NIKKI DENSO

Instruction Manual (Technical Reference)
AC Servo driver

VPH Series

HE Type

τDISC
- NCR-HE2373*-A-*** to
NCR-HE3753*-A-*** -

Document No. TJ-43720

Ver.1.6

Preface

Thank you for adopting the AC servo driver <VPH HE Type>. Before use, please read this manual carefully to fully exploit the performance of this device.

About this manual

This manual is a technical reference for the AC servo driver <VPH HE Type> NCR-HE2373*-A-*** to NCR-HE3753*-A-***.
Matters not particularly mentioned should conform to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)". Refer to this manual.

Trademarks

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Definition of terms

In this instruction manual, the terms listed below are used unless otherwise specified.

Term	Description
This manual	TJ-43720* VPH Series HE Type τDISC NCR-HE2373*-A-*** to NCR-HE3753*-A-*** Technical Reference
Device, this device	Our AC servo driver (VPH HE Type)
Motor	Our τDISC motor (iD roll)
VPH DES	VPH Data Editing Software (editing software dedicated to VPH)
P***	Parameter number ("***" is a 3-digit number.)
Maintenance mode	Mode in which this device operates alone

Precautions in safety

Before installation, wiring, operation, maintenance and inspection, and error diagnosis and countermeasures, carefully read this manual and all other related operating instruction manuals for proper usage.
Before use, be sure to fully acquaint with the equipment, safety information, and other related precautions.

The following labels are used to indicate safety precautions in this manual.
Cautions are ranked as "Danger" and "Caution".
And contents to follow are ranked as "Prohibition" and "Compulsion".

 Danger	If mishandling is made, dangerous situation as death or serious injury on a worker could occur.
 Caution	If mishandling is made, dangerous situation as medium or light injury could occur and damages on goods could be suspected. However, since ⚠Caution-marked item could also cause serious results depending on the actual conditions, please comply with the important instructions.
 Prohibition	Prohibitions (actions not to be done) are indicated.
 Compulsion	Compulsions (actions to be done) are indicated.

Precautions in handling

Danger		
Prohibition	● Never touch inside of this device and terminal blocks. ● Do not give damages, apply excessive force, and put any heavy articles on cables, and do not pinch any cable.	Electric shock may occur.
Prohibition	● Never touch rotating blocks of a running motor.	Injury may occur.
Compulsion	● Be sure to ground the earth terminal or earth cable of this device or the motor. ● Use the earth cable specified in this manual or a thicker cable than that, for the D-class grounding or better. ● Execute relocation, wiring, maintenance, and inspection a certain period of time (15 minutes for 55 kW or less and 20 minutes for 75 kW) after power-off. Start the job after the "CHARGE" LED is turned off. Never fail to shut off the control power, in addition to the main power.	Electric shock may occur.
Caution		
Prohibition	● Never use this device in the atmosphere such as water splash, corrosive or flammable gas, nor place it close to combustible materials.	Fire or failure may occur.
Prohibition	● Since temperatures of the motor, this device, and peripheral equipment raise high, do not touch them. ● In supplying power or for a while after shutting power off, since a radiator, motor, regenerative resistor, and other components could be very hot, do not touch them.	Burn may occur.
Compulsion	● Use the motor and this device in the specified combination.	Fire or failure may occur.
Compulsion	● Never conduct voltage withstanding test and Mega test of this device.	Failure may occur.

Storage

⚠ Caution		
⃠Prohibition	● Do not store this device in a place of raining, water dripping, and harmful gas and liquid.	Failure may occur.
❗Compulsion	● Store this device under controlled temperature and humidity within the range specified in this manual in a place avoiding direct sunlight. ● Be sure to contact our sales representative when the storage period after purchase has passed more than three years.	Failure may occur.

Transportation

⚠ Caution		
⃠Prohibition	● Do not hold a shaft when handling the cable and motor in transportation.	Injury or failure may occur.
❗Compulsion	● Piling up or overloading the products can induce collapse of cargo; thus, follow instructions.	Injury or failure may occur.

Installation

⚠ Caution		
⃠Prohibition	● Do not climb or put any heavy thing on this device.	Injury or failure may occur.
⃠Prohibition	● Do not apply heavy shock.	Equipment may be damaged.
❗Compulsion	● Never block air-intake/exhaust windows and do not allow foreign substance to go in. ● Be sure to install this device to the specified directions. ● Attach this device to a metal or non-flammable object.	Fire may occur.
❗Compulsion	● Distance of alignments between this device and the internal walls of control panel and other equipment should follow the measurements specified by this manual.	Fire or failure may occur.
❗Compulsion	● Conduct proper attachment suitable for the output or weight of this unit.	Equipment may be damaged.

Wiring

Danger		
Compulsion	● To avoid electric shock and noise influence, be sure to make proper grounding (earth).	Motor runaway, electric shock, injury, or machine damage may occur.
Caution		
Compulsion	● Be sure to conduct correct wiring.	Motor runaway or burnout, injury, or fire may occur.
Compulsion	● To avoid the impact of noise on this device, use cables having the adequate length and features (shielded, twisted, and other treatments) specified by this manual. For the control input/output signal cable of this device, prepare another cable system separate from other power cables and motor power cables.	Motor runaway, injury, or machine damage may occur.

Operation and run

Caution		
Prohibition	● Since excessive adjustment can make the operation unstable, avoid this situation. ● Brake of the brake-incorporated motor is to keep the machine position. Thus, do not use it for braking or to secure the machine safeness.	Injury or machine damage may occur.
Prohibition	● Do not turn on the power in the condition where the motor shaft is in rotation or in vibration.	Motor runaway, injury, or machine damage may occur.
Prohibition	● While the main power supply is ON, make sure the control power supply to be ON as well, and avoid energizing the main power supply only.	Motor runaway, injury, or machine damage may occur. Failure may occur.
Compulsion	● Protect the motor by providing an emergency stop circuit having a built-in thermostat, for example. If the motor does not have a thermostat, add protective functions separately.	Injury or fire may occur.
Compulsion	● Check the power specifications are normal.	Injury, fire, or machine damage may occur.

Compulsion	● Install an emergency stop circuit externally, to stop operation instantly and shut off the power. ● For trial run, fix the motor, check this device and motor only for operation, and then attach them to the machine. ● When alarm happened, be sure to remove the cause after reset, and then restart.	Injury or machine damage may occur.
Compulsion	● After sudden blackout and restoration of power, keep away from the machine as it may restart suddenly. Design the machine to secure safeness of people even if it restarts.	Injury may occur.
Compulsion	● Avoid turning ON/OFF repeatedly. It may cause the deterioration of main circuit element.	Failure may occur.

Maintenance and inspection

⚠ Caution		
Prohibition	● Overhaul/repair shall be conducted only by us or personnel designated by us.	Failure may occur.
Compulsion	● Be sure to use the device in the range of stipulated environmental temperature and humidity.	Unusual operation and failure may occur.
Compulsion	● The device lifetime has a close relation with the temperature in use. Note that a use under the high temperature and high humidity environment may shorten the device lifetime. Generally, it is said that an increase of 10°C in temperature can shorten the lifetime of equipment to half. ● Capacitance of the main circuit electrolytic capacitor inside the device becomes low due to deterioration. To prevent secondary accidents caused by failures, it is recommended to replace it earlier than arranged. For the standard replacement period, refer to the section related to maintenance. ● Cooling effect of an equipped cooling fan motor of this device will deteriorate as time goes by. To prevent secondary accidents caused by failures, it is recommended to replace it earlier than arranged. For the standard replacement period, refer to the section related to maintenance.	Failure may occur.

Precautions before installation (during transportation)

During transportation, please handle with care so as not to damage the device.
Do not pile up devices and do not put any item on the cover.

Cautions in storage

If the products are not used soon after receiving, store them under the following conditions in order to prevent deterioration of insulation and rust formation. However, unpack the packages, soon after receiving and check any damage and other non-conformances incurred during transportation.

Storage conditions of the device

Item		Description
Ambient condition	Temperature	-20°C to +65°C
	Humidity	90% or less (non-condensing)
	Storage location	Store in a clean place free from dust and dirt. (Avoid a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, and oil.)
Vibration		Store in a place free from vibration.
Others		If you store the product for a long period of time, conduct rust prevention treatments onto the screws at the terminal block and carry out periodic inspection.

Precautions in transportation

When it is necessary to transport the products after receive, satisfy following conditions.

Transporting conditions of the device

Item		Description
Ambient condition	Temperature	-20°C to +65°C
	Humidity	90% or less (non-condensing)
	Storage location	Do not transport the products in a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, oil, etc.
Vibration		0.5G or less

⚠ Caution

Humidity conditions remarkably affect the life of the device.
Recommended storing or transporting condition is in humidity of 75% RH or less.
If the humidity exceeds 75% RH, contact our sales representative.

About this manual

This manual explains installation, wiring, way of use, maintenance and inspection, error diagnosis, and countermeasures about the device and motor.
In order to use this device correctly, deeply understand the contents of this manual.
At the time of installation, wiring, operation, maintenance and inspection, and in other works, follow the conditions and procedures described on this manual.
Note that contents in this manual are subject to change without prior notification in future.

When using a customized device, read this manual and the specification document for the customized device.
Here, the specification document prevails over this manual, if description and items are overlapped.

Warranty period

Warranty period of our products is one year after shipment from our factory.
However, please note that any failure or error resulting from the following causes is not covered by the warranty.

① Modification by parties other than us.
② Nonstandard operation different from rules and regulations stipulated by this manual.
③ Natural disasters.
④ Connection with another maker's unit which is not approved by us.

- Warranty of this device is limited for repairing only. Any damage caused by the fault of delivered device, or lost opportunity on the customer's side, profit loss, secondary damage, and accident will not be covered.
- Regardless of the warranty period, please inform our sales person whenever you find any failure or error.

⚠ Caution

- Our products have been designed and manufactured for the aim of the general purpose applications in the general industry. The products are not intended to be used in any equipment and system that may involve human life. If, therefore, they are used in any other equipment and system, Nikki shall not assume any responsibility whatsoever. (Examples: Uses that are expected to have a significant influence on human life and property, such as in nuclear energy, aerospace, and medical equipment and systems and passenger cars)
- When installing the product to the facility that may involve serious accidents and loss by excessive exterior noises or failure on the motor, install the back-up and fail-safe functions systematically.
- If used under the conditions where sulfur or sulfide gas is produced, splitting due to corrosion on the tip resistors or poor connection on the contacts can occur.

Contents

Chapter 1 Features and configuration of the device

1-1 Features of the device

This device supports motor control, and carries out MECHATROLINK-III-compliant controller-based speed control, torque control, and positioning control. The device has features such as those listed below, and the single device can support several types of motors and encoders with parameter settings.

Features of the VPH HE type

① In the MECHATROLINK-III communication mode, high-performance systems can be supported by using half-duplex 100Mbps high-speed communication.
② Connections with simple Ethernet metal cables enable the wiring saving, downsizing, and easy expansion of systems.
③ For each operation, different gain, filter, and acceleration/deceleration time settings can be made. Slow S-curve acceleration/deceleration can be applied in the jog mode and high-response acceleration/deceleration can be applied in the positioning mode without changing the type of acceleration/deceleration using an external signal or the like.
④ Digital control through driftless, solution of adjustment mismatch, enhancement of man-machine interface, and other features pursue the reliability and user friendly operation.
⑤ Adoption of IPM (IGBT) to the power switching block realizes the improvement of servo performance and noise reduction.
⑥ It is possible to connect to VPH DES using USB communication to display servo waveforms on an oscilloscope, display frequency response characteristics, and edit parameters.
⑦ The auto-tuning function makes servo adjustment easy.
⑧ Torque waveforms are controlled with quadric curve under 2-stage S-curve acceleration/deceleration control.
⑨ The positioning drive time is within 1 ms

1-2 System configuration

Figure 1-1 shows a peripheral system configuration of this device.

