Preface

Thank you for purchasing Inovance MDBUN series braking unit.

Inovance MDBUN series braking unit applies to the applications where an AC drive or servo drive (hereinafter referred to as "drive") needs to perform deceleration, positioning or braking operation. When the drive performs braking, kinetic energy is converted to 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. Therefore, a braking unit is required to ensure normal running of the drive. The regenerative energy is consumed by the braking resistor, preventing the drive from stopping or even being damaged due to overvoltage protection.

Inovance MDBUN series braking unit provides full protection functions, such as overcurrent, overheat, and braking unit open-circuit and short-circuit protection. It supports the setting of 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.

Inovance MDBUN braking unit also applies to large-inertia applications that require sudden stop, for example, such as elevators, textile machines, paper making machines, centrifuges, wire drawing machines, winding machines, proportional linkage systems, and crown blocks.

Before performing installation, wiring, operation, maintenance, and inspection, read and understand this manual thoroughly and follow the instructions. Failure to observe the instructions may result in personal injury or even death.

Note
● The drawings in this manual are sometimes shown without cover or protective guard. Remember to install the cover or protective guard as specified first, and then perform operations in accordance with the instructions. ● The drawings in this manual are shown for description only and may not match the product that you have purchased. ● The instructions are subject to change due to product upgrade, specification modification, as well as the efforts to increase the accuracy and convenience of the manual ● Contact the regional agent or customer service center of Inovance if the manual delivered is lost or damaged. ● Contact the customer service center of Inovance if you have problems during the use.

Chapter 1 Safety Information

In this manual, the notices are graded based on the degree of danger:

- **DANGER** indicates that failure to comply with the notice will result in severe personal injury or even death.
- **WARNING** indicates that failure to comply with the notice will result in personal injury or property damage.

Read this chapter carefully so that you have a thorough understanding. Installation, commissioning or maintenance must be performed in conjunction with this chapter. Inovance will assume no liability or responsibility for any injury or loss caused by improper operation.

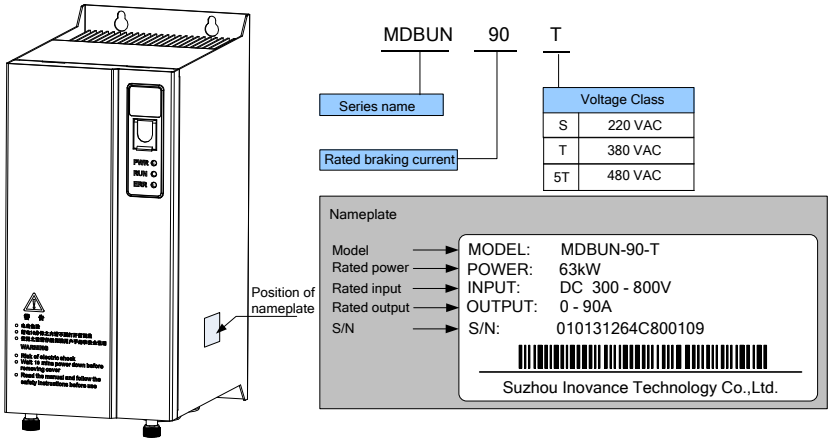
Use Stage	Safety Grade	Precautions
Before installation	DANGER	● Do not install the device if you find water seepage, component missing or damage upon unpacking. ● Do not install the device if the packing list does not conform to the product you received.
	WARNING	● Handle the device with care during transportation to prevent damage to the device. ● Do not use the device if any component is damaged or missing. Failure to comply will result in personal injury. ● Do not touch the components with your hands. Failure to comply will result in static electricity damage.
During installation	DANGER	● Install the device on incombustible objects such as metal, and keep it away from combustible materials. Failure to comply may result in a fire. ● Do not loosen the fixed screws of the components, especially the screws with red mark.
	WARNING	● Do not drop wire end or screw into the braking unit. Failure to comply will result in damage to the braking unit. ● Install the braking unit in places free of vibration and direct sunlight. ● When two braking units are laid in the same cabinet, arrange the installation positions properly to ensure the cooling effect. ● Keep the braking unit close to the drive and ensure that the cable between them is twisted and does not exceed 5 m.
At wiring	DANGER	● Wiring must be performed only by qualified personnel under instructions described in this manual. Failure to comply may result in unexpected accidents. ● Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock. ● Ground the device properly. Failure to comply may result in electric shock.

	⚠WARNING	● Connect the (+) and (-) terminals of the DC bus correctly. Otherwise, the device may be damaged. Pay attention to the terminal marks. ● Ensure that wiring meets the EMC requirements and local safety standard. Use wire sizes recommended in the manual. Failure to comply may result in accidents. ● Never connect the braking resistor between the DC bus terminals (+) and (-). Failure to comply may result in a fire.
Before power-on	⚠WARNING	● Check that the voltage class of the power supply is consistent with the rated voltage class of the braking unit, and that the wiring between the braking unit and the braking resistor is secure. Otherwise, the braking unit may be abnormal or damaged. ● Do not perform the voltage resistance test on any part of the braking unit because such test has been done in the factory. Failure to comply will result in accidents.
	⚠DANGER	● Cover the braking unit properly before power-on to prevent electric shock. ● All peripheral devices must be connected properly under the instructions described in this manual. Failure to comply will result in accidents
After power-on	⚠DANGER	● Do not open the cover of the braking unit cover after power-on. Failure to comply may result in electric shock. ● The braking unit automatically performs safety check on the external strong-current circuit after power-on. Do not touch the +, -, P(+), and BR terminals. Failure to comply may result in electric shock. ● Do not touch the externally connected braking resistor. Failure to comply may result in electric shock.
During operation	⚠DANGER	● Do not touch the fan or the braking resistor to check the temperature. Failure to comply will result in personal burnt. ● Signal detection must be performed only by qualified personnel during operation. Failure to comply will result in personal injury or damage to the braking unit.
During maintenance	⚠DANGER	● Repair or maintenance of the braking unit may be performed only by qualified personnel. Failure to comply will result in personal injury or damage to the braking unit. ● Do not repair or maintain the braking unit at power-on. Failure to comply will result in electric shock. ● Repair or maintain the braking unit only after ensuring that the input bus voltage is lower than 36 VDC, 5 minutes after power off. Otherwise, residual charge on the capacitor may result in personal injury. ● Set and check the parameters again after the braking unit is replaced. ● All the pluggable components must be plugged or removed only after power-off.

