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MDBUN
Braking Unit
User Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19011140A02

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 can cause rising of the DC bus voltage of the drive. To ensure normal operation 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 protective functions, such as protection against overcurrent, overvoltage, overtemperature, 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 starters.

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.

■ Cautions for Initial Use

Read through this user guide carefully before use for the first time. If you have any question concerning product functions or performance, contact Inovance for technical support.

■ Standards Compliance

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

Certification	Name		Standard
CE Certification	EMC Directive	2014/30/EU	EN 61800-3
	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
July 2024	A02	Updated sections 2.2.3, 3.2, and 5.2.2.

Date	Version	Description
June 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”.
May 2019	A00	First release

■ Access to the Guide

Visit the following website to download the user guide:

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

■ Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for faults or damage that occur during normal operation.

Maintenance will be charged after the warranty expires.

Within the warranty period, maintenance will be charged for the following damage:

- ◆ Damage caused by operations not following the instructions in the user guide
- ◆ Damage caused by fire, flood, or abnormal voltage
- ◆ Damage caused by unintended use of the product
- ◆ Damage caused by use beyond the specified scope of application of the product
- ◆ Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

Contents

Fundamental Safety Instructions

Safety disclaimer

1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2) To ensure personal and equipment safety, observe the notes indicated on the product labels and all the safety instructions in the user guide.
3) "CAUTION", "WARNING", and "DANGER" in the user 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 for any personal injury or property damage caused by improper use.

Safety levels and definitions

Indicates that failure to comply with the notice can result in severe personal injury or even death.

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

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

General Safety Instructions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

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, rust, or injuries on the surface of the equipment and equipment accessories before unpacking. ◆ Check whether the package contents are consistent with the packing list before unpacking.

WARNING

- Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon 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 product according to the following requirements. The storage temperature and humidity requirements must be met.
- Do not store or transport the drive in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this product for more than three months. Long-term storage requires stricter protection and necessary inspection.
- 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 tool to carry 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

- Installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Installation, wiring, maintenance, inspection, or parts replacement must be carried out by professionals.
- Ensure that the installation personnel is familiar with equipment installation requirements and related technical information.
- Before installing equipments with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.

Wiring

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

- 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, make sure 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, make sure there are no fallen screws or exposed wire inside the device.

Power-on

- Before power-on, make sure that the equipment and product are installed properly with reliable wiring and the motor can be restarted.
- Before power-on, ensure that the power supply meets equipment requirements. Failure to comply will result in equipment damage or even a fire.
- During power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- Do not touch any wiring terminals during power-on. Failure to comply will result in an electric shock.
- After power-on, do not disassemble any unit or component of the equipment. Failure to comply will result in an electric shock.

Operation

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

- Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage.
- Do not start or stop the equipment by using the contactor. Failure to comply may result in equipment damage.

Maintenance

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

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

Repair

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

- 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 operate damaged equipment. Failure to comply may result in worse damage.
- After the equipment is replaced, check the wiring and set parameters again.

Repair

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

Safety Labels

To guarantee safe operations and maintenance of the equipment, follow the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the meaning of the safety labels.

Safety Labels	Description
	◆ Read this user guide carefully before installation and operation to avoid risks of electric shock. ◆ 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 supply and wait for at least 10 minutes until the power indicator is off.

1 Product Information

1.1 Product Appearance and Nameplate

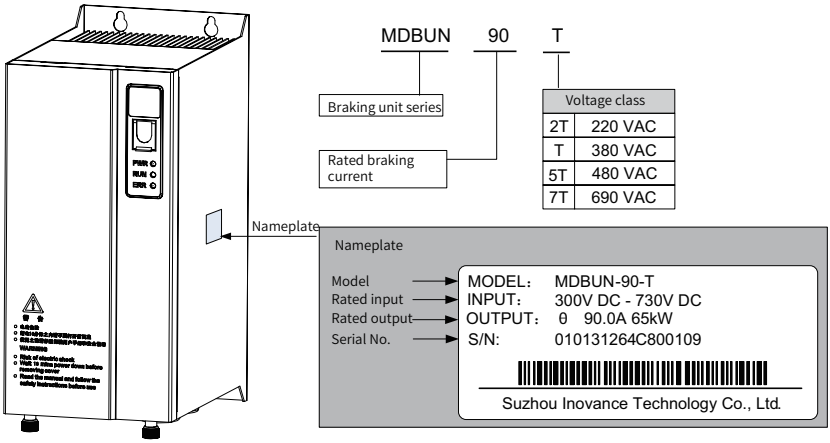

Figure 1-1 Product appearance and nameplate

1.2 Product Model and Technical Data

Table 1-1 Models and technical data of MDBUN series 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 Operating Principle

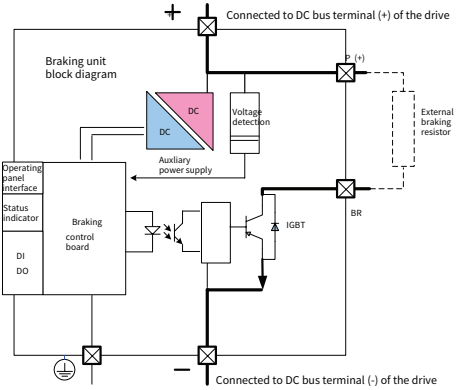

Figure 1-2 Application schematics of the braking unit

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, which ensures the normal operation of the drive.