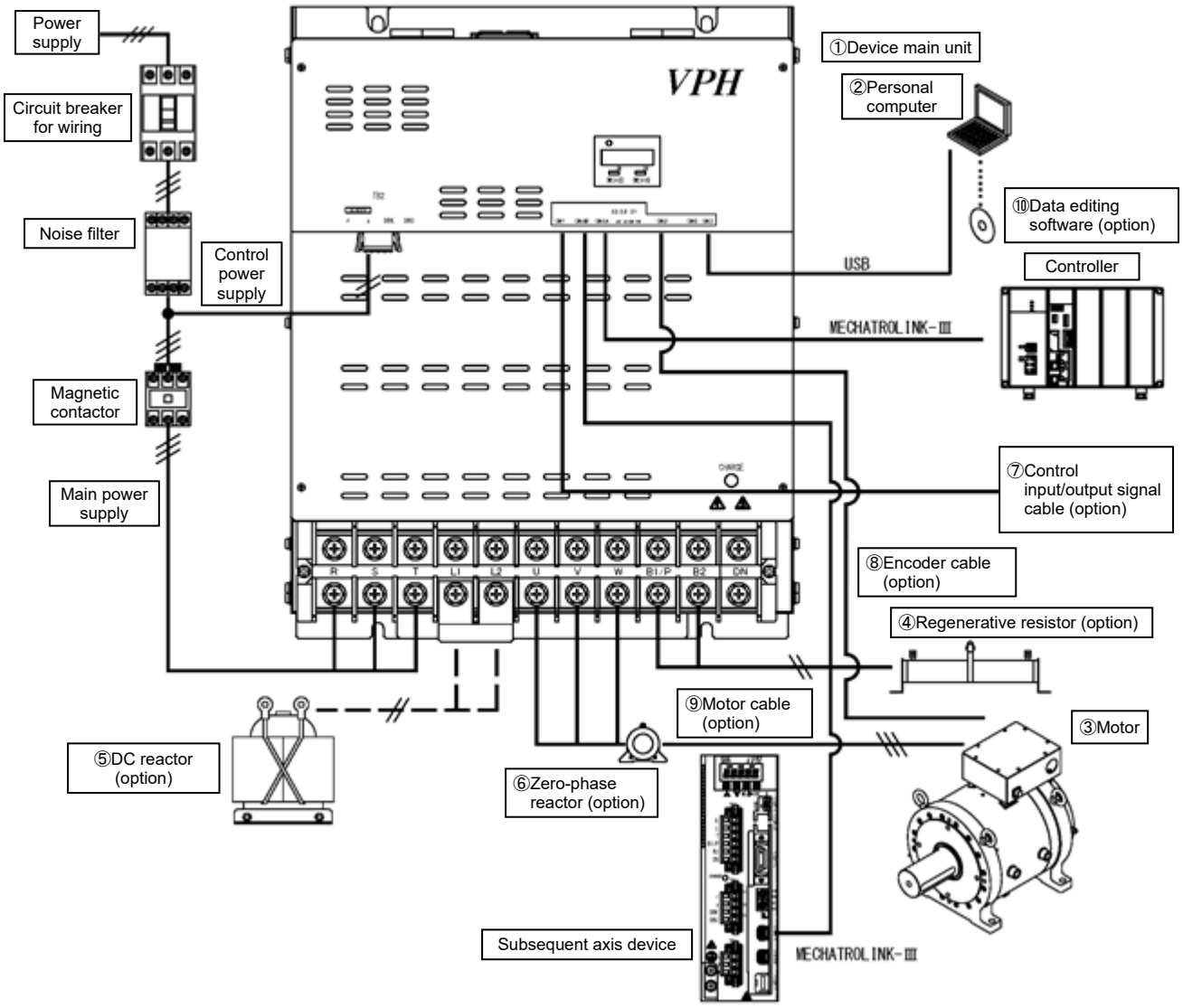


Figure 1-1 VPH HE Type system configuration

Names of parts

① Device main unit
This device controls the motor.
Using parameters, one device can cope with multiple kinds of motors and encoders.

② Personal computer
USB communication with editing software developed by us can perform below:
- Data display of status data (number of rotations, deviations, etc.).
- Control of the device control signal.
- Parameter setting and backup.

Some machine models cannot be connected with a commercial PC; so, please consult us upon necessary.

③ Motor
As standard, our motor is connected.

④ Regenerative resistor (option)
The regenerative resistor is used to consume regenerative power generated by motor braking.

⑤ DC reactor (option)
The AC reactor is used to make the waveform of the input current into a waveform close to that of a sine wave to suppress harmonic waves.

⑥ Zero-phase reactor (option)
The zero-phase reactor is used to absorb noise produced by the main unit of the VPH Series and reduce the impact of noise on the device itself and peripheral equipment.

⑦ Control input/output signal cable (option)
The control input/output signal cable is connected to the control input/output connector (CN1) on the main unit of the VPH Series to input and output signals.

⑧ Encoder cable (option)
The encoder cable is used to connect the encoder feedback input/output connector (CN2) on the main unit of the VPH Series to an encoder and magnetic pole sensor.

⑨ Motor cable (option)
The motor cable is used to connect the motor power connector on the main unit of the VPH Series to the motor power cable.

⑩ Data editing software: VPH DES (option)
Data editing software allows you to perform VPH Series operations including parameter editing, remote operation, checking of the operation status and signal status, and measurement of oscilloscope data from a PC.

* Set parameters and other items through USB communication with VPH DES.
They can also be set on the operation panel at the front of the device and through serial communication from a PC.

1-2-1 Setting a station address

As a slave device of the MECHATROLINK-III network, set the station address and the transmission bytes.

Set the same station address with the device and controller.

- By combining the station address setting switches (S1 and S2), set the station address (03H to EFH) of this device.
- With the transmission byte setting switch (S3), set the transmission bytes (32 bytes or 48 bytes) of this device.
- If there is a duplicate station address in a single communication system, the system does not operate normally.
- The state at power-on is set. Any change during device operation is invalid. If a change is made during operation, [FL.941: MECHATROLINK-III transmission byte setting SW change warning] or [FL942: MECHATROLINK-III station address setting SW change warning] is generated.

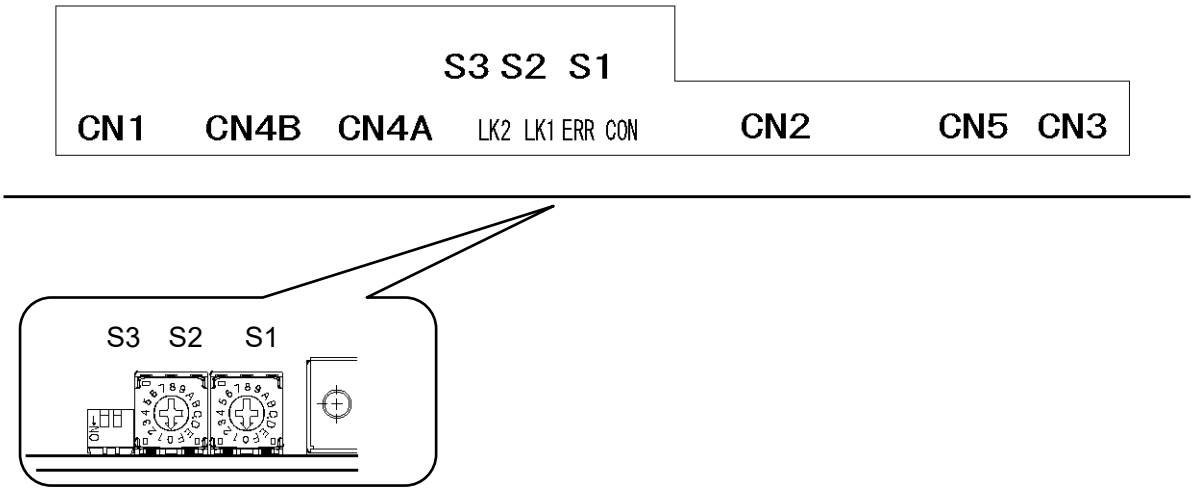


Figure 1-2 Setting a station address

Table 1-1 Station address correspondence table

S1	S2	Station address	
0	1, 2	00h to 02h	Not for use
0	3	03h	Factory setting
0	4	04h	
• •	• •	• •	
E	F	EFh	
F	0 to F	F0h to FFh	Not for use

Table 1-2 Transmission bytes correspondence table

S3-1	S3-2	Transmission bytes
OFF	OFF	Not for use
ON	OFF	32 bytes
OFF	ON	48 bytes (factory setting)
ON	ON	Not for use

1-2-2 Communication status display LEDs

They display the communication status of the MECHATROLINK-III network.

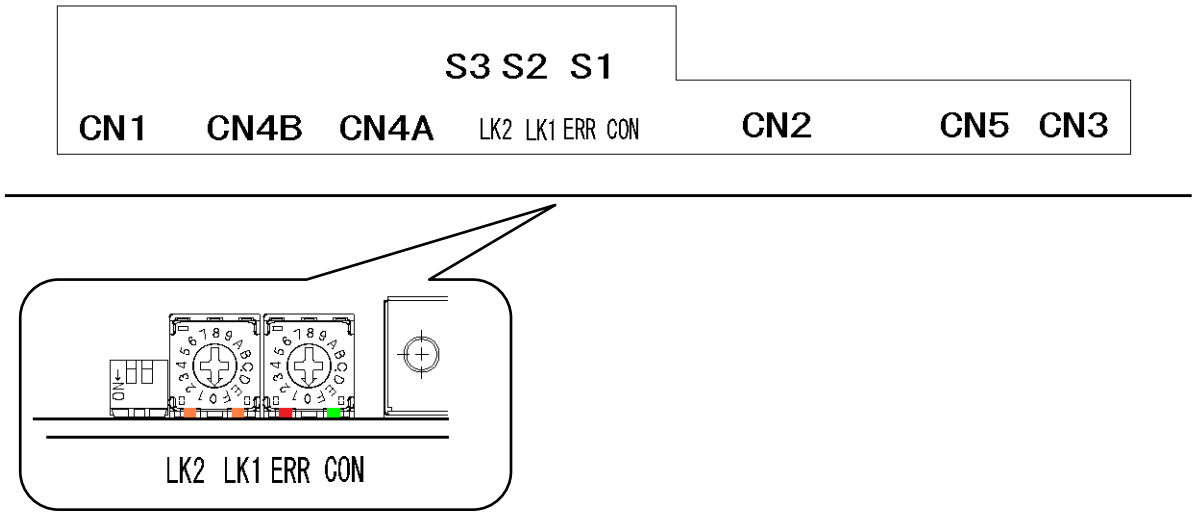


Figure 1-3 Appearance of the communication status display LEDs

Table 1-3 Communication status display LED correspondence table

Name	Color	Status	Description
CON	Green	On	MECHATROLINK-III communication between the controller and this device is established. (The "CONNECT" command is processed normally.) Motor operation with a command from the controller is possible.
		Off	MECHATROLINK-III communication between the controller and this device is not established. (The "CONNECT" command is not executed or terminates abnormally.)
ERR	Red	On	An error regarding MECHATROLINK-III communication occurred.
		Off	MECHATROLINK-III communication is normal.
LK1	Brown	On	To the communication cable connected to the "CN4A" connector, a hardware connection is established.
		Off	No communication cable is connected to the "CN4A" connector. Or, the power to the controller and this device is OFF.
LK2	Brown	On	To the communication cable connected to the "CN4B" connector, a hardware connection is established.
		Off	No communication cable is connected to the "CN4B" connector. Or, the power to the controller and this device is OFF.

1-3 Configuration of the run modes

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

1-4 Mode switching

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

1-5 Restrictions

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

1-6 Startup procedure

To run this device, prepare according to the following procedure.

Product check at delivery
No damages during transportation? (Check packages for no breakages and product surface for no abnormalities.)

① Correct products? (Check the model and rated output, referring to "13-1-1 Model".)
② Accessories packaged? (Check the accessories, referring to "2-1 Incoming check".)

↓

Installation

Correctly install the device, referring to "2-2 Installation environment" and "2-3 Installation method".

↓

Wiring

① Wiring of the power supply block of the device main unit
Connect the power supply of the device main unit, referring to "2-4 Power supply connection".
② Motor connection
Connect the motor and the device main unit, referring to "2-5 Motor connection".
③ Grounding
Be sure to ground to prevent electric shock and for noise protection measures, referring to "2-6 Grounding".
④ Connecting of the regenerative resistor
When the regenerative resistor is supplied, refer to "2-7 Regenerative resistor wiring".
⑤ Control circuit wiring
Connect the control circuit to connect with the device main unit. Refer to "2-8 Control circuit wiring".
⑥ Noise protection
To prevent troubles due to noise, be sure to take noise prevention measures and treatments, referring to "2-9 Noise protection".

