



OPERATING MANUAL

Tuning-free AC servo motor unit

NX Series Driver



Introduction

■ Before use

Only qualified personnel of electrical and mechanical engineering should work with the product.

Use the product correctly after thoroughly reading the section "Safety precautions." In addition, be sure to observe the contents described in warning, caution, and note in this manual.

The product described in this manual has been designed and manufactured to be incorporated in general industrial equipment. Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Structure of the manual

The **NX Series** comes with the manuals specified below.

● **NX Series OPERATING MANUAL Motor (Supplied with the product)**

This manual explains the motor functions and how to install the motor, among others.

● **NX Series OPERATING MANUAL Driver (this document)**

This manual explains the driver functions and how to install the driver, among others.

● **NX Series USER MANUAL**

This manual explains the motor and driver functions as well as how to install/connect and troubleshooting, among others.

Regulations and standards

■ UL Standard and CSA Standard

This product is recognized by UL under the UL and CSA Standards.

● **Applicable Standards**

Applicable Standards	Certification Body	Standards File No.
UL 61800-5-1 CSA C22.2 No.274	UL	E171462

● **WARNING FOR UL MARKING ON DRIVER**

- For UL standard (UL 61800-5-1), the product is recognized for the condition of Maximum Surrounding Air Temperature 50 °C (122 °F).
- Suitable For Use On A Circuit Capable Of Delivering Not More Than 5,000 A rms Symmetrical Amperes, 120 Volts or 240 Volts Maximum.
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electric Code and any additional local codes.
- Is used UL Listed Inverse Time Circuit Breaker rated 240 Vac, 15 A.
- Solid State motor overload protection is provided in each model. (NXD20-A/C)
- Solid State motor overload protection reacts at 150% FLA or less. (NXD75-S)
- Drives have no provision for motor over temperature protection. Motor over temperature protection is required at end application.
- Do not touch the connection terminals on the driver while the power is supplied or for at least 10 minutes after turning off the power. Doing so may result in electric shock.

Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

■ EU Directives

● **CE Marking**

This product is affixed the CE Marking under the Low Voltage Directive and EMC Directive.

● **Low Voltage Directive**

This product is certified by TÜV Rheinland under the EN 61800-5-1. (NXD20-A and NXD20-C only)

Applicable Standards	EN50178, EN61800-5-1
Installation conditions (EN Standard)	To be incorporated in equipment. Overvoltage category: II Pollution degree: 2 Protection against electric shock: Class I

- This product cannot be used with cables normally used for IT power distribution systems.
- Install the product within the enclosure in order to avoid contact with hands.
- Be sure to maintain a protective ground in case hands should make contact with the product.
Be sure to connect the protective earth lead of the cable for motor to the protective earth terminal on the driver, and ground the driver's protective earth terminal.
- To protect against electric shock using an earth leakage breaker (RCD), connect a type B earth leakage breaker to the primary side of the driver.
- When using a circuit breaker (MCCB), use a unit conforming to the EN or IEC standard.
- Isolate the motor cable, power-supply cable and other drive cables from the signal cables (CN1, CN4 to CN7) by means of double insulation.

● **EMC Directive**

This product has received EMC compliance under the conditions specified in "Example of installation and wiring" on the **USER MANUAL**. The conformance of your mechanical equipment with the EMC Directive will vary depending on such factors as the configuration, wiring, and layout for other control system devices and electrical parts used with this product. It therefore must be verified through conducting EMC measures in a state where all parts including this product have been installed in the equipment.

Applicable standards

EMI	EN 55011 group 1 class A
	EN 61000-6-4, EN 61800-3
	EN 61000-3-2, EN 61000-3-3
EMS	EN 61000-6-2, EN 61800-3




This product is not intended to be used on a low-voltage public network which supplies domestic premises; radio frequency interference is expected if used on such a network.

■ RoHS Directive

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).



Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

 Warning	Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.
 Caution	Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.
 Note	The items under this heading contain important handling instructions that the user should observe to ensure the safe use of the product.

Warning

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock or injury.
- Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- The terminals on the driver's front panel marked with   symbol indicate the presence of high voltage. Do not touch these terminals while the power is on to avoid the risk of fire or electric shock.
- When the driver generates an alarm (= any of the driver's protective functions is triggered), the motor will stop and lose its holding torque. Accordingly, provide measures to hold the moving part in place in the event of an alarm. Failure to do so may result in injury or equipment damage.
- When the driver's protection function is triggered, first remove the cause and then clear the protection function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.

Installation

- The driver is a Class I equipment. When installing the driver, do not touch the driver or ground the driver first. Failure to do so may cause electric shock.
- Install the driver in an enclosure in order to prevent electric shock or injury.

Connection

- Keep the driver's input-power voltage within the specified range to avoid fire and electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire and electric shock.
- Do not forcibly bend, pull or pinch the cable. Doing so may fire and electric shock.

Operation

- Turn off the driver power in the event of a power failure, or the motor may suddenly start when the power is restored and may cause injury or damage to equipment.
- Do not turn the FREE input to ON while the motor is operating. The motor will stop and lose its holding ability, which may result in injury or damage to equipment.

Maintenance and inspection

- Do not touch the connection terminals on the driver while the power is supplied or for at least 10 minutes after turning off the power. Before making wiring connections or carrying out checks, also wait for the CHARGE LED to turn off and check the voltage with a tester, etc. Failure to do so may result in electric shock.

Repair, disassembly and modification

- Do not disassemble or modify the driver. This may cause electric shock or injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

Caution

General

- Do not use the driver beyond its specifications, or electric shock, injury or damage to equipment may result.
- Keep your fingers and objects out of the openings in the driver, or fire, electric shock or injury may result.
- Do not touch the driver during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).

Installation

- To prevent the risk of damage to equipment, leave nothing around the driver that would obstruct ventilation.

Connection

- The driver's data edit connector (CN4) and analog I/O signals connector (CN6) are not insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both.

Operation

- Provide an emergency-stop device or emergency-stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Before supplying power to the driver, turn all input signals to the driver to OFF. Otherwise, the motor may start suddenly and cause injury or damage to equipment.
- When moving the motor output shaft by hand while the motor is at standstill, confirm first that the FREE input of the driver is turned ON. If the FREE input is not ON, an attempt to move the motor output shaft by hand may result in injury.
- Use a 24 VDC power supply that has been given reinforced insulation between the primary side and secondary side. Failure to do so may cause electric shock.
- Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire, electric shock or injury.
- To prevent electric shock, use only an insulated screwdriver to adjust the driver's switches.