Before operating the braking unit, set the braking start and stop voltages 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 operation of the bus capacitor.

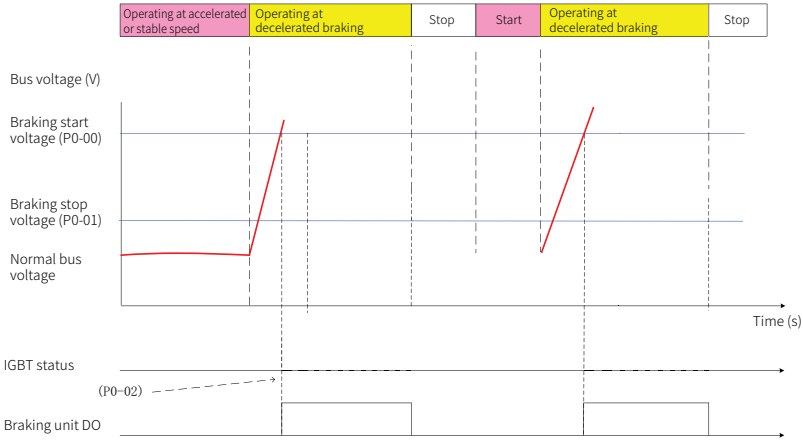

Figure 1-3 Operating principle of the MDBUN series braking unit

As shown in Figure 1-3, 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 (P0-00), the IGBT starts to work and discharges the electricity in the main capacitor of the drive through the external braking resistor, so that the bus voltage reduces to a value lower than the braking stop voltage (P0-01). The braking start rate (P0-02) of the braking unit can also be set to adjust the bleeder power during braking so as to change the braking time.

1.4 Load Curve of the Braking unit

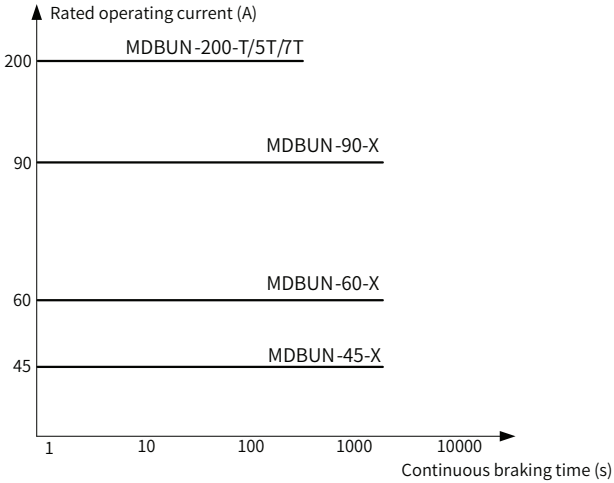

Figure 1-4 Load curve of the MDBUN series braking unit

Note:

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

(2) Curves in Figure 1-4 represent the maximum continuous braking time of the braking unit under rated current. The maximum continuous braking time of the MDBUN-200-T/5T/7T is 4 min, with the braking frequency not higher than 50% and the interval time not shorter than 4 min. The maximum continuous braking time of MDBUN-45-X, MDBUN-60-X, and MDBUN-90-X is 30 min, with the braking frequency not higher than 50% and the interval time not shorter than 30 min.

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 and humidity of the braking unit cannot exceed the permitted range of design, as shown in Table 2-1.
2) Install the braking unit and external braking resistor on the surface of incombustible objects with sufficient space reserved for heat dissipation.
3) Ensure that the installation place meets the following requirements:
   a. Free from corrosive, flammable, and explosives gases
   b. Away from dust and metal powder

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

Operating Condition	Requirements
Altitude	Below 1000 m (For altitudes above 1000 m, derate 1% for every additional 100 m. The maximum altitude is 3000 m.)
Ambient temperature	-10° C to +40° C
Humidity	Less than 95% RH (without condensation)
Vibration	Below 5.9 m/s^2 (0.6 g)
Storage temperature	-20° C to +60° C
Pollution degree	PD2
Cooling mode	Air cooling
IP rating	IP10

2.1.2 Outline Dimensions and Installation Clearance

See Figure 2-1 and Figure 2-2 for outline dimensions.

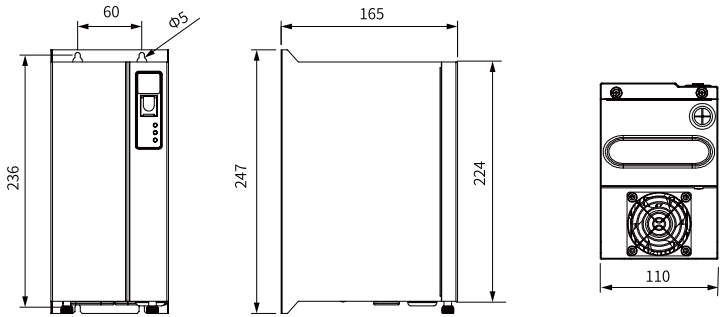

Figure 2-1 Outline dimensions of MDBUN series braking unit in mm (MDBUN-45-2T to MDBUN-90-2T, MDBUN-45-T to MDBUN-90-T, and MDBUN-45-5T to MDBUN-90-5T)