Chapter 2 Product Information

2.1 Product Appearance and Designation Rules

Figure 2-1 Nameplate and designation rules of the MDBUN



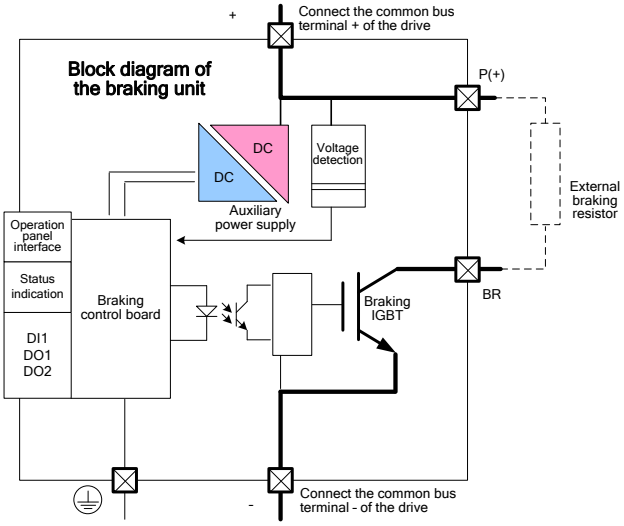
2.2 Model and Technical Specifications

Table 2-1 Model and technical specifications of MDBUN series braking unit

Braking Unit Model	Input Voltage of Adaptable Drive	Rated Continuous Braking Current (A)	Peak Braking Current (A)	Max. Continuous Braking Power (kW)	Min. Braking Resistance (Ω)
MDBUN-45-S	220 VAC	45	54	21	8
MDBUN-60-S		60	72	27	6
MDBUN-90-S		90	108	41	4
MDBUN-45-T	380 VAC	45	54	38	15
MDBUN-60-T		60	72	51	11
MDBUN-90-T		90	108	76	8
MDBUN-45-5T	480 VAC	45	54	43	17
MDBUN-60-5T		60	72	58	13
MDBUN-90-5T		90	108	86	9

2.3 Working Principle of the MDBUN

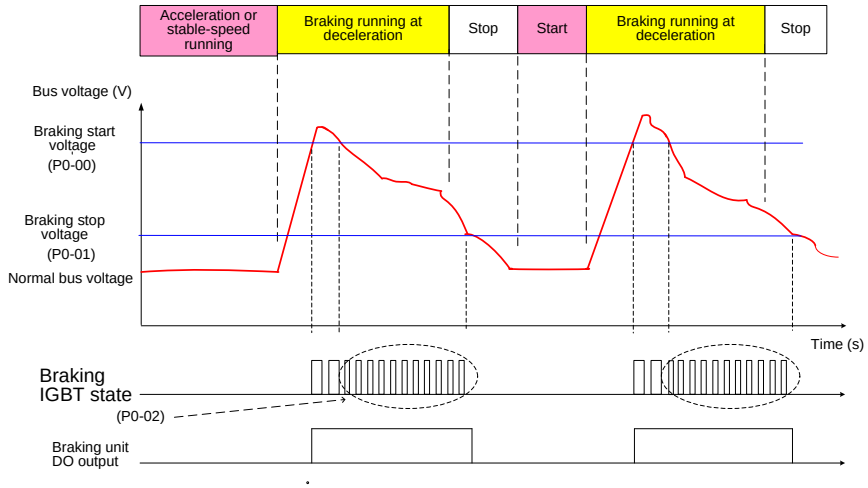
Figure 2-2 Application principle of the MDBUN braking unit



The braking unit consumes the electric energy fed back from the motor to the drive to limit the voltage of the drive within a secure range.

Before normal running of the braking unit, you need to set the braking start and stop voltages based on the AC power voltage class of the drive. The following figure shows the braking start and stop voltages and voltage during normal running of the main capacitor.

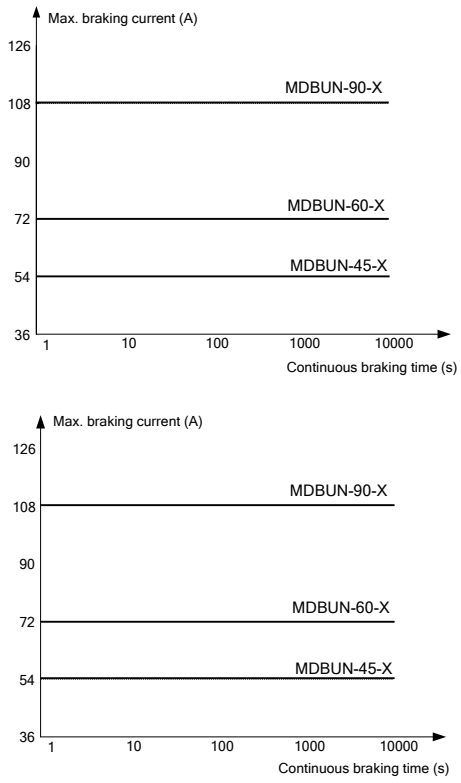
Figure 2-3 Working principle of the MDBUN braking unit



As shown in the preceding figure, the relationship between 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, so that the bus voltage reduces to lower than 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 rate during braking so as to change the braking time.

