable	Braking UnitTerminal Width(mm)	Screw
MDBUN-45-2T	45	54	10	GTNR10-6	10	GTNR10-6	16	M6
MDBUN-60-2T	60	72	16	GTNR16-6	16	GTNR16-6	16	M6
MDBUN-90-2T	90	108	35	GTNR35-6	16	GTNR16-6	16	M6
MDBUN-45-T	45	54	10	GTNR10-6	10	GTNR10-6	16	M6
MDBUN-60-T	60	72	16	GTNR16-6	16	GTNR16-6	16	M6
MDBUN-90-T	90	108	25	GTNR25-6	16	GTNR16-6	16	M6
MDBUN-200-T	200	300	70	GTNR70-8	35	GTNR35-8	26.8	M8
MDBUN-45-5T	45	54	10	GTNR10-6	10	GTNR10-6	16	M6
MDBUN-60-5T	60	72	16	GTNR16-6	16	GTNR16-6	16	M6
MDBUN-90-5T	90	108	35	GTNR35-6	16	GTNR16-6	16	M6
MDBUN-200-5T	200	300	70	GTNR70-8	35	GTNR35-8	26.8	M8
MDBUN-200-7T	200	300	70	GTNR70-8	35	GTNR35-8	26.8	M8

NOTE

- The preceding recommended cable lugs are the GTNR series lugs of Suzhou Yuanli.

2.2.3 Wiring of the Braking Unit

(1) Standard wiring method 1

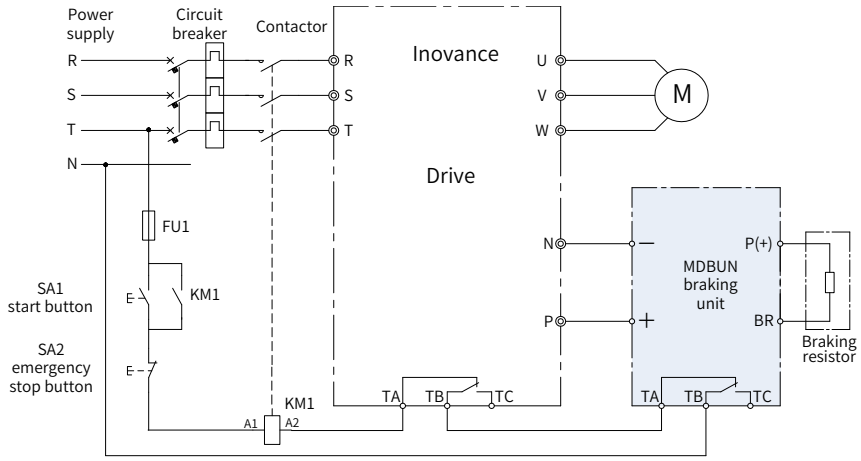


Figure 2-7 Standard wiring method 1

Note

- In the preceding wiring method, the TA/TB/TC terminals on the drive side are used for relay fault signal output of the drive, and the TA/TB/TC terminals on the braking unit side are used for relay fault signal output of the braking unit.
- The input voltage class of the contactor control coil is 220 VAC.

(2) Standard wiring method 2

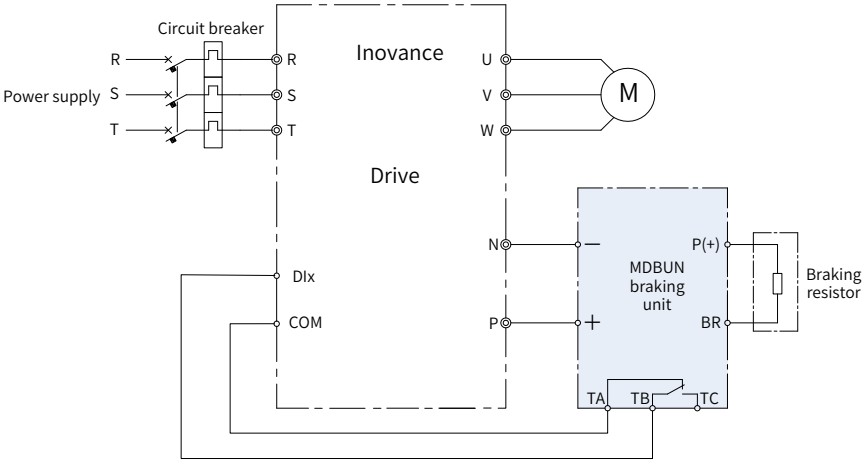


Figure 2-8 Standard wiring method 2

Note

- When the preceding wiring method is used, you need to allocate the function of external fault NO input to a certain DI (for example, DI1) of the drive. Take Inovance IS300 servo drive as an example. To allocate the function of external fault NO input to the DI3, set F4-02 to 33.
- When drives of other companies are used, set the DI according to the user guide of the drive.