When carrying out each wiring task, refer to "3-1 External wiring diagram".
As for electric wire to use in wiring, adopt the one described in "2-10 Applicable electric wire".
As for cables for the control circuit, use our optional cables.

↓

Before-run inspection and start-up of the device

Referring to "Chapter 4 Run", conduct before-run inspection and start-up of the device, as well as adjustment.

↓

Run start

Chapter 2 Installation and wiring

2-1 Incoming check

At the time of product delivery, check below points.

① Correct products as you ordered? (Model, rated output, etc.)
② No damages during transportation? (If no breakages in the package and no exterior abnormalities on products)
③ Found all accessories?

If found any short shipment or damages, please contact our sales representative immediately.
An accessory of this device differs depending on the model, as listed below.

Table 2-1 Accessory list

Driver model	Accessory	
	Model	Quantity
NCR-HE2373*-A-*** Input power supply: 200 VAC system Capacity: 37 kW	Plug connector for the control block [231-704/037-000] Open tool [231-131]	1 1
NCR-HE3373*-A-*** Input power supply: 400 VAC system Capacity: 37 kW	Plug connector for the control block [231-704/037-000] Open tool [231-131]	1 1
NCR-HE3553*-A-*** Input power supply: 400 VAC system Capacity: 55 kW	Plug connector for the control block [231-704/037-000] Open tool [231-131]	1 1
NCR-HE3753*-A-*** Input power supply: 400 VAC system Capacity: 75 kW	Plug connector for the control block [231-704/037-000] Open tool [231-131]	1 1

⚠ Caution

If found damages on the package such as a cardboard box, please contact our sales representative without opening the package.

2-2 Installation environment

(1) For information about the ambient conditions of the device, refer to "13-1-2 General specifications".

(2) The device lifetime has a close relation with the temperature in use. A use under the high temperature and high humidity environment may shorten the device lifetime. Generally, it is said that an increase of 10°C in temperature can shorten the lifetime of equipment to half.

(3) For the temperature inside the storage control panel, consider the surrounding temperature and the temperature increase due to a loss in this device and in the equipment inside the panel. Be sure to keep the surrounding temperature of the device within the permissible range. In general, the calorific value of this device due to loss is as listed below.
NCR-HE2373*-A-***: 5% + 100 W of the connected motor capacity
NCR-HE3373*-A-***: 5% + 100 W of the connected motor capacity
NCR-HE3553*-A-***: 5% + 100 W of the connected motor capacity
NCR-HE3753*-A-***: 5% + 200 W of the connected motor capacity

(4) As the device is equipped with a fan to cool the radiator, secure an opening not to block airflow. When storing plural devices, align them so that ventilation does not influence each other. (Refer to Figure 2-1.)

(5) If there are nearby heating elements and vibrating sources, prepare an appropriate construction against the influence.

(6) Do not install the product in a place of high temperature and high humidity or in places where excessive dust particles, metal powder, and cloud of steam exist, and in an environment where corrosive gas exists.

(7) If there is a noise generation source, reinforce the grounding treatment to avoid mixture of induction noises. Depending on the use conditions, a noise filter may be required.
Conduct the noise protection measures, referring to "2-9 Noise protection".

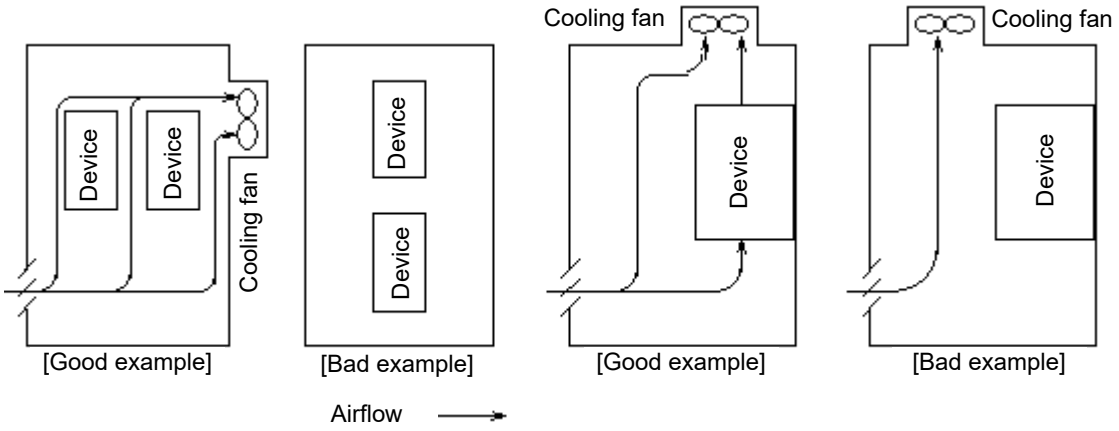


Figure 2-1 Alignment example when storing plural devices

Caution

Be sure to use this device within the range of permissible surrounding temperature and humidity. Negligence may result in errors and failures.

2-3 Installation method

(1) Be sure to install the device in the vertical direction to secure normal heat radiation effect.
(2) Space around the device must be secured with the designated distance appointed by Figure 2-2 (distance from other components or parts and a side wall of the control panel) in view of heat radiation efficiency and maintenance easiness.
(3) The round holes created on the right and left panel covers of the device can be used for temporary wire rope lifting necessary for installing and replacing this device. Note the following:
- Use both right and left holes at the same time for lifting, not only one of them.
- Do not leave the device lifted for a long time or lift and move it over a long distance.

2-3-1 Installation method

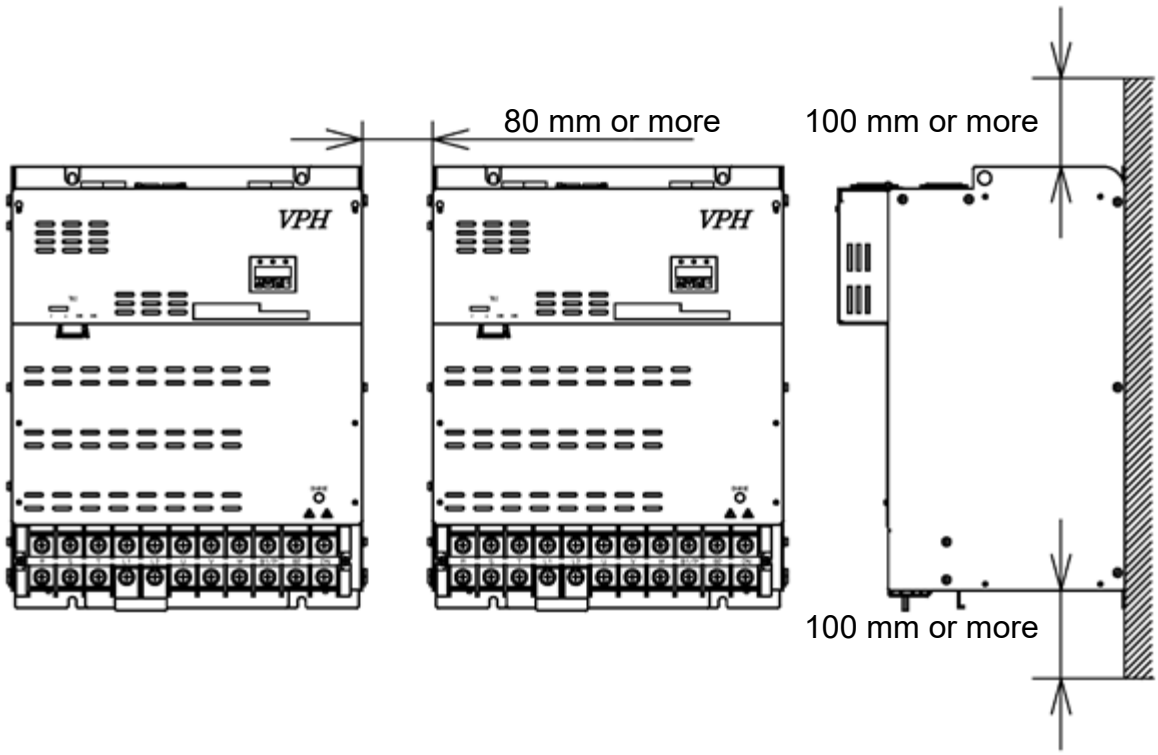


Figure 2-2 Installation and ventilation for a device

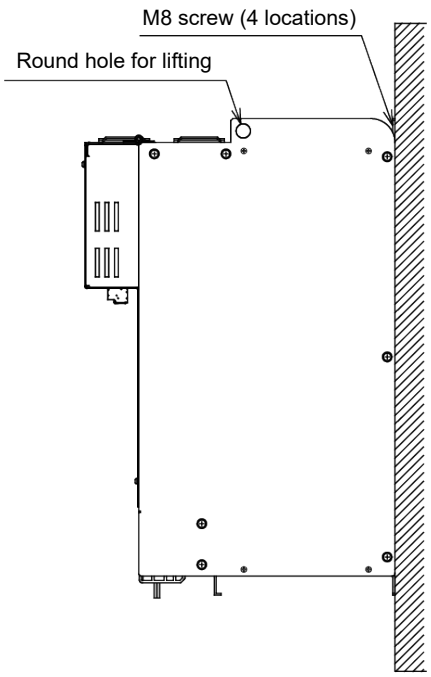
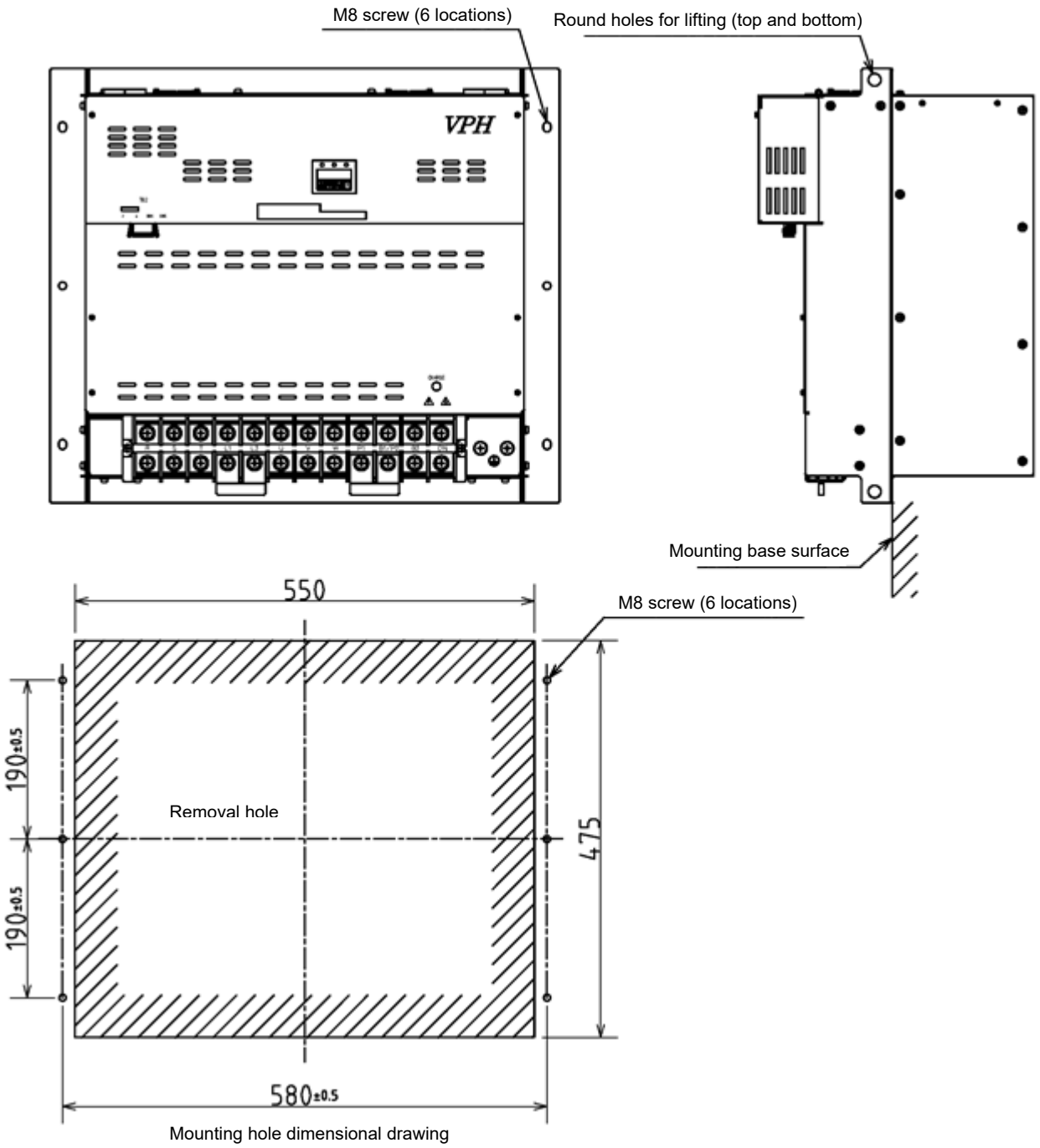


Figure 2-3 Device installation method (37 kW, 55 kW)



* The panel mount type, for which no mounting holes are used, is also available.*1

Figure 2-4 Device installation method (75 kW)

*1 If you need the panel mount type, contact our sales representative.