2.4 Load Curve Diagram

Figure 2-4 Load curve diagram of the MDBUN braking unit



Note

In the preceding figure, "X" indicates the voltage class S, T, or 5T. The preceding figure shows that the MDBUN series braking unit can perform continuous braking at the maximum braking unit.

Chapter 3 Mechanical and Electrical Installation

3.1 Mechanical Installation

3.1.1 Installation Environment

1. Ensure that the ambient temperature and humidity meet the requirements in the following table. Install the braking unit in an environment free from vibration and direct sunlight.

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 from corrosive, combustible, and explosive gas.

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

Item	Requirement
Altitude	Lower than 1000 m (1% de-rated for each 100 m above this height; max. 4000 m)
Ambient temperature	–10°C to +40°C
Humidity	Lower than 95% RH, without condensing
Vibration	Lower than 5.9 m/s^2 (0.6 g)
Storage temperature	–20°C to +60°C
Pollution level	Level 2
Cooling method	Air cooling
Ingress level	IP20

3.1.2 Overall Dimensions and Installation Clearance Requirements

Figure 3-1 Overall dimensions of the MDBUN series braking unit

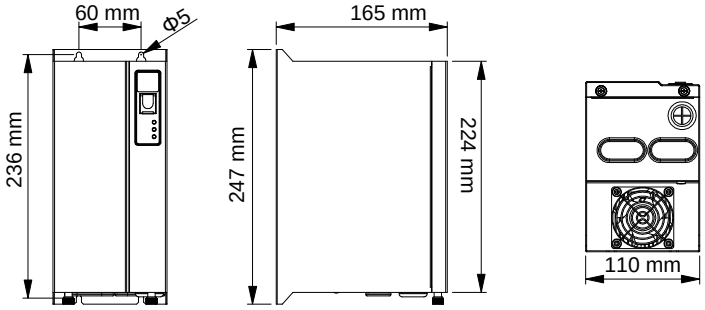
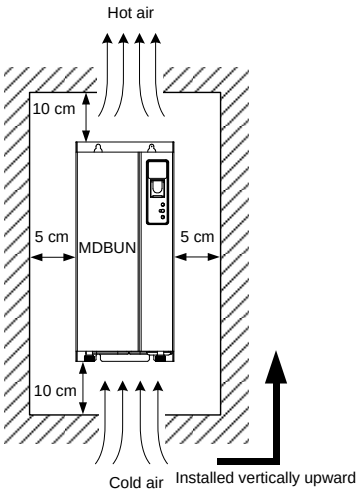


Figure 3-2 Installation clearances of the MDBUN series braking unit



3.1.3 Mechanical Installation Suggestions

Install the braking resistor in a space with good ventilation, because the braking resistor gets heated when consuming the feedback energy generated during braking.

Install the braking unit upright to facilitate heat dissipation. Do not lay it upside-down or horizontally.

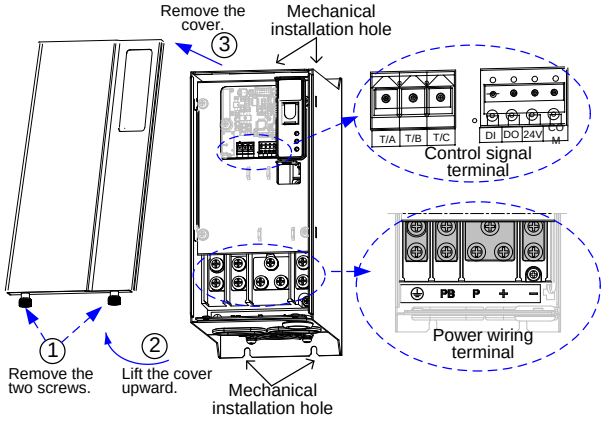
If multiple braking units are connected to the drive, install them side by side. If one row of braking units needs to be installed above another row, install an insulation guide plate to prevent braking units in the lower row to bake those in the upper row.

Ensure that the distance between the braking unit, drive, and other electric device meets the requirements shown in Figure 3-2.

3.2 Electrical Installation

The following figure shows the terminal arrangement of the braking unit.

Figure 3-3 Terminal arrangement of the braking unit



3.2.1 Terminal Description

■ **Description of Power Wiring Terminals**

Terminal	Name	Description
+, –	Positive and negative terminals of the DC bus	Used as the input point of the common DC bus

Terminal	Name	Description
P(+), BR	Terminals for connecting the braking resistor	Used for connecting the braking resistor
⏚	Grounding terminal	Used for grounding

The wiring precautions are as follows:

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

2. The grounding terminal ⏚ and the power zero line terminal N must be different terminals.

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

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

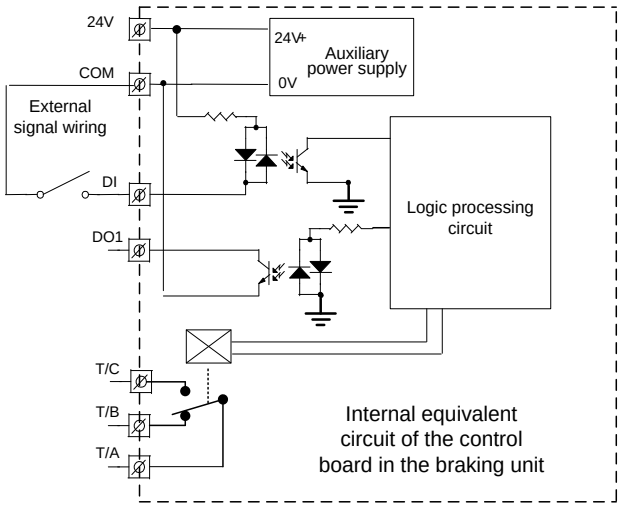
■ Description of Control Terminals

The following table describes functions of the control terminals.

Terminal	Name	Description
DI	Digital input	In master mode: block input in the case of an external fault In slave mode: start or stop input of braking unit
DO	Digital output	Running/Stop signal output
TA/TB/TC	Fault relay output	Normally open (NO)/Normally closed (NC) contact, which acts when the braking unit becomes faulty
24V and COM	Power supply/Common terminal	I/O auxiliary power supply and reference ground

The following figure shows the internal equivalent circuit of the control terminals.

Figure 3-4 Internal equivalent circuit of the control terminals



The descriptions of the preceding figure are as follows:

1. Master braking unit

DI is used as block input. The master stops working and blocks the output when DI is valid.

DO is sent as the running/stop signal to the slave. When the master starts braking, DO is valid; when the master stops braking, DO is cancelled.

2. Slave braking unit

DI is used as start/stop signal input. The slave starts braking when DI is valid and stops braking when DI is cancelled. When the slave starts braking, DO is valid; when the slave stops braking, DO is cancelled.

3. TA/TB/ TC

TA and TB are in NC contact, and TA and TC are in NO contact. The three terminals are used as fault output.

Note that the TA, TB, and TC terminals use the following relay contact specifications. Pay attention to the control power of the control coil in the main circuit contactor.

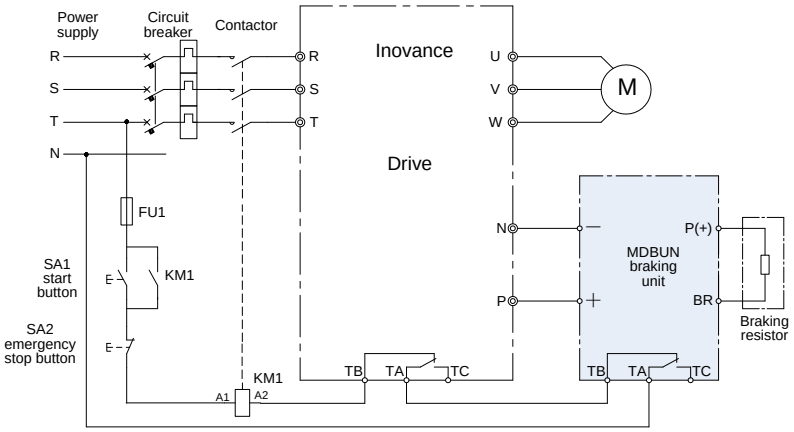
NC: 3 A, 250 VAC/1 A, 30 VDC

NO: 5 A, 250 VAC/3 A, 30 VDC

3.2.2 Wiring of the Braking Unit

1. Standard wiring method 1

Figure 3-5 Standard wiring method 1

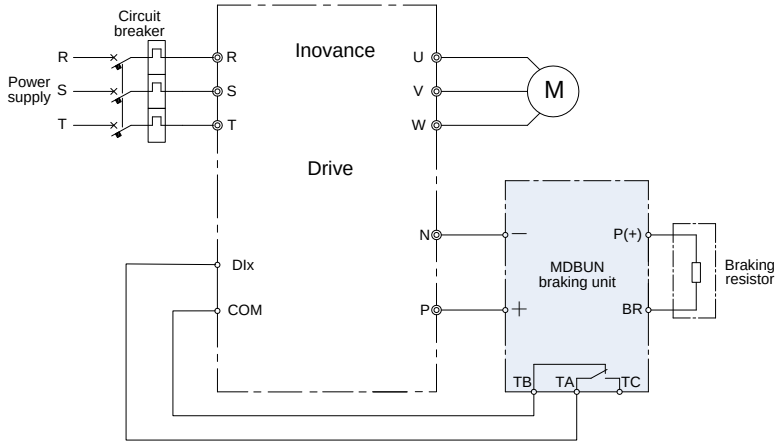


In the preceding wiring method, TA/TB/TC on the drive side are used as relay fault output of the drive, and TA/TB/TC on the braking unit side are used as relay fault output of the braking unit.

The input voltage class of the contactor control coil is 220 VAC.