(3) Standard wiring method 3

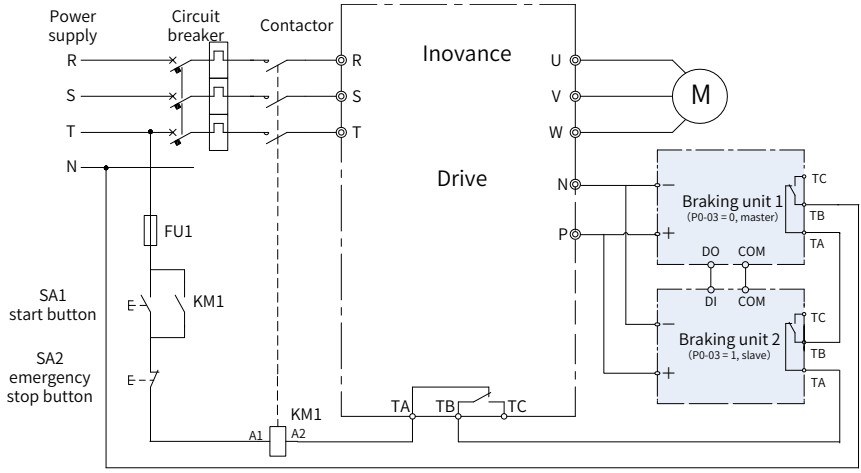


Figure 2-9 Standard wiring method 3

Note

- The preceding wiring method is applicable to scenarios where multiple braking units are connected in parallel. The wiring between the braking unit and the braking resistor is not shown in the figure.
- The input voltage class of the contactor control coil is 220 VAC.
- When multiple braking units are connected in parallel, set one braking unit as the master (P0-03 = 0), and set the other braking units as the slave (P0-03 = 1).
- Set the same start braking voltage (P0-00), stop braking voltage (P0-01), and start braking rate (P0-02) for the master and all slaves.

Chapter 3 Operation and Display

3.1 Introduction to Indicators

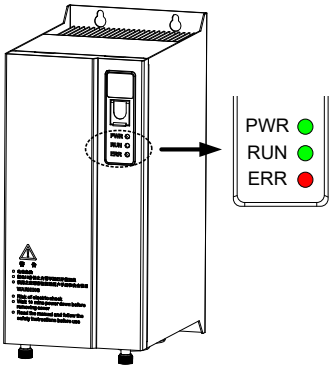


Figure 3-1 Indicators of the braking unit

- PWR: It is the power supply indicator. The indicator is on after the braking unit is powered on.
- RUN: It is the running indicator. The indicator is on after when the braking unit is operating.
- ERR: It is the fault indicator. The indicator is on after when the braking unit encounters a fault.

You can check whether the braking unit is faulty by viewing the status of the ERR indicator or observing whether the TA-TB or TA-TC terminal acts. The braking unit can store records of the latest four faults. You can view the records by reading the P2 parameter group. For details, see the section of parameter list.

3.2 Introduction to Parameter Settings and Operating Panel

An external operating panel is optional for the braking unit for parameter settings. The following figure shows the wiring between the external operating panel and the braking unit.

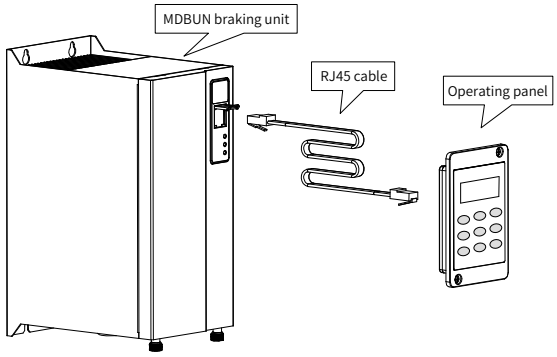


Figure 3-2 Wiring between the external operating panel and the braking unit

NOTE

- The model of the external operating panel is MD32NKE1.
- The model of the external operating panel cable is ES401ZD.

With the operating panel, you can modify parameters and monitor the working status of the braking unit. The following figure shows the appearance and function areas of the operating panel.