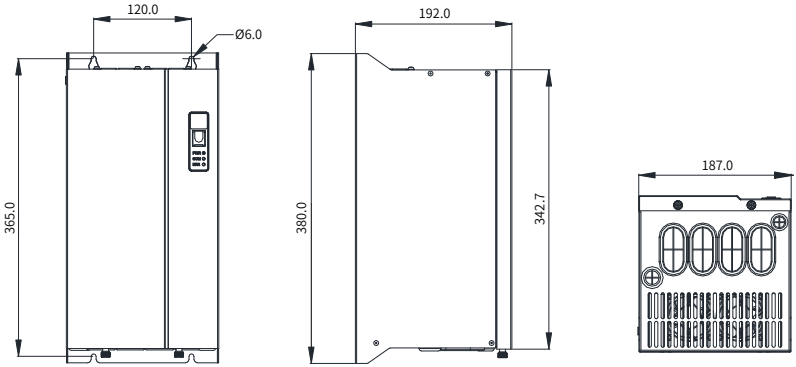

Figure 2-2 Dimensions of MDBUN series braking units in mm (MDBUN-200-T, MDBUN-200-5T, and MDBUN-200-7T)

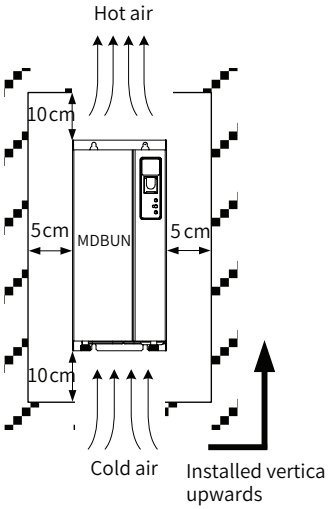

Figure 2-3 Installation clearance for the MDBUN series braking units

2.1.3 Mechanical Installation Recommendations

1) Install the braking resistor in a place with good ventilation. The braking resistor will be heated when it consumes the regenerative energy generated during braking.

2) Install the braking unit vertically 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 the heat generated by braking units in the lower row from being transmitted to 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 wiring terminals are shown in Figure 2-4 and Figure 2-5.

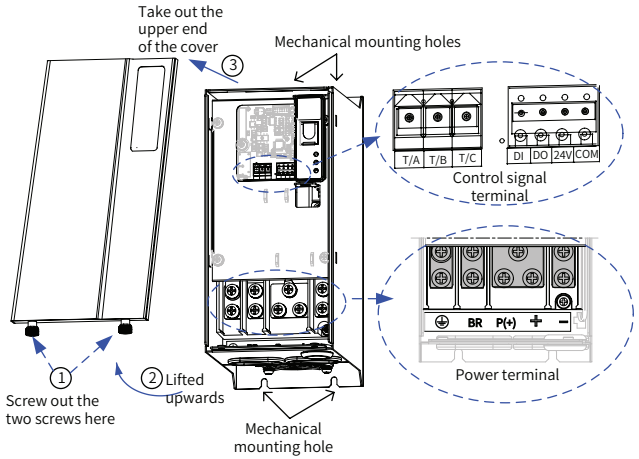

Figure 2-4 Terminals of the MDBUN series braking units (MDBUN-45-2T to MDBUN-90-2T, MDBUN-45-T to MDBUN-90-T, and MDBUN-45-5T to MDBUN-90-5T)

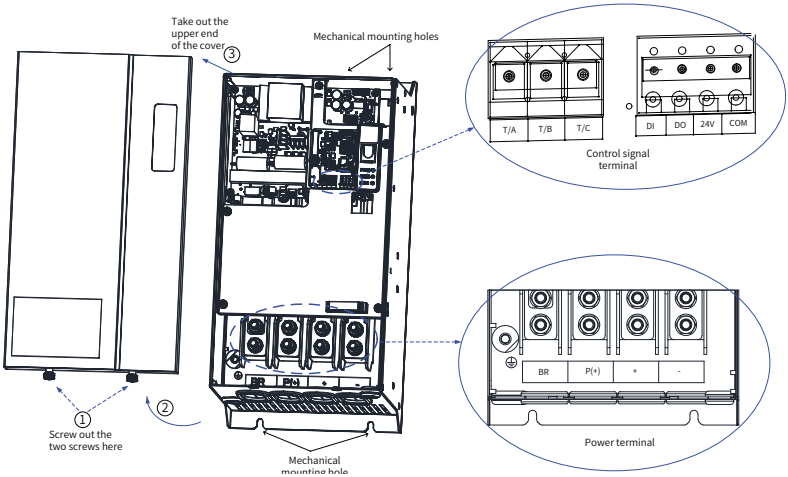

Figure 2-5 Terminals of the MDBUN series braking units (MDBUN-200-T, MDBUN-200-5T, and MDBUN-200-7T)

2.2.1 Functions of the Terminals

(1) Function of power terminals

Mark	Name	Description
+, -	Positive and negative terminals of the DC bus	Used to connect the common DC bus.
P(+), BR	Terminals for connecting the braking resistor	Used to connect the braking resistor.
⏚	Grounding terminal	Grounding terminal

Note:

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

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

3. PE terminal ⏚ : Ground the PE terminal properly with the grounding cable resistance lower than 4 Ω.

4. The cable between the braking unit and the drive must be a twisted-pair cable not longer than 5 m. The length of the cable between the braking unit and the braking resistor cannot be longer than 10 m.