2-4 Power supply connection

2-4-1 Power supply wiring

(1) The rated voltages of this device are as listed below.

NCR-HE2373*-A-***

Main power supply	200 to 240 VAC, 50/60 Hz, 3-phase power supply
Control power supply	200 to 240 VAC, 50/60 Hz, single-phase power supply

NCR-HE3373*-A-***, NCR-HE3553*-A-***, NCR-HE3753*-A-***

Main power supply	380 to 480 VAC, 50/60 Hz, 3-phase power supply
Control power supply	380 to 480 VAC, 50/60 Hz, single-phase power supply

(2) For accident and fire prevention, install a circuit breaker for wiring or fuse that is absolutely suitable for the line breaking capacity. When using an earth leakage circuit breaker, select a model that employs high-frequency measures for inverters.

(3) As the main circuit of this device is the capacitor input type, big inrush current flows at the time of power-on. Therefore, voltage drop can be induced depending on the power capacity and power supply impedance. Allow enough spare or ample room in choosing the power capacity and electric wire.

(4) Be very careful not to connect the motor connecting terminal (U, V, W, E) of this device to the main power supply (R, S, T, E) erroneously.

(5) When the power supply capacity exceeds 500 KVA, connect a reactor to coordinate power supply. (For the reactor, contact our sales representative.)

⚠ Caution

Be very careful not to connect the motor connecting terminal (U, V, W, E) of this device to the main power supply (R, S, T, E) erroneously. Otherwise, the device may be damaged.

2-4-2 Power supply circuit

Representative power supply circuits are shown in Figure 2-5.

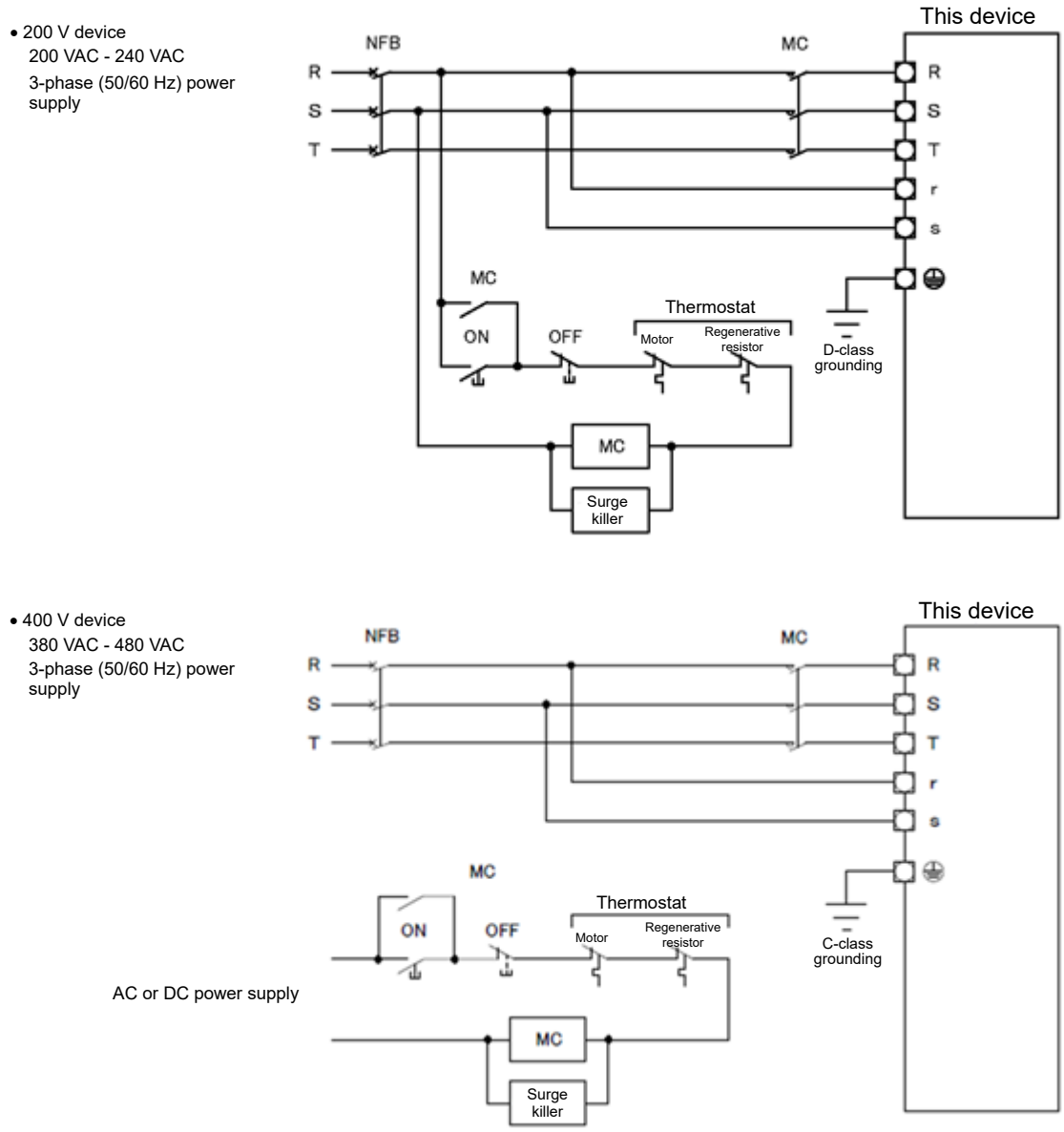


Figure 2-5 Representative power supply circuits

⚠ Caution

- Never use by turning on the main power supply only. Device can be broken.
- Be sure to strictly keep the range of specifications for the power supply. Device can be broken.
- Install the circuit breaker for wiring, for power supply cable protection and for fire and accident prevention.
- As for the breaker capacity, refer to "13-1-5 Device electrical specification".
- When using the magnet contact, be sure to install the surge killer.
- Prepare special power supply for the device apart from the power supply for other high-power equipment when possible.

2-4-3 Power-on sequence

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

2-4-4 Selecting circuit breaker for wiring and earth leakage circuit breaker

- For short circuit protection in case of device failure, select an appropriate breaker that has the rated breaking capacity suitable for the power capacity. For the breaker capacity per device, refer to "13-1-5 Device electrical specification".
- When using the earth leakage circuit breaker, as the inverter block of the device is PWM control, its output contains harmonic components. Therefore, electrostatic capacitance against the ground in the electric line from the device to the motor and floating capacitance between the winding wire and the iron core in the motor generate leakage current. Thus, the earth leakage circuit breaker should be selected in the inverter applicable type. A zero-phase reactor can be connected to the motor power supply line to suppress leakage current.

⚠ Caution

- The device may not function properly when the power is turned on immediately after power-off.
- If the over current or overload protection has been activated, remove the cause of error, leave it for about 30 minutes for cooling, then restart the device. Repeated reset operation in a short period of time increases the device temperature abnormally, which leads to the device breakages.
- Make sure that the sequence control is such that it stops the command upon the alarm occurrence (output) due to the activation of the protective function. Make sure also that the sequence control is not such that when the power supply is restored after the occurrence of an electricity failure (or a sudden stop), commands (such as speed command voltage and pulse train) are input so that the motor immediately runs.

2-5 Motor connection

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

2-6 Grounding

(1) Be sure to ground for electric shock prevention and noise protection measures.
(2) Use a wire for grounding which has a conductor cross-sectional area greater than or equal to that described in "2-10 Applicable electric wire".
(3) Connect grounding wire to grounding terminal (E) of the device.
(4) Use exclusive grounding. If common grounding is used, be sure to apply one-point grounding.
(5) Be sure to connect the motor grounding wire to the grounding terminal (E) of the device.

⚠ Caution

- To decrease common mode noise and to prevent erroneous run of the device, grounding should be the exclusive grounding better than D-class grounding (grounding resistance 100 Ω or less) for 200 VAC systems and C-class grounding (grounding resistance 10 Ω or less) for 400 VAC systems.
- If exclusive grounding is impossible, secure one-point common grounding to commonly ground with other equipment at the grounding spot.
- Be sure to avoid common grounding with high-power equipment and grounding to steel frames.
- Carefully wire not to loop the grounding wire. Failure in this can increase leakage current of the device and activate the earth leakage circuit breaker.

2-7 Regenerative resistor wiring

(1) Use the regenerative resistor supplied as an option, unless otherwise specified.
(2) The regenerative resistor is used to consume excessive energy that the capacitor in the device cannot absorb, among regenerative energy generated by motor braking when load inertia (GD^2) is large.
(3) Since heat is generated by regenerative energy, locate the regenerative resistor not to influence other equipment.
(4) A thermostat is supplied with the optional regenerative resistor. The contact of the thermostat operates (is opened) when the regenerative resistor gets overheated. Carry out wiring so that the main power supply is shut down when the contact operates. In the contact specifications of the thermostat, the contact current is 15 A at 100 VAC or 10 A at 200 VAC. When mounting the thermostat, refer to Figure 2-6.
(5) The cable length between the regenerative resistor and device shall be up to 3 m or as short as possible. As the cable is longer, surge voltage generated by power element switching becomes higher, and the device could be damaged.

Mounting a thermostat on a vitreous enamel resistor

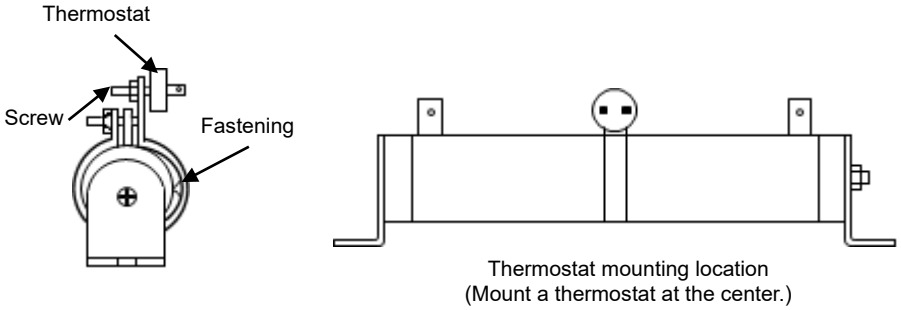


Figure 2-6 Thermostat mounting location

Caution

If abnormally high current flows in a regenerative resistor, the resistor becomes hot in a short time and quite dangerous. Be sure to construct a circuit to shut down the main power supply using the contact of the thermostat.

2-8 Control circuit wiring

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

2-9 Noise protection

1. There are two intrusion routes for the incoming noise; one is "power supply cable" and the other is "signal cable". Incoming noise can cause erroneous run, which induces troubles. To prevent troubles by noises, it is important to suppress noise generation and not to lead generated noises. Therefore, be sure to carry out following countermeasures and preventive treatments.

2. Setting surge absorptions and noise filters

(1) Be sure to attach surge killers (for AC power supply) and diodes (for DC power supply) to the relay, magnet switch, solenoid brake, and solenoid that are used around the device, and suppress noise generation.
(2) If the noise source such as electric welding machines and electric discharge machines exists close to the power supply cable, and it makes the high noise environment, install noise filters or noise cut transformers on the main power supply and control power supply of the device to carry out noise protection measures on the power supply cable.
(3) When using noise filters, be sure to separate input wiring and output wiring of the filter and never bundle all wires together. Harness the grounding wire of filter separately from the filter output wire and be sure to carry out wiring (grounding) in the shortest distance.
(4) This device switching controls the motor at the high speed. For this reason, generated switching noise can affect other equipment. In this case, install noise filters or common mode choke coils to the main power supply of the device to prevent round-about noises to the power supply. Furthermore, carry out countermeasures against radiation noises by housing power supply lines and motor lines into an iron-made pipe.
(5) If wishing to use a DC reactor, use the DC reactor supplied as an option, unless otherwise specified.