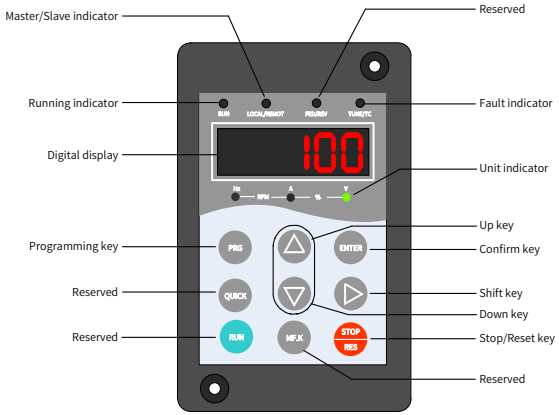
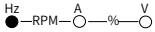


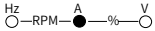
Figure 3-3 Operating panel

(1) Unit indicators

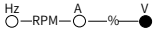
Hz ○—RPM—○ A ○—%—○ V : It is the unit indicator, which indicates the displayed data unit. (○ indicates that the indicator is off, and ● indicates that the indicator is on.)



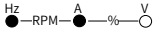
: Hz, unit of frequency



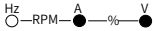
: A, unit of current



: V, unit of voltage



: RPM, unit of rotation speed



: %, percentage

(2) Operation indicator The indicator is on when the braking unit is operating.

(3) Main/slave mode indicator When the braking unit is configured as the master, the indicator is off; when the braking unit is configured as the slave, the indicator is on.

(4) Digital display area:

The 5-digit LED displays the bus voltage, continuous braking current, IGBT module base plate temperature, current braking rate, alarm code, and so on.

(5) Keys on the operating panel

Table 3-1 Keys on the operating panel

Key	Name	Description
PRG	Programming key	Enter or exit Level I menu.
ENTER	Confirm key	Enter the menu level by level, and confirm parameter settings.
△	Up key	Increase the data or parameter.
▽	Down key	Decrease the data or parameter.
▷	Shift key	Select the displayed parameters in turn in the stop or running state, and select the digit to be modified when modifying parameters.
RUN	Reserved	–
STOP RES	Stop/Reset	Reset the braking unit after a fault occurs.
MF.K	Reserved	–
QUICK	Reserved	–

3.3 Parameter View and Modification

Like all Inovance drives, the operating panel of the MDBUN series braking unit adopts the three-level menu for parameter settings and other operations.

The three-level menus are as follows: parameter group (level I menu), parameter

code (level II menu), and parameter value (level III menu). The operating flowchart in shown in figure 3-4.

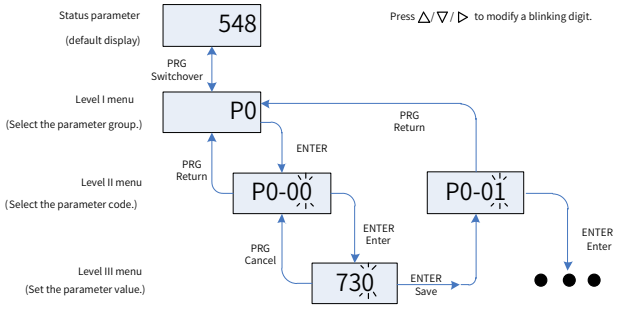


Figure 3-4 Operation procedure of the three-level menu

Note: You can return to level II menu from level III menu by pressing the PRG or ENTER key. The differences between pressing the PRG key and pressing the ENTER key are as follows: After you press the ENTER key, the braking unit saves the parameter settings, and then returns to level II menu and switches to the next parameter. After you press the PRG key, the braking unit does not save the parameter settings. It directly returns to level II menu and the current parameter.

In the level III menu, if the parameter is displayed without any blinking digit, the parameter cannot be modified. This may be caused by the following:

1) The parameter is a non-modifiable parameter, such as a detection parameter or an operation record parameter.

2) The parameter can be modified only at stop.

3.4 Parameter Settings at First Power-on

At the first-use, connect the braking unit, drive, and braking resistor, and then power on the drive. After the braking unit is energized, you can set parameters in the P0 parameter group using the operating panel according to the preceding table.

After the P0 parameters are set, the braking unit starts working based on the bus voltage of the drive and the set working mode without the need of pressing RUN or STOP key on the operating panel.

Once the parameters are set, the braking unit can work properly even if the operating panel is removed.