Maintenance and inspection

- To prevent the risk of electric shock, do not touch the terminals while measuring the insulation resistance or conducting a voltage-resistance test.

Disposal

- Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

Precautions for use

- **Use the supplied cable to connect the motor and driver.**

Always use the supplied cable to connect the motor and driver. If a flexible cable or cable longer than 3 m (9.8 ft.) is to be used, an appropriate cable must be purchased separately.

- **When conducting the insulation resistance measurement and the dielectric strength test, be sure to separate the connection between the motor and the driver.**

Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.

- **Preventing electrical noise**

Refer to [USER MANUAL](#) for measures with regard to noise.

- **Saving data to the non-volatile memory**

Do not turn off the main power supply or 24 VDC power supply while writing the data to the non-volatile memory, and also do not turn off for 5 seconds after the completion of writing the data. Doing so may abort writing the data and cause an EEPROM error alarm to generate. The non-volatile memory can be rewritten approximately 100,000 times.

● Preventing leakage current

Stray capacitance exists between the driver's current-carrying line and other current-carrying lines, the earth and the motor, respectively. A high-frequency current may leak out through such capacitance, having a detrimental effect on the surrounding equipment. The actual leakage current depends on the driver's switching frequency, the length of wiring between the driver and motor, and so on.

When providing a leakage current breaker, use the following products, for example, which have high-frequency signal protection:

Mitsubishi Electric Corporation: NV series

Fuji Electric FA Components & Systems Co., Ltd.: EG and SG series

● Motor excitation at power ON

When the driver has been set to lock the servo after the motor stops in the position control mode or speed control mode: Turning on the power supply will not excite the motor. To excite the motor, you must turn the S-ON input ON.

You can set the motor to be excited automatically after the power has been turned on, by changing the applicable driver parameter using the data setter **OPX-2A** or the data setting software **MEXE02**.

● If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertial load is repeated frequently, connect an accessory regeneration unit.

The factory setting is to use the internal regeneration resistor. Note, however, that the internal regeneration resistor does not support continuous regenerative operation, gravitational operation or other operations involving up/down movements, or frequent repeating of sudden starting/stopping of a large inertial load. If any of these operations must be performed, use the accessory regeneration unit.

● Note on connecting a power supply whose positive terminal is grounded

The data edit connector (CN4) and analog I/O signals connector (CN6) are not insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both. Use the data setter **OPX-2A** to set data, etc.

Preparation

■ Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

- Driver..... 1 unit
- CN1 connector (6 pins)..... 1 pc.
- CN2 connector (3 pins)..... 1 pc.
- CN3 connector (7 pins)..... 1 pc.
- CN7 connector (36 pins)..... 1 pc.
- Connector wiring lever (for CN2, CN3)..... 1 pc.
- OPERATING MANUAL Driver (this document)..... 1 copy

■ Combinations of motors and drivers

□ indicates the cable length. ◆ indicates the gear ratio.

● Standard type

Model	Motor model	Driver model
NX45AA-□	NXM45A	NXD20-A
NX45AC-□		NXD20-C
NX410AA-□	NXM410A	NXD20-A
NX410AC-□		NXD20-C
NX620AA-□	NXM620A	NXD20-A
NX620AC-□		NXD20-C
NX640AS-□	NXM640A	NXD75-S
NX975AS-□	NXM975A	

● Standard type with electromagnetic brake

Model	Motor model	Driver model
NX45MA-□	NXM45M	NXD20-A
NX45MC-□		NXD20-C
NX410MA-□	NXM410M	NXD20-A
NX410MC-□		NXD20-C
NX620MA-□	NXM620M	NXD20-A
NX620MC-□		NXD20-C
NX640MS-□	NXM640M	NXD75-S
NX975MS-□	NXM975M	

● PS geared type

Model	Motor model	Driver model
NX65AA-PS◆-□	NXM65A-PS◆	NXD20-A
NX65AC-PS◆-□		NXD20-C
NX610AA-PS◆-□	NXM610A-PS◆	NXD20-A
NX610AC-PS◆-□		NXD20-C
NX920AA-PS◆-□	NXM920A-PS◆	NXD20-A
NX920AC-PS◆-□		NXD20-C
NX940AS-PS◆-□	NXM940A-PS◆	NXD75-S

● PS geared type with electromagnetic brake

Model	Motor model	Driver model
NX65MA-PS◆-□	NXM65M-PS◆	NXD20-A
NX65MC-PS◆-□		NXD20-C
NX610MA-PS◆-□	NXM610M-PS◆	NXD20-A
NX610MC-PS◆-□		NXD20-C
NX920MA-PS◆-□	NXM920M-PS◆	NXD20-A
NX920MC-PS◆-□		NXD20-C
NX940MS-PS◆-□	NXM940M-PS◆	NXD75-S

● PJ geared type

Model	Motor model	Driver model
NX810AA-J◆-□	NXM810A-J◆	NXD20-A
NX810AC-J◆-□		NXD20-C
NX820AA-J◆-□	NXM820A-J◆	NXD20-A
NX820AC-J◆-□		NXD20-C
NX1040AS-J◆-□	NXM1040A-J◆	NXD75-S
NX1075AS-J◆-□	NXM1075A-J◆	

● PJ geared type with electromagnetic brake

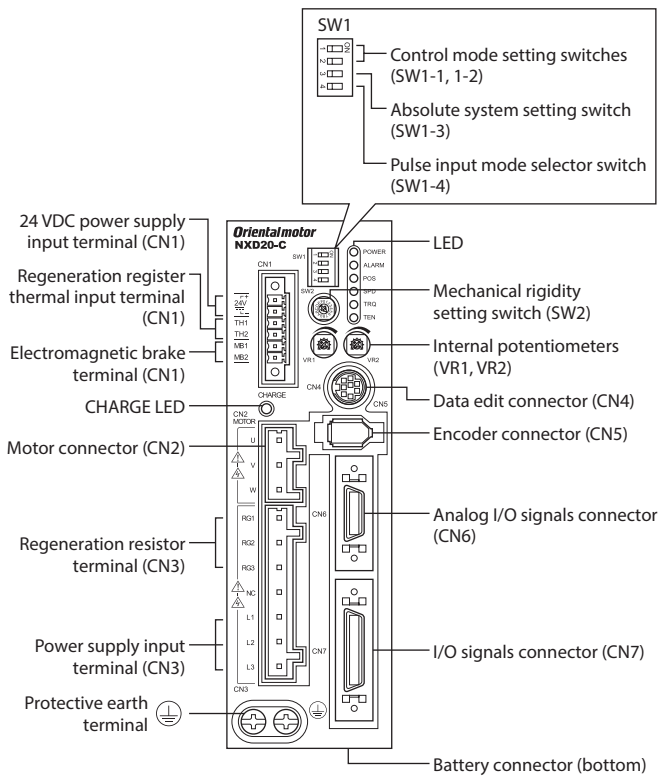
Model	Motor model	Driver model
NX810MA-J◆-□	NXM810M-J◆	NXD20-A
NX810MC-J◆-□		NXD20-C
NX820MA-J◆-□	NXM820M-J◆	NXD20-A
NX820MC-J◆-□		NXD20-C
NX1040MS-J◆-□	NXM1040M-J◆	NXD75-S
NX1075MS-J◆-□	NXM1075M-J◆	

Input/output power ratings

- indicates **A** (single shaft) or **M** (with electromagnetic brake).
- indicates the cable length.
- ◆ indicates the gear ratio.
- The model names of motors (UL recognized) apply to the condition before a gearhead is assembled.