2. Standard wiring method 2

Figure 3-6 Standard wiring method 2

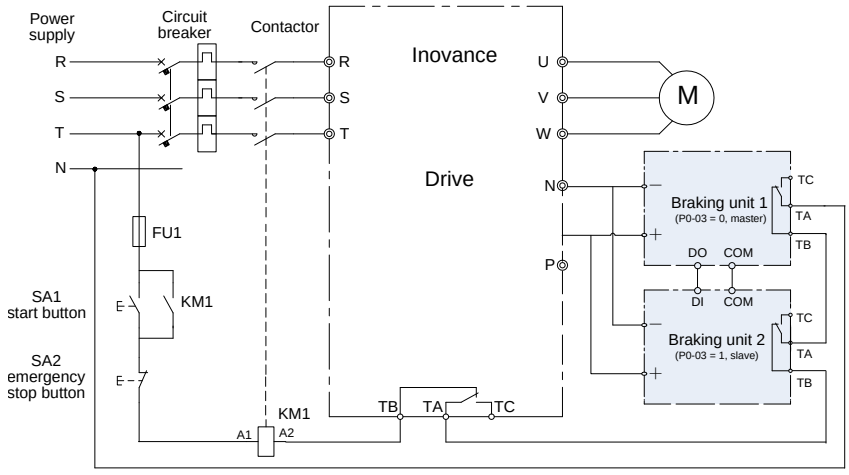


If the preceding wiring method is used, you need to allocate a certain DI (for example, DI1) of the drive with the function of external fault NO input. Take Inovance IS300 servo drive as an example; to allocate DI3 with the function of external fault NO input, set F4-02 to 11.

When you use the drive of other companies, perform the setting according to the user manual of this drive.

3. Standard wiring method 3

Figure 3-7 Standard wiring method 3



The preceding wiring method is used when 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.

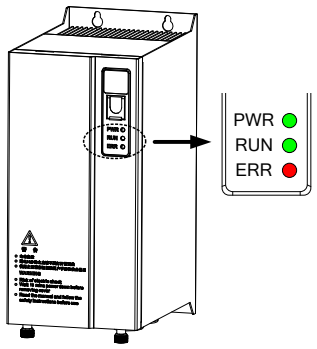
When multiple braking units are connected in parallel, set one braking unit as the master (P0-03 = 0), and set all other braking units as the slave (P0-03 = 1).

Set the same braking start voltage (P0-00), braking stop voltage (P0-01), and start braking rate (P0-02) for the master and all slaves.

Chapter 4 Operation and Display

4.1 Front Panel

Figure 4-1 Front panel of the braking unit



- PWR: power indicator. It is ON after the braking unit is energized.
- RUN: running indicator. It is ON when the braking unit is in running state.
- ERR: fault indicator. It is ON when the braking unit becomes faulty.

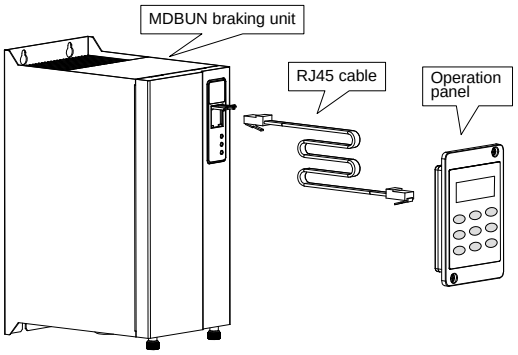
Note

1. 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.
2. The braking unit can store records of the latest four faults. You can view the records by reading the P2 function code group.

4.2 Operation Panel

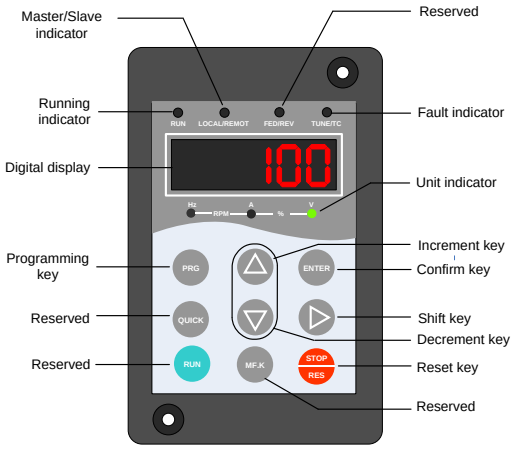
An external operation panel is optional for the braking unit for setting the parameters. The following figure shows the wiring between the external operation panel and the braking unit.

Figure 4-2 Wiring between the external operation panel and the braking unit



You can modify the braking unit parameters and monitor the working status of the braking unit by using the operating panel. The following figure shows the appearance and function areas of the operation panel.

Figure 4-3 Diagram of the operation panel



■ Unit Indicators

Hz ○ RPM ○ A ○ % ○ V : Unit indicators, used for displaying the current data unit.

○ means that the indicator is off, and ● means that the indicator is 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 %: percentage

■ Running Indicator

This indicator is on when the braking unit is in running state.

■ Master/Slave indicator

ON indicates that the braking unit is in slave mode, and OFF indicates that the braking unit is in ON state.

■ Digital Display

The 5-digit LED display is able to display the bus voltage, maximum continuous braking current, IGB module base plate temperature, present braking rate, and fault code.

■ Keys on the Operation Panel

Key	Name	Function
PRG	Programming key	Enter or exit Level I menu.
ENTER	Confirm key	Enter the menu interfaces level by level, and confirm the parameter setting.
△	Increment key	Increase data or function code.
▽	Decrement key	Decrease data or function code.
▷	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	-

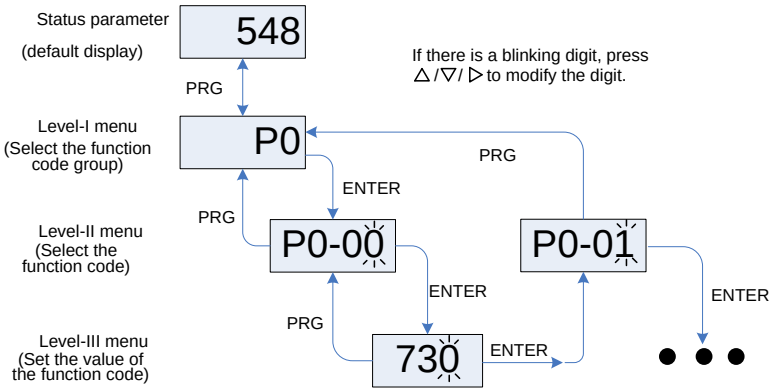
STOP RES	Reset key	Reset the braking unit after a fault occurs.
MF.K	Reserved	-
QUICK	Reserved	-

4.3 Viewing and Modifying Function Codes

The operation panel of the MDBUN series braking unit adopts three-level menu.