3.5 Status Parameter View

In the stop or running state, you can press the shift key ▷ on the operating panel to view status parameters.

You can determine whether to show the following five status parameters, including bus voltage, output current, current braking rate, IGBT module temperature, and fault code. Pressing the shift key can switch between selected parameters in sequence. Check the unit indicator of a parameter. If the drive is powered off and then powered on, the bus voltage is displayed by default.

3.6 Parameter List

The parameters in the shortcut menu are not password protected.

The symbols in the following parameter table are described as follows:

☆ : The parameter can be changed when the drive is in either stop or running state.

★ : The parameter cannot be changed when the drive is in the running state.

● : The parameter value is the measured value and cannot be modified.

*: The parameter is a factory parameter and can be set only by the manufacturer.

Table 3-2 Parameter List

Para. Code	Para. Name	Value	Description	Min. Unit	Default	Change Attribute
Group P0						
P0-00	Braking start voltage	Voltage class: 220 V: P0-01 to 390.0 V 380 V: P0-01 to 730.0 V 480 V: P0-01 to 820.0 V 690 V: P0-01 to 1250.0 V	The braking unit starts braking when the bus voltage is higher than the parameter value.	0.1 V	Voltage class: 220 V: 350.0 V 380 V: 670.0 V 480 V: 760.0 V 690 V: 1170.0 V	☆
P0-01	Braking stop voltage	Voltage class: 220 V: 320 V to P0-00 380 V: 620 V to P0-00 480 V: 700 V to P0-00 690 V: 1100 V to P0-00	The braking unit stops braking when the bus voltage is lower than the parameter value.	0.1 V	Voltage class: 220 V: 340.0 V 380 V: 650.0 V 480 V: 730.0 V 690 V: 1140.0 V	☆

Para. Code	Para. Name	Value	Description	Min. Unit	Default	Change Attribute
P0-02	Start braking rate	30% to 100%	This parameter specifies the duty ratio when the bus voltage is equal to the value of P0-00.	1%	100	☆
P0-03	Master/ Slave mode selection	0: Master 1: Slave	This parameter specifies the working mode of the braking unit.	1	0	☆
P0-04	Load loss protection	0: Disable 1: Enable	-	1	1	☆
P0-05	Self-test discharge time	0-2000 ms	This parameter specifies the delay time after the load loss detection is completed.	1	0	☆
P0-06	Restore default settings	0: Disable restoration 1: Restore parameters in P0 group to default settings. 2: Clear all recording information of P2 group.	-	1	0	★
P0-07	Continuous braking time	0s to 65535s	This parameters specifies the continuous braking time.	1	0	☆
P0-08	Load loss detection	0: Disable 1: Enable	This parameter specifies whether the load loss detection function is enabled.	1	1	☆

Para. Code	Para. Name	Value	Description	Min. Unit	Default	Change Attribute
P0-09	Load loss detection delay	10s to 130s	After the load loss detection is enabled, the braking unit performs detection at the set time.	1	10	☆
Group P2						
P2-00	Software version	-	This parameter displays the manufacturer version with two decimal places.	-	-	●
P2-01	Types of last four faults	-	This parameter specifies the last four fault types. The digit in the ones position is the type of the last fault, the digit in the tens position is the type of the second last fault, and so on.	-	-	●
P2-02	Bus voltage upon fault	-	This parameter specifies the bus voltage when the last fault occurs.	-	-	●
P2-03	Current upon fault	-	This parameter specifies the current when the last fault occurs.	-	-	●
P2-04	Braking rate upon fault	-	This parameter specifies the braking rate (duty ratio) when the last fault occurs.	-	-	●
P2-05	Module temperature upon fault	-	This parameter specifies the module temperature when the last fault occurs.	-	-	●

Para. Code	Para. Name	Value	Description	Min. Unit	Default	Change Attribute
P2-06	Braking unit status upon fault	-	This parameter specifies the status of the braking unit when the last fault occurs. Binary bit 0: DI Binary bit 1: DO Binary bit 2: Fan Binary bit 3: Relay Binary bit 4:Braking in progress Binary bit 5:Power-on test Binary bit 6:Current sampling detection Binary bit 7:Bus voltage normal The data displayed on the operating panel is decimal, which needs to be converted into a binary value before state check. For example, if 224 is displayed on the operating panel, you need to convert it into the binary value 11100000,based on which the fault status can be determined.	-	-	●