⚠ Caution

- For control input/output signals wiring, use specified type of cable with the specified conductor cross-sectional area, and strictly follow precautions in wiring. No countermeasures may result in unexpected erroneous run due to noises and is very dangerous.
- Separate wiring of control input/output signals from power cable (power supply cable, motor cable, etc.), and never put them into the same duct and avoid all-in-one wire bundling.

2-10 Applicable electric wire

Use electric wires shown in Table 2-2 to Table 2-5.
As for cables for control circuit, use optional items.

Table 2-2 Applicable electric wires

	Item	Terminal	Conditions
Control circuit	Encoder feedback input/output	A/A*, B/B*, Z/Z*, (EP5, GND)	90 deg phase contrast pulse encoder • Shielded twisted pair cable of AWG24 (0.2 mm^2) • For EP5 and GND, AWG20 (0.5 mm^2) *2 • Length: 20 m or less *3
		SD/SD*, (EP5, GND)	Serial encoder • Shielded twisted pair cable of AWG24 (0.2 mm^2) • For EP5 and GND, AWG20 (0.5 mm^2) *2 • Length: 30 m or less
	Magnetic pole sensor input	HA/HA*, HB/HB*, HC/HC*, (EP5, GND)	• Shielded twisted pair cable of AWG24 (0.2 mm^2) • For EP5 and GND, AWG20 (0.5 mm^2) *2 • Length: 30 m or less
	Other control input/output		• Shielded cable of AWG28 (0.08 mm^2) • Length: 3 m or less

Table 2-3 Electric wires applicable to the main circuit (200 VAC device)

	Item	Terminal	NCR-HE2373*-A-***
Main circuit	Main power supply, grounding	R, S, T, E	• AWG2/0 (67 mm^2) or more
	Control power supply	r, s	• AWG12 (3.5 mm^2) to 18 (0.75 mm^2)
	Motor power supply	U, V, W	• AWG3/0 (85 mm^2) or more
	Regenerative resistor	B1/P, B2	• AWG2 (33 mm^2) or more
	DC reactor	L1, L2	• AWG3/0 (85 mm^2) or more
	N terminal	DN	• AWG3/0 (85 mm^2) or more

Table 2-4 Electric wires applicable to the main circuit (400 VAC device (1/2))

	Item	Terminal	NCR-HE3373*-A-***	NCR-HE3553*-A-***
Main circuit	Main power supply, grounding	R, S, T, E	• AWG4 (22 mm^2) or more	• AWG1/0 (55 mm^2) or more
	Control power supply	r, s	• AWG12 (3.5 mm^2) to 18 (0.75 mm^2)	• AWG12 (3.5 mm^2) to 18 (0.75 mm^2)
	Motor power supply	U, V, W	• AWG2 (33 mm^2) or more	• AWG2/0 (67 mm^2) or more
	Regenerative resistor	B1/P, B2	• AWG8 (8.0 mm^2) or more	• AWG6 (14 mm^2) or more
	DC reactor	L1, L2	• AWG4 (22 mm^2) or more	• AWG1/0 (55 mm^2) or more
	N terminal	DN	• AWG4 (22 mm^2) or more	• AWG1/0 (55 mm^2) or more

*2 Wire diameter of EP5 and GND of the encoder feedback input/output differs depending on the encoder and the length of cable to combine. Thus, for details, contact our sales representative.
*3 If using a cable exceeding 20 m, contact our sales representative.

Table 2-5 Electric wires applicable to the main circuit (400 VAC device (2/2))

	Item	Terminal	NCR-HE3753*-A-***
Main circuit	Main power supply, grounding	R, S, T, E	• AWG2/0 (67 mm^2) or more
	Control power supply	r, s	• AWG12 (3.5 mm^2) to 18 (0.75 mm^2)
	Motor power supply	U, V, W	• AWG2/0 (67 mm^2) or more
	Regenerative resistor	B1/P2, B2, P1	• AWG4 (22 mm^2) or more
	DC reactor	L1, L2	• AWG1 (42 mm^2) or more
	N terminal	DN	• AWG1 (42 mm^2) or more

① Electric wire diameters in Table 2-2 are decided based on PVC shielded twisted pair cable under the following conditions.
- PVC shielded twisted pair cable: Rated 300 V, 80°C, Surrounding maximum temperature: 40°C, Wiring conditions: aerial, single-track line

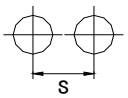
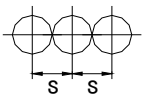
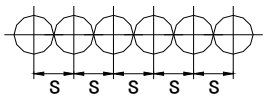
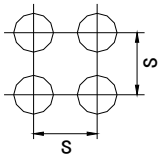
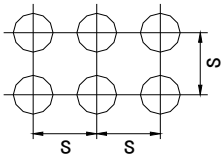
② The electric wire diameter of the main circuit in Table 2-3 to Table 2-5 is decided based on vinyl insulation electric wire (KIV electric wire) for electric equipment under the following conditions.
- KIV electric wire: Rated 600 V, 60°C, Operating temperature: 40°C, Wiring conditions: aerial, three-track line (interval s = d).

③ Permissible current of electric wire differs depending on use conditions (operating temperature, wiring conditions, etc.), trunking, insulation, and maker. Thus, choose appropriate electric wire diameter depending on use environment and conditions.

④ In the case of calculating the permissible current by changing operating temperature and wiring conditions to be used, the calculation should be performed by multiplying with the permissible current reduction coefficient and permissible current compensatory coefficient according to the objective temperature and conditions. Permissible current reduction coefficient (when cable permissible maximum temperature is 60°C) when operating temperature is higher 30°C.

$$\text{Permissible current reduction coefficient} = \sqrt{\frac{(60-\theta)}{30}} \qquad (\theta = \text{using temperature } \theta<60)$$

Table 2-6 Permissible current compensatory coefficients when wiring plural cables in air

Coefficient	1	2	3	6	4	6
Center-Interval / Alignment						
s=d s=2d s=3d	1.00	0.85 0.95 1.00	0.80 0.95 1.00	0.70 0.90 0.95	0.70 0.90 0.95	0.60 0.90 0.95

Caution

- Wire type and wire diameter can differ depending on use conditions and environment. For details, contact our sales representative.
- If control signal wire is long, it becomes easy to receive the influence of noises. Thus, wire within the stipulated length.
- As for cable type, be sure to use the stipulated type.

2-11 Wiring to control power supply block

For this device, the supplied plug connector is used for wiring to the control power supply block.

2-11-1 Wiring procedure

(1) Strip 8 to 9 mm of the coating of the application electric wire.
For details of the size of the application electric wire, refer to 2-10 Applicable electric wire.
(2) Open the electric wire insertion block of the plug connector, using the supplied open tool.
For insertion, disconnect the plug connector from the device, then start work.
(3) With the electric wire insertion block still open, insert the electric wire.
After insertion, remove the open tool to secure the electric wire.
(Be sure to check that the electric wire is connected tightly.)
(4) Mount the plug connector to the device.
(Check that wiring is conducted according to the signals printed on the connector.)

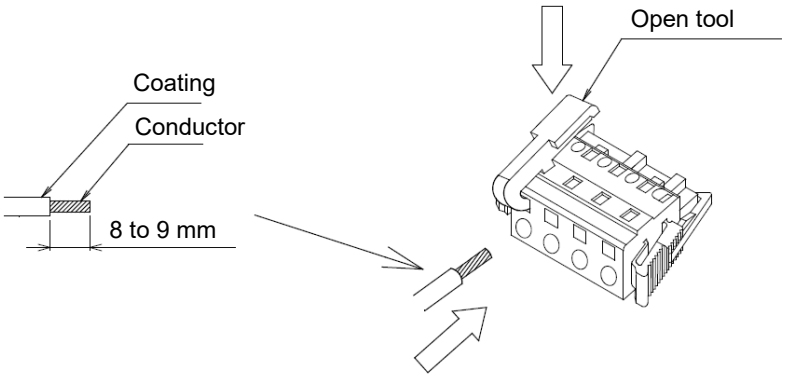


Figure 2-7 Plug connector wiring diagram

Chapter 3 Signal connection

3-1 External wiring diagram

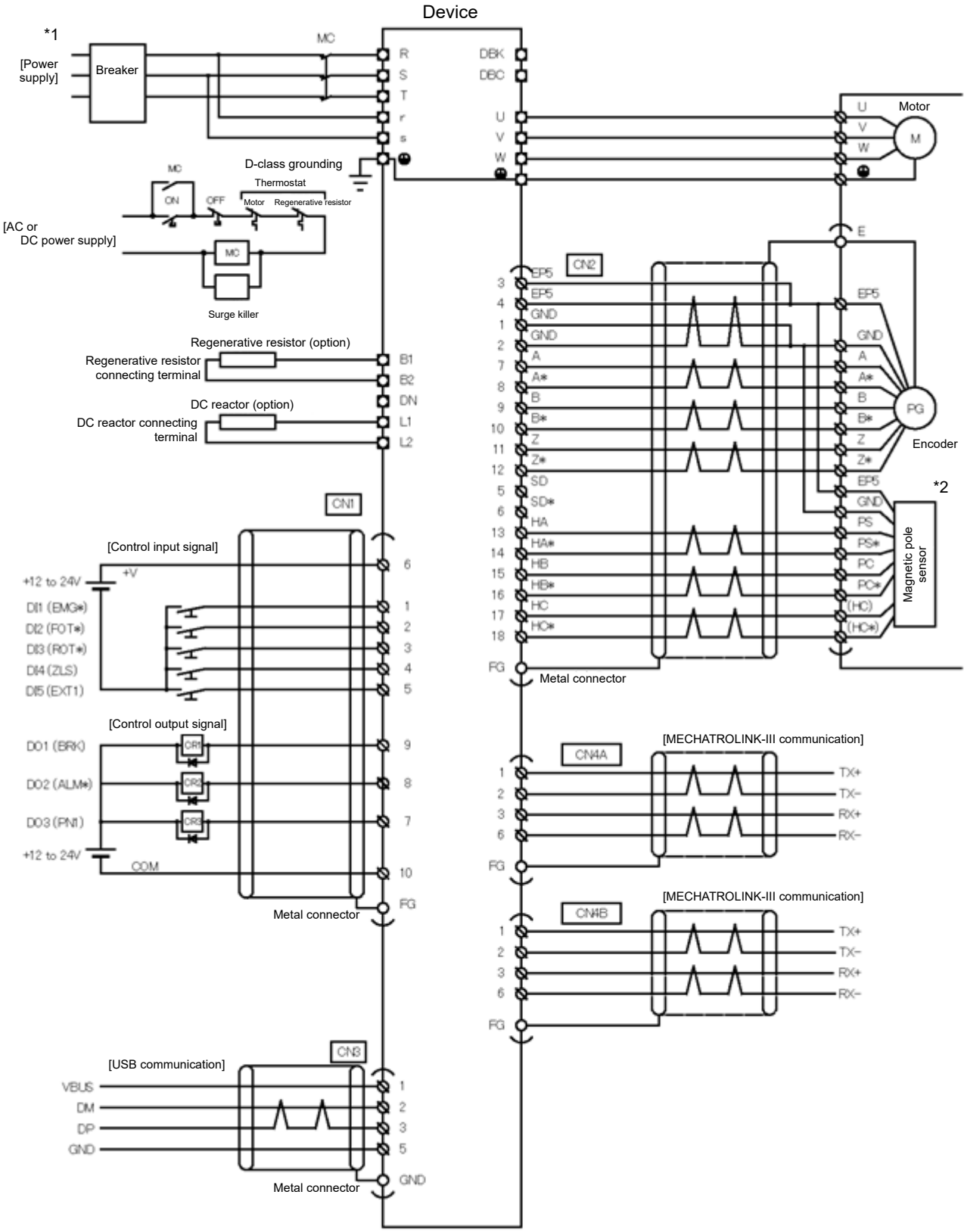


Figure 3-1 External wiring diagram

*1: For details of connecting the power supply, refer to 2-4-2　Power supply circuit.
*2: Wiring is required when using the magnetic pole sensor.