(2) Function of control terminals

Mark	Name	Description
DI	Digital input	Master mode: input inhibited upon an external fault Slave mode: braking unit run/stop signal input
DO	Digital output	Run/Stop signal output
TA/TB/TC	Relay output upon a fault	TA/TB is MC contact and TA/TC is NO contact, which act if the braking unit fails.
24V, COM	Power supply/Common terminal	Input/output auxiliary power supply and reference ground

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

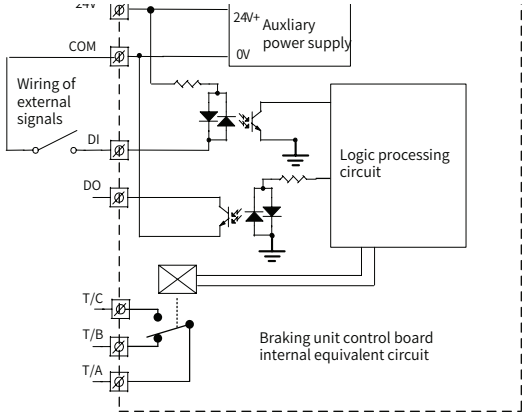

Figure 2-6 Internal equivalent circuit of the control signal terminal

Note:

1) Master: The DI is for blocking purpose. When the input is active, 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 NC contact and TA/TC is NO contact. 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 requirements:

- Compliant with EN 60204-1 and IEC 60364-5-52 standards;
- PVC-insulated
- Ambient temperature: 40° C;
  Max. temperature of cable insulation layer: 70°C during continuous operation
- 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 (mm^2)	Recommended +/-/P(+)/BR cable lug	Recommended grounding cable (mm^2)	Recommended grounding cable lug	Braking unit terminal 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 made by Suzhou Yuanli.

2.2.3 Wiring of the Braking Unit

(1) Standard wiring method 1

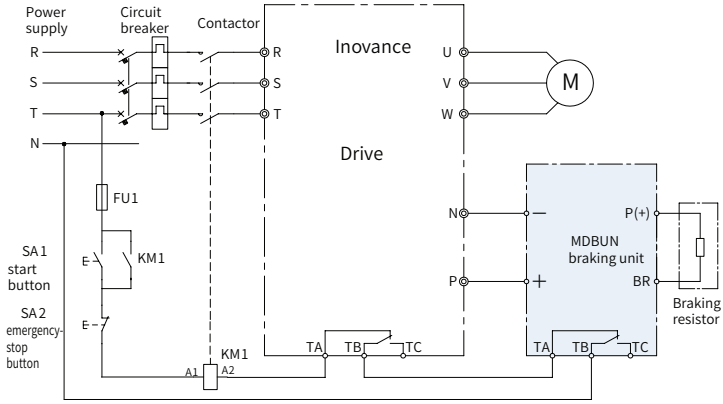

Figure 2-7 Standard wiring method 1

Note

- In the preceding wiring scheme, TA/TB/TC on the drive side are used for relay fault signal output of the drive, and TA/TB/TC on the braking unit side are used for relay fault signal output of the braking unit.
- In this wiring method, the input voltage class of the contactor control coil is 220 VAC.
- The P and N poles correspond to the positive and negative poles respectively.

(2) Standard wiring method 2

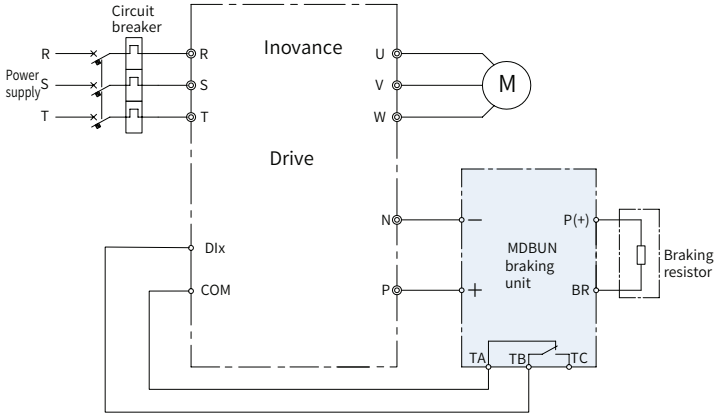

Figure 2-8 Standard wiring method 2

Note

- When the preceding wiring method is used, you need to assign 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 assign DI3 with the function of external fault NO input, set F4-02 to 33.
- When drives made by other manufacturers are used, set the DI according to the user guide of the drive.
- The P and N poles correspond to the positive and negative poles respectively.