Para. Code	Para. Name	Value	Description	Min. Unit	Default	Change Attribute
P2-07	Running time before fault	-	This parameter specifies the running time (in the unit of seconds) before the last fault occurs. The time is cleared when the braking unit is powered off and then powered on or when the braking unit encounters a fault. s	-	-	●
P2-08	Cumulative braking time	-	This parameter specifies the accumulative braking time in the unit of seconds.	-	-	●
P2-09	Accumulative power-on time	-	This parameter specifies the accumulative power-on time in the unit of hours.	-	-	●
P2-10	Braking unit usage rate	-	The value is equal to P2-08 divided by P2-09 in the unit of percentage.	-	-	●

Chapter 4 Troubleshooting and Solutions

The MDBUN series braking unit provides nine types of faults and protection functions. After a fault occurs, the protection function is enabled. The braking unit stops working and displays the fault code on the operating panel. If a fault occurs during running or commissioning, you can check the fault type, analyze the causes, and perform troubleshooting according to the following table.

If you cannot locate the fault during commissioning, contact technical support engineers of Inovance.

Table 4-1 Troubleshooting and solutions of the braking unit

Fault Code	Fault Name	Possible Cause	Solution
ERR01	Hardware overcurrent	1. The external circuit is short-circuited. 2. The feedback energy changes suddenly or becomes abnormal. 3. The power of the braking unit is too low. 4. The resistance of the braking resistor is too small.	1. Check and ensure that the external circuit is corrected correctly and press the STOP key to reset the braking unit or power on the braking unit again. 2. Reduce sudden change of the feedback energy. 3. Select a braking unit of a higher power rating. 4. Select a proper braking resistor. 5. Contact technical support engineers of Inovance. View the overcurrent threshold through P2-03.
ERR02	Software overcurrent		
ERR03	Overvoltage	1. The input voltage of the adaptable drive is set incorrectly. 2. The feedback energy becomes abnormal. 3. The capacity of the braking unit is insufficient.	1. Set the input voltage class of the adaptable drive correctly. 2. Check the input feedback energy. 3. Select a braking unit of a higher power rating. 4. Contact technical support engineers of Inovance. View the overvoltage threshold through P2-02.
ERR04	Overtemperature	1. The air duct is blocked or the fan is damaged. 2. The power supply cable of the fan is not securely inserted or is damaged. 3. The ambient temperature is high. 4. The power of the braking unit is too low.	1. Clear the air duct or replace the fan. 2. Check and ensure that the power cable of the fan is securely inserted and is normal. 3. Reduce the ambient temperature. 4. Contact technical support engineers of Inovance. View the overtemperature threshold through P2-05.

ERR05	Braking resistor short circuit	1. The braking resistor or the wiring of the braking resistor is short-circuited. 2. The resistance of the braking resistor is too small.	1. Check that the braking resistor and the wiring are normal. 2. Contact technical support engineers of Inovance.
ERR06	Load lost	1. No braking resistor is connected or the braking resistor is damaged. 2. The IGBT is damaged.	1. Check that the braking resistor is normal and connected properly. 2. Check that the IGBT is normal. 3. Contact technical support engineers of Inovance.
ERR07	Continuous braking timeout	1. The braking time is long. 2. The IGBT is damaged.	1. Check that P0-07 is set correctly. 2. Contact technical support engineers of Inovance.
ERR08	IGBT short circuit	The IGBT is damaged.	1. Replace the braking unit. 2. Contact technical support engineers of Inovance.
ERR09	Reference source failure	The analog sampling reference source fails.	1. Replace the braking unit. 2. Contact technical support engineers of Inovance.

Chapter 5 Selection of Braking Units and Braking Resistors

5.1 Selection of Braking Units

Select a braking unit based on the following:

1. Select the braking unit of a proper input voltage class based on the input voltage class of the drive.

2. Select the braking unit of a proper power rating based on the braking power required by the drive.

Ensure that the power of the braking unit is larger than the braking power. If the braking power is unknown, estimate it according to the following formula:

$$Pb = P \times Td \times K$$

In this formula, Pb indicates the braking power.

P indicates the motor power.

K indicates the mechanical energy conversion efficiency (generally, K = 0.7).

Td indicates the ratio of the braking torque to the rated motor torque.

The value of Td varies with the system, as shown in the following table.

Scenario	Elevator, hoist, crane	Winding and unwinding	Large-inertia device requiring quick stop	Common-inertia Load
Td	100%	120%	120%	80%

5.2 Braking Resistor Selection

5.2.1 Calculating the Resistance

During braking, almost all the regenerative energy of the motor is consumed by the braking resistor. The braking resistance can be obtained using the formula

$$U \times U/R = Pb$$

In this formula, U indicates the braking voltage for system stable braking.