Note 1: COM of CN1 connector is a common for control input/output signals. GND is a common for control power supply (+5 V) in the device.
Note 2: As COM of CN1 and GND are isolated, avoid common wiring and all-in-one wire bundling.
Note 3: Status of switches connected to control input signal show OFF status of each input signal.
Note 4: As for connection between motor and encoder, refer to each motor instruction manual.
Note 5: A pin not mentioned in this connecting diagram is NC.
Note 6: For a control input/output signal name, the value in parentheses is the initial value of the parameter.
Note 7: In the maintenance mode, all control input signals can be allocated.
Note 8: When a serial encoder is used, make a connection as shown below.

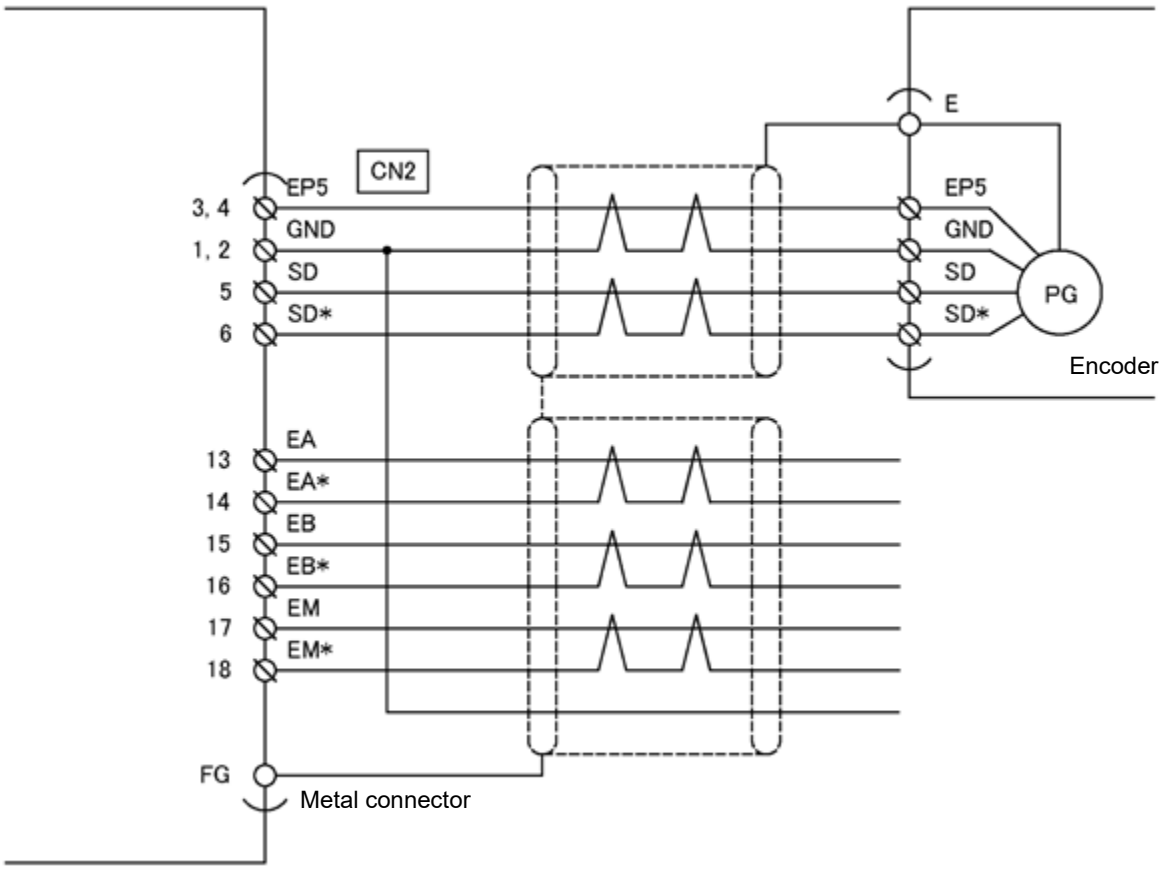


Figure 3-2 Serial encoder connecting diagram

3-2 Input/output interface

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

3-3 Connector pin alignment

3-3-1 Control input/output connector CN1

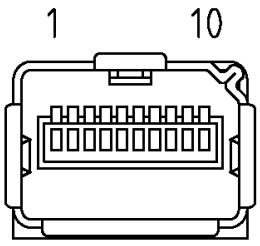
Table 3-1 Control input/output

No.	Signal code	Signal name	No.	Signal code	Signal name
1	DI1	Control input signal 1 (EMG*)	6	+V	External power supply (+12 VDC to +24 VDC)
2	DI2	Control input signal 2 (FOT*)	7	DO3	Control output signal 3 (PN1)
3	DI3	Control input signal 3 (ROT*)	8	DO2	Control output signal 2 (ALM*)
4	DI4	Control input signal 4 (ZLS)	9	DO1	Control output signal 1 (BRK)
5	DI5	Control input signal 5 (EXT1)	10	COM	External power supply common

Connector to be used (receptacle): MUF-RS10DK-GKXR (J.S.T. Mfg.) or equivalent
Applicable cable side connector (soldered plug): MUF-PK10K-X (J.S.T. Mfg.) or equivalent

*1 The initial values are indicated in parentheses for control output signals DO1 to DO3 and control input signals DI1 to DI5.
An asterisk "*" indicates a negative logic signal.

*2 Figure below is connector alignment of the main unit side viewed from the connecting block.



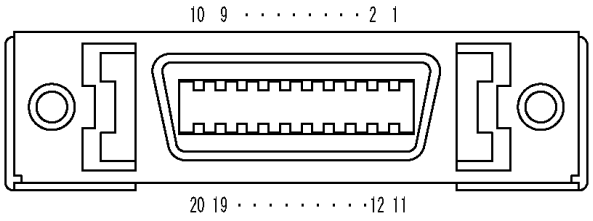
3-3-2 Encoder feedback input/output connector CN2

Table 3-2 Encoder feedback input/output

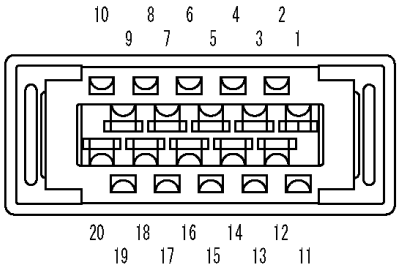
No.	Signal code	Signal name	No.	Signal code	Signal name
1	GND	Internal control power supply common	11	Z	Encoder marker signal input (positive pole)
2	GND	Internal control power supply common	12	Z*	Encoder marker signal input (negative pole)
3	EP5	Encoder power supply (+5 V)	13	HA EA	Magnetic pole sensor input Encoder pulse A-phase output (positive pole)
4	EP5	Encoder power supply (+5 V)	14	HA* EA*	Magnetic pole sensor input Encoder pulse A-phase output (negative pole)
5	SD	Communication data (positive pole)	15	HB EB	Magnetic pole sensor input Encoder pulse B-phase output (positive pole)
6	SD*	Communication data (negative pole)	16	HB* EB*	Magnetic pole sensor input Encoder pulse B-phase output (negative pole)
7	A	Encoder pulse A-phase input (positive pole)	17	HC EM	Magnetic pole sensor input Encoder marker output (positive pole)
8	A*	Encoder pulse A-phase input (negative pole)	18	HC* EM*	Magnetic pole sensor input Encoder marker output (negative pole)
9	B	Encoder pulse B-phase input (positive pole)	19	NC	Not connected (reserved)
10	B*	Encoder pulse B-phase input (negative pole)	20	NC	Not connected (reserved)

Connector to be used (receptacle): 10220-52A2PL (3M) or equivalent
Applicable cable side connector (soldered plug): 10120-3000PE (3M) or equivalent
Applicable cable side connector (shell): 10320-52A0-008 (3M) or equivalent

*1 Figure below is connector alignment of the main unit side viewed from the connecting block.



*2 Figure below is connector alignment of the cable side viewed from the soldering terminal side.



*3 According to the parameter setting, pins 13 to 18 can be used as an encoder pulse output and a marker output.

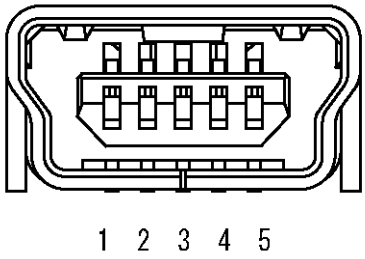
3-3-3 USB communication connector CN3

Table 3-3 USB communication

No.	Signal code	Signal name	No.	Signal code	Signal name
1	VBUS	USB power supply (+5 V)	4	NC	Not connected (reserved)
2	DM	Communication data (a pair with DP)	5	GND	Internal control power supply common
3	DP	Communication data (a pair with DM)			

Connector to be used (receptacle): UX60SC-MB-5S8 (HIROSE) or equivalent
Applicable cable: Commercially available USB cable
(host: A plug ⇔ device: Mini B plug)

Figure below is connector alignment of the main unit side viewed from the connecting block.



* We do not offer any USB cable as an option.

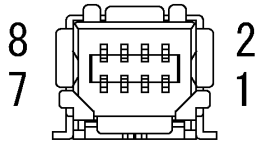
3-3-4 MECHATROLINK-III communication connector CN4

Table 3-4 MECHATROLINK-III communication

No.	Signal code	Signal name	No.	Signal code	Signal name
1	TX+	Transmitting data (a pair with TX-)	5	NC	Not connected (reserved)
2	TX–	Transmitting data (a pair with TX+)	6	RX–	Receiving data (a pair with RX+)
3	RX+	Receiving data (a pair with RX-)	7	NC	Not connected (reserved)
4	NC	Not connected (reserved)	8	NC	Not connected (reserved)

Connector to be used (receptacle): 1981386-1 (Tyco Electronics) or equivalent
Applicable cable side connector (soldered plug): 2040008-1 (Tyco Electronics) or equivalent

Figure below is connector alignment of the main unit side viewed from the connecting block.



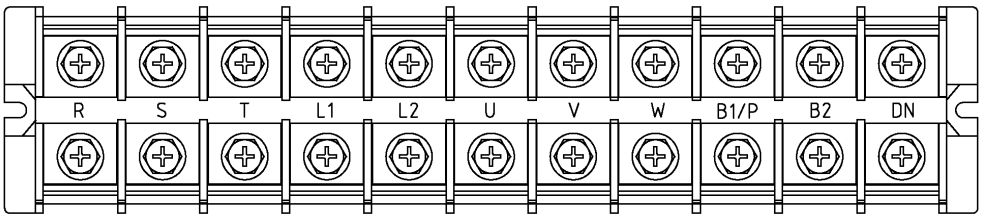
* We do not offer any MECHATROLINK-III cable as an option.
Use a MECHATROLINK-III-compliant cable.

3-3-5 Power supply terminal TB1

Table 3-5 37 kW and 55 kW power supply terminals (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase	7	V	V-phase
2	S	Main power supply S-phase	8	W	W-phase
3	T	Main power supply T-phase	9	B1/P	Regenerative resistor
4	L1	DC reactor	10	B2	Regenerative resistor
5	L2	DC reactor	11	DN	Not used
6	U	U-phase			

Terminal block to be used: Number of terminals - 11, screw size - M8

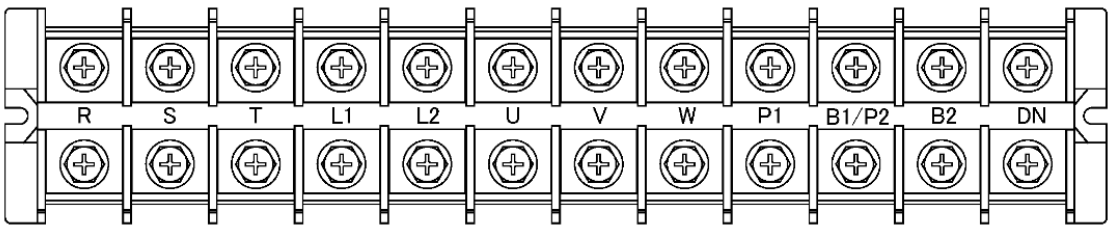


Connect the grounding to the grounding terminal on the device cabinet.
When not using a DC reactor, do not remove the shorting bar between L1 and L2.