(3) Standard wiring method 3

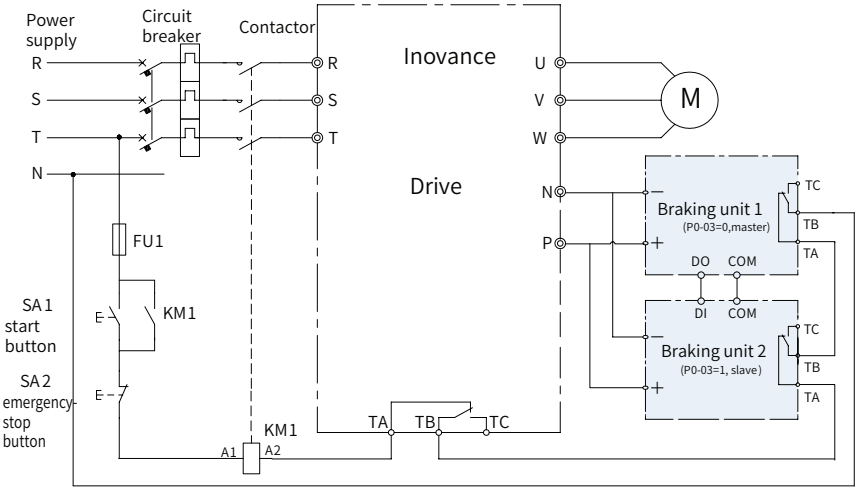

Figure 2-9 Standard wiring method 3

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.
- In this wiring method, 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 all other braking units as the slave (P0-03 = 1).
- Set the braking start voltage (P0-00), braking stop voltage (P0-01), and braking start rate (P0-02) to the same values for the master and all slaves.
- The P and N poles correspond to the positive and negative poles respectively.

3 Operation and Display

3.1 Introduction to the Operating Panel

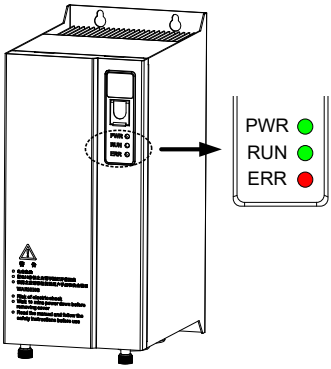

Figure 3-1 Operating panel of the braking unit

- PWR: Power indicator, which turns on when the braking unit is powered on.
- RUN: Operation indicator, which turns on during operation of the braking unit.
- ERR: Fault indicator, which turns on when the braking unit is faulty.

You can check whether the braking unit is faulty by viewing the status of the ERR indicator or by 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 parameters in group P2. For details, see section Parameter List.

3.2 Introduction to Parameter Setting and Operating Panel

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

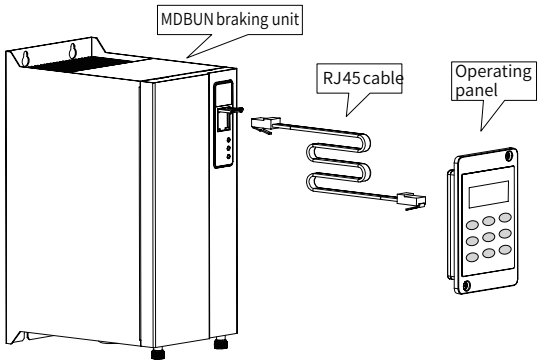

Figure 3-2 Diagram for connection with the operating panel

NOTE

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

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.

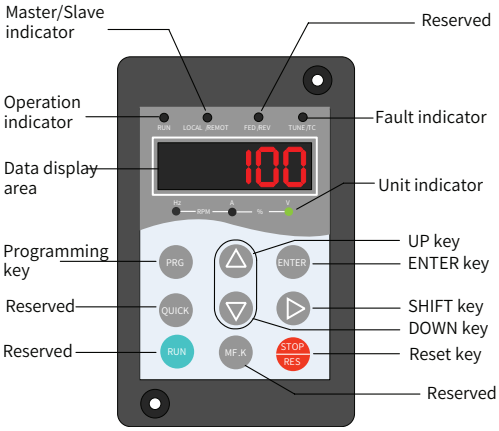

Figure 3-3 Operating panel

(1) Unit indicators:

Hz ○ RPM ○ A ○ % ○ V : Unit indicator, used to indicate the unit of the displayed data (○ indicates OFF and ● indicates ON.)

Hz ● RPM ○ A ○ % ○ V : Hz, unit of frequency

Hz ○ RPM ● A ○ % ○ V : A, unit of current

Hz ○ RPM ○ A ○ % ● V : V, unit of voltage

Hz ● RPM ● A ○ % ○ V : rpm, unit of rotation speed

Hz ○ RPM ● A ○ % ● V : %, unit of percentage

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

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

(4) Digital display area:

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

(5) Keys on the operating panel

Table 3-1 Functions of the keys

Key	Name	Function
PRG	Programming key	Used to enter or exit level I menus.
ENTER	ENTER key	Used to enter the menu interfaces level by level and confirm the parameter setting.
△	UP key	Used to increase the data or parameter value.
▽	DOWN key	Used to decrease the data or parameter value.
▷	SHIFT key	Used to select parameters to be displayed cyclically in the stop or operation interfaces or the bit to be modified during parameter modification.
RUN	Reserved	–
STOP RES	Stop/Reset	Used to reset the braking unit after a fault occurs.
MF.K	Reserved	–
QUICK	Reserved	–

3.3 Parameter View and Modification

The operating panel of the MDBUN series braking unit adopts the three-level menu for parameter setting and other operations.

The three levels of menus are function parameter group (level-I menu), parameter (level-II menu), and parameter value (level-III menu). The operating flowchart in shown in Figure 3-4.