The braking voltage varies with different systems. For 220 VAC systems, set U to 380 V. For 380 VAC systems, set U to 700 V. For 480 VAC systems, set U to 800 V. For 690 VAC systems, set U to 1200 V.

Note: If the calculated value of R is smaller than the minimum resistance under each voltage class, multiple braking units are required.

5.2.2 Selecting Power for the Braking Resistor

In theory, the power of the braking resistor is the same as the braking power. When the derating ratio is 70%, The power of the braking resistor can be obtained using the following formula:

$$0.7 \times Pr = Pb \times ED$$

Pr: power of the braking resistor

ED: braking frequency, that is, percentage of the braking process to the whole working process

Scenario	Elevator	Winding and unwinding	Crane and centrifuge	Occasional braking load	Injection molding machine	Regular applications
ED	20% to 30%	20% to 30%	50% to 60%	5%	5% to 10%	10%

In the following table, the recommended resistance of the braking unit and braking resistor can meet most drive application requirements (ED from 0% to 100%), and the braking resistor power needs to be determined based on different applications. The following table lists the recommended braking resistor power when ED is 10% and 50%.

Table 5-1 Recommended values of braking units and braking resistors (Td = 100%)

Rated Drive Power	Braking Unit Model	Recommended Resistance of Braking Resistors	Recommended Power of Braking Resistors (ED = 10%)	Recommended Power of Braking Resistors (ED = 50%)
Three-phase 220 V, braking start voltage = 350 V				
18.5 kW	MDBUN-45-2T	⩾ 8 Ω	⩾ 4 kW	⩾ 19 kW
22 kW	MDBUN-60-2T	⩾ 6 Ω	⩾ 4.5 kW	⩾ 22 kW
30 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 6 kW	⩾ 30 kW
37 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 7.5 kW	⩾ 37 kW
45 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 9 kW	⩾ 45 kW
55 kW	MDBUN-90-2T x 2	⩾ 4 Ω x 2	⩾ 5.5 kW x 2	⩾ 27.5 kW x 2
75 kW	MDBUN-90-2T x 2	⩾ 4 Ω x 2	⩾ 7.5 kW x 2	⩾ 37.5 kW x 2
90 kW	MDBUN-90-2T x 3	⩾ 4 Ω x 3	⩾ 6 kW x 3	⩾ 30 kW x 3
110 kW	MDBUN-90-2T x 3	⩾ 4 Ω x 3	⩾ 7.5 kW x 3	⩾ 37 kW x 3
132 kW	MDBUN-90-2T x 4	⩾ 4 Ω x 4	⩾ 7 kW x 4	⩾ 33 kW x 4
160 kW	MDBUN-90-2T x 5	⩾ 4 Ω x 5	⩾ 6.5 kW x 5	⩾ 32 kW x 5
Three-phase 380 V, braking start voltage = 670 V				
37 kW	MDBUN-45-T	⩾ 15 Ω	⩾ 7.5 kW	⩾ 37 kW
45 kW	MDBUN-45-T x 2	⩾ 15 Ω x 2	⩾ 4.5 kW x 2	⩾ 22.5 kW x 2
55 kW	MDBUN-45-T x 2	⩾ 15 Ω x 2	⩾ 5.5 kW x 2	⩾ 27.5 kW x 2