The three-level menu consists of function code group (Level I), function code (Level II), and function code setting value (level III), as shown in the following figure.

Figure 4-4 Operation procedure on the operation panel



You can return to Level II from Level III by pressing PRG or ENTER key.

- After you press the ENTER key, the system saves parameter setting first, and then goes back to Level II and shifts to the next function code.
- After you press the PRG key, the system does not save parameter setting, but directly returns to Level II and keeps staying at the current function code.

In Level III menu, if the parameter has no blinking digit, it means that the parameter cannot be modified. This may be because:

- Such function code is only readable, such as actually detected parameter and running record parameter.
- Such function code cannot be modified in the running state and can only be changed at stop.

4.4 Setting Function Codes at First Power-On

At the first-use, reliably connect the braking unit, drive, and braking resistor, and power on the drive. Then, the braking unit is energized, and you can set parameters in function code group P0 on the operation panel according to the table in section 4.5.

After the parameters in function code group F0 are set, the braking unit starts working in the preset working mode based on the bus voltage of the drive, and you need not operate the operation panel, that is, pressing RUN or STOP RES.

After the parameter setting is completed, the braking unit can work properly even if the operation panel is removed.

4.5 Viewing Status Parameters

When the braking unit is in stop or running state, you can press  to display status parameters in turn.

When the braking unit is in stop or running state, you can view the values of five status parameters including the bus voltage, output current, present braking rate, and IGBT module temperature, and fault code. You can press  to view the parameter values in turn, and pay attention to the state of the unit indicators when each parameter value is displayed.

If the drive is powered off and then powered on, the bus voltage value is displayed by default.

Chapter 5 Function Code Table

The symbols in the function code table are described as follows:

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

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

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

Function Code	Parameter Name	Setting Range	Parameter Description	Min. Unit	Default	Property
Group F0						
P0-00	Braking start voltage	Voltage class: 1) 220 V: P0-01 to 390.0 V 2) 380 V: P0-01 to 730.0 V 3) 480 V: P0-01 to 820.0 V	The braking unit starts braking when the bus voltage is higher than the value.	0.1 V	Voltage class: 1) 220 V: 350.0 V 2) 380 V: 670.0 V 3) 480 V: 760.0 V	☆
P0-01	Braking stop voltage	Voltage class: 1) 220 V: 320 V to P0-00 2) 380 V: 620 V to P0-00 3) 480 V: 700 V to P0-00	The braking unit stops braking when the bus voltage is lower than the value.	0.1 V	Voltage class: 1) 220 V: 340.0 V 2) 380 V: 650.0 V 3) 480 V: 730.0 V	☆
P0-02	Start braking rate	1%–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 whether the working mode of the braking unit is master or slave.	1	0	☆
P0-04	Reserved	-	-	-	-	-
P0-05	Reserved	-	-	-	-	-
P0-06	Restore default setting	0: Not restore 1: Only restore group P0 2: Clear all information of group P2	-	1	0	★
Group P2						
P2-00	Software version	-	-	-	-	●

P2-01	Types of latest four faults	-	This parameter specifies the latest four fault types. The digit in the unit's place is the type of the latest fault, and the digit in the ten's place is the type of the latest second fault, by analogy.	-	-	●
P2-02	Bus voltage upon fault	-	This parameter specifies the bus voltage when the latest fault occurs.	-	-	●
P2-03	Current upon fault	-	This parameter specifies the current when the latest fault occurs.	-	-	●
P2-04	Braking rate upon fault	-	This parameter specifies the braking rate (duty ratio) when the latest fault occurs.	-	-	●
P2-05	Module temperature upon fault	-	This parameter specifies the module temperature when the latest fault occurs.	-	-	●
P2-06	Braking unit status upon fault	-	This parameter specifies the status of the braking unit when the latest fault occurs. bit0: DI bit1: DO bit2: fan bit3: relay bit4: braking bit5: power-on detection bit6: current sampling detection bit7: bus voltage setup	-	-	●
P2-07	Running time before fault	-	This parameter specifies the running time (in unit of seconds) when the latest fault occurs. The time is measured starting from this power-on, and is cleared in the case of power-on again or fault.	-	-	●
P2-08	Accumulative braking time	-	This parameter specifies the accumulative braking time, in unit of	-	-	●

			seconds.			
P2-09	Accumulative power-on time	-	This parameter specifies the accumulative power-on time, in unit of hours.	-	-	●
P2-10	Braking unit use ratio	-	The value is equal to P2-08 divided by P2-09, in unit of percentage.	-	-	●

Chapter 6 Troubleshooting

The MDBUN series braking unit provides nine pieces of alarm information and protection function. After a fault occurs, the protection function is implemented, and the braking unit stops working and displays the fault code on the operation panel (if the operation panel is available).

If a fault occurs during running or commissioning, you can determine the fault type, analyze the causes, and perform troubleshooting according to the following table before contacting Inovance.

If you do not know how to perform troubleshooting during commissioning, contact technical support engineers of Inovance.