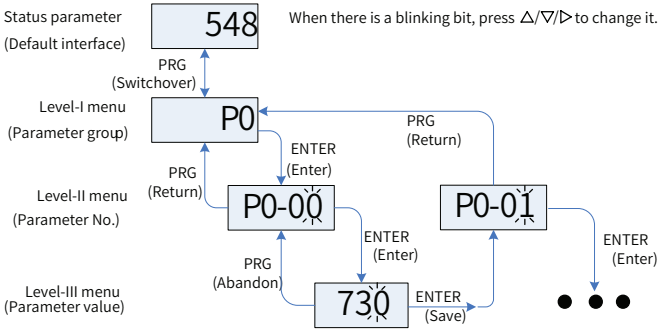

Figure 3-4 Operation flowchart for level-III menus

Note: You can return to level-II menus from level-III menus by pressing PRG or ENTER keys. The difference between the ENTER key and PRG key is as follows: After you press the ENTER key, the system saves the set parameter, returns to the level-II menu, and shifts to the next parameter automatically. After you press the PRG key, the system returns to the level-II menu and current parameter directly, without saving the set parameter.

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

1) This 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 Setting for Initial Power-on

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

After the parameters in group P0 are set, the braking unit starts working based on the bus voltage of the drive and the set working mode without the need for 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 Viewing Status Parameters

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

In the stop or operation state, five status parameters can be displayed, which are the bus voltage, output current, current braking rate, IGBT module temperature, and fault code. You can switch between selected parameters in sequence. Check the unit indicator of the 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 operation state.

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

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

*: The parameter is the "factory parameter" that can be set only by the manufacturer.

Table 3-2 Parameter list

Param.	Name	Setting range	Descriptions	Min. unit	Default	Attribute
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 setpoint.	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	☆

Param.	Name	Setting range	Descriptions	Min. unit	Default	Attribute
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 setpoint.	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	☆
P0-02	Braking start rate	30% to 100%	Defines 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	Defines the working mode of the braking unit.	1	0	☆
P0-04	Load loss protection	0: Disable 1: Enable	-	1	1	☆
P0-05	Auto-detection discharge time	0 ms to 2000 ms	Defines the delay time after the load loss detection is done.	1	0	☆
P0-06	Restoring parameters to default	0: Not restored 1: Restore parameters in group P0 to default 2: Clear all recording information in group P2	-	1	0	★
P0-07	Continuous braking time	0s to 65535s	Defines the continuous braking time.	1	0	☆
P0-08	Load loss detection	0: Disable 1: Enable	Used to enable/disable the load loss detection function.	1	1	☆
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	-	Displays the manufacturer version with two decimal places.	-	-	●
P2-01	Types of last four faults	-	The ones indicates the type of the last fault, ones indicates the 2nd to last fault, and so on.	-	-	●
P2-02	Bus voltage upon fault	-	Defines the bus voltage when the last fault occurs.	-	-	●

Param.	Name	Setting range	Descriptions	Min. unit	Default	Attribute
P2-03	Current upon fault	-	Defines the current upon occurrence of the last fault.	-	-	●
P2-04	Braking rate upon fault	-	Defines the braking rate (duty ratio) upon occurrence of the last fault.	-	-	●
P2-05	Module temperature upon fault	-	Defines the module temperature upon occurrence of the last fault.	-	-	●
P2-06	Braking unit status upon fault	-	Defines the braking unit status upon occurrence of the last fault. 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 detection Binary bit 6: Current sampling detection Binary bit 7: Bus voltage build-up The data displayed on the operating panel is decimal, which needs to be converted into a binary value before state check. For example, the binary equivalent of 224 that displayed on the operating panel is 11100000, which can be used to determine the fault state.	-	-	●
P2-07	Operating time before fault	-	Defines the operating time (in seconds) before the last fault occurs. The time is cleared when the braking unit is restarted or when a fault occurs on the braking unit.	-	-	●
P2-08	Cumulative braking time	-	Defines the accumulative braking time in seconds.	-	-	●
P2-09	Cumulative power-on time	-	Defines the cumulative power-on time in hours.	-	-	●
P2-10	Braking unit usage rate	-	Equals to the value of P2-08/P2-09 in the unit of percentage.	-	-	●

4 Troubleshooting

The MDBUN series braking unit provides nine types of faults and protective 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 operation or commissioning, rectify the fault according to this chapter.

If a fault occurs during commissioning, see Table 4-1 to rectify the fault.

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

Table 4-1 Fault diagnosis and protective functions of the braking unit

Fault Type	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 in 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 in 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 in 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 loss	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.

5 Selection of Braking Units and Braking Resistors

5.1 Selection of the Braking Unit

Select a braking unit based on the following principles.

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 the preceding 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.

Common Applications	Elevator, Hoist, Crane	Decoiler and recoiler	High-inertia device that requires quick stop	Regular inertia load
Value of Td	100%	120%	120%	80%

5.2 Selection of the Braking Resistor

5.2.1 Calculating the Resistance

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

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

In the preceding formula, U indicates the braking voltage required for stable braking of the system.

(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 need to be used.

5.2.2 Power of the Braking Resistor

In theory, the power of the braking resistor is the same as the braking power. Given that 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 indicates the power of the braking resistor.

ED indicates the braking frequency, which is the percentage of the braking process to the whole working process.