Rated Drive Power	Braking Unit Model	Recommended Resistance of Braking Resistors	Recommended Power of Braking Resistors (ED = 10%)	Recommended Power of Braking Resistors (ED = 50%)
75 kW	MDBUN-45-T x 3	⩾ 15 Ω x 3	⩾ 5 kW x 3	⩾ 25 kW x 3
90 kW	MDBUN-60-T x 2	⩾ 11 Ω x 2	⩾ 9 kW x 2	⩾ 45 kW x 2
110 kW	MDBUN-60-T x 2	⩾ 11 Ω x 2	⩾ 11 kW x 2	⩾ 55 kW x 2
132 kW	MDBUN-90-T x 2	⩾ 8 Ω x 2	⩾ 13 kW x 2	⩾ 66 kW x 2
160 kW	MDBUN-90-T x 2	⩾ 8 Ω x 2	⩾ 16 kW x 2	⩾ 80 kW x 2
200 kW	MDBUN-200-T x 2	⩾ 3.5 Ω x 2	⩾ 19 kW x 2	⩾ 100 kW x 2
220 kW	MDBUN-200-T x 2	⩾ 3.5 Ω x 2	⩾ 21 kW x 2	⩾ 110 kW x 2
250 kW	MDBUN-200-T x 2	⩾ 3.5 Ω x 2	⩾ 24 kW x 2	⩾ 125 kW x 2
280 kW	MDBUN-200-T x 2	⩾ 3.5 Ω x 2	⩾ 27 kW x 2	⩾ 140 kW x 2
315 kW	MDBUN-200-T x 3	⩾ 3.5 Ω x 3	⩾ 20 kW x 3	⩾ 105 kW x 3
355 kW	MDBUN-200-T x 3	⩾ 3.5 Ω x 3	⩾ 23 kW x 3	⩾ 119 kW x 3
400 kW	MDBUN-200-T x 3	⩾ 3.5 Ω x 3	⩾ 26 kW x 3	⩾ 134 kW x 3
450 kW	MDBUN-200-T x 4	⩾ 3.5 Ω x 4	⩾ 22.5 kW x 4	⩾ 112.5 kW x 4
Three-phase 480 V, braking start voltage = 760 V				
37 kW	MDBUN-45-T	⩾ 17 Ω	⩾ 7.5 kW	⩾ 37 kW
45 kW	MDBUN-45-T x 2	⩾ 17 Ω x 2	⩾ 4.5 kW x 2	⩾ 22.5 kW x 2
55 kW	MDBUN-45-T x 2	⩾ 17 Ω x 2	⩾ 5.5 kW x 2	⩾ 27.5 kW x 2
75 kW	MDBUN-45-T x 3	⩾ 17 Ω x 3	⩾ 5 kW x 3	⩾ 25 kW x 3
90 kW	MDBUN-60-T x 2	⩾ 13 Ω x 2	⩾ 9 kW x 2	⩾ 45 kW x 2
110 kW	MDBUN-60-T x 2	⩾ 13 Ω x 2	⩾ 11 kW x 2	⩾ 55 kW x 2
132 kW	MDBUN-90-T x 2	⩾ 9 Ω x 2	⩾ 13 kW x 2	⩾ 66 kW x 2
160 kW	MDBUN-90-T x 2	⩾ 9 Ω x 2	⩾ 16 kW x 2	⩾ 80 kW x 2
200 kW	MDBUN-200-T x 2	⩾ 4 Ω x 2	⩾ 19 kW x 2	⩾ 100 kW x 2
220 kW	MDBUN-200-T x 2	⩾ 4 Ω x 2	⩾ 21 kW x 2	⩾ 110 kW x 2
250 kW	MDBUN-200-T x 2	⩾ 4 Ω x 2	⩾ 24 kW x 2	⩾ 125 kW x 2
280 kW	MDBUN-200-T x 2	⩾ 4 Ω x 2	⩾ 27 kW x 2	⩾ 140 kW x 2
315 kW	MDBUN-200-T x 3	⩾ 4 Ω x 3	⩾ 20 kW x 3	⩾ 105 kW x 3
355 kW	MDBUN-200-T x 3	⩾ 4 Ω x 3	⩾ 23 kW x 3	⩾ 119 kW x 3
400 kW	MDBUN-200-T x 3	⩾ 4 Ω x 3	⩾ 26 kW x 3	⩾ 134 kW x 3
450 kW	MDBUN-200-T x 4	⩾ 4 Ω x 4	⩾ 22.5 kW x 4	⩾ 112.5 kW x 4
Three-phase 690 V, braking start voltage = 1170 V				
110kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 22 kW	⩾ 110 kW
132 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 26.5 kW	⩾ 132 kW
160 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 32 kW	⩾ 160 kW

Rated Drive Power	Braking Unit Model	Recommended Resistance of Braking Resistors	Recommended Power of Braking Resistors (ED = 10%)	Recommended Power of Braking Resistors (ED = 50%)
200 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 40 kW	⩾ 200 kW
220 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 44 kW	⩾ 220 kW
250 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 50 kW	⩾ 250 kW
280 kW	MDBUN-200-7T x 2	⩾ 6 Ω x 2	⩾ 28 kW x 2	⩾ 140 kW x 2
315 kW	MDBUN-200-7T x 2	⩾ 6 Ω x 2	⩾ 31.5 kW x 2	⩾ 157.5 kW x 2
355 kW	MDBUN-200-7T x 2	⩾ 6 Ω x 2	⩾ 35.5 kW x 2	⩾ 177.5 kW x 2
400 kW	MDBUN-200-7T x 2	⩾ 6 Ω x 2	⩾ 40 kW x 2	⩾ 200 kW x 2
450 kW	MDBUN-200-7T x 2	⩾ 6 Ω x 2	⩾ 45 kW x 2	⩾ 225 kW x 2
500 kW	MDBUN-200-7T x 2	⩾ 6 Ω x 2	⩾ 50 kW x 2	⩾ 250 kW x 2