Model	Motor model	Motor model (UL recognized)	Driver model	Input			Output			
				Voltage	Frequency	Current	Voltage	Frequency	Current	Output
NX45■A-□	NXM45■	NXM45■	NXD20-A	Single-phase 100-115 V	50/60 Hz	1.9 A	Three-phase 0-119 V	0-150 Hz	0.91 A	50 W
NX45■C-□			NXD20-C	Single-phase/ Three-phase 200-230 V		1.2 A/ 0.7 A				
NX410■A-□	NXM410■	NXM410■	NXD20-A	Single-phase 100-115 V		2.9 A	Three-phase 0-144 V		1.12 A	100 W
NX410■C-□			NXD20-C	Single-phase/ Three-phase 200-230 V		1.8 A/ 1.0 A				
NX65■A-PS◆-□	NXM65■-PS◆	NXM45■	NXD20-A	Single-phase 100-115 V		1.9 A	Three-phase 0-119 V		0.91 A	50 W
NX65■C-PS◆-□			NXD20-C	Single-phase/ Three-phase 200-230 V		1.2 A/ 0.7 A				
NX610■A-PS◆-□	NXM610■-PS◆	NXM410■	NXD20-A	Single-phase 100-115 V		2.9 A	Three-phase 0-144 V		1.12 A	100 W
NX610■C-PS◆-□			NXD20-C	Single-phase/ Three-phase 200-230 V		1.8 A/ 1.0 A				
NX620■A-□	NXM620■	NXM620■	NXD20-A	Single-phase 100-115 V		4.6 A	Three-phase 0-152 V		1.8 A	200 W
NX620■C-□			NXD20-C	Single-phase/ Three-phase 200-230 V		2.8 A/ 1.6 A				
NX640■S-□	NXM640■	NXM640■	NXD75-S	Three-phase 200-230 V	2.8 A	Three-phase 0-162 V	3.2 A	400 W		
NX810■A-J◆-□	NXM810■-J◆	NXM610■-J	NXD20-A	Single-phase 100-115 V	2.8 A	Three-phase 0-141 V	1.1 A	100 W		
NX810■C-J◆-□			NXD20-C	Single-phase/ Three-phase 200-230 V	1.8 A/ 1.0 A					
NX820■A-J◆-□	NXM820■-J◆	NXM620■-J	NXD20-A	Single-phase 100-115 V	4.6 A	Three-phase 0-152 V	1.8 A	200 W		
NX820■C-J◆-□			NXD20-C	Single-phase/ Three-phase 200-230 V	2.8 A/ 1.6 A					
NX920■A-PS◆-□	NXM920■-PS◆	NXM620■	NXD20-A	Single-phase 100-115 V	4.6 A	Three-phase 0-152 V	1.8 A	200 W		
NX920■C-PS◆-□			NXD20-C	Single-phase/ Three-phase 200-230 V	2.8 A/ 1.6 A					
NX940■S-PS◆-□	NXM940■-PS◆	NXM640■	NXD75-S	Three-phase 200-230 V	2.8 A	Three-phase 0-162 V	3.2 A	400 W		
NX975■S-□	NXM975■	NXM975■			4.7 A	Three-phase 0-160 V	5.9 A	750 W		
NX1040■S-J◆-□	NXM1040■-J◆	NXM940■-J			2.9 A	Three-phase 0-127 V	5.1 A	400 W		
NX1075■S-J◆-□	NXM1075■-J◆	NXM975■-J			4.7 A	Three-phase 0-160 V	5.9 A	750 W		

■ Names and functions of parts (Example: NXD20-C)



Name	Description
Control mode setting switches (SW1-1, 1-2)	These switches are used to set the control mode of the driver (position control, speed control, torque control or tension control).
Absolute system setting switch (SW1-3)	This switch is effective in the position control mode. Set the switch when the absolute function of the driver is used by connecting the accessory battery. ON: Enable the absolute function. OFF: Disable the absolute function. The factory setting is "OFF".
Pulse input mode selector switch (SW1-4)	In the position control mode, this switch toggles the driver between the 1-pulse input mode and 2-pulse input mode according to the pulse output mode of the controller. ON: 1-pulse input mode, negative logic. OFF: 2-pulse input mode, negative logic. The factory setting depends on the destination country.
LED	These LED indicate the status of the driver. POWER (green): This LED is lit while the main power or 24 VDC is input. ALARM (red): This LED will blink when an alarm generates (a protective function is triggered). You can check the generated alarm (triggered protective function) by counting the number of times the LED blinks. POS (green): This LED is lit in the position control mode. SPD (green): This LED is lit in the speed control mode. TRQ (green): This LED is lit in the torque control mode. TEN (green): This LED is lit in the tension control mode.
Mechanical rigidity setting switch (SW2)	<ul style="list-style-type: none"> Position control mode or speed control mode The switch sets the gain adjustment level according to the mechanical rigidity. The factory setting is "6." Torque control mode Not used. Tension control mode The switch sets the minimum speed in the simple mode. The factory setting is "6." The switch is not used in high function mode I or high function mode II.