Table 3-6 75 kW power supply terminal (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase	7	V	V-phase
2	S	Main power supply S-phase	8	W	W-phase
3	T	Main power supply T-phase	9	P1	Not used
4	L1	DC reactor	10	B1/P2	Regenerative resistor
5	L2	DC reactor	11	B2	Regenerative resistor
6	U	U-phase	12	DN	Not used

Terminal block to be used: Number of terminals - 12, screw size - M8



Connect the grounding to the grounding terminal on the device cabinet.
When not using a DC reactor, do not remove the shorting bar between L1 and L2.
Do not remove the shorting bar between P1 and B1/P2.

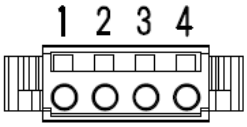
3-3-6 Power supply terminal TB2

Table 3-7 Control power supply terminal (TB2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	r	Control power supply R-phase (400 V)	3	DBK	Not used
2	s	Control power supply S-phase (400 V)	4	DBC	Not used

Connector to be used (pin header): 231-934/001-000 (WAGO) or equivalent
Applicable cable side connector (plug): 231-704/037-000 (WAGO) or equivalent
(supplied with the device main unit)

Figure below is the alignment of the plug viewed from the cable insertion block.



Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 4 Run

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 5 Maintenance mode

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 6 Additional functions

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 7 Maintenance

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 8 Protective function

8-1 Error code list

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

8-2 Error code specifications

8-2-1 Alarm specifications

For details of each item, refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

AL.102 Main power supply undervoltage error

a. Description

The DC voltage of the main power supply is lower than the specified value in the servo on status. When the setting of [P124 (1st digit): Main power supply undervoltage error spec selection] is "1" or "2", this error may occur.

Possible causes of this error include:

- A voltage drop due to an insufficient power supply capacity or an instantaneous power failure (power failure for at least about 10 ms) occurred.
- Servo-on operation is performed immediately after power-on.
- The shorting bar between "L1 and L2" of the power supply terminals is removed.

After an instantaneous power failure occurs and the protective function is activated, if the power failure status continues, no control power is supplied and the protective circuit is reset. After that, when the power is recovered, various commands (including the speed command and pulse train command) are input. If the motor runs immediately after power recovery in a sequence, it is dangerous. Do not design such a sequence. Design an external sequence in which each signal is switched OFF and the execution of each command is stopped when the protective function is activated and an alarm occurs (is output).

The following table lists the DC voltage values of the main power supply in the device with which this error occurs.

Table 8-1 Values detected as a main power supply undervoltage error

Input power supply specification	Voltage detected as an error
200 VAC	177 V or less
400 VAC	350 V or less

b. Operation at an error

Servo OFF

c. Release method

Execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

d. Related display

C016: Main power supply DC voltage

e. Related parameters

P124[1st digit]: Main power supply undervoltage error spec selection

P124[5th - 2nd digits]: Detection allowed time for main power supply undervoltage error

f. Output signal status

ALM: ○/ WNG: ●/ RDY: ●/ ZRDY: ●/ BRK: ●

AL.103 Main power supply excessive voltage error

a. Description

The regeneration processing capacity is exceeded due to a rise of the main power supply voltage, excessive load inertia, or another reason, and the DC voltage of the main power supply exceeds the specified value.

The ground potential rises due to a ground fault in the motor or excessive leak current, and the DC voltage of the main power supply exceeds the specified value.

If a main power supply excessive voltage error occurs when the motor is stopping or decelerating, regenerative energy may be excessive due to too large load inertia. In this case, take the following measures:

• Attach a regenerative resistor.
• Increase the deceleration time.
• Decrease the applicable operation speed.

This error may also be caused because the ground potential rises due to a ground fault in the motor or excessive leak current, and the DC voltage of the main power supply exceeds the specified value. Check the connection circuit and grounding for the device and motor, and the applicable power supply voltage.

The following table lists the detection voltage values of the main power supply DC voltage in the device with which this error occurs.

Table 8-2 Values detected as a main power supply excessive voltage error

Input power supply specification	Voltage detected as an error
200 VAC	410 V or more
400 VAC	855 V or more

b. Operation at an error

Servo OFF

c. Release method

Execute one of the following operations:

• Input the ARST signal.
• Input the RST signal.
• Turn the power off, then on again.

d. Related display

—

e. Related parameter

—

f. Output signal status

ALM: ○/ WNG: ●/ RDY: ●/ ZRDY: ●/ BRK: ●

* For information about other alarm items, refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

8-2-2 Warning specifications

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 9 Parameters

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 10 Status display

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 11 Self-diagnosis

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 12 Operation panel

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

Chapter 13 Specifications

13-1 Device specifications

13-1-1 Model

Model of VPH Series is as follows.

Table 13-1 Model display

NCR– ① ② ③ ④ ⑤ – ⑥ – ⑦ ⑧ ⑨ – ⑩

No.	Item	Display	Description
		NCR	AC servo controller series
①	Series name	H	VPH Series
②	Function type	E	MECHATROLINK-III specifications
③	Input power supply specification	2	200 VAC system
		3	400 VAC system
④	Output capacity	373	37 3 = 37 × 10^3 = 37 kW | └ Exponent portion of exponentiation of 10 └ Significant figures
⑤	Hardware specification	A	Standard specification
		B	Coating specification
⑥	Software type	A	τDISC
⑦	Reserved	0	Fixed
⑧	Absolute position compensation	0	None
		1	Absolute position compensation data incorporation
⑨	STO option	0	None
		1	Yes
⑩	Special specification	None	Standard specification
		S***	Special specification

13-1-2 General specifications

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

13-1-3 Functional specifications

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

13-1-4 Performance

Refer to "VPH Series HE Type τDISC Instruction Manual (TI-14870*)".

13-1-5 Device electrical specification

(1) Electrical specification of the 200 V, 3-phase input device

Table 13-2 Electrical specification of the 200 V, 3-phase input device

Item			NCR-HE2373*-A-***
Control power supply	Rated voltage Frequency	[V] [Hz]	200 - 240 AC 1φ 50/60 Hz
	Permissible voltage fluctuation	[V]	170 - 264 AC
	Rated current	[Arms]	0.9
	Power consumption	[W]	108
	Inrush current	[A]*1	27.8 [2.16 ms]
Main power supply	Rated voltage Frequency	[V] [Hz]	200 - 240 AC 3φ 50/60 Hz
	Permissible voltage fluctuation	[V]	170 - 264 AC
	Rated current	[Arms]	192.0
	Rated capacity	[kVA]	66.5
	Inrush current	[A]*1	157 [40 ms]
Rated output		[W]	37 k
Drive method			3-phase sine wave PWM
Brake method			Regenerative brake: External regenerative resistor
Continuous output current		[Arms]	180.0
Instant output current		[Arms]	360.0
Output frequency		[Hz]	0 - 400
Carrier frequency		[kHz]	8
Structure (IP code)			Forced cooling (IP00)
Mounting type			Panel mounting
Shape			Type1
Weight		[Kg]	About 45.0
Accessory			Control power plug terminal × 1, Open tool × 1
Option			Regenerative resistor, etc.

*1 Value at the rated voltage of 240 VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide.

(2) Electrical specification of the 400 V, 3-phase input device

Table 13-3 Electrical specification of the 400 V, 3-phase input device

Item			NCR-HE3373*-A-***	NCR-HE3553*-A-***	NCR-HE3753*-A-***
Control power supply	Rated voltage Frequency	[V] [Hz]	380 - 480 AC 1φ 50/60 Hz		
	Permissible voltage fluctuation	[V]	323 - 528 AC		
	Rated current	[Arms]	0.52	0.65	0.75
	Power consumption	[W]	126	156	180
	Inrush current	[A]*2	56 [0.54 ms]	56 [0.54 ms]	56 [0.54 ms]
Main power supply	Rated voltage Frequency	[V] [Hz]	380 - 480 AC 3φ 50/60 Hz		
	Permissible voltage fluctuation	[V]	323 - 528 AC		
	Rated current	[Arms]	96.0	143	192
	Rated capacity	[kVA]	66.5	99.0	133
	Inrush current	[A]*2	78.6 [40 ms]	78.6 [49 ms]	120 [47 ms]
Rated output		[W]	37 k	55 k	75 k
Drive method			3-phase sine wave PWM		
Brake method			Regenerative brake: External regenerative resistor		
Continuous output current		[Arms]	98.0*3	90.0	135.0
Instant output current		[Arms]	180.0	180.0	270.0
Output frequency		[Hz]	0 - 400		
Carrier frequency		[kHz]	8		
Structure (IP code)			Forced cooling (IP00)		
Mounting type			Panel mounting	Panel mounting	Duct mounting Panel mounting*4
Shape			Type1	Type2	Type3
Weight		[Kg]	About 43.0	About 45.0	About 63.0
Accessory			Control power plug terminal × 1, Open tool × 1		
Option			Regenerative resistor, etc.		

*2 Value at the rated voltage of 480 VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide.
*3 Rev.3.00 or later
*4 If you need the panel mount type, contact our sales representative.

13-2 Outline drawings and names of parts

13-2-1 Device with 37 kW

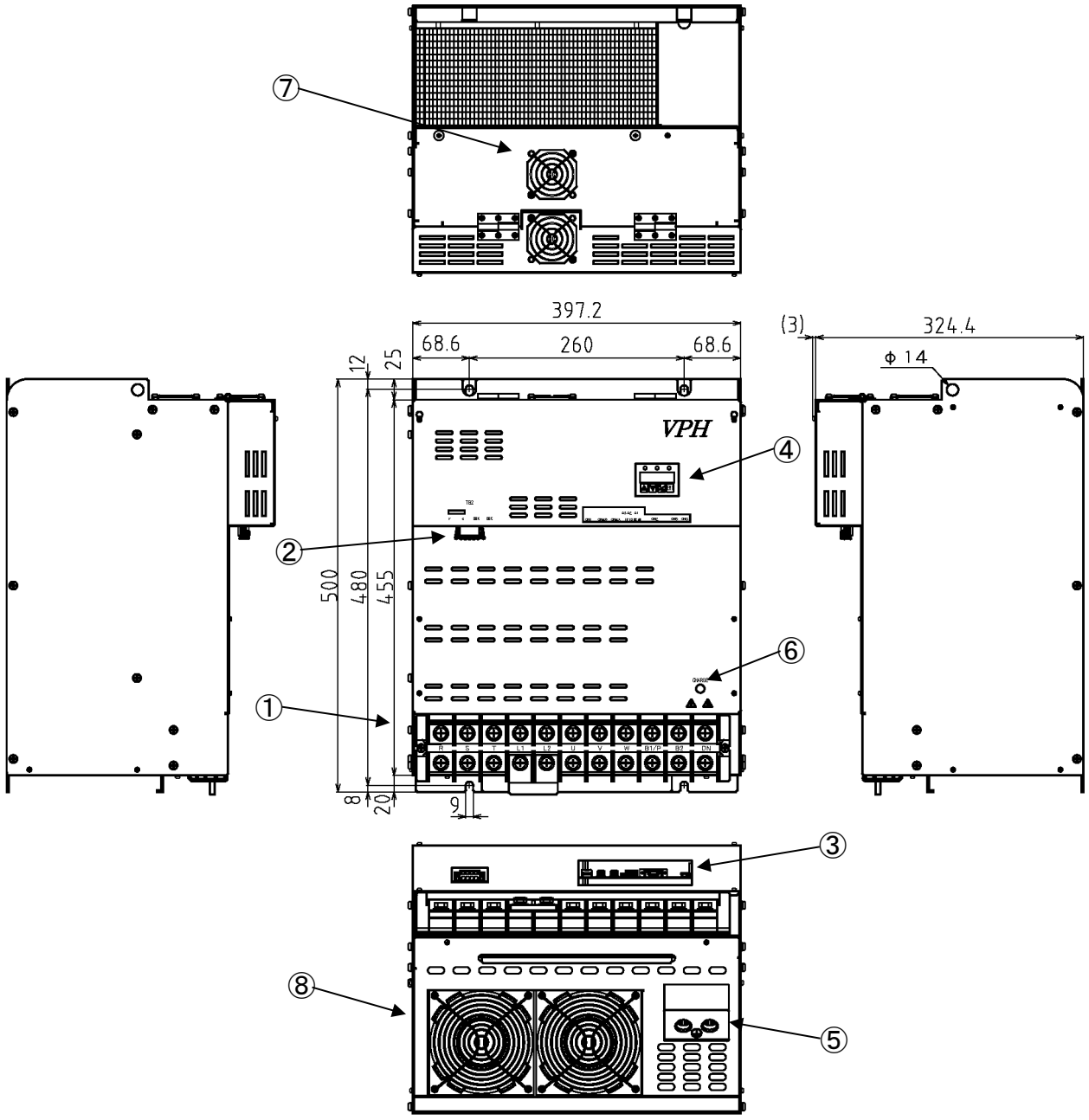


Figure 13-1 Outline drawing of the main unit of the device with 37 kW (Type 1)