Chapter 6 Repair and maintenance

Danger 

- Do not repair or maintain the equipment at power-on. Failure to comply will result in an electric shock.
- Repair or maintain the braking unit only after the input bus voltage is lower than 36 VDC (5 minutes after power-off). Otherwise, the residual charge on the capacitor will result in personal injury.
- Repair or maintenance of the braking unit must be performed only by qualified personnel. Failure to comply will result in personal injury or device damage.
- Ensure that all screws are secured after repair or maintenance. Never leave any tools or screws inside the braking unit.
- Re-set the parameters after the braking unit is replaced. All the pluggable parts must be plugged or removed only after power-off.

6.1 Routine Maintenance

Influence of the ambient temperature, humidity, dust, and vibration will age the components in the braking unit, which will cause potential faults or reduce the device service life. Therefore, it is necessary to carry out routine and periodic maintenance.

Routine inspection items:

1) Whether the installation environment of the braking unit changes
2) Whether the cooling fan of the braking unit works normally
3) Whether the barking unit vibrates abnormally
4) Whether the braking unit overheats

Routine cleaning items:

1) Keep the braking unit clean all the time.
2) Remove the dust, especially metal powder on the surface of the braking unit, to prevent the dust from entering the braking unit.
3) Clear the oil stain on the cooling fan of the braking unit.

6.2 Periodic Inspection

Check the less accessible areas periodically.

Periodic inspection items:

1) Check and clean the air duct periodically.
2) Check whether the screws become loose.

3) Check whether the braking unit is corroded.

4) Check whether arcing signs occur on the wiring terminals.

5) Perform the insulation test on the main circuit.

Note Before measuring the insulating resistance with a megameter (500 VDC megameter recommended), disconnect the main circuit from the braking unit. Do not use the insulating resistance meter to test the insulation of the control circuit. The high voltage test is not required because it has been completed before delivery.

6.3 Replacement of Quick-Wear Parts

The quick-wear part of the braking unit is the cooling fan. Its service life is related to the operating environment and maintenance status. The following table describes the general service life of the cooling fan.

Part	Service Life
Fan	2 to 3 years

Notes The service life indicates the time when the part is used in the following conditions. You can determine when to replace the part according to the actual operating time.

- Ambient temperature: The average annual temperature is about 30° C.
- Load rate: Below 80
- Running rate: Shorter than 20 hours/day

The cooling fan may be damaged due to bearing wearing or blade aging.

You can determine when to replace the cooling fan based on whether cracks exist on the blade and whether abnormal vibration noise exists upon startup.

6.4 Storage of Braking Units

For storage of the braking unit, pay attention to the following two aspects:

1) Pack the braking unit into the original packing box provided by Inovance.
2) Long-term storage degrades the electrolytic capacitor. Therefore, the unit must be energized once every 2 years for at least 5 hours. The input voltage must be increased slowly to the rated value with the voltage regulator.

6.5 Warranty Agreement

1) Free warranty only covers the braking unit.
2) Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the equipment) to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
3) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
4) Operations not following the user instructions
5) Fire, flood, abnormal voltage, or other disasters
6) Use of the brake unit for abnormal functions
7) The maintenance fee is charged according to the latest Price List of Inovance. If

otherwise agreed upon, the agreed terms and conditions shall prevail.

Warranty Agreement INOVANCE

1) Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the equipment) to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.

2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:

   A. Improper use or repair/modification without prior permission
   B. Fire, flood, abnormal voltage, other disasters, and secondary disasters
   C. Hardware damage caused by dropping or transportation after procurement
   D. Operations not following the user instructions
   E. Damage out of the equipment (for example, external device factors)

3) The maintenance fee is charged according to the latest Maintenance Price List of Inovance.

4) If there is any problem during the service, contact Inovance's agent or Inovance directly.

5) Inovance reserves the rights for explanation of this agreement.

Shenzhen lnovance Technology Co., Ltd.

Customer Service Center

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