Application Occasion	Elevator	Decoiler and recoiler	Crane, Centrifuge	Occasional braking load	Injection molding machine	Regular application
ED	20% to 30%	20% to 30%	50% to 60%	5%	5% to 10%	10%

NOTE

In table 5-1 and 5-2, the recommended resistance of the braking unit and braking resistor can meet most of drive application requirements (ED = 0%...100%), and the braking resistor power needs to be determined based on different applications. Table 5-1 and Table 5-2 are for reference only. For details, see the related user guide.

Table 5-1 Recommended values of braking units and braking resistors (Td = 100%, ED = 10%)

Rated power of the drive	Braking unit	Recommended resistance of the braking resistor	Recommended power of the braking resistor (ED = 10%)
Three-phase 220 V, braking start voltage = 350 V			
18.5 kW	MDBUN-45-2T	⩾ 8 Ω	⩾ 4 kW
22 kW	MDBUN-60-2T	⩾ 6 Ω	⩾ 4.5 kW
30 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 6 kW
37 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 7.5 kW
45 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 9 kW
55 kW	MDBUN-200-2T	⩾ 3 Ω	⩾ 11 kW
75 kW	MDBUN-200-2T	⩾ 3 Ω	⩾ 11 kW
90 kW	MDBUN-90-2Tx3	⩾ 4 Ωx3	⩾ 6 kWx3
110 kW	MDBUN-90-2Tx3	⩾ 4 Ωx3	⩾ 7.5 kWx3
132 kW	MDBUN-200-2Tx2	⩾ 3 Ωx2	⩾ 7 kWx2
160 kW	MDBUN-200-2Tx2	⩾ 3 Ωx2	⩾ 7 kWx2
Three-phase 380 V, braking start voltage = 670 V			
37 kW	MDBUN-45-T	⩾ 15 Ω	⩾ 7.5 kW
45 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 9 kW
55 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 9 kW
75 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 9 kW
90 kW	MDBUN-200-T	⩾ 6 Ω	⩾ 12 kW
110 kW	MDBUN-200-T	⩾ 6 Ω	⩾ 12 kW
132 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 16 kW
160 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 16 kW
200 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 19 kWx2
220 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 21 kWx2
250 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 24 kWx2
280 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 27 kWx2
315 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 20 kWx3

Rated power of the drive	Braking unit	Recommended resistance of the braking resistor	Recommended power of the braking resistor (ED = 10%)
355 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 23 kWx3
400 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 26 kWx3
450 kW	MDBUN-200-Tx4	⩾ 4 Ωx4	⩾ 22.5 kWx4
Three-phase 480 V, braking start voltage = 760 V			
37 kW	MDBUN-45-T	⩾ 15 Ω	⩾ 7.5 kW
45 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 9 kW
55 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 9 kW
75 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 9 kW
90 kW	MDBUN-200-T	⩾ 6 Ω	⩾ 12 kW
110 kW	MDBUN-200-T	⩾ 6 Ω	⩾ 12 kW
132 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 16 kW
160 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 16 kW
200 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 19 kWx2
220 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 21 kWx2
250 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 24 kWx2
280 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 27 kWx2
315 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 20 kWx3
355 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 23 kWx3
400 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 26 kWx3
450 kW	MDBUN-200-Tx4	⩾ 4 Ωx4	⩾ 22.5 kWx4
Three-phase 690 V, braking start voltage = 1170 V			
110 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 22 kW
132 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 26.5 kW
160 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 32 kW
200 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 40 kW
220 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 44 kW
250 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 50 kW
280 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 28 kWx2
315 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 31.5 kWx2
355 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 35.5 kWx2
400 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 40 kWx2
450 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 45 kW: 2
500 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 50 kWx2

Table 5-2 Recommended values of braking units and braking resistors (Td = 100%, ED = 50%)

Rated power of the drive	Braking unit	Recommended resistance of the braking resistor	Recommended power of the braking resistor (ED = 50%)
Three-phase 220 V, braking start voltage = 350 V			
18.5 kW	MDBUN-45-2T	⩾ 8 Ω	⩾ 19 kW
22 kW	MDBUN-60-2T	⩾ 6 Ω	⩾ 22 kW
30 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 30 kW
37 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 37 kW
45 kW	MDBUN-90-2T	⩾ 4 Ω	⩾ 45 kW
55 kW	MDBUN-200-2T	⩾ 3.5 Ω	⩾ 55 kW
75 kW	MDBUN-200-2T	⩾ 3.5 Ω	⩾ 75 kW
90 kW	MDBUN-90-2Tx3	⩾ 4 Ωx3	⩾ 30 kWx3
110 kW	MDBUN-90-2Tx3	⩾ 4 Ωx3	⩾ 37 kWx3
132 kW	MDBUN-200-2Tx2	⩾ 3 Ωx2	⩾ 33 kWx2
160 kW	MDBUN-200-2Tx2	⩾ 3 Ωx2	⩾ 32 kWx2
Three-phase 380 V, braking start voltage = 670 V			
37 kW	MDBUN-45-T	⩾ 15 Ω	⩾ 37 kW
45 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 45 kW
55 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 55 kW
75 kW	MDBUN-200-T	⩾ 5 Ω	⩾ 25 kW
90 kW	MDBUN-200-T	⩾ 5 Ω	⩾ 90 kW
110 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 110 kW
132 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 132 kW
160 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 160 kW
200 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 100 kWx2
220 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 110 kWx2
250 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 125 kWx2
280 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 140 kWx2
315 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 105 kWx3
355 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 119 kWx3
400 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 134 kWx3
450 kW	MDBUN-200-Tx4	⩾ 4 Ωx4	⩾ 112.5 kWx4
Three-phase 480 V, braking start voltage = 760 V			
37 kW	MDBUN-45-T	⩾ 17 Ω	⩾ 37 kW
45 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 45 kW
55 kW	MDBUN-90-T	⩾ 10 Ω	⩾ 55 kW
75 kW	MDBUN-200-T	⩾ 5 Ω	⩾ 25 kW