Fault Code	Description	Possible Causes	Troubleshooting
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 small. 4. The resistance of the braking resistor is too small.	1. Check whether the external circuit is short-circuited or abnormal. If yes, press STOP RES or power on the braking unit again. 2. Reduce sudden change of the feedback energy. 3. Select a braking unit of higher power. 4. Select a proper braking resistor. 5. Contact technical support engineers of Inovance.
ERR02	Software overcurrent		
ERR03	Overvoltage	1. The input voltage class of the adaptable drive is incorrectly set. 2. The feedback energy becomes abnormal. 3. The braking unit has insufficient capacity.	1. Correctly set the input voltage class of the adaptable drive. 2. Check the input feedback energy. 3. Select a braking unit of higher power. 4. Contact technical support engineers of Inovance.
ERR04	Overheat	1. The air filter is blocked or the fan is damaged. 2. The power cable of the fan is not securely inserted or is damaged. 3. The ambient temperature is too high. 4. The power of the braking unit is too small.	1. Clear the air filter or replace the fan. 2. Check 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.
ERR05	Braking resistor short-circuit	1. The braking resistor or the wiring of the braking resistor is short-circuited.	1. Check that the braking resistor and the wiring are normal. 2. Contact technical support engineers of Inovance.
ERR06	Braking resistor open-circuit protection	1. No braking resistor is connected or the braking resistor is burnt out. 2. The IGBT is burnt out.	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	Reserved	Reserved	Reserved
ERR08	IGBT direct break-over	The IGBT module is damaged	1. Replace the braking unit. 2. Contact technical support engineers of Inovance.
ERR09	Reference source fault	The reference source for analog sampling is faulty.	1. Replace the braking unit. 2. Contact technical support engineers of Inovance.

Chapter 7 Selection of Braking Unit and Braking Resistor

7.1 Selection of Braking Unit

Select the braking unit by following two rules:

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 proper power based on the braking power required by braking of the drive.

Ensure that the power of the braking unit is larger than the braking power. If the braking power is not known, estimate it according to the formula: Pb = P x Td x K.

In the formula:

Pb: braking power

P: motor power

K: mechanical energy conversion efficiency; generally, k = 0.7

Td: ration of braking torque to rated motor torque

Application	Elevator, hoist, crane	Winding and unwinding equipment	Large-inertia equipment that requires quick stop	Common-inertia equipment
Td	100%	120%	120%	80%

7.2 Selection of Braking Resistor

7.2.1 Calculating the Resistance

During braking, almost all regenerative energy of the motor is consumed by the **braking** resistor.

According to the formula U x U/R = Pb:

U refers to the braking voltage at system stable braking.

The value of U varies with different systems:

- 220 VAC system: U = 380 V
- 380 VAC system: U = 700 V
- 480 VAC system: U = 800 V

If the calculated value of R is smaller than the minimum resistance under each voltage class, multiple braking units need to be used.

7.2.2 Calculating Power of Braking Resistor

In theory, the power of the braking resistor is consistent with the braking power. Considering de-rating use to 70%, you can calculate the power of the braking resistor according to the formula 0.7 x Pr = Pb x ED.

- Pr: power of the braking resistor
- ED: braking frequency, that is, percentage of the regenerative process to the whole working process

Application	Elevator	Winding and unwinding	Crane	Centrifuge	Injection molding machine	Occasional braking load	General application
ED (Braking Frequency)	20%–30%	20%–30%	50%–60 %	50%–60%	5%–10%	5%	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 he 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 7-1 Recommended values of braking unit and braking resistor (Td = 100%)