Table 13-4 Name of each part

No.	Name	Function	
①	TB1	• Main power supply terminals (R, S, T) • DC reactor connection terminals (L1, L2) • Motor connection terminals (U, V, W) • Regenerative resistor connection terminals (B1/P, B2) • Unused (DN)	• Size M8
②	TB2	• Control power supply connection terminals (r, s) • Unused (DBK, DBC)	
③	S1, S2	• Station address setting switch	
	S3	• Transmission bytes setting switch	
	CN1	• Control input/output signal connector	
	CN2	• Encoder connection connector Connect the encoder feedback input/output signals from the encoder mounted on the motor.	
	CN3	• USB communication connector Used to connect a PC on which VPH DES is installed for USB communication.	
	CN4A	• MECHATROLINK-III cable connection connector	
	CN4B	• MECHATROLINK-III cable connection connector	
④	Operation panel	LED1 - 5	• Data display LED panel for displaying the status and alarm (5 digits)
		SW	• Operation key (UP, DOWN, MODE, ENTER)
⑤	E	• Terminal for connecting power and motor grounding cables	• Size M8
⑥	CHARGE LED	• On when high voltage is charged in the main circuit capacitor in the device.	
⑦ ⑧	FAN	Cooling fan	

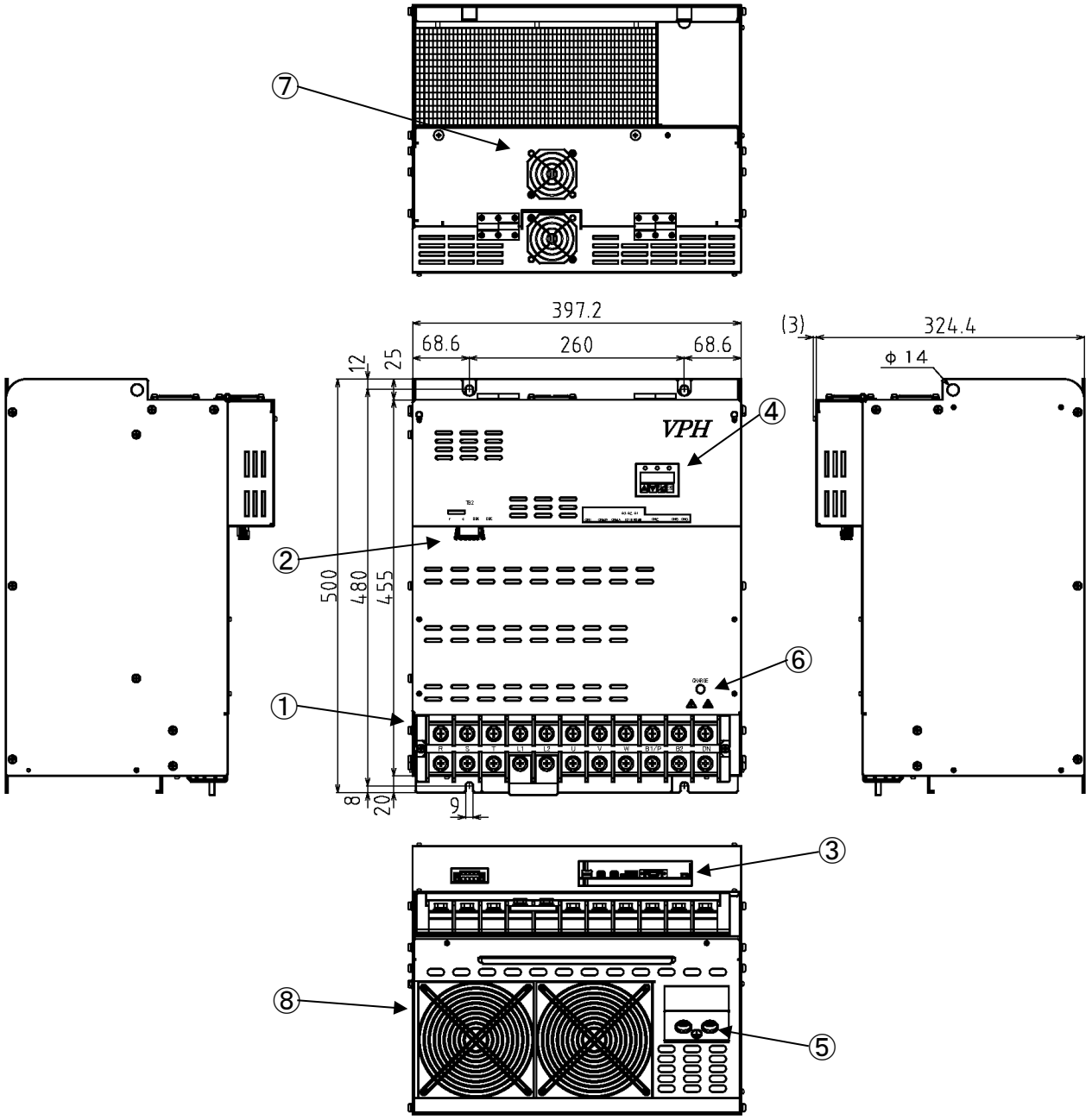


Figure 13-2 Outline drawing of the main unit of the device with 55 kW (Type 2)

Table 13-5 Name of each part

No.	Name	Function	
①	TB1	• Main power supply terminals (R, S, T) • DC reactor connection terminals (L1, L2) • Motor connection terminals (U, V, W) • Regenerative resistor connection terminals (B1/P, B2) • Unused (DN)	• Size M8
②	TB2	• Control power supply connection terminals (r, s) • Unused (DBK, DBC)	
③	S1, S2	• Station address setting switch	
	S3	• Transmission bytes setting switch	
	CN1	• Control input/output signal connector	
	CN2	• Encoder connection connector Connect the encoder feedback input/output signals from the encoder mounted on the motor.	
	CN3	• USB communication connector Used to connect a PC on which VPH DES is installed for USB communication.	
	CN4A	• MECHATROLINK-III cable connection connector	
	CN4B	• MECHATROLINK-III cable connection connector	
④	Operation panel	LED1 - 5	• Data display LED panel for displaying the status and alarm (5 digits)
		SW	• Operation key (UP, DOWN, MODE, ENTER)
⑤	E	• Terminal for connecting power and motor grounding cables	• Size M8
⑥	CHARGE LED	• On when high voltage is charged in the main circuit capacitor in the device.	
⑦	FAN	Cooling fan	
⑧			

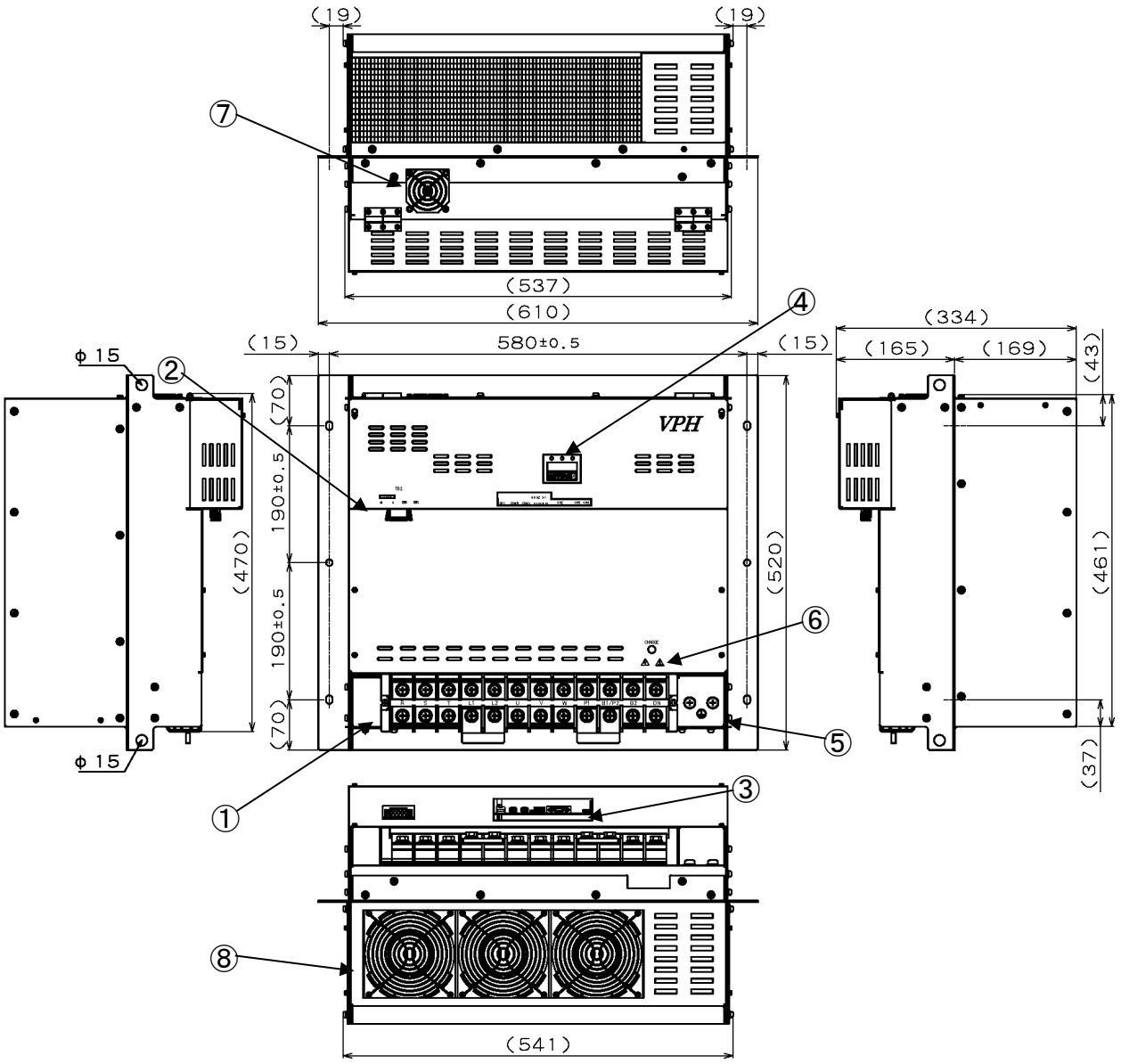


Figure 13-3 Outline drawing of the main unit of the device with 75 kW (Type 3)

Table 13-6 Name of each part

No.	Name	Function	
①	TB1	• Main power supply terminals (R, S, T) • DC reactor connection terminals (L1, L2) • Motor connection terminals (U, V, W) • Not used (P1) • Regenerative resistor connection terminals (B1/P2, B2) • Unused (DN)	• Size M8
②	TB2	• Control power supply connection terminals (r, s) • Unused (DBK, DBC)	
③	S1, S2	• Station address setting switch	
	S3	• Transmission bytes setting switch	
	CN1	• Control input/output signal connector	
	CN2	• Encoder connection connector Connect the encoder feedback input/output signals from the encoder mounted on the motor.	
	CN3	• USB communication connector Used to connect a PC on which VPH DES is installed for USB communication.	
	CN4A	• MECHATROLINK-III cable connection connector	
	CN4B	• MECHATROLINK-III cable connection connector	
④	Operation panel	LED1 - 5	• Data display LED panel for displaying the status and alarm (5 digits)
		SW	• Operation key (UP, DOWN, MODE, ENTER)
⑤	E	• Terminal for connecting power and motor grounding cables	• Size M8
⑥	CHARGE LED	• On when high voltage is charged in the main circuit capacitor in the device.	
⑦ ⑧	FAN	Cooling fan	