Name	Description
Internal potentiometers (VR1, VR2)	<ul style="list-style-type: none"> Position control mode VR1: This switch sets the damping control frequency. VR2: Not used. Speed control mode VR1: This switch sets the speed command value. VR2: This switch sets the acceleration/deceleration time. Torque control mode VR1: This switch sets the torque command value. VR2: This switch sets the speed limit. Tension control mode VR1: This switch sets the tension command value. VR2: This switch sets the speed limit.
Data edit connector (CN4)	Connect a PC in which the data setting software MEXE02 has been installed, or the data setter OPX-2A .
Encoder connector (CN5)	Connect the motor encoder via a cable for encoder.
Analog I/O signals connector (CN6)	Connect the analog I/O signals.
I/O signals connector (CN7)	Connect the I/O signals of the controller.
24 VDC power supply input terminal (CN1) [24V]	Connect 24 VDC. Once a 24 VDC power supply is connected, you can check the contents of alarms that have generated even when the main power is cut off. If a motor with an electromagnetic brake is used, be sure to connect a 24 VDC power supply for the electromagnetic brake power.
Regeneration resistor thermal input terminal (CN1) [TH1, TH2]	Connect the accessory regeneration unit. If no regeneration unit is connected, plug in the CN1 connector to short the TH1 and TH2 terminals.
Electromagnetic brake terminal (CN1) [MB1, MB2]	Connect the lead wires from the cable for electromagnetic brake (24 VDC). MB1: Electromagnetic brake – (black) MB2: Electromagnetic brake + (white)
CHARGE LED (red)	This LED is lit while the main power is input. After the main power has been turned off, the LED will turn off once the residual voltage in the driver drops to a safe level.
Motor connector (CN2)	Connect the cable for motor or cable for flexible motor to connect the motor. Phase U: Red Phase V: White Phase W: Black
Regeneration resistor terminal (CN3) [RG1, RG3]	When using the internal regeneration resistor, short the RG2 and RG3 terminals using a jumper wire supplied with the CN3 connector. If the accessory regeneration unit is used, remove the jumper wire which has shorted the RG2 and RG3 terminals, and connect the lead wires to the RG1 and RG3 terminals.
Power supply input terminal (CN3)	<ul style="list-style-type: none"> Single-phase 100-115 VAC L, N: Connect single-phase 100-115 VAC. Single-phase 200-230 VAC L1, L2: Connect single-phase 200-230 VAC. L3: Not used. Three-phase 200-230 VAC L1, L2, L3: Connect a three-phase 200-230 VAC. NC: Not used.
Protective earth terminal	Ground this terminal using a grounding wire of AWG16 (1.25 mm ²) or larger.
Battery connector	Connect the accessory battery when using the absolute function of the driver in the position control mode.

Installation

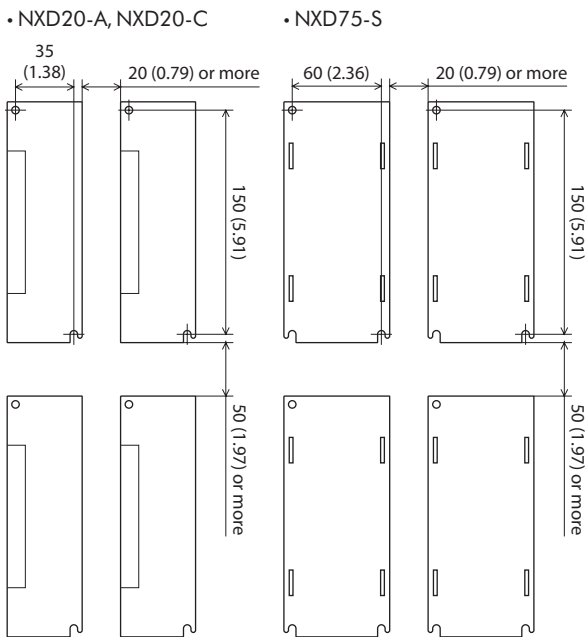
Location for installation

The driver is designed and manufactured for installation in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature 0 to +50 °C (+32 to +122 °F) (non-freezing)
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1,000 m (3,300 ft.) or lower above sea level

Installation direction

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. When two or more drivers are to be installed side by side, provide 20 mm (0.79 in.) and 50 mm (1.97 in.) clearances in the horizontal and vertical directions, respectively. When installing the driver in an enclosure, use two screws (three screws for NXD75-S) to secure the driver through the mounting holes. Screws (M4) are not supplied. Please provide separately.



Unit: [mm (in.)]



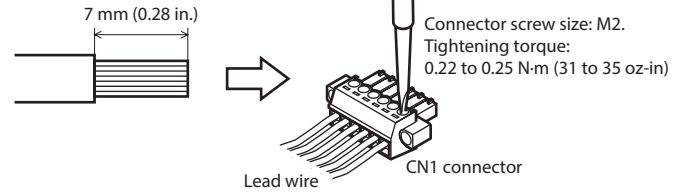
- Install the driver in an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the controller or other equipment vulnerable to heat.
- Check ventilation if the ambient temperature of the driver exceeds 50 °C (122 °F).
- Be sure to install the driver vertically (vertical position).

Connection

Connection method for connectors

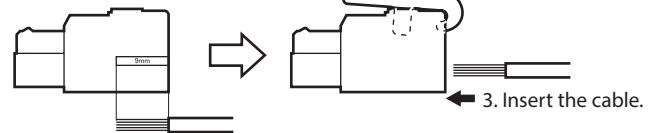
Wiring the CN1 connector

1. Strip the insulation cover of the lead wire by 7 mm (0.28 in.)
2. Insert each lead wire into the CN1 connector and tighten the screw using a screwdriver

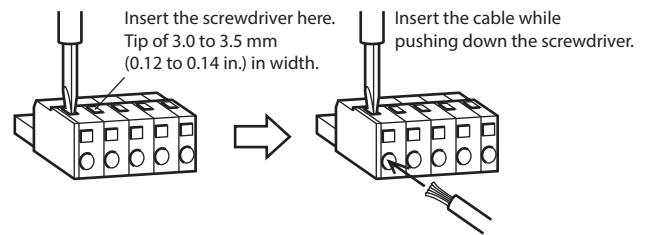


Wiring the CN2/CN3 connectors

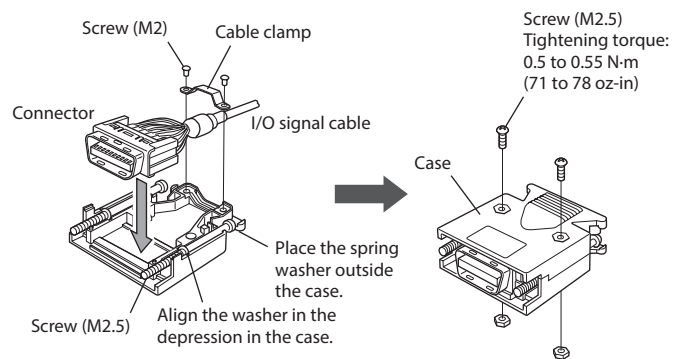
1. Strip off the cable sheath based on the strip gauge.
2. Push the connector wiring lever in the direction of the arrow.