Rated Power of Drive	Braking Unit Model	Recommended Resistance of Braking Resistor	Recommended Power of Braking Resistor (ED =10%)	Recommended Power of Braking Resistor (ED = 50%)
Three-phase 220 V, braking start voltage = 350 V				
18.5 kW	MDBUN-45-S	≥ 8 Ω	≥ 2 kW	≥10 kW
22 kW	MDBUN-45-S	≥ 8 Ω	≥ 2.5 kW	≥12 kW
30 kW	MDBUN-60-S	≥ 6 Ω	≥ 3 kW	≥ 15 kW
37 kW	MDBUN-90-S	≥ 4 Ω	≥ 4 kW	≥ 19 kW
45 kW	MDBUN-90-S	≥ 4 Ω	≥ 5 kW	≥ 23 kW
55 kW	MDBUN-90-S	≥ 4 Ω	≥ 6 kW	≥ 28 kW
75 kW	MDBUN-90-S x 2	≥ 4 Ω x 2	≥ 4 kW x 2	≥ 19 kW x 2
90 kW	MDBUN-90-S x 2	≥ 4 Ω x 2	≥ 5 kW x 2	≥ 23 kW x 2
110 kW	MDBUN-90-S x 3	≥ 4 Ω x 3	≥ 4 kW x 3	≥ 19 kW x 3
132 kW	MDBUN-90-S x 3	≥ 4 Ω x 3	≥ 5 kW x 3	≥ 23 kW x 3
160 kW	MDBUN-90-S x 3	≥ 4 Ω x 3	≥ 6 kW x 3	≥ 28 kW x 3
Three-phase 380 V, braking start voltage = 670 V				
37 kW	MDBUN-45-T	≥ 15 Ω	≥ 4 kW	≥ 19 kW
45 kW	MDBUN-45-T	≥ 15 Ω	≥ 5 kW	≥ 23 kW
55 kW	MDBUN-60-T	≥ 11 Ω	≥ 6 kW	≥ 28 kW
75 kW	MDBUN-90-T	≥ 8 Ω	≥ 8 kW	≥ 38 kW
90 kW	MDBUN-90-T	≥ 8 Ω	≥ 9 kW	≥ 46 kW
110 kW	MDBUN-60-T x 2	≥ 11 Ω x 2	≥ 6 kW x 2	≥ 28 kW x 2
132 kW	MDBUN-60-T x 2	≥ 11 Ω x 2	≥ 7 kW x 2	≥ 34 kW x 2
160 kW	MDBUN-90-T x 2	≥ 8 Ω x 2	≥ 9 kW x 2	≥ 40 kW x 2
200 kW	MDBUN-90-T x 2	≥ 8 Ω x 2	≥ 11 kW x 2	≥ 50 kW x 2
220 kW	MDBUN-90-T x 3	≥ 8 Ω x 3	≥ 8 kW x 3	≥ 40 kW x 3
250 kW	MDBUN-90-T x 3	≥ 8 Ω x 3	≥ 9 kW x 3	≥ 43 kW x 3
280 kW	MDBUN-90-T x 3	≥ 8 Ω x 3	≥ 10 kW x 3	≥ 48 kW x 3
Three-phase 480 V, braking start voltage = 760 V				
37 kW	MDBUN-45-5T	≥ 17 Ω	≥ 4 kW	≥ 19 kW
45 kW	MDBUN-45-5T	≥ 17 Ω	≥ 5 kW	≥ 23 kW
55 kW	MDBUN-60-5T	≥ 13 Ω	≥ 6 kW	≥ 28 kW
75 kW	MDBUN-60-5T	≥ 13 Ω	≥ 8 kW	≥ 38 kW
90 kW	MDBUN-90-5T	≥ 9 Ω	≥ 9 kW	≥ 46 kW
110 kW	MDBUN-90-5T	≥ 9 Ω	≥ 12 kW	≥ 56 kW
132 kW	MDBUN-60-5T x 2	≥ 13 Ω x 2	≥ 7 kW x 2	≥ 34 kW x 2
160 kW	MDBUN-90-5T x 2	≥ 9 Ω x 2	≥ 9 kW x 2	≥ 40 kW x 2
200 kW	MDBUN-90-5T x 2	≥ 9 Ω x 2	≥ 11 kW x 2	≥ 50 kW x 2
220 kW	MDBUN-90-5T x 2	≥ 9 Ω x 2	≥ 12 kW x 2	≥ 56 kW x 2
250 kW	MDBUN-90-5T x 3	≥ 9 Ω x 3	≥ 9 kW x 3	≥ 43 kW x 3
280 kW	MDBUN-90-5T x 3	≥ 9 Ω x 3	≥ 10 kW x 3	≥ 48 kW x 3

315 kW	MDBUN-90-5T x 3	≥ 9 Ω x 3	≥ 11 kW x 3	≥ 53 kW x 3

Chapter 7 Repair and Maintenance

DANGER

- Do not repair or maintain the braking unit at power-on. Fail to comply will result in electric shock.
- Repair or maintain the braking unit only after ensuring that the input bus voltage is lower than 36 VDC, 5 minutes after power-off. Otherwise, residual charge on the capacitor may 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 fixed after repair or maintenance. It is forbidden to leave 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 after power-off.

7.1 Routine Maintenance

The influence of the ambient temperature, humidity, dust and vibration will cause the aging of the components inside the braking unit, which may cause potential faults or reduce the service life of the braking unit. Therefore, it is necessary to carry out routine and periodical maintenance.

Routine maintenance involves:

- Whether the installation environment of the braking unit changes
- Whether the cooling fan works properly
- Whether abnormal vibration exists
- Whether braking unit is overheated

Routine cleaning involves:

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

7.2 Periodic Inspection

Perform periodic inspection on the items that are difficult to check during running. Periodic inspection involves:

- Check and clean the air filter periodically.
- Check whether the screws become loose.
- Check whether the braking unit is corroded.
- Check whether the wiring terminals have arc signs.
- Carry out main circuit insulation test.

Note

Before measuring the insulating resistance with 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 need not be performed again because it has been completed before delivery.

7.3 Replacement of Vulnerable Parts

The cooling fan of the braking unit is a vulnerable component part. Its service life is closely related to the usage environment and maintenance.

You can determine whether to replace the cooling fan based on its running conditions.

The service life of the two components is shown as follows:

Part	Service Life	Possible Damage Cause	Judging Criteria
Fan	2 to 3 years	● Bearing worn ● Blade aging	● Check whether there is crack on the blade. ● Check whether there is abnormal vibration noise upon startup.

7.4 Storage of the Braking Unit

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

Pack the braking unit with the original packing box provided by Inovance.

Long-term storage will degrade the electrolytic capacitor. Thus, the braking unit must be energized once every 2 years, each time lasting at least 5 hours. The input voltage must be increased slowly to the rated value with the regulator.

7.5 Warranty Agreement

1. The warranty agreement applies only to the braking unit itself.
2. The warranty period of the product is 18 months (refer to the barcode on the product). During the warranty period, if the product fails or is damaged under the condition of normal use by following the instructions, Inovance will be responsible for free maintenance. After 18 months, a proper maintenance fee is charged.
3. Within the warranty period, maintenance will be charged for the damages due to the following causes:
   a) Improper operation without following the instructions
   b) Fire, flood, and abnormal voltage
   c) Using the braking unit for non-recommended functions

The maintenance fee is charged according to Inovance's uniform standard. If there is an agreement, the agreement prevails.