Rated power of the drive	Braking unit	Recommended resistance of the braking resistor	Recommended power of the braking resistor (ED = 50%)
90 kW	MDBUN-200-T	⩾ 5 Ω	⩾ 90 kW
110 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 110 kW
132 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 132 kW
160 kW	MDBUN-200-T	⩾ 4 Ω	⩾ 160 kW
200 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 100 kWx2
220 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 110 kWx2
250 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 125 kWx2
280 kW	MDBUN-200-Tx2	⩾ 4 Ωx2	⩾ 140 kWx2
315 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 105 kWx3
355 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 119 kWx3
400 kW	MDBUN-200-Tx3	⩾ 4 Ωx3	⩾ 134 kWx3
450 kW	MDBUN-200-Tx4	⩾ 4 Ωx4	⩾ 112.5 kWx4
Three-phase 690 V, braking start voltage = 1170 V			
110 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 110 kW
132 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 132 kW
160 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 160 kW
200 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 200 kW
220 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 220 kW
250 kW	MDBUN-200-7T	⩾ 6 Ω	⩾ 250 kW
280 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 140 kWx2
315 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 157.5 kWx2
355 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 177.5 kWx2
400 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 200 kWx2
450 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 225 kWx2
500 kW	MDBUN-200-7Tx2	⩾ 6 Ωx2	⩾ 250 kWx2

6 Maintenance

Danger

- Do not repair or maintain the equipment with power on. Failure to comply can result in electric shock.
- Perform maintenance on the drive only when the input bus voltage of the braking unit is lower than 36 VDC (measured 5 min after power-off). Otherwise, the residual charge on the capacitor can result in personal injury.
- Only well-trained professionals are allowed to perform maintenance on the braking unit. Failure to comply can result in personal injury or equipment damage.
- Ensure that all screws are secured after repair or maintenance. Never leave any tools or screws inside the machine.
- Reset parameters after the braking unit is replaced. All the pluggable parts must be plugged or removed only after power-off.

6.1 Routine Inspection

Influence of the ambient temperature, humidity, dust, and vibration can 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 regular maintenance.

Routine checklist

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 list:

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) Remove the greasy dirt on the cooling fan of the braking unit.

6.2 Regular Inspection

Check the less accessible areas regularly.

Regular checklist:

1) Check and clean the air duct regularly.
2) Check whether the screws are loose.
3) Check whether the braking unit is corroded.
4) Check for arcing signs on the wiring terminals.
5) Main circuit insulation test

Note: Before measuring the insulation resistance with megameter (500 VDC megameter recommended), disconnect the main circuit from the braking unit. Do not use an insulation resistance meter. The high voltage test need not be performed again because it has been done before delivery.

6.3 Replacing Quick-Wear Parts

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

Name	Service life
Fan	2 to 3 years

Note: The service life indicates the time when the parts are used in the following conditions. You can determine when to replace the parts according to the actual operating time.

- Ambient temperature: annual average 30° C
- Load rate: below 80%;
- Operating time: less than 20 hours per day

The cooling fan may be damaged due to bearing worn-out 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 start.

6.4 Storage of Braking Units

Observe the following requirements for storage of the braking unit.

1) Put the drive in the original packing box provided by Inovance.
2) Long-term storage degrades the electrolytic capacitor. Thus, the unit must be energized once every 2 years, each time lasting for at least 5 hours. The input voltage must be increased slowly to the rated value with the regulator.

6.5 Warranty Agreement

1) The warranty service only covers the braking unit.
2) Inovance provides an 18-month warranty (subject to the barcode on the equipment) from the date of manufacturing for failures or damage that occur during normal use of the equipment.
3) Within the warranty period, maintenance will be charged for the following damage:
4) Damage caused by operations not following the instructions in the user guide
5) Damage caused by fire, flood, abnormal voltage, or other disasters
6) Damage caused by unintended use of the equipment
7) The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

INOVANCE Product Warranty Card

<table>
<tr><td rowspan="3">Customer Information</td><td colspan="2">Company address:</td></tr>
<tr><td rowspan="2">Company name:

P.C.:</td><td>Contact person:</td></tr>
<tr><td>Tel.:</td></tr>
<tr><td rowspan="3">Product Information</td><td colspan="2">Product model:</td></tr>
<tr><td colspan="2">Product barcode (attached here):</td></tr>
<tr><td colspan="2">Agent name:</td></tr>
<tr><td>Fault information</td><td colspan="2">(Service date and description):

Serviced by:</td></tr>
</table>

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