You can also use a flat-tip screwdriver.

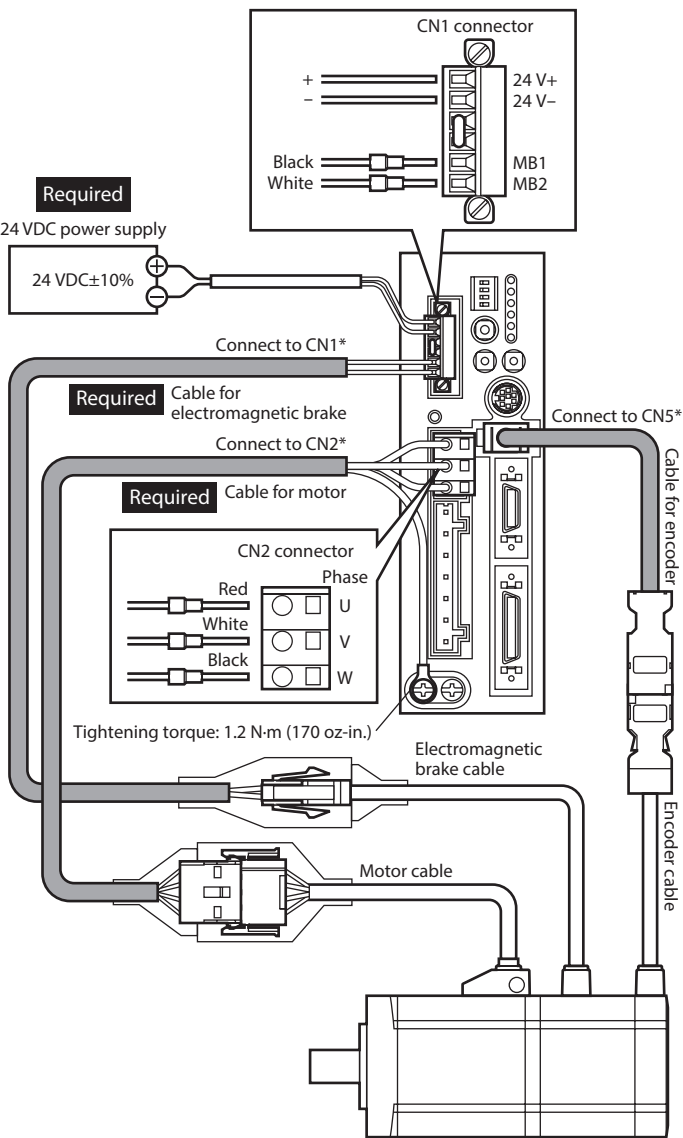


Wiring the CN6/CN7 connectors



■ Connecting the motor

● Connection example (The electromagnetic brake motor)



* Cables represented in gray color are supplied with the product or sold separately. Keep 20 m (65.6 ft.) or less for the extension length between the motor and driver.



- The lead wires of the cable for electromagnetic brake have polarities, so connect them in the correct polarity. If the lead wires are connected with their polarities reversed, the electromagnetic brake will not operate properly.
- Have the connector plugged in securely. Insecure connector connection may cause malfunction or damage to the motor or driver.
- When plugging/unplugging the connector of the motor cable, turn off the power and wait for the CHARGE LED to turn off. The residual voltage may cause electric shock.

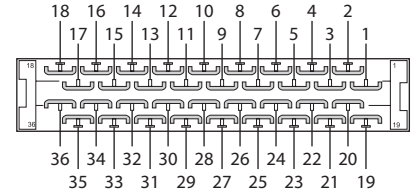


When installing the motor to a moving part, use an accessory flexible cable offering excellent flexibility.

■ Connecting the I/O signals

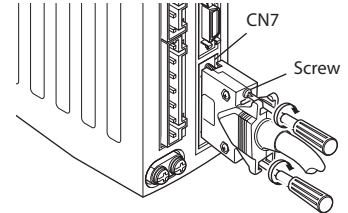
Solder the I/O signal cable (AWG28 to 24: 0.08 to 0.2 mm²) to the CN7 connector (36 pins). Use a shielded cable for I/O signals.

Connector pin assignment (viewed from soldering side)



● Connecting the connector (CN7)

Tightening torque:
0.3 to 0.35 N-m (42 to 49 oz-in)



Be certain the I/O signals cable is as short as possible. The maximum input frequency will decrease as the cable length increases.

● Connector function table (Position control mode)

Pin No.	Signal name	Name
1	—	—
2	GND	Ground connection
3	ASG+	A-phase pulse line-driver output
4	ASG-	A-phase pulse line-driver output
5	BSG+	B-phase pulse line-driver output
6	BSG-	B-phase pulse line-driver output
7	ZSG1+	Z-phase pulse line-driver output
8	ZSG1-	Z-phase pulse line-driver output
9	ALM+	Alarm output
10	ALM-	Alarm output
11	WNG+/MOVE+*/MBC+*	Warning output/ Motor moving output*/ Electromagnetic brake control signal output*
12	WNG-/MOVE-*/MBC-*	Warning output/ Motor moving output*/ Electromagnetic brake control signal output*
13	END+	Positioning complete output
14	END-	Positioning complete output
15	READY+/AL0+*/P-OUTR+	Operation ready complete output/ Alarm code output bit 0*/ Position data output ready output
16	READY-/AL0-*/P-OUTR-	Operation ready complete output/ Alarm code output bit 0*/ Position data output ready output
17	TLC+/AL1+*/P-OUT0+	Torque limit output/ Alarm code output bit 1*/ Position data output bit 0
18	TLC-/AL1-*/P-OUT0-	Torque limit output/ Alarm code output bit 1*/ Position data output bit 0
19	ZSG2+/NEAR+*/AL2+*/P-OUT1+	Z-phase pulse open-collector output/ Near position output*/ Alarm code output bit 2*/ Position data output bit 1
20	ZSG2-/NEAR-*/AL2-*/P-OUT1-	Z-phase pulse open-collector output/ Near position output*/ Alarm code output bit 2*/ Position data output bit 1
21	GND	Ground connection
22	IN-COM	Input common
23	S-ON	Servo on input
24	CLR/ALM-RST/P-CK	Deviation clear input/ Alarm reset input/ Position data transmission clock input
25	P-REQ	Position data request input
26	TL	Torque limit enable input

Pin No.	Signal name	Name
27	M0	Data selection input
28	M1	
29	P-PRESET	Position preset input
30	FREE	Shaft free input
31	CW+/PLS+	CW pulse input/Pulse input
32	CW-/PLS-	
33	CW+24 V/PLS+24 V	CW pulse/pulse input for 24 V
34	CCW+24 V/DIR+24 V	CCW pulse input/direction input for 24 V
35	CCW+/DIR+	CCW pulse input/Direction input
36	CCW-/DIR-	

* The signal will become effective if the applicable setting has been changed using the data setter **OPX-2A** or the data setting software **MEXE02**.



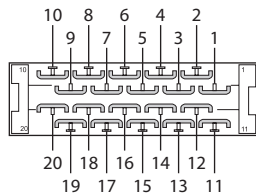
Functions of the connector vary depending on the control mode. Check the [USER MANUAL](#) for other control modes except position control mode.

■ Connecting the analog I/O signals

About the connector (20 pins) for the analog I/O connector (CN6), use the accessory set (Accessory).

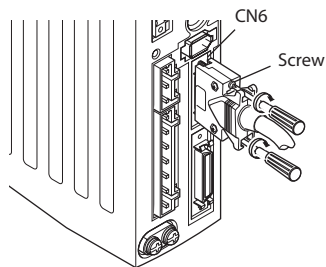
Solder the analog I/O cable (AWG28 to 24: 0.08 to 0.2 mm²) to the CN6 connector. Use a shielded cable for analog I/O signals.

Connector pin assignment
(viewed from soldering side)



● Connecting method of the connector (CN6)

Tightening torque:
0.3 to 0.35 N·m (42 to 49 oz-in)



● Connector function table

Pin No.	Signal name	Name	Description
1	V-REF	Analog speed (command/limit) input	Terminal used to input an analog speed (command/limit).
2	SG	Signal ground	Ground for analog I/Os.
3	P-VREF	Reference voltage output for analog speed (command/limit) input	A power supply output used to connect a variable resistor to the analog speed (command/limit) input.
4	P-TREF	Reference voltage output for analog torque (command/limit) input	Power supply output used to connect a variable resistor to the analog torque (command/limit) input.
5	T-REF	Analog torque (command/limit) input	Terminal used to input an analog torque (command/limit).
6	SG	Signal ground	Ground for analog I/Os.
7	V-MON	Analog speed monitor output	Voltage corresponding to the monitored analog speed is output from here.

Pin No.	Signal name	Name	Description
8	SG	Signal ground	Ground for analog I/Os.
9	T-MON	Analog torque monitor output	Voltage corresponding to the monitored analog torque is output from here.
10	SG	Signal ground	Ground for analog I/Os.
11 to 20	-	-	-

■ Connecting the main power supply

Use the CN3 connector (7 pins) to connect the power supply cable (AWG16 to 14: 1.25 to 2.0 mm²) to the main power supply connector (CN3) on the driver.



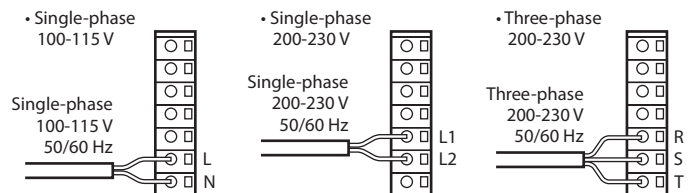
- Do not wire the power supply cable of the driver in the same cable duct with other power line or motor cable. Doing so may cause malfunction due to noise.
- Before plugging/unplugging the CN3 connector, turn off the power and wait for the CHARGE LED to turn off. Failure to do so may cause electric shock due to residual voltage.



The current capacity for the power supply as shown below is the value when operating the motor in the continuous duty region. When operating in the limited duty region, the current will flow maximum three times as much as the continuous region. Refer to the [USER MANUAL](#) for the continuous duty region and limited duty region.

● The current capacity for the power supply

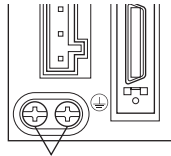
Model	Single-phase 100-115 V	Single-phase 200-230 V	Three-phase 200-230 V
NX45	1.9 A or more	1.2 A or more	0.7 A or more
NX410	2.9 A or more	1.8 A or more	1.0 A or more
NX65	1.9 A or more	1.2 A or more	0.7 A or more
NX610	2.9 A or more	1.8 A or more	1.0 A or more
NX620	4.6 A or more	2.8 A or more	1.6 A or more
NX640	-	-	2.8 A or more
NX810	2.8 A or more	1.8 A or more	1.0 A or more
NX820	4.6 A or more	2.8 A or more	1.6 A or more
NX920			2.8 A or more
NX940	-	-	2.8 A or more
NX975			4.7 A or more
NX1040			2.9 A or more
NX1075	-	-	4.7 A or more



■ Grounding the driver

Be sure to ground the protective earth terminal (screw size: M4) of the driver.
Tightening torque: 1.2 N·m (170 oz·in)

You can ground either of the two protective earth terminals. The terminal not grounded should be connected to the protective earth lead of the motor cable.



Protective earth terminal
(Ground either of the terminals.)

Use a grounding wire (AWG16 to 14: 1.25 to 2.0 mm²), and do not share the protective earth terminal with a welder or any other power equipment.
When grounding the protective earth terminal, use a round terminal and affix the grounding point near the driver.

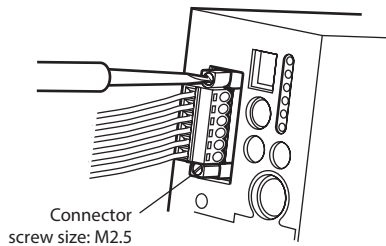
■ Connecting the 24 VDC power supply input, regeneration resistor and electromagnetic brake

Use the CN1 connector (6 pins) to connect the 24 VDC power supply input, regeneration resistor thermal input and electromagnetic brake. Connect the lead wire (AWG28 to 16: 0.08 to 1.25 mm²).

Display	Description
24V+	24 VDC power supply input
24V-	(Be sure to connect this pin when an electromagnetic brake is used.)
TH1	Regeneration resistor thermal input
TH2	(If this pin is not used, short it using a jumper wire.)
MB1	Electromagnetic brake – (Connect the black lead wire of the electromagnetic brake.)
MB2	Electromagnetic brake + (Connect the white lead wire of the electromagnetic brake.)

● Connecting method of the connector (CN1)

Tightening torque:
0.4 N·m (56 oz·in)



● Connecting the 24 VDC power supply input

Once a 24 VDC power supply is connected, you can check the contents of alarms that have generated even when the main power is cut off. Since the 24 VDC power supply is not used for operating the motor, connect it as necessary.

When the electromagnetic brake motor is used, be sure to connect the 24 VDC power supply of the following capacity.

Model	Voltage	Current capacity	
		Without electromagnetic brake	With electromagnetic brake
NX45, NX410 NX65, NX610 NX620, NX640 NX810, NX820 NX920, NX940	DC24 V±10%	0.4 A or more	0.7 A or more
NX975, NX1040 NX1075			0.8 A or more

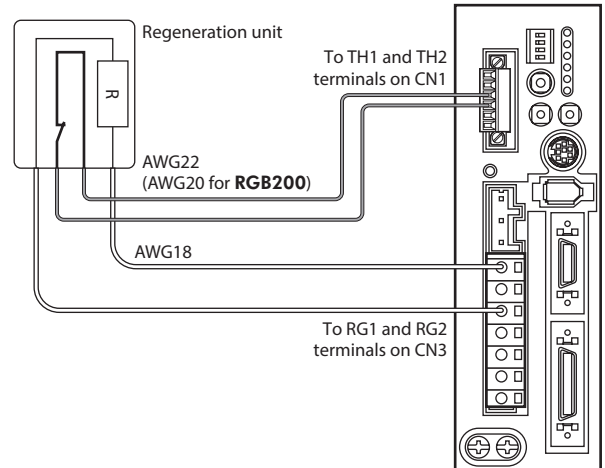
● Connecting the regeneration unit

● When the internal regeneration resistor is used

The driver has an internal regeneration resistor. The driver is shipped with the TH1 and TH2 terminals of CN1, and RG2 and RG3 terminals of CN3, shorted respectively to enable the internal regeneration resistor.

● When the accessory regeneration unit is used

Use the accessory regeneration unit if gravitational operation or other operation involving up/down movement, or sudden starting/stopping of a large inertia load, will be repeated frequently.



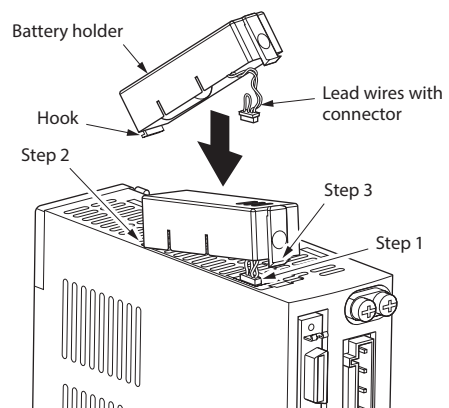
- When connecting the regeneration unit, be sure to remove the jumper wires from the CN1 connector and CN3 connector.
- If the current consumption of the regeneration unit exceeds the allowable level, the thermostat will be triggered and a regeneration unit overheat alarm will generate. If a regeneration unit overheat alarm generates, turn off the power and check the content of the error.

● Connecting the electromagnetic brake

Refer to "Connecting the motor" on p.7.

■ Connecting the battery

1. Hold the driver with its bottom facing up and plug the connector attached at the end of the battery lead wires into the battery connector.
2. Hook the tabs on the battery connector onto the mating parts on the driver.
3. Push in the battery holder carefully by ensuring that the lead wires are not pinched.

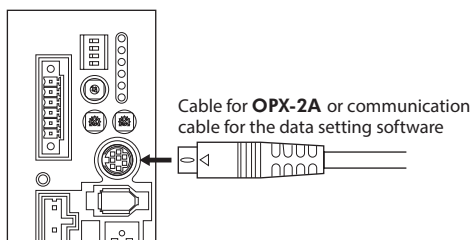


Note

- Installing or removing the battery must be performed by qualified personnel with expert knowledge of the handling of the driver and battery.
- Remove the battery if the driver is not turned on for an extended period exceeding the data retention period. Failure to do so may cause the battery fluid to leak or battery performance to drop.
- When installing or removing the battery, cut off the main power supply and 24 VDC power supply of the driver.
- Once the battery is disconnected, the absolute motor position stored in the driver will be lost. After the battery has been installed, be sure to set the absolute motor position again.

Connecting the data setter

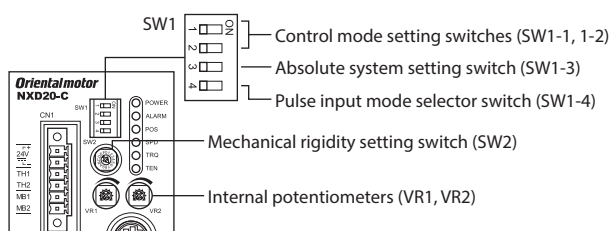
Connect the cable for **OPX-2A** or communication cable for the data setting software, to CN4 on the driver.



Caution

The driver's data edit connector (CN4) and analog I/O signals connector (CN6) are not insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both.

Setting

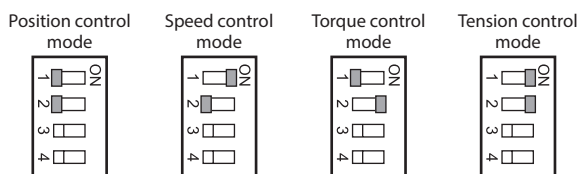


memo

The new setting of the absolute system setting switch (SW1-3) and the pulse input mode selector switch (SW1-4) will become effective after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.

Control mode setting switches (SW1-1, 1-2)

These switches are used to set the control mode of the driver (position control, speed control, torque control or tension control).



Absolute system (SW1-3)

Install the accessory battery. When the battery is connected, the current position will be retained even in the event of power outage or after the driver power is cut off.

ON: Enable the absolute function

OFF: Disable the absolute function (factory setting)



The pulse input mode (SW1-4)

ON: 1-pulse input mode, negative logic

OFF: 2-pulse input mode, negative logic

Each mode can only be set with a negative logic using the pulse input mode selector switch. To select a positive logic, set the applicable parameter using the **OPX-2A** or **MEXE02**. The factory setting depends on the destination country.



Mechanical rigidity setting switch (SW2)

What is set with this switch varies depending on the control mode.

Control mode	Description
Position control mode	The switch sets the gain adjustment level according to the mechanical rigidity.
Speed control mode	
Torque control mode	Not used.
Tension control mode	The switch sets the minimum speed in the simple mode. The switch is not used in high function mode I or high function mode II.

Internal potentiometers (VR1, VR2)

What is set with this switch varies depending on the control mode.

Control mode	Internal potentiometers	Description
Position control mode	VR1	This switch sets the damping control frequency.
	VR2	Not used.
Speed control mode	VR1	This switch sets the speed command value.
	VR2	This switch sets the acceleration/ deceleration time.
Torque control mode	VR1	This switch sets the torque command value.
	VR2	This switch sets the speed limit.
Tension control mode	VR1	This switch sets the tension command value.
	VR2	This switch sets the speed limit.

Inspection

It is recommended that periodic inspections be conducted for the items listed below after each operation of the motor.

If an abnormal condition is noted, discontinue any use and contact your nearest office.

During inspection

- Check for a blocked opening of the driver case.
- Are any of the driver mounting screws or power connection terminal screws loose?
- Are there any strange smells or appearances in the power elements and filtering capacitors within the driver?

Note

The driver uses semiconductor elements, so be extremely careful when handling them. Static electricity may damage the driver.

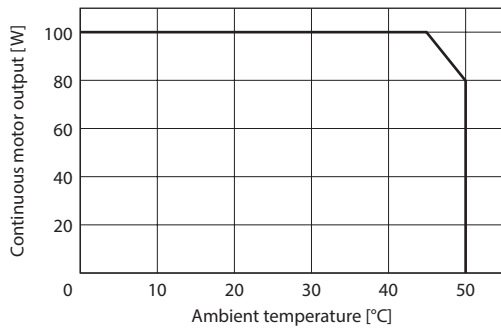
Driver specifications

Operation environment	Degree of protection	IP20
	Ambient temperature	0 to +50 °C (+32 to +122 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 1,000 m (3,300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Storage environment	Ambient temperature	-20 to +60 °C (-4 to +140 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3,000 m (10,000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Shipping environment	Ambient temperature	-20 to +60 °C (-4 to +140 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3,000 m (10,000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil

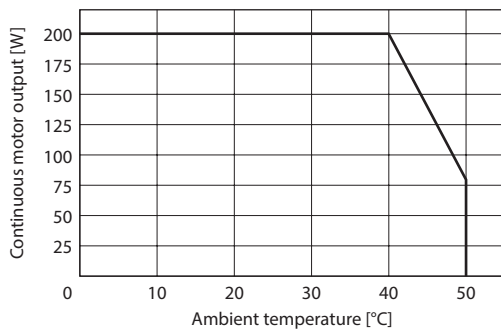
Note

- Maximum Surrounding Air Temperature 40-50 °C. When the surrounding air temperature exceeds 40 °C, continuous motor output power shall be within the derating curve. (NXD20-A and NXD20-C)
- Maximum Surrounding Air Temperature 50 °C. When the surrounding air temperature exceeds 45 °C, continuous motor output power shall be within the derating curve. (NXD75-S)

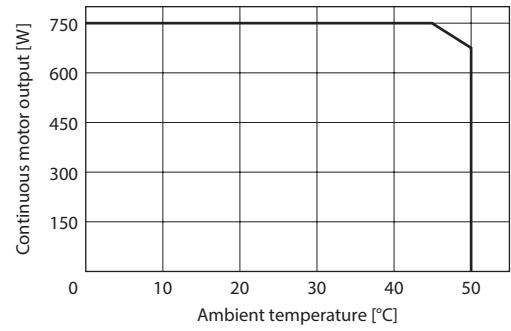
- Derating curve for continuous motor output;
Rated output: 100 W



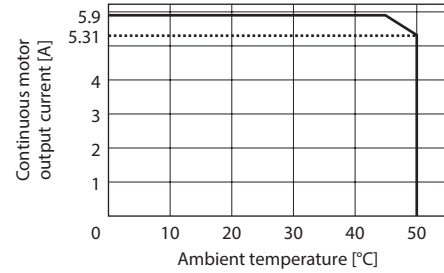
- Derating curve for continuous motor output;
Rated output: 200 W



- Derating curve for continuous motor output;
Rated output: 750 W



- Derating curve for continuous motor output;
Rated output: 750 W



- Unauthorized reproduction or copying of all or part of this manual is prohibited.
- Oriental Motor shall not be liable whatsoever for any problems relating to industrial property rights arising from use of any information, circuit, equipment or device provided or referenced in this manual.
- Characteristics, specifications and dimensions are subject to change without notice.
- While we make every effort to offer accurate information in the manual, we welcome your input. Should you find unclear descriptions, errors or omissions, please contact the nearest office.
- **Oriental motor** is registered trademark or trademark of Oriental Motor Co., Ltd., in Japan and other countries.

© Copyright ORIENTAL MOTOR CO., LTD. 2012

Published in May 2017

• Please contact your nearest Oriental Motor office for further information.

ORIENTAL MOTOR U.S.A. CORP.
 Technical Support Tel:(800)468-3982
 8:30 A.M. to 5:00 P.M., P.S.T. (M-F)
 7:30 A.M. to 5:00 P.M., C.S.T. (M-F)
www.orientalmotor.com

ORIENTAL MOTOR DO BRASIL LTDA.
 Tel:+55-11-3266-6018
www.orientalmotor.com.br

ORIENTAL MOTOR (EUROPA) GmbH
 Schiessstraße 74, 40549 Düsseldorf, Germany
 Technical Support Tel:00 800/22 55 66 22
www.orientalmotor.de

ORIENTAL MOTOR (UK) LTD.
 Tel:01256-347090
www.oriental-motor.co.uk

ORIENTAL MOTOR (FRANCE) SARL
 Tel:01 47 86 97 50
www.orientalmotor.fr

ORIENTAL MOTOR ITALIA s.r.l.
 Tel:02-93906346
www.orientalmotor.it

ORIENTAL MOTOR CO., LTD.
 4-8-1 Higashiueno, Taito-ku, Tokyo 110-8536
 Japan
 Tel:03-6744-0361
www.orientalmotor.co.jp

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
 Singapore
 Tel:1800-8420280
www.orientalmotor.com.sg

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
 Tel:1800-806161
www.orientalmotor.com.my

ORIENTAL MOTOR (THAILAND) CO., LTD.
 Tel:1800-888-881
www.orientalmotor.co.th

ORIENTAL MOTOR (INDIA) PVT. LTD.
 Tel:+91-80-41125586
www.orientalmotor.co.in

TAIWAN ORIENTAL MOTOR CO., LTD.
 Tel:0800-060708
www.orientalmotor.com.tw

SHANGHAI ORIENTAL MOTOR CO., LTD.
 Tel:400-820-6516
www.orientalmotor.com.cn

INA ORIENTAL MOTOR CO., LTD.
 Korea
 Tel:080-777-2042
www.inaom.co.kr

ORIENTAL MOTOR CO., LTD.
 Hong Kong Branch
 Tel:+852-2427-9800